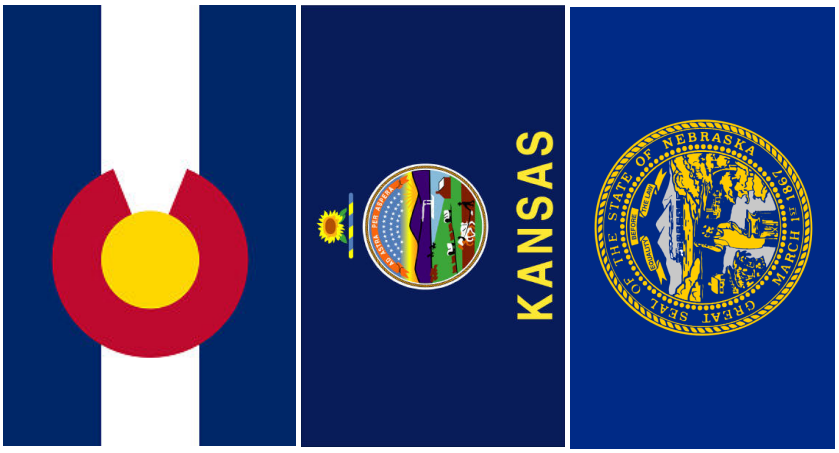
Republican River

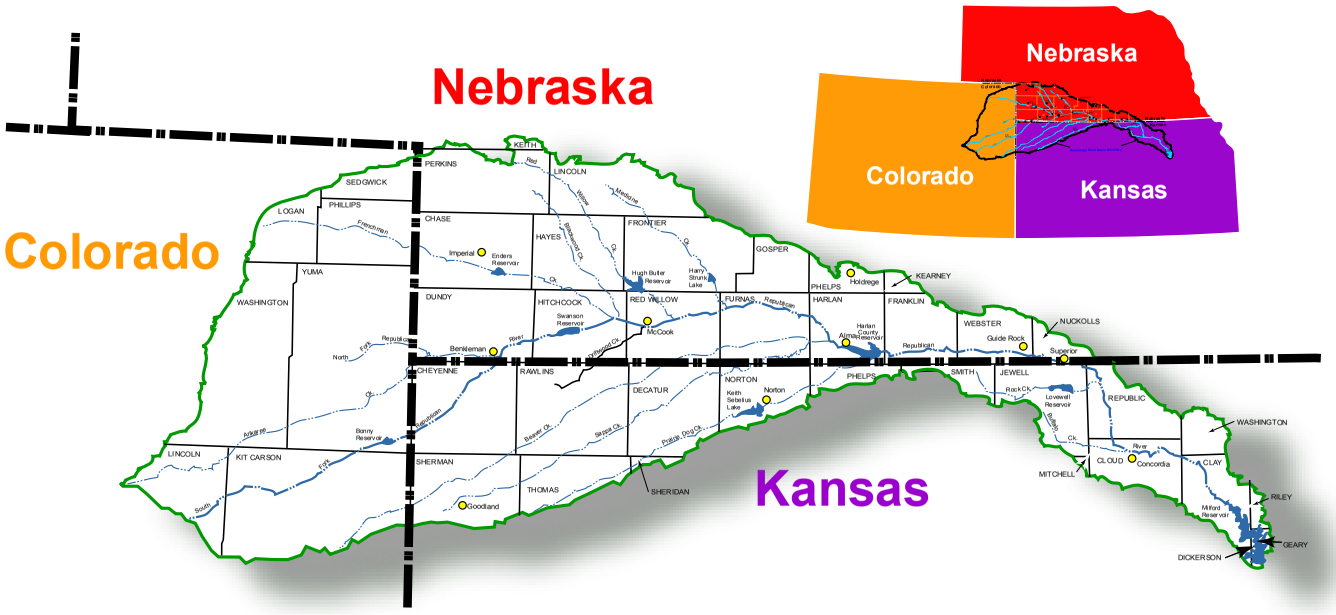
47th Annual Report for the year 2007



COLORADO KANSAS NEBRASKA

Special Meeting - Kansas City, Missouri - March 11&12, 2008
Lincoln, Nebraska - April 11 & May 16, 2008
Annual Meeting - Lincoln, Nebraska - August 13, 2008

Compact Administration



Republican River Basin

TABLE OF CONTENTS

ATTACHMENTS

INTRODUCTION

During early 2008, the Republican River Compact Administration (RRCA) met during a special meeting beginning on March 11, 2008. The meeting was continued on March 12, April 11, and May 16, 2008. The annual meeting of the RRCA was subsequently held on August 13, 2008, in Lincoln, Nebraska.

This annual report contains minutes of the meetings. The respective agendas and transcripts from the special meeting and the annual meeting are attached, along with supporting documents.

Summary of Actions

Special Meeting March 11, 2008 – Kansas City, MO

Special Meeting March 12, 2008 – Kansas City, MO

- Colorado moved to continue the meeting April 11, 2008. Seconded by Kansas. Motion carried. (March 12, 2008 transcript page 179-180)

Special Meeting April 11, 1008 – Kansas City, MO

- Colorado moved to recess into the Engineering Committee meeting and hold it off the record. Seconded by Kansas. Motion passed. (April 11, 2008 transcript page 6)
- Kansas moved to continue this Compact Administration to May 15-16, 2008 in Lincoln, NE under the same conditions as this meeting and assign the Engineering Committee to continue their deliberations on the issues outlined. Seconded by Colorado. Motion passed. (April 11, 2008 transcript page 9-10)

Special Meeting May 16, 2008 – Lincoln, NE

- Kansas moved to adopt the "Resolution of the RRCA, May 16, 2008." Seconded by Colorado. Motion passed. (May 16, 2008 transcript page 12)
- Colorado moved to affirm CDR Associates of Boulder, CO remain as the person or entity to select an arbitrator or arbitrators if the states cannot agree. Seconded by Kansas. Motion passed. (May 16, 2008 transcript page 13)

Annual Meeting August 13, 2008 – Lincoln, NE

- Kansas moved to approve the meeting agenda. Colorado seconded. Agenda approved. (August 13, 2008 transcript page 5)
- Nebraska moved to approve the annual meeting minutes from August 15, 2007. Kansas seconded. (August 13, 2008 transcript page 5)
- Kansas moved to draft a letter to the Bureau to be approved by all commissioners encouraging funding of the Lower Republican Feasibility Study. Seconded by Colorado. Motion passed. (August 13, 2008 transcript page 69)
- Colorado moved to approve the engineering report and their assignments for the coming year. Seconded by Kansas. Motion passed with amended corrections. (August 13, 2008 transcript page 70)
- Kansas moved for an assignment for the engineering committee review an inventory of data exchange. Seconded by Colorado. Motion failed with opposition by Nebraska. (August 13, 2008 transcript page 73)
- Kansas moved to add to the engineering committee's assignments the language that traditionally had been in the assignment for the committee to prepare an accounting based on the currently adopted accounting procedures. Colorado seconded. Motion failed with opposition by Nebraska. (August 13, 2008 transcript page 75-76)

Summary of Actions—cont.

- Kansas moved to request the ad hoc legal committee to continue their discussions on the matter of approval of diversion in one state when used in another and provide the administration with a report on their findings and /or recommendations by November 15, 2008. Seconded by Colorado. Motion passed. (August 13, 2008 transcript page 77)
- Nebraska moved to honor Ann Salomon Bleed's service to the Republican River Compact Administration in a resolution. Kansas seconded. Motion passed. (August 13, 2008 transcript page 85)

MINUTES OF THE
SPECIAL MEETING OF THE
REPUBLICAN RIVER COMPACT ADMINISTRATION
March 11, 2008
Kansas City, Missouri

Welcome and Introductions

The special meeting of the Republican River Compact Administration (Compact) was called to order by Chairman Ann Bleed at 10:08 a.m. on March 11, 2008, at the Holiday Inn/KCI Expo Center in Kansas City, Missouri. Chairman Bleed welcomed everyone in attendance. Everyone introduced him or herself and signed the attendance sheet, which is attached as an exhibit. Attendees included:

Name	Representing
Ann Salomon Bleed	Nebraska Commissioner, Chairman
Dick Wolfe	Colorado Commissioner
David W. Barfield	Kansas Commissioner
Peter J. Ampe	Colorado Attorney General's Office
Kenneth W. Knox	Colorado Department of Water Resources
Megan A. Sullivan	Colorado Department of Water Resources
John B. Draper	Counsel, Kansas Department of Water Resources
Leland Rolfs	State of Kansas
Scott Ross	Kansas Department of Water Resources
Brad Edgerton	Nebraska Department of Natural Resources
Paul Koester	Nebraska Department of Natural Resources
Justin D. Lavene	Nebraska Attorney General's Office
James Schneider	Nebraska Department of Natural Resources
Ron Theis	Nebraska Department of Natural Resources
James R. Williams	Nebraska Department of Natural Resources

Agenda and Transcript

The agenda is included as Attachment A, and a copy of the transcript of this meeting is included as Attachment B.

Approval of Agenda

Dr. Bleed asked for any changes or additions to the agenda. Commissioner David Barfield noted that Kansas provided an alternate agenda to Nebraska at Nebraska's request that he believed was designed to clearly lay out the primary purpose of the current meeting, which Mr. Barfield stated was to consider the dispute that Kansas had and to ask for resolution from the Compact. Mr. Barfield passed out copies of the alternate agenda.

Mr. Barfield expressed that Kansas would like to receive a response to Kansas's letter, as well as to Kansas's request for a remedy to violations. He again proposed that the attendees consider the alternate agenda provided by Kansas and expressed his belief that the alternate agenda covered the same ground and sought to incorporate Colorado's items as well. Mr. Barfield expressed willingness to work under the proposed agenda, but requested that Kansas's agenda be incorporated into the minutes of the meeting.

Dr. Bleed asked for confirmation, and Commissioner Dick Wolfe confirmed that Colorado did not have any disputed issues at that point. Mr. Barfield confirmed that he was willing to work with the agenda proposed by Nebraska.

Consideration of the Disputed Issues Submitted by Nebraska and Kansas

Kansas's Issues

Mr. Barfield stated that Kansas's issues were documented in correspondence that all Compact Commissioners had and was disseminated on Kansas's website and other places. Mr. Barfield reviewed Kansas's issues, which included Kansas's belief that Nebraska had failed the first test of compliance under the settlement according to the agreed-upon data assembled by the Compact. This first test occurred in 2006, which was the first water short year. Mr. Barfield went on to state that Kansas had been shorted of water and that Kansas's water users had been injured in the Kansas Bostwick Irrigation District and the main stem Republican River. Further, Mr. Barfield expressed his belief that with lag depletions, the situation will only worsen. He also stated that there was recognition of these matters at the annual meeting, and that Kansas's Attorney General stated that Kansas would consider its options and act accordingly because it's important that the State of Nebraska get in compliance with the Compact so that Kansas can have water.

Mr. Barfield stated that on December 19, 2007, Kansas sent Nebraska a letter stating what Kansas demanded for the past violations and what Kansas believed Nebraska needed to do to get in compliance with the settlement so that Kansas gets its water. Further, he stated that there was technical analysis supporting the conclusions and what needed to occur for remedy. He stated that documentation of that analysis and model runs showed what it would take for Nebraska to get back into compliance. The letter also requested that Nebraska agree to the actions, including the recovery of economic damages for the 2005/2006 violations. Mr. Barfield stated that subsequently, Kansas asked that Nebraska either agree or provide a well-documented alternative method for compliance that would satisfy Kansas and get Nebraska to the same place that Kansas's proposed remedy would in terms of getting groundwater consumptive use to levels consistent with Nebraska's allocation in dry years, in particular.

Mr. Barfield stated that Kansas had not received anything from Nebraska until he received the notebook at the current meeting.

Colorado was invited to ask Kansas questions, but they had none.

Dr. Bleed stated that Nebraska had worked very hard since December 19, (2007) to analyze what Kansas had done.

Nebraska's Issues

Dr. Bleed stated that Nebraska had some concerns with Kansas's proposal. She expressed the belief that the Kansas modeling and scenarios used to determine the required reductions in the proposed remedy had some problems.

Firstly, Dr. Bleed stated that the scenario Kansas used to look at the target was a dry period, and so they set the target for limitations - or the amount of depletions to the stream during a dry period. Dr. Bleed went on to state that Kansas used a wet period to determine how much had to be reduced by the pumping. She expressed the belief that the problem with that is that in wet periods, depletions from the stream will be much higher because there is more water to deplete from the stream during a wet period than during a dry period. Hence, by using the wet period to set the reductions required, Dr. Bleed asserted that Kansas overestimated the reductions that needed to be required.

Secondly, Dr. Bleed stated that Nebraska attempted to replicate Kansas's modeling. She stated that the major difference that Nebraska looked at was that Nebraska used a more realistic distribution of pumping volumes. She stated that the key issue was that the distributions of pumping volumes in the alluvium along the river itself did not change greatly over time, but as development increased, it occurred more in the uplands and that had a major impact. Dr. Bleed stated that as a result, when Nebraska replicated Kansas's scenario using a 50-55 percent precipitation period for both the scenarios of the target and the reduction, they determined that the long-term five-year average was 42,300 acre-feet more than is required under the Compact.

Dr. Bleed stated that Nebraska had alternative remedies to propose for Nebraska to manage for Compact compliance. She further stated that Nebraska had been working hard over the last three years with the Upper Republican, Middle Republican, and Middle Republican Natural Resources Districts (NRDs), as well as the Tri-Basin NRD, where the mound credit is. Dr. Bleed stated that Nebraska had looked at revising the management plans in the aforementioned NRDs to achieve Compact compliance both in normal precipitation years and in dry years. She also stated that Nebraska was concerned that if there's another severe drought year like Nebraska had in 2002 that Nebraska would be in compliance in those drought years.

Dr. Bleed stated that Nebraska did several model runs to develop the plans. She described the key model run, which was for the ground model, and looked at phreatophyte use and reservoir levels from 1988 to 1991. She went on to say that the starting groundwater head levels in that model run were from Nebraska's estimate of 2007 head levels. She described the models further: pumping volumes were based on an 80 percent reduction in pumping from the baseline pumping (the baseline period was from 1998 to 2002). All pumping throughout was reduced by 20 percent, so it was 80 percent of baseline. All other inputs except the groundwater pumping volumes were based on 2006 input data. Dr. Bleed stated that the model runs used the number of irrigated acres that were developed in 2006. She went on to describe that Nebraska ran the model and came up

with the depletions to the stream from groundwater pumping, then put them into the Compact accounting sheets. For those accounting sheets, they were based on data from 1996 to 2006. That period had precipitation of about 21.06 inches, and the long-term average precipitation was about 20.98 inches. Hence, Dr. Bleed stated that Nebraska figured that was a fairly representative period. Also, she stated that Nebraska adjusted streamflows and reservoir levels to better reflect current conditions.

Dr. Bleed stated that the surface water data used was the average from 1996 to 2006. She also stated that the non-federal reservoir evaporation data was the average from 2004 to 2006. The canal diversion data was again the average of 1996 to 2006, with a few exceptions. Haigler Canal diversions were set to 4,000 acre-feet. Further, Culbertson Canal Extension was set to zero. That was the input.

Dr. Bleed went on to say the stream gaging input was the average from 1996 to 2006, except that the average from 2000 to 2006 was used for the South Fork Republican River, Beaver Creek, Sappa Creek, and Prairie Dog Creek. Any potential flood flows were set to zero.

Dr. Bleed stated that the results of the analysis were that under average precipitation conditions, a 20 percent reduction from baseline groundwater pumping provided compliance with the Compact. Again, she stated that baseline groundwater pumping was the average volume pumped in each NRD for the years 1998 to 2002.

Dr. Bleed stated that this was the result for all three states for the average for the years 2008 to 2012. She stated that the Colorado pipeline was not included. Based on these model runs, Dr. Bleed stated that Colorado would still be in a deficit situation. Further, she stated that Kansas would have a consumptive use 148,280 acre-feet under their allocation. Nebraska would have been 18,950 acre-feet under the allocation for those years. That's the individual years for the modeling Nebraska did, 2008 to 2012.

Dr. Bleed went on to say that Nebraska set the controls in the rules and regulations of the integrated management plans to achieve a 20 percent reduction in average groundwater pumping under average precipitation conditions. She stated that Nebraska was concerned about assurance that Nebraska was in compliance with the Compact in dry years. Therefore, she discussed a second control in the integrated management plans that dictates that the average net depletions due to groundwater pumping in each NRD shall be no greater than each NRD's allotted percentage of allowable groundwater depletions. She went on to explain the allowable groundwater depletions as the maximum level of depletions to streamflow from groundwater pumping that can be allowed in a given year without Nebraska exceeding its allocation. Further, she stated that the allotted percentage is based on the percentage of depletions to streamflow from groundwater pumping in each NRD for baseline years 1998 to 2002.

Dr. Bleed went on to explain that the averaging for the allowable depletions would be based on the same years as would be used to determine the average for Nebraska's compliance with the Compact. Water short years would use a two-year average. If it's not a water short year, it would be a five-year running average.

Additionally, Dr. Bleed stated that the plans have the ability to do some augmentation plans and incentive, or additional purchases of surface water. This is to provide

streamflow quickly to adjust for the varying precipitation in the basin. Dr. Bleed expressed her belief that managing groundwater wells because of the lag effect of wells is not a very responsive way to manage short-term variations in streamflow.

Dr. Bleed expressed Nebraska's belief that it's imperative that the Compact strive to ensure that the accounting is as accurate as possible. Further, she expressed Nebraska's belief that to ensure accuracy, the Compact must address accounting pertaining to the calculation of the groundwater calculated beneficial consumptive use (CBCU). She also expressed Nebraska's belief that the allocation of Harlan County Lake evaporation must be accurate and that evaporation from the non-federal reservoirs is an issue. Dr. Bleed also expressed the belief that return flows from Bureau Canals must be looked at, as well as the Haigler Canal Diversions, return flows, and wasteway returns.

Dr. Bleed expressed Nebraska's belief that there was a discrepancy between groundwater model and surface water accounting points that should be addressed. Further, she expressed concern about how the diversions and returns from the Riverside Canal are accounted for in the Compact.

Dr. Bleed asserted that the most complicated issue was the way the current accounting uses the scenarios from the groundwater modeling runs to calculate the beneficial consumptive use from groundwater well pumping and the mound credit. She stated that the current accounting procedures use two groundwater model scenarios to estimate depletions to streamflow due to groundwater pumping and that Nebraska has looked at the other alternative scenarios that could be used and that they have been discussed with the Engineering Committee. She expressed Nebraska's belief that there's no reason to believe that one alternative set is any better than another.

Dr. Bleed went on to say that Nebraska's problem is that depending on which set of scenarios is used, significantly different numbers will result. Without a reason for those different numbers, she said Nebraska has concerns. She stated that the estimates of the impact vary depending on which set of scenarios is used.

Dr. Bleed went on to discuss two sets of scenarios out of eight total that Nebraska came up with and expressed certainty that others could be developed. She explained that scenario no. 1, which may be referred to as the baseline scenario, is when there are inflows from the Platte River resulting in the mound credit in the model, and all three states' groundwater pumping is turned on. She said that the alternative is to turn off one state's groundwater pumping and compare that with the baseline run to get one answer. She said that the difference between those two scenarios is the depletion to the stream from Nebraska's groundwater pumping.

Dr. Bleed brought up another way to do the model runs, emphasizing that it is not a problem with the model itself, but with the sets of model runs being used to determine the depletions. She explained that one could turn off all the pumping and not have the mound credit importation on (so everything is off), then turn on one state's (in this case, Nebraska's) pumping and look at the difference. She stated that similar accounting procedures could be used to look at the groundwater imported water supply credit. Again, she stated the alternative sets of scenarios give dramatically different estimates of the imported water supply credit. She expressed Nebraska's belief that this needs to be addressed and a mutual agreement reached by all parties.

Dr. Bleed went on to discuss allocation of CBCU from Harlan County Lake evaporation. She stated that the current procedures allocate reservoir evaporation to Nebraska and Kansas based on diversion by the two major Bostwick districts. She brought up Kansas's argument that the current procedures unfairly allocate reservoir evaporation when one district does not divert and stated that that issue needed to be resolved.

Dr. Bleed then discussed calculation of CBCU from the evaporation from non-federal reservoirs and stated that the final settlement stipulation itself states that for purposes of Compact accounting, the states will calculate the evaporation from non-federal reservoirs located in an area that contributes runoff to the Republican River above Harlan County Lake in accordance with the methodology set forth in the Compact accounting procedures.

Dr. Bleed expressed Nebraska's belief that the final settlement stipulation language, which Nebraska believes is controlling if there's a discrepancy between the accounting procedures and the final settlement stipulation language, excludes evaporation from non-federal reservoirs below Harlan County Lake from inclusion in Nebraska's CBCU. She stated that Kansas had stated (in the Engineering Committee) that they believed that evaporation from the non-federal reservoirs located below Harlan County should be included in Nebraska's CBCU. She stated that the difference would have been 1,076 acre-feet in 2005 and 652 acre-feet in 2006.

Dr. Bleed went on to discuss procedures to estimate return flow from the Bureau of Reclamation irrigation districts. She stated that this was identified as an issue that needed to be addressed during the negotiations of the final settlement stipulation and accounting procedures. She pointed out that attachment 7 in the Republican River accounting procedures has a footnote on the table dealing with return flows that says that average field efficiencies for each district and percent loss that returns to the stream may be reviewed and, if necessary, changed by the Compact to improve the accuracy of the estimates. She expressed Nebraska's belief that this does not need to be reviewed.

Dr. Bleed then discussed procedures to estimate return flows from the Bureau of Reclamation irrigation districts and expressed Nebraska's belief that the field efficiencies and percent loss that returns to the stream must be reviewed.

Dr. Bleed then discussed accounting points and pointed out a discrepancy in the accounting points used in the groundwater model and the accounting points used for the administration of surface water. She went over several examples using a PowerPoint presentation that was provided to meeting participants in a binder published by Nebraska.

Next, Dr. Bleed discussed other issues involving Haigler Canal and Riverside Canal. She stated that current accounting procedures do not correctly account for diversions, field returns, and wasteway returns from Haigler Canal to the Arikaree sub-basin and Main Stem. Further, she stated that the current accounting procedures do not correctly account for return flows from Riverside Canal in the Frenchman Creek sub-basin. She stated that return flows are not getting accounted for in the correct sub-basin and that return flows are also underestimated because the drain return flows are not subtracted from the diversions at the head gate. She also discussed the Riverside project, which she said was similar. She stated Nebraska's belief that the return flows that go into the Main Stem

should be subtracted from the Main Stem and added back into Frenchman Creek as part of the virgin water supply.

All parties agreed to move on to agenda item IV, recognition of Nebraska's and Colorado's Compact compliance efforts, before moving to item III.C. (Colorado's issues). Colorado stated they would present their issues the following day.

Recognition of Nebraska's Compact Compliance Efforts

Dr. Bleed moved on to discuss Nebraska's compliance efforts. She stated that Nebraska had been working very hard to come into compliance with the Compact by revising the integrated management plans, reducing pumping volumes, using incentive plans to retire irrigated acres, performing vegetation management to clear the channel of vegetation, purchasing surface water, and passing legislation for future funding for other compliance efforts.

Dr. Bleed stated that the original integrated management plans were based on a 5 percent reduction in baseline pumping. After 2002 (one of the driest years in record), which was the year the settlement stipulation was signed, Dr. Bleed stated that Nebraska realized that they'd have to further reduce consumptive use. She also said that after 2002, irrigators in the basin also realized that Nebraska needed to reduce consumptive use and voluntarily made reductions in their pumping volumes.

Dr. Bleed showed a graph of the pumping from 1998 to 2006 by the Upper, Middle, and Lower Republican NRDs, including annual pumping volumes in each NRD, and the 20 percent reduction in the baseline pumping. She stated that the reduction was based on the 1998 to 2002 pumping levels and that Nebraska is requiring a 20 percent reduction in those pumping levels. Dr. Bleed stated that the only district that had controls on in 2002 was the Upper Republican NRD. However, the Middle, Lower, and Upper Republican NRDs reduced pumping. Controls went on in the Middle and Lower Republican NRDs in 2005. Dr. Bleed stated that in the last few years, the pumping volumes had been at about the 20 percent reduction level even without new controls in the integrated management plans.

Dr. Bleed discussed the Upper Republican NRD water use and the conservative nature of producers when managing their irrigation. She also discussed efforts in the Middle Republican and Lower Republican NRDs to reduce pumping. Further, she discussed the Environmental Quality Incentive Program (EQIP), in which the state produced money and signed up 12,296 acres for reduction. Some are permanently retired.

Dr. Bleed also discussed the CREP program, used to conserve irrigation water. She stated that 39,039.72 acres had been signed up in the Republican Basin and that the total reduction in irrigated acres since Nebraska signed the stipulation is 51,336 acres.

Next, Dr. Bleed discussed the legislation passed to establish a Vegetation Task Force in the state. The task force, funded with $2 million per year to do vegetation management, has cleared 3,000 acres in the channel itself between Harlan County Lake and Hardy. Dr. Bleed also discussed Nebraska's plans to go upstream from Harlan County Lake to Cambridge and further upstream to clear the channel vegetation. She stated that the focus

will be on invasive species, but that the basic purpose for the Compact is to allow the channel to have the flows go through the channel and increase the channel capacity.

Dr. Bleed discussed that Nebraska had purchased surface water to provide timely response of flows for Compact compliance. She stated that in 2006, Nebraska purchased 23,518 acre-feet of surface water and in 2007, 51,000 acre-feet of surface water. She stated that Nebraska has plans to continue to use surface water as one of the tools to respond to variability of flows in a timely manner. She also discussed legislation passed in 2007 to ensure that there would be future funding for Compact compliance. This legislation provided the NRDs the authority to issue bonds and the authority to levy taxes on irrigated acres up to $10 per acre and to levy a property tax of up to $0.10 per $100 taxable valuation to be used for Compact compliance.

Next, Dr. Bleed discussed future plans to initiate some augmentation planning. She stated that Nebraska is finalizing preliminary feasibility studies and that the sites selected would be best based on aquifer properties and location. She stated that the target completion date for the augmentation plan would be the summer of 2009. Mr. Knox asked Dr. Bleed what the monetary expenditure for the surface water allocations would be and she said that she'd get it to him at a later date.

Dr. Bleed expressed that she and the other commissioners are in agreement that successful resolution of the issues is very important for the Compact.

Damage and Accounting Issues

Dr. Bleed expressed a desire to sit down and work with Kansas's and Colorado's modelers to better understand questions on the model. She stated that Nebraska doesn't have an understanding of what Kansas used as the basis for their request for damages.

Mr. Barfield stated that Kansas's water users have been shorted substantially as a result of violations, including Kansas Bostwick Irrigation District and Kansas's users. He expressed his belief that economic damages would be appropriate to compensate Kansas for Nebraska's use of Kansas's water. He discussed the possibility of those financial damages being either Kansas's damages or Nebraska's benefit, whichever are greater in Kansas's view, in addition to the other pieces that were in the aforementioned letter.

Mr. Barfield invited John Draper (special counsel to the State of Kansas) to speak, who added that the issue of damages is an important component of the remedy that Kansas is seeking and that in the responses that Kansas has received from Nebraska, that aspect has been ignored. Mr. Draper stated that Kansas interpreted that as disagreement regarding the concept that there should be any kind of remedy for the past violations of the Compact and the FSS in 2005 and 2006. He posed the question of whether it is appropriate for a state to include some kind of remedy for a past violation.

Mr. Draper stated that the timetable that was set out in the FSS had just been reached, and that was for the water short period 2005 - 2006. He stated that as included in the transmittal, the amount of violation as Kansas calculated it was over 80,000 acre-feet during those two years.

Further, Mr. Draper stated that Kansas's understanding of the accounting issues was that they're marginal, but that there was a sizable violation that occurred in 2005 and 2006. Therefore, he stated that it would be important for Kansas, consistent with the law that applies to compacts in the U.S., to obtain an appropriate remedy for that – the past failure to comply with the Supreme Court decree.

Dr. Bleed stated that Nebraska had made no conclusion that it is not going to consider damages as part of a remedy. She stated that Nebraska needed a better understanding of what kind of damages Kansas was seeking. Mr. Draper and Dr. Bleed both clarified that Nebraska had not rejected the idea of paying damages.

Mr. Draper stated that Kansas feels it's appropriate to consider the benefits that have accrued to Nebraska as a result of the violations as the primary criteria and that compensation in some form is necessary in order to deter further noncompliance.

Justin Lavene (Nebraska Attorney General's office) stated that Nebraska needs an understanding of where Kansas is coming from regarding the aforementioned issue. Further, he stated that further articulation of those issues, including past harm to Kansas would be beneficial for Nebraska assess the situation.

Dr. Bleed expressed her belief that it would be appropriate to get together with the modeling people to better understand how Kansas was using the model and how Nebraska was using the model, and the differences therein.

Mr. Wolfe stated that though Colorado had not taken a position on damages, Colorado believes it is of great interest if damages are assessed and whether Colorado is involved in that; those types of things should be used to help bring Colorado into Compact compliance.

Questions to Nebraska

Mr. Barfield raised a question about Nebraska's assertion that Kansas used a dry period to set one criteria and a wet period to set another criteria. Mr. Barfield stated that he responded to that concern on page 2 of Kansas's February 19 letter. He stated that Kansas's methodology was not to do that.

Further, Mr. Barfield stated that Kansas took the most recent period of record and repeated it over time, and that that period included both wet and dry periods. He also stated that Kansas's analysis was focused on figuring out what Nebraska needed to do to be in compliance during dry periods. Mr. Barfield posed questions regarding the aforementioned methodology. Dr. Jim Schneider (Nebraska Department of Natural Resources) responded that the problem was with comparing what happened then to a target that's derived solely from a dry period, and that is attempting to find out what kind of groundwater pumping levels would need to be required to meet the 175,000 acre-foot target that stems from the analysis of 2002 through 2006 and counting, which Dr. Schneider and Mr. Barfield confirmed, was a dry period.

Dr. Bleed explained that if there's no water in the stream, there will be no depletions because there's no water to deplete. However, she explained that if the stream is wet, the depletions will be high because there's a larger amount of water to deplete. She stated that as a result, the amount of reduction in pumping is overestimated. Mr. Barfield expressed that Kansas looked at a period that went up and down with wet and dry, and

that the dry period was establishing the target. Dr. Bleed raised concerns about the lag effect of the impact of wells. Mr. Barfield stated that although Kansas used that replicating period to model the future, they weren't using an average of that period to really come to the conclusion that they came to, and that it was really the critical dry periods of those cycles that caused Kansas to land where it did. Mr. Barfield stated that Kansas would look at the analysis further and assess whether it says something different.

Mr. Barfield raised a question about Nebraska's difficulty in replicating the model. Dr. Schneider confirmed that though Nebraska used the same data and assumptions, a different conclusion was reached. Mr. Barfield stated that there are several assumptions that must be made to run the model. Dr. Schneider stated that though the general pattern of the results was similar, the annual output was not, and that the largest discrepancy was the methodology employed to distribute the pumping in Nebraska. Dr. Bleed stated that the model itself was probably not the problem, but the input.

Dr. Schneider stated that Nebraska took the results from the December 19 letter from Kansas's model run and compared them to the accounting for 1990-2006 as opposed as comparing them to the target Kansas developed from 2002-2006. He went on to say that Nebraska used similar assumptions, like reduction in groundwater pumping, increases in streamflow due to reductions in groundwater pumping, some of that would be diverted, but that Nebraska followed generally the same assumptions Kansas used. Dr. Schneider clarified for Mr. Barfield that the 42,300 represents the long-term average of the net for Nebraska, five-year compliance test under Kansas's modeling results as performed by Nebraska. Dr. Schneider clarified that actually, Nebraska used Kansas's results, took the output from the model run Kansas provided, the annual output, and took historic accounting data, historic surface water diversions, historical locations, and did a year-by-year analysis of what the annual balance would be for Nebraska. Further, he stated that this represented the long-term average of the five-year compliance test.

Dr. Bleed and Dr. Schneider clarified that to develop the integrated management plans, Nebraska looked at the total amount of pumping on average for the 1998-2002 period and looked at what percent of that total pumping was done by the Upper Republican, Middle Republican, and the Lower Republican. Further, this was considered baseline pumping, which is what Nebraska reduced from. Dr. Bleed also stated that the NRDs had to reduce pumping levels by 20 percent. She also stated that while Nebraska looked at other percentages, 20 percent is what the modeling suggested would get Nebraska into compliance in the not-too-distant future during average precipitation years. Dr. Bleed also acknowledged that as the lag effect changes in the future, things may have to change, but that the compliance plans are set for the next five years. She stated that Nebraska will then revisit and make changes later if needed. Dr. Bleed confirmed that the base period was used to distribute the pumping goals. When figuring out pumping reductions, it was tied to the pumping volume total, distributed by the number of acres being irrigated. Further, she stated that it was not necessarily based on the allocation at a given time.

Dr. Schneider confirmed that in the integrated management plan run, the precipitation data were based on long-term average precipitation, and that average precipitation every year was assumed. Average pumping was also assumed. Further, Dr. Schneider confirmed that once Nebraska took the model output and put it into what Nebraska felt was the correct accounting analysis, Nebraska was in compliance.

Dr. Bleed and Mr. Barfield confirmed that Nebraska has to be in compliance in dry years, but the aforementioned procedures have determined the base for the normal long-term average.

Dr. Schneider stated that return flows were based on the pumping volumes and Mr. Barfield responded that Kansas does not believe that assumption is appropriate since as people go to allocation systems, they become much more efficient in their operations to maintain economic viability. Further, Mr. Barfield expressed his belief that the accounting needs to account for that.

In response to Mr. Barfield's question, Dr. Bleed stated that the long-term average of the integrated management plans has to show a reduction of 20 percent from the baseline in pumping. Further, she stated that the critical standard in the dry year is that each NRD must make sure that their net depletions to streamflow are no greater than their allotted percentage of the total depletions. Again, she stated that that percentage was based on the baseline usage from 1998-2002, and that that criterion is looked at on an average basis, with the average depending on whatever average is being used for those same years in the Compact.

Compliance During Water Short Years

Dr. Bleed stated that various ways of augmenting streamflow may be looked into, or purchases of surface water. She stated that if the concept is to get the background pumping or the overall pumping down to a level so that on short notice, these other methodologies may be used to ensure that the net depletions are not greater than their allotted percentage of the allowable groundwater pumping. She also stated that Nebraska struggles with this with the integrated management plans with the lag effect from pumping wells. Dr. Bleed also stated that if augmented streamflow is needed, Nebraska will then have to work out some kind of understanding through dry year leasing or an augmentation pipeline plan to make sure that the net depletions are within that allowable percentage by NRD.

Mr. Barfield, Dr. Bleed, and Dr. Schneider discussed details of the Nebraska Integrated Management Plans, overall pumping limits, allowable depletions, and timetables for review. Dr. Bleed described the annual forecast process in Nebraska, and stated that the pumping allowable in the five-years may be adjusted during the effective time on an as-needed basis.

Dr. Bleed stated that a surface water purchase was being contemplated for 2008.

Discussion of Accounting Issues

Mr. Barfield and Dr. Schneider discussed details regarding the issues Nebraska raised with the way the groundwater model is used to determine consumptive use of groundwater by the respective states and the imported water supply credit.

Mr. Barfield described Kansas's concern with the current accounting for evaporation from Harlan County Lake when only one state used water for irrigation. Kansas

suggested that assignment of evaporation should be a constant value based on historical usage of the water.

Evaporation from non-federal reservoirs was discussed, along with Haigler Canal accounting, and the location of selected accounting points within the groundwater model.

Additional Compliance Issues

The states reviewed the decrease in pumping in recent years, and voluntary programs to cease irrigation. They also reviewed the availability of surface water for purchase for the purpose of Compact compliance. The provisions of LB 701 and the new tools available for compliance were discussed, along with the court challenge to taxing provisions in the bill.

Adjournment

After discussing the possible next steps that could be taken, the meeting adjourned at 3:43 p.m.

MINUTES OF THE
CONTINUATION OF THE
SPECIAL MEETING OF THE
REPUBLICAN RIVER COMPACT ADMINISTRATION
March 12, 2008
Kansas City, Missouri

Introductions

The continuation of the special meeting of the Republican River Compact Administration (Compact) was called to order by Chairman Ann Bleed at 8:37 a.m. on March 12, 2008, at the Holiday Inn/KCI Expo Center in Kansas City, Missouri. Attendees included:

Name	Representing
Ann Salomon Bleed	Nebraska Commissioner, Chairman
Dick Wolfe	Colorado Commissioner
David W. Barfield	Kansas Commissioner
Peter J. Ampe	Colorado Attorney General's Office
Kenneth W. Knox	Colorado Department of Water Resources
Megan A. Sullivan	Colorado Department of Water Resources
John B. Draper	Counsel, Kansas Department of Water Resources
Leland Rolfs	State of Kansas
Scott Ross	Kansas Department of Water Resources
Brad Edgerton	Nebraska Department of Natural Resources
Paul Koester	Nebraska Department of Natural Resources
Justin D. Lavene	Nebraska Attorney General's Office
James Schneider	Nebraska Department of Natural Resources
Ron Theis	Nebraska Department of Natural Resources
James R. Williams	Nebraska Department of Natural Resources

Agenda and Transcript

The agenda is included as Attachment A. A copy of the transcript of this meeting is included as Attachment C.

Colorado Augmentation Plan

Dr. Bleed turned the meeting over to Commissioner Dick Wolfe to give a presentation on the pipeline augmentation plan that Colorado is proposing. Colorado gave a lengthy and very informative presentation and the states discussed possible augmentation plan details and issues.

Additional Meetings and Adjournment

After a break, Dr. Bleed announced that the Compact would be continuing this special meeting on April 11, followed by an Engineering Committee meeting, and a continuation of the Compact's special meeting on May 15-16. The issues discussed at this meeting were assigned to the Engineering Committee to review Colorado's proposed augmentation plan for further clarification.

The meeting adjourned at 12:23 p.m.

MINUTES OF THE
CONTINUATION OF THE
SPECIAL MEETING OF THE
REPUBLICAN RIVER COMPACT ADMINISTRATION
April 11, 2008
Kansas City, Missouri

Introductions

The continuation of the special meeting of the Republican River Compact Administration (Compact) was called to order by Chairman Brian P. Dunnigan at 8:14 a.m. on April 11, 2008, at the Holiday Inn/KCI Expo Center in Kansas City, Missouri. Attendees included:

Name	Representing
Brian P. Dunnigan	Nebraska Commissioner, Chairman
Dick Wolfe	Colorado Commissioner
David W. Barfield	Kansas Commissioner
Peter J. Ampe	Colorado Attorney General's Office
Kenneth W. Knox	Colorado Department of Water Resources
Megan A. Sullivan	Colorado Department of Water Resources
Dale Book	Spronk Water Engineers/Consultant to Kansas
John B. Draper	Counsel, Kansas Department of Water Resources
Scott Ross	Kansas Department of Water Resources
Brad Edgerton	Nebraska Department of Natural Resources
Paul Koester	Nebraska Department of Natural Resources
Justin D. Lavene	Nebraska Attorney General's Office
James Schneider	Nebraska Department of Natural Resources
Ron Theis	Nebraska Department of Natural Resources
James R. Williams	Nebraska Department of Natural Resources

Agenda and Transcript

The agenda is included as Attachment D. A copy of the transcript of this meeting is included as Attachment E.

Approval of Agenda

After the introductions were made, Mr. Dunnigan asked for comments on the agenda. Commissioner David Barfield indicated that for the record the majority of the agenda would be discussed by the Engineering Committee. The Republican River Compact Administration (Compact) accepted motions to recess into the Engineering Committee at 8:19 a.m.

Discussion of Future Meeting Dates and Data Exchange

Proceedings of the special meeting of the Compact reconvened at 2:17 p.m.

Mr. Barfield moved that the special meeting of the Compact be continued in Lincoln, Nebraska May 15-16, 2008. Commissioner Dick Wolfe seconded the motion.

Mr. Wolfe stated for the record that he delivered a letter to Mr. Dunnigan and Mr. Barfield, pursuant to Section VII.A.3 of the final settlement stipulation, requesting approval of Colorado's Compact compliance pipeline as part of their augmentation plan. Both Mr. Dunnigan and Mr. Barfield indicated that by their receipt of the letter, they were not necessarily expressing approval or disapproval of the request.

Mr. Barfield brought up the original agenda item 6a, Accounting for Imported Water Supply Credit and Ground Water Computed Beneficial Consumptive Use. He stated that it appears that Nebraska did not have a specific proposal on the table. Dr. Jim Schneider indicated that an alternate method of accounting had indeed been presented.

Justin Lavene stated that Nebraska had not received any feedback with questions on specific issues. Mr. Lavene asked for feedback. John Draper asked that Nebraska present specific proposals to the Compact and further consideration would be reviewed if necessary.

Adjournment

The meeting was adjourned at 2:36 p.m.

MINUTES OF THE
CONTINUATION OF THE
SPECIAL MEETING OF THE
REPUBLICAN RIVER COMPACT ADMINISTRATION
May 16, 2008
Lincoln, Nebraska

Introductions

The continuation of the special meeting of the Republican River Compact Administration was called to order by Chairman Brian P. Dunnigan on May 16, 2008, at the Holiday Inn, in Lincoln, Nebraska. Chairman Dunnigan indicated that this meeting was a continuation of the meetings held on March 11-12 and April 11, 2008. Attendees included:

Name	Representing
Brian P. Dunnigan	Nebraska Commissioner, Chairman
Dick Wolfe	Colorado Commissioner
David W. Barfield	Kansas Commissioner
Peter J. Ampe	Colorado Attorney General's Office
Kenneth W. Knox	Colorado Department of Water Resources
Megan A. Sullivan	Colorado Department of Water Resources
John B. Draper	Kansas Department of Water Resources
Scott Ross	Kansas Department of Water Resources
Leland Rolfs	State of Kansas
Brad Edgerton	Nebraska Department of Natural Resources
Paul Koester	Nebraska Department of Natural Resources
Justin D. Lavene	Nebraska Attorney General's Office
James Schneider	Nebraska Department of Natural Resources
James R. Williams	Nebraska Department of Natural Resources

Transcript

There was no agenda approved or referred to in the transcript; a statement regarding the agenda is included as Attachment F. A copy of the transcript of this meeting is included as Attachment G.

Opening Remarks

Mr. Dunnigan stated his appreciation for the series of the special meetings and that the meetings had been helpful for the parties.

Commissioner David Barfield indicated that this series of special meetings has been driven by Kansas's concerns with Nebraska's non-compliance with the Compact and the settlement. Mr. Barfield stated that Kansas had formally submitted the matter to the Compact.

Commissioner Dick Wolfe thanked his staff for their efforts and asked to recognize the Republican River Water Conservation District for theirs efforts as well. Mr. Wolfe noted that the Colorado Legislature did approve a $60.6 million dollar loan to the Republican River Water Conservation District as part of their $71 million dollar loan package for construction and operation of the pipeline that had been discussed previously. Mr. Wolfe also reported that they had recently filed with the Colorado Secretary of State for promulgation of well measurement rules in the Republican River Basin. That hearing is to be held July 2-3, 2008 to seek approval for rules requiring measuring devices on all high capacity wells in the Republican River Basin.

Engineering Committee Report

James Williams, Chair of the Engineering Committee, reported that three items would be discussed in the annual Engineering Committee Report when presented at the Annual Meeting. The first item would refer to return flows from canals fed by Bureau of Reclamation projects. The Engineering Committee was in agreement regarding two additional agreements. First of all, the groundwater model cell representing the accounting point at the Guide Rock Diversion Dam is going to be moved upstream two miles to match the location of the Guide Rock Diversion Dam. Secondly, on the Riverside Canal, a portion of the return flows from the fields goes back into the Frenchman Creek sub-basin above the gauge, the stream gauge there and a portion goes into the main stem of the Republican River. The Engineering Committee has agreed that those return flows should be accounted for in the proper basin. That percentage is going to be based on the portion of lands above the gauge and in the main stem.

Dispute Resolution

Mr. Barfield stated that Kansas, Colorado, and Nebraska have discussed three items for dispute resolution. Mr. Dunnigan read the resolution. The motion to accept the resolution passed. A copy of the fully signed resolution is included as Attachment H.

Mr. Wolfe offered the following resolution for consideration by the Compact, "Pursuant to Subsection VII.C.2 of the FSS, the RRCA hereby affirms that CDR of Boulder, Colorado, remains the person or entity that will select an arbiter or arbiters if the states cannot agree on an arbiter or arbiters pursuant to the dispute resolution process of the FSS."

The motion to accept the resolution passed.

Adjournment

It was confirmed that the next meeting of the Compact would be the Annual Meeting held in Lincoln, Nebraska, August 13, 2008.

The meeting was adjourned at 10:03 a.m.

MINUTES OF THE
ANNUAL MEETING OF THE
REPUBLICAN RIVER COMPACT ADMINISTRATION
August 13, 2008
Lincoln, Nebraska

Introductions

The 48th annual meeting of the Republican River Compact Administration (Compact) was called to order by Chairman Brian P. Dunnigan at 8:47am on August 13, 2008, at the Downtown Holiday Inn, in Lincoln, Nebraska. Mr. Dunnigan welcomed everyone in attendance. Each Commissioner introduced key staff and representatives of various water districts. Attendees included:

Name	Representing
Brian P. Dunnigan	Nebraska Commissioner, Chairman
Dick Wolfe	Colorado Commissioner
David W. Barfield	Kansas Commissioner
Peter J. Ampe	Colorado Attorney General's Office
John M. Cassidy	Colorado Attorney General's Office
Kenneth W. Knox	Colorado Department of Water Resources
Megan A. Sullivan	Colorado Department of Water Resources
John B. Draper	Kansas Department of Water Resources
Scott Ross	Kansas Department of Water Resources
Brad Edgerton	Nebraska Department of Natural Resources
Justin D. Lavene	Nebraska Attorney General's Office
James R. Williams	Nebraska Department of Natural Resources

Agenda and Transcript

The agenda is included as Attachment I. A copy of the transcript of this meeting is included as Attachment J.

Approval of Agenda

Commissioner David Barfield moved to approve the agenda after clarification of items 6(c) and 8(b). Commissioner Dick Wolfe seconded the motion. The agenda was approved as proposed with all commissioners in favor.

Approval of Minutes

Mr. Dunnigan moved to approve the annual minutes of the August 15, 2007, meeting. Mr. Barfield seconded the motion. The previous minutes were approved with all commissioners in favor.

Report of the Commissioner from Nebraska

Mr. Dunnigan gave the report for Nebraska with Brad Edgerton reporting on the water administration activities in Nebraska for calendar year 2007. Mr. Dunnigan stated that Nebraska has made significant progress toward compliance of the Compact. The natural resource districts, surface water irrigation districts and the Nebraska Department of Natural Resources worked with the citizens to decrease consumptive use of water in the basin. The efforts were aided by high rainfall during 2007 and 2008 and stream flows recovered as a result.

New integrated management plans were approved in the Lower, Middle and Upper Republican Natural Resource Districts (NRDs). Allocations decreased in all three districts and additional measures were added to ensure compliance by decreasing consumptive use.

Substantial amounts were paid by Nebraska and the three NRDs during 2007 for the leasing of water rights within the Republican Basin. Nebraska estimated their dry-year leasing of surface water decreased consumptive use by more than 50,000 acre-feet during 2007 and provided more than 39,000 acre-feet to Kansas.

Nebraska reported that Water Short Year Administration was not in effect in the Republican River Basin during 2008. Nebraska carried out the following measures to avoid a water short year during 2008 and make more water available downstream. The Riverside Canal Company agreed to forego diversion from Frenchman Creek during the 2008 irrigation season. According to Nebraska, this action ensured maintaining 2,000 acre-feet in the river above Harlan County Lake, not diverting into Riverside Canal. This reduced Nebraska's consumptive use in the Frenchman sub-basin. Second, an agreement was made with Frenchman Valley Irrigation District. An estimated 8,000 acre-feet remained in the river above Harlan County Lake which would have otherwise been diverted into the Culbertson Canal thus reducing Nebraska's consumptive use. In addition, the irrigation district also agreed to not divert water to the Cambridge Canal until June 22, 2008, to increase Harlan County Lake water storage. Thus an additional 5,000 acre-feet was available for storage in Harlan County Lake that otherwise would have been diverted. Combined, these measures more than avoided water short year status.

Funding of $1.63 million for dry-year leasing of surface water was provided by the Nebraska Legislature through LB 701's Water Resources Cash Fund. LB 701 was a comprehensive water law that enabled the NRDs to levy additional taxes for local support of measures for Compact compliance. A lawsuit was filed challenging the taxation authority of LB 701 halting payments for contracts for $9 million made by NRDs with surface water irrigators to obtain rights to reduce consumptive use of water in the basin in 2007. The Nebraska Legislature responded by passing LB 1094 in 2008 creating a method to ensure immediate payment of state funds for obligations made in 2007 by NRDs for Compact compliance. If the challenge to LB 701 succeeds, the Nebraska Department of Natural Resources anticipates the Legislature will provide additional funding options to implement integrated management plans (IMPs).

LB 701 also put into place a comprehensive planning approach for riparian vegetation and created a task force committee including $2 million per year for management of invasive species. The task force contracted for services to remove excessive phreatophytes along the Republican River.

Nebraska stated that it continues to explore stream augmentation and to participate in CREP and EQIP, which have removed nearly 38,000 acre-feet from production. In addition, Nebraska continues to take an active role with the Compact's Engineering Committee and is working with other states to develop more accurate accounting methods.

The Bureau of Reclamation placed a call on all appropriated reservoirs above Swanson Lake, Enders Reservoir, Hugh Butler Lake, and Harry Strunk Lake on August 25, 2006, that continued into 2007.

Harry Strunk Lake was filled in March, 2007, and those junior reservoirs upstream of Harry Strunk Lake were opened. On March 8, 2007, letters were sent to all junior permit holders between Harlan County Lake and Guide Rock Diversion Dam informing them of the potential for water short year administration during 2007. Shortly after a high water event on Frenchman Creek, the Nebraska Department of Natural Resources declared the dam at Champion Lake to be unsafe. On June 15, 2007, an order was issued to evacuate all the storage water in that facility. That order was still in effect on the day of the meeting (August 13, 2008).

On June 30, 2007, the irrigation supply in Harlan County Reservoir was estimated by Reclamation to be less than 130,000 acre-feet. On July 4, 2007, senior permits were regulated and closing notices were issued to all permits junior to February 26, 1948, located between Harlan County Lake and the Guide Rock Diversion Dam as provided by the Republican River Compact Final Settlement Stipulation. This order was lifted on August 25, 2007.

Pioneer Irrigation District irrigated with a limited supply during 2007. Meeker-Driftwood, Culbertson extension, Red Willow and Bartley canals did not divert due to a shortage of storage water. Surface water irrigators on Culbertson, Riverside, Cambridge, Naponee, Franklin, Franklin Pump, Superior and Courtland Canal were compensated not to irrigate in 2007. The estimated consumptive use portion of Culbertson and Riverside Canal's natural flow was protected through Harlan County Lake.

A total of 26,000 acre-feet was released from Harry Strunk Lake during the irrigation season and the estimated consumptive use portion of that water was protected to Harlan County Lake. The State of Nebraska leased the rights to 12,500 acre-feet of Nebraska Bostwick's storage water supply. This water was available for use by Kansas Bostwick Irrigation District. In addition to the 12,500 acre-feet of storage water, all of the natural flow available at Guide Rock Diversion Dam was made available to Kansas Bostwick. All natural flow permits located upstream of Harlan County Reservoir and downstream of Guide Rock Diversion Dam were regulated to their legal limit during 2007.

Report of the Commissioner from Colorado

Mr. Wolfe gave the report for Colorado. Total recorded stream flow in the North Fork Republican River at the Colorado-Nebraska state line was 20,560 acre-feet, 10,420 acre-feet less than the 1935-2006 annual average of 30,980 acre-feet. Total recorded stream flow in the South Fork in 2007 near Benkelman was 674 acre-feet, an improvement over the previous three years when there was no recorded flow. And for context, the 1938 to 2006 annual average was 27,000 acre-feet. Total recorded stream flow on the Arikaree state line was 1,330 acre-feet, which was a significant decline from the 12,920 acre-foot annual average for the period 1933 to 2006. Active storage in Bonny Reservoir as of Sunday, August 10, 2008, was 10,030 acre-feet. For context, the capacity at the top of the conservation pool was 41,340 acre-feet, and the reservoir is designed to hold 170,160 acre-feet at the top of the flood pool at full capacity.

Mr. Wolfe gave an update on the status of the Pioneer Ditch litigation where the plaintiffs allege injury to their senior surface water rights requesting curtailment of wells in the Northern High Plains Basin. An interim agreement was reached on June 5, 2008, for the remainder of the irrigation year thus prompting a stay in the hearing. Mr. Wolfe stated that the Yuma County water authority is working to pass a bond issue that would generate funds to purchase the surface water rights. The case has been stayed until February 2009.

Under EQIP, Colorado reported 1,203 acres under the three year lease program, 2,258 acres under the five year, and 6,177 acres permanently retired. As part of the CREP program in 2007 there were 17,194 acres. In other conservation measures, a one year lease for 206 acres occurred in 2007 plus 1,830 acres of conservation dry-up as part of the Pioneer Laird Lease. Colorado is seeking to complete the original 30,000 acres in the CREP program and filed for an addendum for an additional 30,000 acres.

Compact rules and Compact compliance are ongoing efforts. The State Engineer's Office initiated the process to promulgate rules and regulations governing the diversion, use and control of water resources in the basin for compliance within the Compact. Mr. Wolfe stated that they continue to receive comments on the rules and will consider what the next steps are in moving forward with them or holding them in abeyance. Colorado continues to move forward on adopting rules to govern the measurement of groundwater diversion in the basin. The rules will assist in gathering accurate pumping information and authorize the need to make and enforce regulations to meet its Compact obligations. Draft rules were completed and a public hearing held on July 2, 2008, for public comment. The rules were adopted July 14, 2008, and require the install of a flow measuring device on all wells greater than fifty gallons per minute within the Republican River Basin by March 1, 2009. Staff and resources needed to enforce and implement the rules are in process.

Colorado continues to work on the augmentation plan and Compact compliance pipeline as a long-term solution to aid in meeting their state's obligation to the Compact. They

presented a proposed plan to the Compact on March 12, 2008, and have participated in several informational and technical meetings with Kansas and Nebraska.

In summary, Colorado stated they are working on promulgation and the requirement of measuring devices on groundwater wells, implementing land retirement programs, constructing and operating the pipeline, and operating the Bonny Reservoir to achieve Compact compliance.

Report of the Commissioner from Kansas

Mr. Barfield provided the report from Kansas. Climatic conditions in Kansas have included multiple years of drought, and very unusual weather in 2007 including a severe winter storm, an F1 tornado devastating Greensburg, Kansas, and severe flooding. The Year 2008 was milder and near normal with a great range of precipitation from very wet in the southwest to large deficits in the west. Stream flow and reservoir levels were reported near normal to above average through much of the state with the west still somewhat dry.

Mr. Barfield reported on the updates from the Kansas Legislature. Recent efforts were made to pass a bill with regard to intensive groundwater use control areas where appropriation exceeds recharge. The provision would allow for a hearing process and corrective control provisions to improve management of those areas. The bill was unable to pass. Senate Bill 89 dealing with the utilization of monies recovered as a result of litigation with respect to violations of the Republican River Compact passed. House Bill 2860 was the result of a municipality seeking to use eminent domain to obtain water. The bill would prohibit the chief engineer from approving an application in the area for two years to give the legislature time to review the use of eminent domain for such a purpose. Updated litigation of the Kansas v. Colorado Arkansas River case included a fifth and final decree on January 31, 2008, which Kansas hoped to conclude by the end of 2008. Lastly, the Kickapoo Tribe in Kansas filed suit for failing to build a reservoir on Plum Creek within the reservation. Kansas is not named in the suit but will likely play a role in the case if quantifying the tribe's water right is part of the settlement.

In terms of Republican River matters, Kansas closed northwest Kansas to new surface water rights and alluvial groundwater rights in 1984 and has had a very restrictive policy with regard to new rights elsewhere in the basin as well. Thus, they have not had to take a lot of action, in terms of curtailing use, because the action has kept them within Compact allocations. Kansas is also working on improving measuring. While Kansas required all surface water users on alluvial groundwater users to be metered in 1987, they are currently in the third year of a four-year program with the Northwest Kansas Groundwater Management District No. 4 to meter all high capacity wells. Over 80% of those points of diversion are being metered and checked. They are also using a new state program that's similar to CREP and EQIP, utilizing the acronym Water TAP (Water Transition Assistance Program). Water TAP is a pilot program authorized in 2006 by House Bill 2710 that creates a voluntary incentive base to retire water rights. Prairie Dog Creek is the target for this program to provide an additional buffer in terms of compliance. Kansas continues to look for ways to improve participation in the program.

Report from the Bureau of Reclamation

Aaron Thompson presented the report for the Bureau of Reclamation with Marv Swanda addressing the hydraulic data. The Bureau of Reclamation report is included as Attachment K.

Mr. Thompson gave a brief update on several studies, including the Lower Republican feasibility study, the Frenchman Valley appraisal study, and the draft appraisal study report (final report is scheduled for October 1, 2008). Legislation was passed in 2006 extending the drought program authority to 2010. In 2007 and 2008 both Kansas and Nebraska sought drought assistance. Installation of municipal wells for Mason City and Stockville are expected in fall 2008. The Water 2025 program funding to the Bostwick Irrigation District in Nebraska and the Bostwick Irrigation District No. 2 in Kansas reached just over the one million dollar mark for varied laterals. The Bureau continues to have water conservation programs and demonstration projects including limited projects with the University of Nebraska-Lincoln led by Steve Melvin. Beginning in October 2008 the Bureau is partnering to implement a new initiative, Water for America, to address increasing demands on a limited water supply.

Mr. Swanda gave the report on the 2007 operational data on the reservoirs in the basin, federal reservoirs, and the current state of affairs. The report from the Bureau is included with the annual report.

Precipitation in the Republican River Basin varied from 90% of normal at Bonny to 130% of normal at Enders Dam. Total precipitation at the dams ranged from 15 ½ inches at Bonny to over 31 inches at Lovewell. Inflows varied from 68% of most probable forecast for Bonny to 191% of the most probable at Harry Strunk Lake.

Almena delivered approximately one inch of water, while Kansas Bostwick, above Lovewell, delivered five inches, and below Lovewell, seven inches. In 2007 Bonny started the year 21 feet below the top of conservation. Below normal in-flows were reported during every month of the year. A total of 1,359 acre-feet was released to the river from May 22 to June 5, 2007, as directed by Colorado. Eighty-seven acre-feet were released to Hale Ditch for irrigation purposes. A new historical low reservoir elevation was reached in December 2007. The end of the year finished with the Bonny Reservoir water level 23 ½ feet below the top of the conservation pool.

Enders started 2007 over 26 feet below the top of conservation. Storage water was not released for either Frenchman Valley or Hitchcock and Red Willow (H&RW). This was the 60th consecutive year for the H&RW not to divert water. Frenchman Valley also did not divert water for 2007.

Swanson began the year with 20 feet below full. Hugh Butler was 18 ½ feet below full while Harry Strunk was eight feet below the top of conservation. Releases were not made from Swanson or Hugh Butler Lakes to the Meeker-Driftwood units or Red Willow canals. Harry Strunk Lake reached the top of conservation on April 23, 2007, and peaked

at six feet into the flood pool on June 3, 2007. Big storm events occurred at the end of May 2007. Frenchman-Cambridge Irrigation District entered into an agreement with the Republican River Basin Coalition to purchase 26,000 acre-feet of water in 2007.

Keith Sebelius Lake was 18 feet below full level at the beginning of 2007. Irrigation releases were made from the lake in 2007. The Kansas Department of Wildlife and Parks and the district entered into an agreement to maintain a minimum pool at the lake.

Beginning elevation at Harlan County was 19 feet below the top of conservation in 2007. Inflow for the year totaled just over 198,000 acre-feet. No irrigation diversions were made for the Nebraska Irrigation District in 2007. An agreement was in place with Nebraska's Department of Natural Resources to purchase the water supply for 2007. The Bureau projected a water short year putting administration into effect.

Lovewell started the year 2007 6 ½ feet below the full level. The reservoir failed on April 25, 2007. It finished the year 1 ½ feet down.

Bonny Reservoir was about 21 feet below the top of full, about one foot above last year at the same time.

Swanson was 14 ½ feet from full and 1.2 feet above last year at the same time with precipitation 108 % of normal. Frenchman-Cambridge Irrigation District was not irrigating from Swanson.

Lake level at Enders was 20.5 feet below full level and the reservoir was 3.8 feet below last year at the same time. H&RW was not irrigating for the seventh year in a row due to short water supply. Frenchman-Valley was not taking storage water from the lake.

Hugh Butler storage was 6 ½ feet below full level in the lake. Precipitation was 143% of normal for the area. Irrigation releases were being made for diversion into Red Willow Canal.

Harry Strunk was less than one feet below the top of conservation. The lake filled at the end of April and increased nearly eight feet into the flood pool by May 25, 2008, due to large storms. Frenchman-Cambridge was irrigating from it into the Cambridge Canal. Precipitation was 140% of normal.

Keith Sebelius was 11 feet below the full level. The lake was 5.3 feet above last year at the same time. Irrigation release began July 13, 2008.

Harlan County was two-tenths of a foot below the full point and was 15 ½ feet above last year's level. Bostwick Irrigation District in Nebraska was irrigating from Harlan County for the first time since 2003.

Lovewell was 1 ½ feet below full level. The reservoir filled on April 26, 2008, and peaked to 4.7 feet into the flood pool with storms in May and June. Irrigation releases

began on May 27, 2008. Maintenance work at the reservoir is scheduled for mid-September and releases may be made to the river at this time.

A dam safety project was completed in 2007 at Norton Dam. Additional work is to be completed in 2009.

A small depression was found in 2004 at Enders and a corrective action study is being conducted with scheduled completion by October 1, 2008. A corrective action study is also under way at Red Willow Dam due to an issue with drains.

Report from the U.S. Army Corps of Engineers

Jim Pennaz, the chief of the hydrologic engineering branch of the Kansas City District Army Corps of Engineers, presented their report. Mr. Pennaz presented the Harlan County Dam Safety Study which has three areas of concern. First, the spillway gate design is being reviewed to rehabilitate or strengthen the design. Secondly, they are looking into providing additional freeboard with the crest flood wall and third, there is an issue with spillway stability during extreme flooding events that may require additional foundation anchors to stabilize it. The study report will be available in early 2009. Repairs will be dependent on Corps budgets and at this time Mr. Pennaz stated that they "are not very robust." A draft environmental assessment will be released with the report.

The second issue presented by Mr. Pennaz was the Lovewell Water Manual Revision that would take two feet of storage in the flood control pool and use it for irrigation support. This would only be accomplished if the Harlan County reservoir had less than 109 acre-feet of storage through June 30 and thus the revisions are time dependent. There would be no storage in Lovewell for irrigation supply when Harlan County water storage is over 119 acre-feet.

Engineering Committee Report

The Engineering Committee met six times during the year, and held a number of conference calls to try to resolve various disputes related to Compact accounting and streamflow augmentation. The Engineering Committee was unable to complete an accounting for 2008 due to the unresolved disputes. The Engineering Committee report is included as Attachment L.

The committee was able to resolve two matters and recommended to the Compact that they approve two changes for the accounting procedures. First, the committee agreed with the proposal for distributing estimated return flows from Riverside Canal. The proposal is attached to the Engineering Committee report. Second, the committee agreed to relocate the groundwater model accounting cell in the vicinity of Guide Rock to match the surface water stream gage located at the Guide Rock Diversion Dam. The details were included as Attachment B to the Engineering Committee report.

The report included suggested assignments for the committee for the upcoming year.

Conservation Committee Report

The Conservation Committee Report was presented by Scott Guenthner of the Bureau of Reclamation. Copies of the fourth annual Conservation Committee report (Attachment M) were distributed, discussing the relative effects of tilling, terraces, and small dams on streamflow in the basin.

Arbitration Update

Peter Ampe provided an update on the various disputes among the states. He described the resolution passed by the Compact on May 16, 2008, at the special meeting. Mr. Ampe stated that the states hoped to have selected and contracted with an arbiter within 30 days.

Report from the U.S. Geological Survey (USGS)

Phil Soenksen, data chief with the USGS gave a summary of streamflow within the basin (Attachment N). Mr. Soenksen described the issues the USGS had with the Sappa Creek gage and their reasons for relocating it. He also described efforts to rebuild the gage on the North Fork Republican River at the Colorado – Nebraska state line.

Ad Hoc Legal Committee

The issue of water from one state being used in a neighboring state was discussed. The Compact agreed to continue studying the issue.

Lower Republican Feasibility Study

Mr. Barfield volunteered to draft a letter to the Bureau of Reclamation and the congressional delegations thanking them for authorizing the feasibility study on the Lower Republican and encouraging them to fund the effort. The Compact voted in favor of providing the letter as described.

Approval of Committee Reports

The Compact voted to approve the Engineering Committee report, with some corrections. The Compact voted to request that the Ad Hoc Legal Committee continue to work on their assignment regarding the transfer of water for one state to another.

Closing Remarks

Mr. Barfield provided closing remarks related to compliance.

Resolution Honoring Dr. Ann Bleed

Mr. Dunnigan entered a motion honoring Dr. Ann Bleed for her service to the Compact (Attachment O). The resolution was approved.

Adjournment

The meeting was adjourned at 11:06 a.m.

The 47th annual RRCA report is hereby approved on this 12th day of September 2013.

David W. Barfield, Chair, Kansas Commissioner

Dick Wolfe, Colorado Commissioner

Brian Dunnigan, Nebraska Commissioner

ATTACHMENT A

AGENDA

SPECIAL MEETING OF THE RRCA

MARCH 11 and 12, 2008
KANSAS CITY, MISSOURI

DRAFT AGENDA

Special Meeting of the Republican River Compact Administration
10:00 a.m. March 11 to 3:00 p.m. March 12, 2008

Holiday Inn/KCI Expo Center
11728 & 11730 NW Ambassador Drive
Kansas City, MO
(816) 801-8400

I. Introductions

II. Review Agenda

III. Identification of Disputed Issues Presented to the RRCA for Resolution

A. Kansas' Issues
    1. Damages
    2. Proposed Remedy
B. Nebraska Issues
    1. Nebraska's Review of Kansas' Proposal
    2. Nebraska's Integrated Management Plans
    3. Accounting Issues
C. Colorado Issues

IV. Recognition of Nebraska's and Colorado's Compact Compliance Efforts

A. Nebraska
B. Colorado

V. Proposed Augmentation Plans

A. Nebraska
B. Colorado

VI. Future Process and Procedures to Resolve Disputes
A. Colorado-Kansas-Nebraska Communications
B. Dedication of Personnel Time and Resources to Address Factual, Legal, Economic and Administrative Issues

ATTACHMENT B

TRANSCRIPT

SPECIAL MEETING OF THE
REPUBLICAN RIVER COMPACT ADMINISTRATION
VOLUME I, PAGES 1-126

MARCH 11, 2008
KANSAS CITY, MISSOURI

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11730 NW AMBASSADOR DRIVE
KANSAS CITY, MISSOURI

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APPEARANCES

Ms. Ann Salomon Bleed
Mr. James R. Williams
Mr. James Schneider
Mr. Justin D. Lavene
Mr. Brad Edgerton
Mr. Ron Theis
Mr. Paul Koester
Mr. John B. Draper
Mr. Scott Ross
Mr. David W. Barfield
Mr. Leland E. Rolfs
Mr. Peter J. Ampe
Mr. Dick Wolfe
Mr. Kenneth W. Knox
Ms. Megan A. Sullivan

EXHIBITS

(attached to end of Volume I)

Sign in sheets

Agenda

Draft Agenda - proposed by Kansas

Notebook presented by Nebraska - provided to Kansas and Colorado, not attached to transcript

(Proceedings commenced at 10:08 a.m.)

MS. BLEED: My name is Ann Bleed. I'm the Director of the Department of Natural Resources in Nebraska and also Chairman of the Republican River Compact Administration this year. What I'd like to do is go around the table up front and have everybody introduce themselves and then go into the audience and have you introduce yourselves. There is a signup sheet on the table in the back. If you haven't signed in, would you please do so and indicate the organization you're with, if there is an organization. John, why don't you start.

MR. DRAPER: Thank you, Madam Chairman. I'm John Draper. I'm here with the State of Kansas as special counsel.

MR. ROSS: Scott Ross, Kansas Division of Water Resources.

MR. BARFIELD: I'm David Barfield, Chief Engineer for the Division of Water Resources and Kansas Commissioner to the Administration.

MR. ROLFS: Lee Rolfs, Kansas Department of Agriculture.

MR. WILLIAMS: Jim Williams,

Nebraska Department of Natural Resources.

MR. SCHNEIDER: Jim Schneider, Nebraska Department of Natural Resources.

MR. LAVENE: Justin Lavene with the Attorney General's Office in Nebraska.

MR. EDGERTON: Brad Edgerton with the Department of Natural Resources out of Cambridge, Nebraska.

MS. BLEED: And Jean Crawford is the court reporter, so make sure you give your cards to Jean.

MR. THEIS: I'm Ron Theis with Nebraska Department of Natural Resources.

MR. AMPE: I'm Peter Ampe of the Colorado Attorney General's Office.

MR. WOLFE: Dick Wolfe, state engineer for Colorado.

MR. KNOX: Good morning. I'm Jim Knox from the State of Colorado.

MS. SULLIVAN: Megan Sullivan with Colorado Division of Water Resources.

(Audience introductions.)

MS. BLEED: Thank you. And welcome everybody to the special meeting of the Republican River Compact Administration. The

agenda which was passed out, are there any changes or additions that need to be made to the agenda?

MR. BARFIELD: Ann, I would like to note for the record that we provided an alternate agenda to you at your request that I think is designed, you know, probably to lay out maybe more clearly exactly why we're here, or at least the primary purpose of our meeting today, which is to consider the dispute we have and have asked for resolution at this Compact Administration. So I'll pass out copies of that agenda to the table here.

I guess, you know, we're here to hear from you I think primarily in terms of a response to our letter and our request for a remedy to the violations here. Anyway, I guess I would ask us to consider this agenda. Again, I think it covers the same ground and sought to incorporate Colorado's items as well. I guess -- well, I'll leave it at that.

MS. BLEED: And your point is that -- is what? I mean, it seems to me both agendas we get to the same point. One has a coloring of it that the other one does not.

MR. BARFIELD: Well, that really wasn't the intent. Your agenda item 3 I think was the one that -- I just wanted -- we just wanted to be clear that the primary purpose here is to consider this dispute and see if we can resolve it. So your agenda item 3 that's identification of issues for resolution just wasn't very satisfactory.

I'm willing to work under your agenda because, again, we're primarily here to hear from you all. I guess I'd just like our agenda to be incorporated into the minutes of this meeting because, again, I just want you to understand what we're here primarily for.

MS. BLEED: Well, and I think that the item No. 3 is broader than your item No. 3, and that's important to Nebraska because we do have disputes to bring as well.

MR. BARFIELD: Right, right.

MS. BLEED: And I did not want to see those omitted from the agenda.

MR. BARFIELD: And that really wasn't the purpose of our alternative so --

MS. BLEED: As long as it's clear that we do have disputes that we would like to

try to resolve in this meeting. My understanding, and correct me if I'm wrong, that Colorado does not have any disputed issues at this point in time?

MR. WOLFE: That is correct.

MS. BLEED: Well, with that, we'll recognize that there is an alternative agenda that Kansas presented, but I'm understanding, Dave, it's okay with you if we work off the agenda that I sent out and passed out?

MR. BARFIELD: (Nods head.)

MS. BLEED: Any other comments on the agenda?

Okay. We'll move to the item No. 3, consideration of the disputed issues submitted by Nebraska and Kansas. And the first item on the agenda is Kansas's issues.

MR. BARFIELD: Well, I guess I think for the most part our issues are documented in our correspondence that obviously all of the Compact Commissioners have here as well as it's been available to I think pretty much everybody in terms of being disseminated on our website and other places.

But just as a matter of kind of an overview of what those issues are, with 2006 being a water short year as it was, the first test of compliance under the settlement occurred. And Nebraska, at least according to -- you know, using the data that's been agreed to and assembled by the Compact Administration under any reasonable interpretation that failed that first test.

Kansas has been shorted of water during this initial period, and our water users have been injured, both in the Kansas Bostwick irrigation district as well as in the mainstem Republican River that's experienced historical lows and that we've been curtailing. You know, with the lag depletions, you know, this situation is only going to worsen.

So at the annual meeting, there was a recognition of these matters, and our Attorney General put on the record that Kansas would consider its options and act accordingly because it's important that the State of Nebraska get in compliance with the Compact so that we can have water.

And so, you know, after a lot of

working with our Attorney General's office and a careful review of the record and all that, on December 19th, I sent you a letter basically saying what Kansas demanded for the past violations and what we believe Nebraska needed to do to get in compliance with the settlement so that we get our water.

And again, there was a fair amount of technical analysis, as you know, Ann, and Dick, that was part of that letter in terms of how we came to the conclusions in terms of what needed to occur for remedy, documentation of that analysis and then model runs that showed what it would take for Nebraska to get -- to get back in compliance and with a request that Nebraska agree to these actions, including the recovery of economic damages for the 2005/2006 violations.

So I guess -- you know, subsequently, we've had some level of correspondence. I've written a number of letters. That correspondence asked you to either agree with that or provide some alternative should the State of Nebraska desire to get in compliance in a different way and an expectation that if

Nebraska was going to provide for an alternative that they would document to our satisfaction that those alternative actions would get you to the same place that our proposed remedy does in terms of getting your groundwater consumptive use to levels consistent with your allocation in dry years in particular.

So that's kind of the summary of where we are today. We have -- other than one letter that kind of described generally you had some concerns and didn't have agreement, despite four letters, until I was handed this notebook today, we really haven't gotten anything. But we look forward to I guess working through today's agenda to hear your responses and concerns and what you believe will get you to compliance. I don't know if that's enough detail. Again, I think it's all fairly well documented in the letters. But I just want to provide I guess a brief overview for everybody here present so --

MS. BLEED: Colorado, do you have any questions for Kansas?

MR. WOLFE: Not at this point.

MS. BLEED: From Nebraska's perspective, we did get your letter

December 19th. There was, as you say, a lot of technical information in that letter. And we have worked very, very hard since that date to try to analyze what you have done. And today we'd like to present our alternative to what you are proposing as a remedy.

We have worked extremely hard over the last few weeks to come up with the bases for the technical analysis necessary for the alternative. And I guess with that, unless there are other questions for Commissioner Barfield, we'll go on to the next agenda item, which is Nebraska's issues.

Jim will do the screen. Okay. Great. That's the pointer. Okay. Do we need to turn off some lights?

Go ahead, Jim, Brad, whoever.

I'll just start out by saying that the first thing I'll talk about is our review of Kansas's proposal. We did have some concerns with that proposal, which I will very briefly go through, and then I'll explain some of the alternatives. Dave has already referred to the notebooks that we put together with the background data and more technical analyses and

details of what I'm going to talk about here.

Okay. Go ahead, Jim.

When we looked at Nebraska's -- or Kansas's December 19th letter, we reviewed that very carefully, and we did believe after our analysis that the Kansas modeling and the scenarios used to determine the required reductions in their proposed met remedy had some problems.

The first thing that we looked at was we saw that the scenario Kansas used to look at the target was a dry period, and so they set the target for the limitations -- or the amount of depletions to the stream during a dry period. However, when you look at how many -- how much had to be reduced by the pumping, Kansas used a wet period. And the problem with that is that in wet periods, your depletions from the stream are going to be much higher because there's more water to deplete from the stream during a wet period than during a dry period. So by using the wet period to set the reductions required, they overestimated in our opinion the reductions that needed to be required.

The second thing we did was we

attempted to replicate the Kansas modeling. The one major difference that we looked at was that when it came to the distribution of the pumping volumes that were used in the model, we used a more realistic distribution. And the key issue there is the distributions of pumping volumes along the -- in the alluvium along the river itself did not change greatly over time, but as increased development occurred, it occurred more in the uplands and that has a major impact.

As a result, when we replicated Kansas's scenario using a 50 percent -- or 55 percent precipitation period for both the scenarios of the target and the reduction, we determined that the long-term five year average was 42,300 acre feet more than is required under the Compact. So we did have concerns with Kansas's proposed remedy and the technical basis for it.

We have alternative remedies. We've been working very hard on these alternative remedies, and so I'd like to propose to you what the alternatives are for Nebraska to manage for Compact compliance. We've been working very hard over the last three years along with the

Natural Resources Districts in the basin, that's the Upper Republican Natural Resources District the Middle Republican Natural Resources District and the Lower Republican Natural Resources District and then Tri-Basin where the Mound Credit is also a major part of the Tri-Basin Natural Resources District. They do have a portion of their district actually in the Republican Compact area.

What we looked at was revising those management plans to achieve Compact compliance both in normal precipitation years and in dry years. And we were concerned that if there's another severe drought year that we had in 2002 -- it's the third driest year in the record from 1918 to present -- that we would be in compliance even in those drought years.

We looked at -- did a lot of model runs to come up with the plans that we had developed. The key model run we looked at -- I'll just go through some of the basics of that -- is for the ground model we looked at phreatophyte use and reservoir levels from 1988 to 1991. The starting groundwater level head in that model was our estimates of the 2007 using the

Republican River Compact model. Pumping volumes were based on an 80 percent reduction in pumping from what we call the baseline pumping, and that's the pumping that occurred in the three NRDs from 1998 to 2002. We reduced all that pumping throughout by 80 -- by 20 percent, so it was 80 percent of baseline. And then all the other inputs except the groundwater pumping volumes were based on 2006 input data. And most notably, that's the number of irrigated acres that were developed in 2006.

We ran the model, came up with the depletions to the stream from groundwater pumping and then put them into the Republican River Compact Administration accounting sheets. For those accounting sheets, they were based on data from 1996 to 2006. That period was a precipitation of about 21.06 inches, and the long-term average precipitation was 20.98. So we figured that was a fairly representative period. We did adjust stream flows and reservoir levels to better reflect the current conditions. And this is a more detail of that.

The input, the surface water pumping data was the average from 1996 to 2006. The

nonfederal reservoir evaporation data was the average from 2004 to 2006. The canal diversion data was again the average of 1996 to 2006 with a few exceptions. Haigler Canal diversions we set to 4,000 acre feet. Culbertson Canal Extension we set to zero. That was the input.

And then the stream gaging input was the average from 1996 to 2006, except that we used the average from 2000 to 2006 for the South Fork Republican River, Beaver Creek, Sappa Creek and Prairie Dog Creek. We set any potential flood flows to zero.

The results of the analysis were that under average precipitation conditions, a 20 percent reduction from baseline groundwater pumping provides compliance with the Compact. And again, the baseline groundwater pumping is the average volume pumped in each NRD for the years 1998 to 2002.

The -- this is the results we got for all three states for the average for the years 2008 to 2012. We did not include obviously the Colorado pipeline, but these are the results. You can see that Colorado, based on these model runs, would still be in a deficit situation.

Kansas would be 148,280 over their -- or allocation over the consumptive use. And Nebraska on average would have been 18,950 acre feet under the allocation for those years. That's the individual years for the modeling we did, 2008 to 2012.

So we set the controls in the rules and regulations in the integrated management plans to achieve a 20 percent reduction in average groundwater pumping under average precipitation conditions. However, we were definitely concerned that we needed to be able to ensure that Nebraska was in compliance with the Compact in dry years. So a second control in the integrated management plans is that the average net depletions due to groundwater pumping in each Natural Resources District shall be no greater than each NRD's allotted percentage of allowable groundwater depletions.

The allowable groundwater depletions are the maximum level of depletions to stream flow from groundwater pumping that can be allowed in a given year without Nebraska exceeding its allocation. And that allotted percentage is based on the percentage of

depletions to stream flow from groundwater pumping in each NRD for baseline years 1998 to 2002.

When we do the averaging, the averaging is based on the same years as would be used to determine the average for Nebraska's compliance with the Compact. If it's a water short year, that would be a two year average. If it's not a water short year, it would be a five year running average. So those are the controls and rules and regs that are in the integrated management plans to meet those two standards.

In addition, the plans have in them the ability to do some augmentation plans and incentive -- or additional purchases of surface water. And this is in order to provide stream flow quickly to adjust for the varying precipitation that we have in the basin. As you all know, managing groundwater wells because of the lag effect of wells is not a very responsive way to manage to short-term variations in stream flow. By the way, I will talk a little bit more about the augmentation plan later in the agenda.

Some other issues that Nebraska is very concerned about and would like to make sure we

get resolved in the Compact accounting I'd like to go through now. The bottom line is that Nebraska believes -- would you go back one, please, Jim. It's very -- it's imperative that the Republican River Compact Administration strive to ensure that the accounting is as accurate as possible.

To ensure accuracy, Nebraska believes the RRCA must address accounting pertaining to the calculation of the groundwater CBCU. That's the calculated beneficial consumptive use. And IWS is the imported water supply credit. We believe that the allocation of Harlan County Lake evaporation must be accurate. Kansas has raised this issue. Evaporation from the nonfederal reservoirs is an issue with Nebraska. We believe we need to look at the return flows from the Bureau Canals.

We need to look at the Haigler Canal diversions, return flows and wasteway returns. We believe there's a discrepancy between groundwater model and surface water accounting points that needs to be addressed. And we have issues on how the diversions and returns from the Riverside Canal are accounted for in the

Compact.

Let me go through some of these in a little bit more detail. Perhaps the most complicated issue is the way the current accounting uses the scenarios from the groundwater modeling runs to calculate the calculation of beneficial consumptive use from groundwater well pumping and the Mound Credit.

The current accounting procedures use two groundwater model scenarios to estimate depletions to stream flow due to groundwater pumping. We looked at the other alternative scenarios that could be used, and we've discussed this with the engineering committee. In our view, there's no articulated or equally -- or reason that one alternative set is not better than another.

The problem we've got is depending on which set of scenarios you use, you get significantly different numbers. And without a reason for those different numbers, we have concerns. As I said, the estimates of the impact vary depending on which set of scenarios is used.

This is a list of two sets of scenarios out of eight total that we came up with. I'm sure there are others that could be developed. The first one, scenario No. 1, is often what is referred to as baseline scenario. That is when we have the inflows from the Platte River to make the Mound Credit in the model, so the inflows are turned on, and we have all three states' groundwater pumping turned on. The alternative then is to say we're going to turn off one state's groundwater pumping and compare that then between scenario 5 and 1, and we come up with an answer. And the difference between those two scenarios is the depletion to the stream from Nebraska's groundwater pumping.

Another way of doing the model runs -- and I should emphasize this is not a problem with the model itself, it's a problem with what sets of model runs are being used to determine the depletions. One could say we're going to turn off all the pumping and not have the Mound Credit importation on, so everything is off, and then turn on one state's, in this case, Nebraska's pumping and look at the difference. You could do similar accounting procedures to

look at the groundwater imported water supply credit. And again, the alternative sets of scenarios give dramatically different estimates of the imported water supply credit.

This again is just the scenarios. The column on the -- in the middle is the current choice of scenarios, scenario 5 compared to scenario 1 for the groundwater CBCU, scenario 1 compared to 2 for the Mound Credit. Alternative scenarios, scenario 4 and 8 and then scenario 3 and 4.

When you look at the various scenarios and the numbers you get, you'll see on the -- the far left column is the actual calculation that we're doing with using the scenarios. The second column is the current choice of scenarios and the third column is an alternative that we see no -- have no reason to believe isn't as good as the current choice.

And you can see there that for the difference between groundwater CBCU from Nebraska, it compares 202,000 acre feet to 200,000. For Kansas, there's a difference of about 16,000 acre feet. For Colorado, about 8,000 acre feet, 9,000. And then the Mound

Credit is roughly 16,000 acre feet difference. And we believe we need to address -- sit down together, work out a way to address these differences to the mutual agreement of all parties.

And again, there's no articulated reason that we have come across that one set of scenarios produces more accurate estimates than the other. We simply need to figure out how to agree on what to do about the different scenarios.

Allocation of CBCU from Harlan County Lake evaporation. The current procedures allocate reservoir evaporation to Nebraska and Kansas based on diversions by the two major Bostwick districts. Kansas has argued that the current procedures unfairly allocate reservoir evaporation when one district does not divert. And that is another issue that needs to be resolved.

Calculation of CBCU from the evaporation from nonfederal reservoirs. The final settlement stipulation itself states for purposes of compact accounting, the states will calculate the evaporation from nonfederal

reservoirs located in an area that contributes runoff to the Republican River above Harlan County Lake in accordance with the methodology set forth in the Republican River County accounting procedures.

Nebraska believes that the final settlement stipulation language, which we believe is controlling if there's a discrepancy between the accounting procedures and the final settlement stipulation language, we believe that language excludes evaporation from nonfederal reservoirs below Harlan County Lake from inclusion in Nebraska's CBCU. Kansas has stated in the engineering committee that they believe the evaporation from the nonfederal reservoirs located below Harlan County should be included in Nebraska's CBCU. In 2005 and '6, the difference would have been 1,076 acre feet in 2005 and 652 acre feet in 2006.

Procedures to estimate return flow from the Bureau of Reclamation irrigation districts. This is something that was identified as an issue that needed to be addressed during the negotiations of the final settlement stipulation and accounting procedures. And I just want to

point out that Attachment 7 in the Republican River accounting procedures has a footnote on the table dealing with return flows that says that the average field efficiencies for each district and percent loss that returns to the stream may be reviewed and, if necessary, changed by the RRCA to improve the accuracy of the estimates. We believe this does need to be reviewed.

Procedures to estimate return flows from the Bureau of Reclamation irrigation districts. Nebraska believes that the field efficiencies and percent loss that returns to the stream must be reviewed, as I said.

Okay. Go to the next slide, please.

Accounting points. In looking at the accounting points that are used in the groundwater model and comparing them with the accounting points used for the administration of surface water, we see a discrepancy in the accounting points that are used that leads to inaccuracies in the accounting. And I'll just try to illustrate this. Let's see.

You'll see here, this is a picture of Riverside Canal. This is where the gaging

station for the Riverside Canal itself is. The Frenchman Creek at Culbertson is where the gaging station is for the sub-basin. The actual model cell that is used now to determine the consumptive use in the sub-basin is all the way down here. And we suggest that the model cell should be up in this area of the basin.

Next one. This is Guide Rock diversion dam. Here's the Compact gaging station for Guide Rock diversion dam. The model cell for calculating groundwater pumping for CBCU is downstream here. And we believe it should be up here to get the proper accounting from where the beneficial consumptive use should be calculated.

This is the North Fork of the -- the North Fork sub-basin. This is the North Fork of the Republican River at the state line. This is where the Arikaree River gage is. The model cell to look at the North Fork -- groundwater model cell to look at the computed beneficial consumptive uses in the sub-basin in Colorado is all the way down here. We believe it should be up there. And, finally, on the South Fork, it's a similar -- the model cell for the South Fork is here -- or this is where the model cell is

now. We believe it should be here closer to the actual gage that demarcates the base of the sub-basin for the South Fork.

Other issues involving Haigler Canal and Riverside Canal. Current accounting procedures do not correctly account for diversions, field returns and wasteway returns from Haigler Canal to the Arikaree sub-basin and mainstem. And the current accounting procedures do not correctly account for return flows from Riverside Canal in the Frenchman Creek sub-basin.

This is a picture of Haigler Canal Pioneer irrigation district. And up here you see the gage of the North Fork Republican River at the state line. Here is a gage on the state line on the canal. And diversions here are measured for Nebraska at this gage. We then have return flows that go into the Arikaree River. We also have a measured drainway that returns to the Arikaree River which is right here and yet the sub-basin -- or these acres then are actually in the Arikaree River sub-basin. Here is the Arikaree River gaging station. So the return flows are not getting

accounted for in the right sub-basin. And the return flows are also underestimated because the drain return flows here are not subtracted from the diversions at the head gate.

This is the Riverside project. It's a similar story here. Here's the Riverside gaging station for the canal (indicating). The return flows are going into Frenchman Creek -- I'm sorry, return flows are going into the -- the mainstem as opposed to back into Frenchman Creek. Here is where the gage is for Frenchman Creek. We believe the return flows that go into the mainstem should be subtracted from the mainstem and added back into Frenchman Creek as part of the virgin water supply.

And that is the end of my presentation. Some lights, please.

Are there any questions?

Mr. Knox.

MR. KNOX: Commissioner, would it be possible we receive a copy of the Power Point, please?

MS. BLEED: Yes, yes, we'll do that.

MR. BARFIELD: So that's not in

the notebook?

MS. BLEED: No. The Power Point is not in the notebook.

MR. KNOX: Do we just see Jim?

MS. BLEED: We will get you copies.

MR. WILLIAMS: After you buy me lunch. I'm sorry. That's not on the record.

MR. BARFIELD: Lots of questions I guess. I don't know how procedurally you want to work through this. I guess, you know, that's a quick overview, and I assume it's supplemented by what's in this notebook here?

MS. BLEED: That's correct.

MR. BARFIELD: I think this is the heart and soul of what we're here to meet about is to go through some of the detail. Anyway, your presentation provides for a lot of questions. And so I guess what do you want to do procedurally? How do you think would be best to construct this discussion so we get as much done today as we can? I might just ask your suggestions and maybe ask for a brief pause to consult with my team about, you know, what we think should be done.

MS. BLEED: Well, what I would -- I would suggest is that we could discuss this after we get through the next portion of the agenda, which is the recognition of the states' Compact compliance efforts, and then we could move the end part of the agenda up a little bit to talk about how we should proceed for the rest of the day.

MR. BARFIELD: Well, okay, so you're saying you're going to go through all your presentations and afterwards kind of go back and answer our questions? Because obviously there's a lot of questions that what you just said brings to my mind and we need to understand better.

MS. BLEED: Okay. Yeah. I would suggest -- I think the proposed augmentation plans Colorado wanted to do those tomorrow.

MR. WOLFE: Yeah.

MR. BARFIELD: Again, the fundamental reason for this meeting is to try and resolve our dispute. We certainly want to hear your proposal.

MS. BLEED: We could either talk about how to proceed now or we could go ahead to

the recognition of compliance efforts and let Colorado weigh in on this discussion. Do you have any preference?

MR. BARFIELD: I guess -- are you going to be presenting information -- you're talking about Agenda Item No. 4 now?

MS. BLEED: Right.

MR. BARFIELD: Is some of that connected with, I guess, our disputed matters?

MS. BLEED: Loosely connected. I won't say --

MR. BARFIELD: That's kind of why we proposed our agenda. We sort of put it all together and slotted it as kind of one big discussion because -- again, we said you're in violation. We want you in compliance. Tell us what your plan is. Show us that that plan will get you to compliance so --

MS. BLEED: I would like to go through to show what we have been doing. And I don't know if Colorado has any preference on this.

MR. WOLFE: No particular preference other than, you know, we were prepared to do our presentation tomorrow in

terms of our compliance efforts. We certainly -- in terms of trying to respond to anything in terms of your presentation, we'd like some time to look at that presentation before we could comment on it either today or later today.

MS. BLEED: Why don't I suggest that we go through our compliance efforts because it's not completely unrelated to how we're moving forward --

MR. BARFIELD: Right.

MS. BLEED: -- and then we can have a break and come back. States can caucus --

MR. BARFIELD: Right.

MS. BLEED: -- and then we can come back and discuss how to move forward to resolve the issues presented. Does that make sense?

MR. BARFIELD: Yeah, that makes sense.

MS. BLEED: Okay. We'll go on to Nebraska's compliance.

MR. BARFIELD: But we're just going to hear your compliance?

MS. BLEED: Right. And Colorado can do theirs tomorrow.

MR. WOLFE: That would be fine.

MS. BLEED: So we need another slide show, Jim.

There should be continuing. It's part of that same one. If you just find the "Thank You" slide and then go on.

I'm glad you're feeling free to get something to eat and drink. I want to make sure you eat the goodies. We had to fight to make sure we had refreshments here. We even got our attorneys involved. So I don't want to see any leftovers.

Okay. Nebraska's compliance efforts. We have been working very hard to come into compliance with the Compact. We've revised the integrated management plans. We've reduced pumping volumes. We've used incentive plans to retire irrigated acres. We've done a lot of vegetation management to clear the channel of vegetation. We've purchased surface water. And we have passed legislation for future funding for other compliance efforts.

The original integrated management

plans were based on a 5 percent reduction in baseline pumping. After the experience of one of the driest years in record, 2002, which was the year the settlement stipulation was signed, we realized that we would need to further reduce our consumptive use. The other thing that happened was after 2002, irrigators in the basin, also realizing that we needed to reduce their consumptive use, they voluntarily made reductions in their pumping volumes.

This is a graph showing the pumping from 1998 to 2006 by the Upper, Middle and Lower Republican NRDs. The jagged lines are the annual pumping volumes in each NRD. And the straight lines are the new 19- -- or 20 percent reduction in the baseline pumping. And again, the reduction was based on the 1998 to 2002 pumping levels. We are requiring a 20 percent reduction in those pumping levels.

And you can see in 2002, the only district that had controls on at that point on pumping was the Upper Republican NRD. But even then, the Middle and the Lower as well as the Upper reduced their pumping. Controls went on in the Middle and the Lower in 2005. And in the

last few years, the pumping volumes have been at about the 20 percent reduction level even without new controls in the integrated management plans.

Next slide.

This just shows the Upper Republican NRD water use. And it goes back to 1980, which is when the NRD first put allocations on. The 1980 to '82 period had an allocation on a per year basis of 22 inches. And you can see that the average use in that year on an inch per acre basis was only 10.9. So producers were only using about 50 percent of the allocation they could have used. As that allocation decreased through time, you'll see it went from 22 to an annual average of 16, 15, 14.5 and 13.9 for the years 2003 to 2007, the actual pumping volumes, the average pumping inches per acre continued to be below the allocation. This reflects the conservative nature of producers when they come to managing their irrigation.

This is the Middle Republican NRD water use for the years 2002 through 2007. I was having trouble getting the alignment right on that. I apologize on that one for 2003. Again,

I'll point out that the actual allocations in the Middle Republican were not actually in place until 2005, but I still put on a percentage of what the inches per acre would be based on the allocation that went in in 2005. That's why you see the higher numbers, 186 percent, 125 percent, 112. 2005, '6 and '7, again, well below the actual allocation that irrigators could have used. So the irrigators in the basin have been working very hard to reduce their groundwater pumping volumes.

The Lower Republican, it's a similar story. Again, their allocations weren't actually put in place until 2005, but you can see they have reduced their pumping significantly down in 2006 and '7 to roughly a little more than half in 2006 and 2007 of their actual allocation. So the irrigators have been responding very definitely to the need to reduce our consumptive use for Compact compliance.

We also initiated an EQIP program, Environmental Quality Incentive Program. The state came up with a million dollars to encourage signup on an existing EQIP program. And we signed up 12,296 acres. That's a

reduction then of irrigated acres. Some of those are permanently retired.

We were one of the first CREP programs to be used to conserve irrigation water. And we have 39,039.72 acres signed up in the Republican Basin. Unfortunately, signup has started to slow because of high crop prices. And we are going to be looking to see what we can do to encourage more signup in the future. The total reduction in irrigated acres since we signed the stipulation is 51,336 acres.

Last year, we passed legislation to establish a Vegetation Task Force in the legislature -- or in the state. That task force was funded with $2 million per year to do vegetation management. The bulk of that money has been used in the Republican Basin. Last year, we cleared 3,000 acres in the channel itself between Harlan County Lake and Hardy.

One of the things we noticed before the clearance of vegetation that even a 400 CFS release from Harlan County Lake produced lowland flooding, and we weren't getting the water down to Guide Rock and Hardy, and hence the need to clear vegetation in that channel. This year, we

have plans to go upstream from Harlan County Lake to Cambridge and further upstream to clear the channel vegetation. It focuses on invasive species, but the basic purpose for the Compact is to allow the channel to have the flows be able to go through the channel and increase the channel capacity.

We also have purchased surface water to provide timely response of flows for Compact compliance. In 2006, we purchased 23,518 acre feet of surface water. And in 2007 it was 51,000 (sic) acre feet of surface water. We have plans to continue to use surface water as one of the tools in the toolbox to respond to the variability of flows in a timely manner.

We also passed legislation in 2007 to ensure that there would be future funding for Compact compliance. This legislation provided the Natural Resources Districts the authority to issue bonds and the authority to levy taxes on irrigated acres up to $10 per acre and to levy a property tax of up to $0.10 per $100 taxable valuation to be used for Compact compliance.

And finally, we are initiating some augmentation planning. This is getting a little

bit into tomorrow, but we're just in the initial stages. We're finalizing our preliminary feasibility studies. The sites selected, we're looking at which sites would be best based on aquifer properties and location. We're looking at optimal locations currently being investigated -- we're currently investigating the optimal locations. And the target completion date for the augmentation plan would be the summer of 2009.

And that was -- that's it for our compliance efforts.

The lights.

Any questions right now?

Okay. What I would suggest, it's about 11:00. We expect that there may want to be some time for caucusing, and we're getting up towards lunch. What if we caucus until about 1:00 -- or broke until about 1:00 and then came back at 1:00. Would that be appropriate?

MR. BARFIELD: Yeah. I think that's acceptable, yes. And then we'll plan on going back through and working through the questions we have.

MS. BLEED: Okay. The hotel

asked me to announce that there is a lunch buffet which will be from 12:00 to 1:30. They have chicken fried chicken -- that's interesting -- chicken fried chicken, mashed potatoes and gravy, corn, salad and dessert for $9.

Dick, did you --

MR. WOLFE: We'd just offer if you'd like at 1:00, we can certainly do our presentation on Compact compliance efforts if you'd like.

MS. BLEED: Okay.

MR. BARFIELD: All right. We'll talk about the best agenda -- you know, we'll discuss the best way to go about this.

MR. WOLFE: Yeah. We just offer that. If that fits into your schedule better, we can certainly do that.

MS. BLEED: Okay. So we'll break until 1:00. Thank you.

MR. KNOX: May I ask one question regarding your presentation?

MS. BLEED: Sure.

MR. KNOX: Going back to your surface water allocations of 23,518 acre feet in

2006 and 51,000 (sic), what was the monetary expenditure for those amounts?

MS. BLEED: I can give that to you. I don't have it right off the top of my head.

MR. KNOX: Thank you. I just didn't think that would be in the presentation. If you folks would share.

MS. BLEED: Yeah.

(Recess.)

MS. BLEED: Okay. I'd like to get started again. I'm sorry for the delay. Commissioner Barfield and Commissioner Wolfe and I did have a discussion after lunch in the cocktail lounge. Somebody offered to sell us cocktails but they never came by with any so we didn't have any. And we were talking just in general terms on how we wanted to move forward.

I think we were all in agreement -- and Dave and Dick, tell me if I misstate anything -- that we would really -- are all really trying to resolve the issues that are before us. We all believe it's very important for the three states to get along together for the Compact Administration to be successful in resolving

disputes. And I can say from Nebraska's point of view, we are working very hard and are very committed to try to resolve these disputes within the Compact Administration. I believe, Dick, that was essentially where you were going. You might want to say a few words on what your thoughts were or are.

MR. WOLFE: Yes. Thank you, Commissioner Bleed. Certainly as the new one on the block here in terms of my perspective coming into this -- and I discussed with you and Commissioner Barfield that it's -- Colorado is very interested in finding resolution to these issues through the Compact Commission and the process that's been established historically and most recently through the final agreement.

And we feel it's in everybody's best interest to proceed along those lines and use that process to the best of our abilities to resolve those issues. And as Colorado will demonstrate tomorrow in terms of our proposal in terms of how we'd like to set out some time frames to not only get acceptance by the commissioners on our project but establishing some firm deadlines in which we all can work

against to get to that point because, as we've talked just before lunch, the information that's been presented here today realistically can't -- all the answers can't be resolved today.

And so we need to figure out what the path is that we need to establish out of this meeting that we have here today and tomorrow to help us get into compliance. Because I think that's what we're charged with as commissioners on behalf of the interest of the citizens of our states to bring these disputes before this body and to resolve them through this process.

And I, for one, individually and professionally, would like to see this happen through this process here and try to avoid a litigation process, because I know that can be expensive and long and drawn out. And I know there's a process that's been established before us in this agreement. And I'd like to work within that and see if we can achieve out at the end of today that path in terms of how we can get these questions answered.

I know there's a lot of technical questions that have been raised. And I know we've got a number of folks here on the

Engineering Committee that can help guide us and give us some of that direction and how we can figure out how we can get to the proper application of this model, because it sounds like there is some dispute over that yet in terms of how that model should be applied to show compliance.

We recognize obviously however that's done obviously has a direct impact on Colorado too. So we need to do that collectively and figure out through this Engineering Committee how we can do that. So that's what I'd like to offer in terms of a path and how we can get there. And I understand that there's a desire to have decisions made here today and when is that going to happen, because I know this has been going on for quite some time, and we obviously have a Compact and this agreement that we've got to come into compliance with now. So that's what I'd hope we can achieve out of that yet today.

MR. BARFIELD: Well, you know, Kansas obviously wants to get to Compact compliance as well. And, you know, our preference is obviously to use this

administration to resolve those concerns. You know, our concerns are not new ones. You know, we've been -- since the mid 1980s at least, we've been trying to resolve these concerns in two different drought periods, dry periods where we've been shorted significantly. And, you know, obviously people of Kansas have been injured as a result of that, as I've said at the original statement, and there's a lot of pressure on me to do something about it.

But I understand, you know, your desires and the hard work you're doing. And I guess we want to understand the information that you're presenting here and what your plan is and, you know, assess whether it's going to get you there or not, whether it is. I mean, so again, we want to understand -- make sure that we fully understand all that you're doing and planning to do is very important for us. So I think that's our big purpose in this meeting is to understand and, you know -- so that's -- that's our purpose I guess.

MS. BLEED: Well, I will reiterate, Nebraska's very definitely committed to trying to create understanding among the

three states and to work together to resolve the dispute issues. We want to do everything we can to make sure that Nebraska's in compliance with the Compact and to make sure that Kansas gets the water that she's entitled to. And so that is where we are. We're willing to work very hard and commit the resources necessary to get to that point.

I think with that, it sounds like at least for the moment we're all on the same page, that we need to do the best we can to understand the issues. So maybe what we can do is move into that portion as we talked before about trying to get a better understanding of the issues and then after that put together a game plan to move forward to do what we can to try to resolve what's before us.

So with that, I guess the first thing -- Kansas made their presentation, I'll go into some questions we have. Kansas did give a brief presentation based on the letters that they have provided to us. And we're trying to get a better understanding of where Kansas is coming from, particularly as it applies to the damage issues.

You did give us some technical information to explain some of your modeling. We still have questions about that. The complexity of the questions of the modeling is such that to try to do that by sending letters back and forth is not very helpful. And we would really like to be able to sit down and work with your modelers and include Colorado, because it affects Colorado, to figure out where our misunderstandings and questions are on the model.

But the one thing that we haven't really seen very much of, other than reading statements in the newspaper, and I have learned -- my apologies to the reporters in the audience -- never to completely trust the newspapers. We really don't have any understanding of what Kansas is looking for for damages and on what basis their -- their request for damages -- what is the basis for those requests for damages. I guess that would be a question for Kansas.

MR. BARFIELD: Right. Well, I'll start, although I might -- I might ask our attorney to help me at some point as well

because some of the bases and all that sort of stuff may be just as appropriate for him as for me.

But, you know, in the letter I sent, I basically I think set out at least some of the principles. I mean again, as I've already mentioned multiple times, even here and in the letter, our water users as a result of violations have been shorted substantially, both KBID, Kansas Bostwick Irrigation District, and our users. That cannot be recovered at this point in time, and so economic damages is our belief of what would be appropriate to compensate us for Nebraska's use of our water.

You know, the basis of those financial damages would be either, you know, our damages or Nebraska's benefit, whichever are greater in our view, plus all the other pieces that were in the letter. Again, the basis of the fact that we have been injured and those injuries cannot be recovered except through this meeting.

So I'm afraid -- you know, we did put a lot more time and attention -- this is an important matter for us, and I don't want to diminish it too much here, but, I mean, the most

significant thing has been, you know, how do you get to compliance and laying that out. But -- and we can find a way to deal with this economic thing as we move through the process so -- I guess just -- I don't know if John or anybody wants to add to what I've said.

MR. DRAPER: Well, I might add a few things to that. I think the -- as far as the damages aspect goes, that's an important component of the remedy that Kansas is seeking. And we have noticed that in the responses that we've had from Nebraska that that aspect of our proposal has been ignored. We take that to be a disagreement on the concept that there should be any kind of remedy for the past violations of the Compact and the FSS in 2005 and 2006.

And one of the things we might make some progress on today is whether Nebraska does indeed take the position that we have inferred from the omission of that from the Nebraska responses whether we have an agreement in principle that there is -- it is appropriate for a state to include some kind of remedy for a past violation. What we've talked about so far in this meeting is only future compliance.

There's been no mention of past noncompliance.

We have now just this past year reached the point where we first came under the timetable that was set out in the FSS, the final settlement stipulation, and that was for the water short period 2005, 2006. And as we included in the transmittal, the amount of that violation as we calculate it is over 80,000 acre feet during those two years.

There are some accounting issues that we -- our understanding of those right now is that they're marginal, that there is a sizable violation that occurred in 2005/2006. And it's going to be important for Kansas, consistent with the law that applies to Compacts in the United States, to obtain an appropriate remedy for that -- that past failure to comply with the Supreme Court decree. Maybe that's all I should say at this point, Dave, unless there are specific questions.

MS. BLEED: Let me respond a little bit to that. I think the assumption that we have rejected any kind of concept of damages as part of the remedy because we did not specifically talk about it in the letter is

exactly the kind of misunderstanding that I worry about occurring when you're simply trading letters back and forth, because I don't think Nebraska has made any conclusion that we aren't going -- we are simply not going to consider damages as part of some kind of a remedy. So I think that is a misunderstanding, and I'm glad we can clean it up at this point.

Part of our interest in finding out what kind of damages you're talking about is so we can think about it and figure out how it would be a component of a potential remedy. But we have no idea whether you're talking billions of dollars or hundreds of dollars. We just -- that's something that we need better understanding of. What is it you're thinking of?

MR. DRAPER: Well, if I understand you then, there's not a difference in principle, it's going to be a matter of amounts that would -- would be the major consideration for Nebraska?

MS. BLEED: Right. I think where we are right now, we have not out of principle said, no, we aren't going to consider economic

damages, but we do need to have further discussion as part of, I would hope, an attempt to resolve the dispute of what that -- those damages look like. And, no, it's not a matter of principle that we have rejected the idea of paying damages.

MR. DRAPER: Well, I think we can look more closely at that question as we suggested in our letters to Nebraska. We do feel it's appropriate to consider the benefits that have accrued to Nebraska as a result of the violations as the primary criteria for that. We believe that compensation in some form like that is necessary to deter further noncompliance. So we'll proceed along those lines, and I think we'd be prepared to further delineate that component.

MS. BLEED: Does our attorney want to reply to that?

MR. LAVENE: Well, I was just going to say, I think that's what the director was giving out. You know, obviously you put that forth as a potential part of the remedy that -- as a dispute that Kansas wishes to have resolved. As the director said, I don't think

we have any formal communications that said we're not looking at that issue.

I think where Nebraska's -- for Nebraska to be able to analyze what Kansas is talking about, as you did with your proposed remedy in looking at what would get Nebraska in compliance underneath Kansas's analysis, Nebraska also needs an understanding of where you're coming from.

Although you mentioned potential harm, past harm to Kansas for these supposed Compact violations or unjust measurements supposedly by the State of Nebraska what that actually looks like. What is your analysis of either one of those scenarios for us to move forward to make a determination as a state whether or not that would or would not -- would or would not be appropriate to have as part of the package or remedy as we proceed to resolve the dispute between the parties before the commission.

So I think a further articulation of those issues, past harm to Kansas, what that is, what that entails, would be beneficial for Nebraska to be able to look at that and say we now understand where the harm is at and what I

guess calculation of damages there would be for that. So that's where I think we're -- at this point in time do not have an understanding of from your previous letter of December 19.

MR. DRAPER: That's helpful. Thank you.

MS. BLEED: Any other questions for Kansas at this point? I think that was our main set of questions. I'll look at my team, if you have any other questions to add.

And I will just reiterate again, I think that it would be appropriate to somehow get together with the technical modeling folks to have a better understanding of how Kansas is using the model and how we're using the model and the differences. It's the same model, it's basically the same input data, so I think there should be a way of resolving with the technical people -- it's probably beyond my capabilities, but with the technical people trying to figure out just what is the best way of putting the data into the model to figure out what we need to be doing to resolve the -- what is the -- what is the best remedy. With that, I'll turn it over for people who have questions for

Nebraska.

MR. BARFIELD: That would be me I think.

MS. BLEED: I think so. Although Dick probably has some too -- or Commissioner. My formality is not that great.

MR. WOLFE: No problem.

MS. BLEED: Dick probably has questions too.

MR. BARFIELD: I guess, you know, you've given us a big notebook here, but you also put a lot of information on -- in your Power Points. And I guess I'd like to just -- my preference would be just to kind of use your Power Point presentation as an opportunity to maybe query a little bit more to make sure we understand those differences. Again, we can't -- it's going to take more than this meeting maybe to understand that, but I think there's a lot of information that maybe we can gain just by having some questions from that Power Point. I don't know if we could just haul it back up and just use it as a talking point so -- for that discussion. If we could do that.

MS. BLEED: Certainly. I think

that would be fine. And I think this is exactly what we need to do. When the three of us were talking, I mentioned to Dave that I -- I was having trouble understanding why he couldn't understand.

MR. BARFIELD: Right.

MS. BLEED: And so I think this is exactly what we need to do. If we can get a better understanding of what your questions are, if we can address them today, we will. There probably will be quite a few that we won't be able to get addressed today, but we are very willing to work very hard to get the best answer we can to what your concerns are.

MR. WOLFE: I just have one quick thing maybe while that's being brought up. Even though Colorado has not taken a position on damages here, I think what we believe is of greater interest in terms of if damages are assessed and whether Colorado gets brought into that or not, we think that those type of things should be used to help bring us into Compact compliance.

And, you know, if those damages are assessed, we think it's best used to help us

further get into Compact compliance certainly, because as we recognized with our proposal tomorrow, it's not only about bringing water but it's pipelines and some of those, to bring some of those things there, and it takes money to do that.

So to the extent that those, as part of the remedy phase in any of this, what any of the states are involved, to the extent those moneys can be used towards Compact compliance would certainly be our desire in the interest of, you know, Nebraska's benefit as well, not just Colorado. So I'd just like to present that for you.

MS. BLEED: Thank you.

MR. BARFIELD: Okay. And again, I'm not necessarily going to have questions over every single slide, but -- and obviously --

MS. BLEED: If you have questions on that one, I've got a problem.

MR. BARFIELD: No, no questions on that one.

MR. WOLFE: What river is that?

MR. BARFIELD: Where is that at? It's got water in it so it's a good river.

MR. WOLFE: It's got water in it, what's the problem?

MR. BARFIELD: Anyway, go to the next slide here. You know, you've made this -- this statement also I think in your letter that we use a dry period to set one criteria and a wet period to set another criteria and then compared the two and therefore it was an unfair comparison. And I did respond to that concern on page 2 of my February 19 letter. And basically saying that our methodology was not to do that.

We basically took the most recent period of record and kind of repeated it over time. And that record, you know, included both wet periods and dry periods. And, you know, our analysis was focused on figuring out what Nebraska needed to do to be in compliance during the dry periods, because you can't turn groundwater depletions on and off at will. That's just not the way the system works. And so -- but it's our belief that methodology of analysis, you know, looked at the dry conditions, you know, under dry conditions. So we really aren't clear exactly what the point is

being made here.

I guess a couple questions. Is the backup analysis that is mentioned in these -- in your slides here, summarizing your slides, in this notebook so we can kind of look at it and understand exactly what went into that analysis in terms of the wet versus dry false comparison that you allege?

MR. SCHNEIDER: Yeah, it's in here, in terms of taking the -- the model period, the period of the Kansas model of 1990 through 2006 and comparing it to the accounting from that same period.

MR. BARFIELD: Which section is that in?

MR. SCHNEIDER: That's 2B.

MR. BARFIELD: 2B. Okay. I guess what's wrong with kind of using the methodology that we used to come up with this analysis of taking an actual period of history that included wet and dry and replicating in the future? How does that create this false comparison? It's just a question we have so --

MR. SCHNEIDER: I think the problem comes in when you compare what happened

then to a target that's derived from -- solely from a dry period. You're -- you're attempting to find out what kind of groundwater pumping levels would need to be required to meet that 175,000 acre foot target that stems from your analysis of 2002 through 2006 and counting.

MR. BARFIELD: Which was a dry period.

MR. SCHNEIDER: Correct.

MR. BARFIELD: Okay.

MS. BLEED: I think it goes to the fact that the depletions -- if you had two years and the pumping was exactly the same level in both years and if you have a dry stream -- I'll take an extreme example, there's no water in the stream, you're not going to have any depletions in the stream even though the pumping might be quite high because there's no water to deplete.

If you've got a very wet stream, then the depletions will be quite high because there's quite a bit of water to deplete. So when you compare those two situations, you're comparing apples and oranges. And I think that as a result, you overestimate the amount of

reduction in pumping by using the wet period to figure out what the reduction would be to compare to what kind of a reduction you would need if it was a dry stream.

MR. BARFIELD: Okay. The thing we're disconnecting here I still believe is that -- the statement that we're using a wet period to evaluate, because, again, we looked at the period that went up and down, it had wet and dry, and I really think the dry period, you know, was establishing the target.

MS. BLEED: I think part of the problem is -- that we're dealing with is you could have one or two dry years but with the lag effect of the impact of wells, we can't just look at dry year to dry year. You have to look at the whole period. And, Jim, do you want to add to that?

MR. SCHNEIDER: Yeah. And I think we're using the term wet and dry in a relative sense here. But it, you know, was wetter for the period as a whole in 1990 through 2006 than it was for 2002 through 2006. It was significantly different. So it's not to say that the period 1990 through 2006 as a whole was

abnormally wet, but it was wet, sure, so it may be better stated that way.

MR. BARFIELD: Well, although we used that replicating period to model the future, that -- that wasn't the whole average -- we weren't using an average of that period to really come to the conclusion that we were coming to. It was really the critical dry periods of those cycles that I think caused us to land on where we were, so -- but we'll look at your analysis further and just figure out if it says something different than we think so --

You mention in the second point on this slide that you had difficulty replicating our modeling. I guess in replicating it -- I mean, the groundwater model is the groundwater model, and I guess I'm not understanding that statement. You're saying you used the same data and assumptions and you came up with something different?

MR. SCHNEIDER: Yes. I mean, it was essentially -- it appeared that, you know, in order to run forward from 2006 using past years, you have to adjust for the current level of development. And when we did that the way

that seemed appropriate -- that is appropriate in our view, we didn't get the same results. It wasn't entirely clear -- we inferred from your letter the methodology that you used. We weren't entirely clear on that. But basically, we just couldn't reproduce the results.

MR. BARFIELD: We laid out in a fair amount of detail the assumptions we had to make in order to run the future. There are quite a few assumptions that you have to make. I grant that.

MR. SCHNEIDER: Yeah.

MR. BARFIELD: But given those assumptions, it seems like you should be able to get fairly close to replicating ours. You mentioned something about doing it the way you thought. Did that mean you -- does that mean you came up with differing assumptions that you thought more appropriate and that was the reason for the significant difference in the results?

MR. SCHNEIDER: I mean, the best I can say is we think so. I mean, you know, again, without seeing exactly the exact -- I agree, the details were fairly well laid out in your letter, but it was difficult to -- without

seeing exactly the data to see if we were replicating it the same way. We don't know.

MR. BARFIELD: Well, what I'm trying to get at is -- I mean, you know, we all run the model annually for routine calculations and come up with the same answers, otherwise some have complained about those answers. So I'm trying to get at if the significant differences were really because we've got two different versions of the model or because in your replication you're replicating under different assumptions, because it shouldn't be that we're getting significantly different results if we're trying to do the same thing so --

MR. SCHNEIDER: I'd say the general pattern of the results was similar, but, you know, the annual output was not. And it appears to us that the largest discrepancy between the two was the methodology employed to distribute the pumping in Nebraska.

MS. BLEED: The model itself is probably not the problem. It's more the input than the assumptions on the input.

MR. SCHNEIDER: Right. It

appears that it had to do with the methodology employed to distribute the pumping.

MR. BARFIELD: Right. So --

MR. SCHNEIDER: And that's laid out -- that's section 2A.

MR. BARFIELD: Okay. So you've got information in here as to the difference in the methodology for distributing pumping that was different than ours?

MR. SCHNEIDER: Yes.

MR. BARFIELD: Okay. And you think that was a lot of the difference in the results then?

MR. SCHNEIDER: That's our best guess at this point.

MR. BARFIELD: Okay. Okay. I guess I'll just keep this moving. Now, the 42,300 acre feet difference, that's the difference between your running the model and our running this model; is that right?

MR. SCHNEIDER: No. We took -- we took the results that were in your letter from your running the model and we compared them to the accounting for 1990 through 2006 as opposed to comparing them to that -- to the

target that you developed from 2002 through 2006. And that -- again, that's in section 2B, the results of that analysis. We used similar assumptions like reduction in groundwater pumping, increases in stream flow due to reductions in groundwater pumping, some of that would be diverted, but we followed generally the same assumptions used.

MR. BARFIELD: I'm sorry, just tell me again, what is the 42,300 difference?

MR. SCHNEIDER: What does it represent?

MR. BARFIELD: Yeah. It represents the difference in Kansas and Nebraska's -- just tell me where this number comes from. It's the difference in two things. What are the two things it's contrasting?

MR. SCHNEIDER: What that -- that number represents a long-term average of the net for Nebraska, five year compliance test under your modeling results.

MS. BLEED: We took your model results and we -- we didn't use their model results, per se. We tried to replicate your model results using your inputs, put them

through the accounting procedures and looked at then what the five year -- the average of the five year running averages for that period, and it was 42,300 acre feet, the difference between the allocation plus the imported water supply minus the consumptive use.

MR. BARFIELD: So you took your best attempt to replicate our model results and ran them through the accounting procedures and then you did the same thing for yourself and came up with that result?

MR. SCHNEIDER: Actually -- I'm sorry, Ann, it was actually -- we did use the results from your -- not knowing, you know -- we tried to replicate results, then we just said, okay, let's assume these are correct, we took your results, we ran -- and then we took the output from those -- from that model run that you provided, the annual output, and we took historic accounting data, historic surface water diversions, historical locations and did a year by hear analysis of what the annual balance would be for Nebraska --

MR. BARFIELD: Okay.

MR. SCHNEIDER: -- with that

output. And then this represents long-term average of the five year compliance test.

MR. BARFIELD: All right. I'm sorry. So there was no Nebraska analysis in this. You took our numbers, stuck them in the accounting procedures with the other data and found for the average 1996 through 2006, you were 42,300 in the plus?

MR. SCHNEIDER: Yeah, but it represents going forward into the future because it -- the only thing that basically changes, we used 1990 to 2006 accounting data, but we had to do groundwater inputs.

MR. BARFIELD: So you're saying -- over what future period did you consider?

MR. SCHNEIDER: The same as -- the 50 year scenario, yeah, or 51 I think.

MR. BARFIELD: Okay. So you're saying on average you're in compliance is essentially what that analysis says?

MR. SCHNEIDER: It says that when we look at the five year running average --

MR. BARFIELD: Right.

MR. SCHNEIDER: -- on average,

that number is 42,300 acre foot.

MR. BARFIELD: All right. Well, isn't it really a 50 year running average then?

MR. SCHNEIDER: Well, the number -- if you take the 50 year average of those annual values, you get a slightly different number. And, again, that's in the write-up.

MR. BARFIELD: Okay.

MR. SCHNEIDER: Just two different ways of looking at the output.

MR. BARFIELD: Right. Okay. So this number doesn't look at the critical dry periods, right? It just looks at the sort of long-term average compliance?

MR. SCHNEIDER: It includes 1990 through 2006, so it has -- you know, it has wet and dry.

MR. BARFIELD: Okay. Okay. Thank you.

Okay. So this says you've adopted IMPs to help you achieve compliance. They have wet and dry components or normal and dry components. Okay. Go ahead to the next one I guess.

And again, this analysis is in -- what

section of the notebook is this analysis in?

MR. SCHNEIDER: 3B.

MR. BARFIELD: So the baseline period that's used -- that you refer to here is 1998 to 2006; is that right?

MR. SCHNEIDER: No. It's 1998 to 2002.

MR. BARFIELD: I'm sorry. I meant to say 2002. So for purposes of doing this IMP analysis, you essentially took 80 percent of that -- those values and used those in the future?

MR. SCHNEIDER: Uh-huh. Right.

MR. BARFIELD: Okay. '98 to 2002 I guess had mostly wet years or wetter years. There was obviously a very dry year. You mentioned 2002 was strictly dry. I mean, how -- I guess I --

MS. BLEED: Let me interject -- maybe this will help -- because I think you might be confusing something. When we're talking about baseline pumping, what we did to develop the integrated management plans, given that the final settlement stipulation was signed in 2002, we had an agreement among the resource

districts in the basin that we would distribute the amount of pumping that could be allowed among the NRDs based on what they pumped in the 1998 to 2002 period because that represents both wet and dry years, but it also represents the current level of development up through 2002. So when we talk about the baseline pumping, that's simply to look at what the pumping level needed to be. The modeling itself does not use '98 to 2002 years.

MR. BARFIELD: Okay. So to develop your IMPs, you -- you took the '98 to 2002 period to sort of --

MS. BLEED: We assigned a percentage. We looked at the total amount of pumping on average for those years --

MR. BARFIELD: Right.

MS. BLEED: -- and then we looked at what percent of that total pumping was done by the Upper Republican and the Middle Republican and the Lower Republican, and that's the percentages that we are using in the IMPs. And it's also -- the baseline pumping, when we said we had to reduce from what, it was those pumping levels, the averages for those five

years, and we said you have to reduce your pumping level for each NRD by 20 percent.

And we obviously in looking at this looked at other percentages, but that's the one that our modeling told us was going to get us into a place where at least for the not too distant future that we would be in compliance with the Compact during average precipitation years. And we understand as the lag effect changes in the future, things may have to change. The compliance plans are set for the next five years. We will then revisit and if we have to make changes later, we can. If we have to make changes within the five year period, we can.

MR. BARFIELD: Okay. So the base period was used to distribute, you know, your pumping goals --

MS. BLEED: Right, right.

MR. BARFIELD: -- for lack of a better way to put it. But I remember somewhere in one of the slides, you know, Upper Republican used 14 inches in that five year period on average. So when you were figuring out the percent reductions, it was tied to that average

number of inches?

MS. BLEED: No. It was really tied to the pumping volume total.

MR. BARFIELD: Oh, the total volume of the district.

MS. BLEED: And then it gets distributed by the number of acres obviously being irrigated.

MR. BARFIELD: Okay.

MS. BLEED: But it was not necessarily based on the allocation, per se, at a given time, partly because until 2005, as I mentioned before, the Middle and the Lower Republican hadn't set allocations.

MR. BARFIELD: So this integrated management plan run that you did, you say that 80 percent of the baseline pumping -- I guess how did you implement that?

MR. SCHNEIDER: You mean within the modeling?

MR. BARFIELD: Yeah. So you took the 1990 to 2006 period and replicated it into the future or --

MR. SCHNEIDER: No. The precipitation data, input data were based on

long-term average precipitation at each official compact gage.

MR. BARFIELD: So you just assumed average precip happened every year?

MR. SCHNEIDER: Yes.

MR. BARFIELD: Okay. And then in terms of pumping then, you took 80 percent of the '98 to 2000 and assumed that was the pumping each year?

MR. SCHNEIDER: Right. The pumping levels --

MS. BLEED: 2002.

MR. SCHNEIDER: Right.

MR. BARFIELD: Okay. Okay. So this was again sort of an average analysis, if average precip and average pumping occurred every year for 50 years or whatever, this is what would happen?

MR. SCHNEIDER: Correct.

MR. BARFIELD: Okay. Okay. And so again, this analysis said under those sort of average future conditions, you'd be in compliance?

MR. SCHNEIDER: Once -- once we took the model output and put it into what we

felt was correct accounting analysis.

MR. BARFIELD: Okay. And I guess the next slide then. So again, that's what the rest of these slides are about is about the other assumptions made in the analysis both in terms of the -- in terms of the accounting?

MR. SCHNEIDER: Right.

MR. BARFIELD: Okay. Now you obviously do agree that Nebraska has to be in compliance in dry years, but this is what you've used as setting your base for sort of the normal long-term average?

MS. BLEED: Absolutely. We understand that we also have to be in compliance in dry years.

MR. BARFIELD: Okay. In any of your analysis, did you take into account the fact that if you reduce the pumping allocations that there would be a reduction in the return flows that would be achieved? In other words --

MS. BLEED: In the modeling?

MR. BARFIELD: I'm sorry?

MS. BLEED: In the modeling you mean?

MR. BARFIELD: In the modeling,

yes. Did you change the return flows at all in the model?

MR. SCHNEIDER: The return flows were based on the pumping volumes.

MR. BARFIELD: Okay. So the 20 percent still?

MR. SCHNEIDER: Right.

MR. BARFIELD: You know, again, as we mentioned in other forums here, that's an assumption we just don't believe is appropriate. As people go to allocation systems, they become much more efficient in their operations, and that's how they maintain economic viability of their operations. And really, you know, the modeling needs to account for that in our view.

Okay. We can go ahead. I'm not going to query every slide, I just want to have a general understanding of what we've been looking at here.

Okay. Next slide.

Okay. Next slide.

Do the IMPs actually cut pumping 20 percent? Is that, in fact, true? I mean, that was assumed for the purposes of this analysis, so I'm actually stepping away from the

slide for a moment here.

MS. BLEED: The IMPs, as I explained before, have essentially two -- two types of compliance standards is what we call them. And it's a little bit different -- differently worded, but essentially, it's the same thing.

The long-term average has to show a reduction of 20 percent from the baseline in pumping. It is true that in any given year, it can be higher, the long-term average has to be, but then there's this second compliance standard, and this is the one that really may be the -- the critical standard in the dry year says that each NRD must make sure that their depletions to the stream flow, their net depletions to the stream flow are no greater than their allotted percentage of the total depletions.

And again, that percentage was based on the baseline usage from 1998 to 2002. And that that criterion is looked at on an average basis, the average depending on whatever average is being used for those same years in the Compact. So, for example, if it's a normal period and we

don't have water short year criteria in effect for the Compact, we will look at the -- the average percentage allotted to each NRD to make sure they were under that on a five year running average. If, however, we're in water short years, it would be looked at on a two year running average.

MR. BARFIELD: You know, again, you can't turn depletions on and off. So how do they -- how do they get there under water short years when the allocation is down?

MS. BLEED: That's why I use the word net depletions.

MR. BARFIELD: What does that mean?

MS. BLEED: Well, it means that they can also look at various ways of augmenting stream flow through an augmentation plan, for example, or through purchases of surface water to what I usually refer to as fine tune the system. So the concept is to get the background pumping or the overall pumping down to a level such that when we need to, on short notice, because it's an abnormally dry year, we can use these other methodologies to ensure that the net

depletions are not greater than their allotted percentage of the allowable groundwater pumping. But that -- I mean, that's one of the things we struggle with with the integrated management plans, as I've mentioned before, and as you well know, with the lag effect from pumping wells, it's very difficult to manage for a highly variable stream simply through managing groundwater pumping. You need to do some other -- have some other tools in the toolbox to manage the system, and that's what we have tried to do.

MR. BARFIELD: You mentioned augmentation and purchase of surface water. Are those, I guess, credits or however you want to term it to get to the right net depletions, are they -- have you determined those? Are they still under development? What's their status?

MS. BLEED: Well, it depends on whatever year you're dealing with. What Nebraska's going to have to do is look at the -- try to estimate what's going to happen in the future. And as you know, that's very difficult to do. But we're going to have to make the best estimate we can of what kind of management

activities we will need for the next year. And then if it looks like we're going to need to augment stream flow to make sure the net depletions are within the allowable -- allowable percentage of the total depletions from groundwater, we will then have to work out some kind of an understanding through dry year leasing or through an augmentation pipeline plan to make sure that the net depletions are within that allowed percentage by NRD.

MR. BARFIELD: I mean, obviously we're here today because you haven't got there yet. You know, you've tried surface water purchases, but they haven't been sufficient. You know, how do you know there's going to be surface water available in future water short years is one question we have. How do we -- what assurances do we have that those purchases are going to be done and delivered in a way that gets to Compact compliance.

I mean, this is some of what we're looking for to Nebraska is again, show us the plan that gives us certainty that you're going to get there because we're obviously not there yet. You know, the actions you've taken in the

past have been insufficient. And again, our look at the groundwater model data says unless there's very significant action, more significant than you propose, that the amount of surface water available in the future is going to be even less than what it was in this last drought period. That's -- that's our big concern. To rely on surface water, I'm just not sure unless there's some very significant action is -- is doubtful to us so --

MS. BLEED: I think part of that problem that we have here is your modeling and our modeling is obviously giving different answers, and that's one of the things I think we need to sit down and sort through, because we believe that we can get, if I can say, within spitting distance of where we need to be with the 20 percent reduction during average years. In drier years, it's definitely going to be a bigger challenge. If necessary, we will reduce pumping even further. But we also believe that there are other things we can do that can be successful.

Now the reality is, Dave, the new plans were adopted this January. So we are confident

that they will get us where we need to be in the future. Last year, we were in good shape. We had some help with mother nature, but we also had a lot of help from the fact that we had reduced pumping and that we did purchase surface water last year.

Clearly, if Nebraska's going to stay in compliance with the Compact, we have got to find the right level of pumping, groundwater pumping so that we can have the surface water available when needed to offset those dry year depletions. But again, our modeling says we can get there with a 20 percent reduction, and that's where I think we need to sit down with you and go through all those modeling runs to see how to convince you that we can get there. Alternatively, if you convince us that we can't get there, as I said before, the plans do include the ability to change the allocations if necessary to comply with the Compact.

MR. BARFIELD: Okay. So does a 20 percent reduction according to your modeling actually reduce depletions in the future?

MS. BLEED: Yes, it does. Do you want to go ahead, Jim?

MR. SCHNEIDER: The depletions are less than if they were pumping 100 percent of the baseline.

MR. BARFIELD: Well, that's not what I asked.

MR. SCHNEIDER: From what I guess is kind of my point.

MR. BARFIELD: Well, from the current level. I mean, you know, if you look at a graph of what the model has said to date that we all agree on, you know, are the model results, you know, you're -- Nebraska's level of depletion is going up. Obviously there's some year to year variation, but if you look at any sort of -- you know, just take your eyeball through that, it goes up.

And, you know, as we built futures, and I've seen it in slide presentations from you all, without a change in the pumping, it continues to go up from an average of 200,000 acre feed current level to 250 or 275 or something in the foreseeable future. That's the model ones we've done, and I think I've seen similar from you all.

So -- I mean, the lag effects are still

out there coming, barring some action. And I guess what I'm asking is, are you saying you have model runs that say a 20 percent reduction stops and reverses that?

MS. BLEED: We have model runs that indicate that from 2008 on that the 20 percent reduction will get is into compliance. Now, we are in -- as far as we can tell, based on our estimates of what happened in 2007, we will be in compliance in 2006, 2007.

MR. BARFIELD: Well, there will be a five year test. You're talking about for the two year.

MS. BLEED: The two year water short year, right.

MR. BARFIELD: Okay. We have not reached that conclusion. But again, we don't have all the data. Obviously for the '03/'07 period, every evidence is you will be out of compliance and also for the next five year. So you said based on your modeling, the 20 percent reduction will get you into compliance again on this kind of long term average basis --

MS. BLEED: Right.

MR. BARFIELD: -- average

pumping, average precip?

MS. BLEED: And we understand that in dry years, we're going to have to do something more. And what we're telling you is the IMPs are put into place that will get us there, and we will honor those IMPs.

MR. BARFIELD: If I might just return to that. The IMPs aim for reduction in pumping of 20 percent from the '98 to 2002 average. So how do you know that that's going to occur? You know, these IMPs have, you know, obviously lids on the pumping in an individual year but -- well, the average pumping over the five year period that allow carryover from year to year. How do you know that 20 percent reduction is really happening given all that?

MS. BLEED: Well, the -- the -- we do have carryover in some cases, not all. As I said, each IMP is a little bit different. And we have established rules and regulations in the IMP that if what we're doing now is not going to get us where we need to be, we will change the rules and regs.

MR. BARFIELD: Do you have a certain point in time you're going to evaluate

whether you are getting there?

MS. BLEED: We're going to evaluate every year.

MR. BARFIELD: When will that start?

MS. BLEED: 2008.

MR. BARFIELD: Okay. I guess I'm ready to move on unless somebody else has questions here.

Okay. That's just the result of the analysis given the assumptions we spoke about earlier?

MS. BLEED: Right.

MR. BARFIELD: Okay. Okay. Yeah. This is on an annual basis?

MS. BLEED: That's right.

MR. BARFIELD: Okay. All right. And we spoke about the second point of this already. Right. This is where they have to go somewhere else to get their water.

MS. BLEED: (Nods head.)

MR. BARFIELD: Okay. Thank you.

MS. BLEED: Or otherwise reduce their pumping.

MR. BARFIELD: Or -- right.

MS. BLEED: Either one or the other or some combination.

MR. BARFIELD: And, again, you spoke about this one as well --

MS. BLEED: Uh-huh.

MR. BARFIELD: -- that you've allocated what each NRD is going to do. Okay.

Now, you know, our analysis said 175,000 acre feet is kind of the depletions that we felt Nebraska could allow to stay within their overall allocation as experienced over, you know, five years, sort of dry periods. What number did you use to share -- I mean, what was the goal? I assume you established a depletion goal that's the basis of that allocation sharing?

MR. SCHNEIDER: I guess I'm not sure what you're -- I mean, we explained how we compared the model results to the -- to our average compact accounting to see the result. I'm not sure what you mean beyond that.

MR. BARFIELD: Okay. What is this slide saying, I guess? Let me ask it that way.

MS. BLEED: What we did in the

integrated management plans is we said that you have to be within a certain percentage of your allowable groundwater depletions. This is the definition of what an allowable groundwater depletion is in the plan, that's the maximum level of depletions to stream flow from groundwater pumping that can be allowed in a given year without Nebraska exceeding its allocation.

MR. BARFIELD: Okay. Is that a number?

MS. BLEED: No. It depends on the year what that number would be. As you know, the allocation goes up and down every year, so the surface water use goes up and down every year, and so the allowable groundwater depletions would go up and down as well.

MR. BARFIELD: So how are they annually established? I mean, is this the first process?

MS. BLEED: Well, it would be -- the compliance will be looked at in an after the fact matter, just as the Compact compliance is after the fact. What we're going to have to do is, as I said before, ahead of time make

estimates of where we need to be and take whatever actions we think are necessary so that when we do the after the fact accounting we are within -- we have Compact compliance and each NRD is within their compliance.

MR. BARFIELD: So they're established -- how are they established ahead of time?

MS. BLEED: Well, just as anybody would have to do with the Compact. The Compact is an after the fact accounting system. We don't know precisely in any given year what the allocation is going to be. So we are going to have to make our best guess at what we think the allocation will be to establish what we'll need to do for the next year to be in compliance. This is not an easy thing to do, but the Compact itself, it pretty much sets that as what has to be done. Unless we change the Compact, I don't know how you get out of after the fact accounting.

MR. BARFIELD: So you're going to go through this process annually?

MS. BLEED: Yes.

MR. BARFIELD: Okay.

MS. BLEED: And, in fact, the state statutes were changed last year to say that the Department of Natural Resources has to make an estimate of the allowable depletions in any state that is -- well, in this case, subject to the Compact. So we will make our best estimate of what that will be to assist in our management of the river. Can I guarantee that that estimate is going to be right? No. Unless you can tell me how much our allocation is going to be every year.

MR. BARFIELD: So this is kind of a new process that you all are envisioning for the future?

MS. BLEED: That's correct.

MR. BARFIELD: You haven't done that yet, have you?

MS. BLEED: No. This is forward looking.

MR. BARFIELD: How does this intersect with the NRD's -- I mean, they just developed allocations for the next period of years, five years or three years, whichever --

MS. BLEED: Five years.

MR. BARFIELD: So those can be

adjusted based on this analysis?

MS. BLEED: They can be adjusted if necessary.

MR. BARFIELD: Okay. And again, they can either meet that through pumping changes or finding some way to reduce their net depletions or whatever they are through some other method, augmentation or buying surface water?

MS. BLEED: That's correct.

MR. BARFIELD: If surface water is not available for whatever reason, then it's cutting or an aug plan?

MS. BLEED: Exactly. If there isn't any surface water available, that's exactly what will happen.

MR. BARFIELD: I know I'm jumping all over, but --

MS. BLEED: That's okay.

MR. BARFIELD: -- is there any plan -- this coming year there's no plans for surface water purchases; is that right?

MS. BLEED: No, that's not correct.

MR. BARFIELD: Okay.

MS. BLEED: We are working on a potential surface water purchase. That's about all I can say right now.

MR. BARFIELD: Okay. I know -- I've heard certain districts that have been involved in the past are not interested this year so -- I guess again, as we've expressed in the past, we obviously have some interest in that process, at least to the extent it involves Kansas Bostwick and Harlan County in particular.

MS. BLEED: What I can tell you is that at this moment, we aren't talking with either -- we aren't talking with Nebraska Bostwick about a surface water purchase.

MR. BARFIELD: Okay. Next slide I guess. I guess this doesn't prompt any additional questions here so -- and again, I think you've hit this one well. Next.

Okay. Next slide. I guess this kind of turns the page to sort of a new set of issues so -- so I guess let's keep going unless -- if you're ready for a break at any time.

MS. BLEED: Do you want to take a quick break?

MR. BARFIELD: Yes. Let's make

it quick.

MS. BLEED: Why don't we take -- just check your watch. Why don't we take a 10-minute break.

(Recess.)

MS. BLEED: Dave, do you want the slides up again or --

MR. BARFIELD: Yeah, unless you have a better idea.

MS. BLEED: No, that's fine. That's fine.

MR. BARFIELD: I think this is helpful to help us understand what you are proposing.

MS. BLEED: Whatever will help us make progress.

(Off the record.)

MR. BARFIELD: Well, good, I think maybe just proceeding is the best way. I guess just reflecting on what I've heard here in the last little bit, you know, we -- we do have some skepticism I guess about certain pieces of the plan or at least need to have some way to have more certainty about what's going to happen.

Again, well depletions cannot be turned on and off at will, that's just not the way the system works. And surface water, it might be available, it might not be. And contracting to get it available and getting it to where it needs to is not easy. And so this is -- this is kind of why Kansas is somewhat uncomfortable is we need some certainty because again our people are trying to buy seed right now and what's going to happen this year or next year. Are you going to be in compliance or not and who's taking the risk? What happens if you fall short? You know, if you're short, we're short. So this is a big issue to us so --

MS. BLEED: It's a big issue to us as well, Dave. And all I can tell you is we are trying to put the pieces and tools in place to make sure that we will have whatever water is necessary to comply with the Compact.

MR. BARFIELD: Okay. Well, let's carry on I guess. I should have had a different seat. Should have sat where Ken's sitting.

All right. Next slide.

These are discussed in more detail, Ann, right? This is just an introductory slide?

MS. BLEED: Yes. Those are just the introductory slides.

MR. BARFIELD: Go ahead then.

Well, you know, I guess the next number of slides talk about your concerns about the way the model runs are done, I guess for lack of a better way to summarize it, so, I guess I do have one question on it. You know, we have had some interaction with you and your staff on this issue. You know, we worked pretty hard to try and understand the issue and still aren't convinced that there's a problem with the model. In this analysis --

MS. BLEED: Let me make it clear. There's not a problem with the model. The problem is the scenarios used to determine the depletions.

MR. BARFIELD: Yeah. Yes, I understand. And in one of these slides, you had a breakdown of the beneficial consumptive use by state. How did you do that, because the previous paper you did on this didn't have a methodology to do that. So have you added to the proposal since our last discussion, or how did you break down the beneficial consumptive

use by state?

MR. SCHNEIDER: Yeah, it's detailed. It's in section 4A. And there's a -- I mean, we -- it's basically the same process that the last paper outlined but takes it that step further to do it, to do, you know, each state at a time so --

MR. BARFIELD: Can you just give a summary of -- I mean, what's the principle on which you did it, because the old method or the one you had last time, as I understand it, didn't really have a state by state impact run.

MR. SCHNEIDER: Right. Well, I mean, basically what we've looked at at this point, we can take the current Compact methodology, and that's -- as Ann was saying, that's one set of scenarios that could be used. So, you know, like we do now, we compare each state off with the baseline run. Alternatively, we can take a --

MS. BLEED: Why don't you move down the slides to that. That one. Yeah.

MR. SCHNEIDER: There. I mean, this is an example that looks at how you would do this for Nebraska and also how you would do

this for -- I'm sorry, this is just for Nebraska pumping. So this is two sets of scenarios. The top two rows are the current method and the bottom two rows are an alternative method. And, you know, the only thing that's -- within each of these two sets, the only thing that changes is Nebraska pumping. Something similar was done for the other two states.

MS. BLEED: Another way of saying it I think is that in the first set where you compare one and five, which is the current methodology, the baseline is with the pumping on and the mound on and you turn off one state.

MR. BARFIELD: Right.

MS. BLEED: An alternative set would be everything is off and you turn on one state. And unless there's something we are missing, and we're willing to talk about it if there is something missing, we don't see any reason one methodology is superior to the other or makes more sense than the other and you get different answers.

And, I mean, we could -- we have ideas about how it might be fixed, but we think the better way of looking at this is to try to sit

down together and figure out what are the different answers related to and what is a reasonable way to make whatever adjustments are needed so that the model is as accurate as possible.

The reality on the ground is there is one answer. Now, we can never be precisely sure every drop of water where it is, but there's one answer about what's happening in a given year. Our modeling gives us two different answers.

MR. BARFIELD: Is the mound evaluated in the same method?

MR. SCHNEIDER: Yeah.

MR. BARFIELD: Well, and this is in your --

MR. SCHNEIDER: In the notebook, yeah.

MR. BARFIELD: We've been looking at this through the Engineering Committee, and we'll continue to look at it with you. But, you know, again -- well, I'll just leave it at that.

Okay. I guess you can keep rolling through these because we're going to have to look at your write-up here.

I guess now we're at Harlan County

evap. We didn't skip one, did we?

MS. BLEED: I don't believe so.

MR. SCHNEIDER: No, no.

MR. BARFIELD: Okay. And I don't know, is this the appropriate time to talk about that or -- you know, as you know, we, in one of my recent letters, provided a revised procedure on this form. You know, in the past, you know, we, as you know, allocated Harlan evap based on, you know, the Nebraska Bostwick versus Kansas Bostwick diversions. And that worked until nobody was taking any water. Again, after the settlement was done, we never really expected that, but it happened. And we decided, okay we'll use a three year average. And that worked until -- really, I think the issue for us is, you know, when Nebraska purchases water for Compact compliance and essentially Nebraska Bostwick's not taking any water because of that, then the formula doesn't seem to work.

Again, as I articulated in my memo, Nebraska's using Harlan County in that case, in our view, they're getting benefit from Harlan. They're just using it essentially as a way to offset well depletions or a way to get to

Compact compliance so -- it just seems like coming up with a way that works for every different scenario that has happened or might happen in the future, you know, you might use Harlan as a -- in different ways in the future to get to Compact compliance.

So how do we anticipate every different thing that could happen? You know, how do we deal with carryover of purchased water like we had this year? So again, our simple suggestion after trying to figure out, okay, do we do, you know, daily accountings, you know, break it into accounts and daily accountings and all that stuff. You know, we're both going to accrue benefits from the storage, let's just split it in a fairly even way based on historic records. Again, we're open to more complicated ways to do it, but that was our suggestion for your consideration.

MS. BLEED: And I appreciate your suggestion, Dave. I think that that's something that we really do need to sit down, and this might be an issue that Colorado might not want to go through all the boring details on, but you're welcome to be part of it, but I think

especially Nebraska and Kansas just need to sit down and figure out what would be the fairest thing to do with the Harlan County evap.

MR. BARFIELD: Okay. Now -- I assume you understand the proposal that we had, instead of just trying to fix certain very specific years, which is what originally we were working on is let's just fix this problem in certain years, it's meant to be a global fix for every year. And again, we're open to -- if that's not the way you all want to go, we're open to other ideas, but that's our suggestion.

MS. BLEED: And I appreciate that. And again, I think it's a matter where we just need to sit down and work through the issue.

MR. BARFIELD: Okay. Okay. Next issue. Nonfederal reservoir evaporation. Again, your numbers show -- it's not a huge issue in terms of magnitude, but it's sort of a principle issue, is that language in the FSS, is it binding I guess in terms of this is exactly how you'll do the computation or you must at least include this, which is sort of our view of it. I don't know how to move forward with this

issue.

MS. BLEED: I guess I have a question there, Dave. The -- is your concern that the language of the FSS isn't correct, isn't the correct way to do it, or is it the way we interpret the language of the FSS?

MR. BARFIELD: That language is in a section -- I forget the name of the section now --

MR. EDGERTON: Conservation.

MS. BLEED: It's in the conservation section.

MR. BARFIELD: In conservation. From our understanding of the language, it says that we bound ourselves to include nonfederal reservoir evaporation in our computations, which we had not done before. We'd only done it on the federal reservoirs before the settlement. We've bound ourselves to do it above Harlan. We must include those.

But again, we don't believe it says you cannot include them below. And we believe it's appropriate to include them below because they are beneficial consumptive uses of the water supply in the basin, just as they are above they

are below. So we don't see that language as being restricted to including those uses below Harlan.

MS. BLEED: So the issue is on the interpretation of that language?

MR. BARFIELD: That's correct.

MS. BLEED: Okay.

MR. BARFIELD: And it's sort of a black/white issue. You know, the Harlan evap split, we can kind of get imaginative and hopefully come up with something we can agree on. This one is just very difficult to get there. We believe those are beneficial consumptive uses and should be included.

Okay. I guess we can carry on.

MS. BLEED: That's still that same issue.

MR. BARFIELD: Keep going. Go back one slide, make sure we didn't miss something.

Right. I think I understand what this issue is. We used to assume 25 percent of the return flows were consumptively used. In the settlement we agreed to move it down to 17 percent.

MS. BLEED: Right. And there's a footnote to review it.

MR. BARFIELD: Yes. Okay. So you're calling for that review at this point.

MS. BLEED: Right, right.

MR. BARFIELD: Okay. Again, this is something that can be assigned to the Engineering Committee in my view to work on so -- and I think that's probably going to be the case on a number of these issues that follow so --

Okay. Yeah. One more. Okay. Here you're talking about just moving the accounting points in the model for specific sub-basins.

MS. BLEED: Right.

MR. BARFIELD: It wouldn't -- it wouldn't change the total consumptive use, it would just change which basin it's ascribed to, if I understand it right.

MS. BLEED: It changes the basin ascribed to, and given that there are different percentages in each basin, it changes that. To be honest, in the Frenchman sub-basin, it works against Nebraska.

MR. BARFIELD: Right.

MS. BLEED: But as I said before, we're trying to look at the most accurate accounting that we can get because we believe that down the road that if we aren't as accurate as we can be, the whole Compact is going to be called into question and the Compact Administration. And I'd just as soon that not happen.

MR. BARFIELD: Uh-huh. Okay. Again, we have no objections to this being assigned to the Engineering Committee to review together. So I think we can roll through the -- several of these slides here, at least from my standpoint. I don't need to dominate all the discussion here but --

MR. WOLFE: You're doing just fine.

MR. BARFIELD: Pioneer. I guess Haigler is the next issue then.

MS. BLEED: Uh-huh. You need to back up a little. There you go.

MR. BARFIELD: I might even be quiet on this one. I'm not sure how much of a dog we have in this fight.

MR. KNOX: We have a dog in this

fight.

MR. BARFIELD: Okay.

MR. KNOX: And we've made our position clear to the good folks of Nebraska and Kansas as well. Succinctly, there's a couple issues in play. First and foremost, when you look at the historic correspondence, this function of return flows had occurred pre-Compact. The authors recognized it at that time and they chose not to incorporate it, so this would be a departure from the original intent.

The second aspect of that is like most water administration throughout, to my best knowledge, the western United States, when you have excess flows in a ditch, the first cause of action should be to curtail that ditch so there's not waste. So perhaps that is where our attention should be better directed.

Thank you.

MS. BLEED: I assume you're willing to discuss this issue further or no?

MR. KNOX: You bring the cookies, we'll be glad to talk.

MS. BLEED: Okay. Hey, we've

already brought some cookies. We'll bring more.

MR. KNOX: There's more opportunities coming. Of course. Of course.

MR. BARFIELD: Okay. Well we're certainly willing to continue discussions on that so --

All right. Keep rolling here. One more. Well --

MS. BLEED: Riverside is essentially the same kind of issue.

MR. BARFIELD: Okay.

MS. BLEED: It doesn't involve Colorado so much as -- it's basically where are the return flows from Riverside accounted in the sub-basin or the mainstem.

MR. BARFIELD: Okay. Well, we're willing to explore that one with you as well so --

Okay. I guess that's the first presentation. We might as well roll through the other one too.

Okay. This one is the overview, so keep going. Go ahead. Another one. So this just -- these are the historic volumes put in the model; is that correct?

MS. BLEED: This is just what the historic pumping was. The real point of putting this in is that, as you know, until 2002, we were still negotiating the final settlement stipulation. 2002 was an extremely dry year. With the exception of the Upper Republican NRD we still had not been able to put any controls in place for the Middle and the Lower.

But the point here is that in Nebraska, we took compliance with the Compact very seriously. 2002 was a dreadful year for everybody. And as I said before, it emptied our reservoirs, both our surface water reservoirs and our groundwater reservoirs. And it's taking us a while to climb out of that hole. I think we are now out of the hole that we created in 2002.

But the point of this slide was to show that in every case, the pumping volumes for the Natural Resources Districts have decreased year by year partly because of the allocations that were put in place, but a lot of credit has to go to the individual irrigators who work very hard to reduce their pumping to attain Compact compliance. I have no reason to think that

irrigators in the future aren't going to be as concerned as they were in the past to try to get in compliance by reducing their pumping.

MR. BARFIELD: So again, these estimates are from the model?

MS. BLEED: These are not estimates. These are actual groundwater pumping numbers. And the reason --

MR. BARFIELD: Well, for the Upper they may be.

MS. BLEED: For the Upper. The '98 through 2002 were based on the power records, as you know. 2003, '4 and '5 and '6 is when we started using the meter records. 2003 and '4 we didn't have all the wells metered in the Middle and the Lower. But these are our best estimates of what the pumping was based on power records and to the extent we could use the meter records. And I believe all the wells were metered in 2006 and '7 in each NRD. 2005 I think Middle had like 90 percent of theirs metered; is that right, Dan?

MR. DAN SMITH: They were all done by 2004, the end of --

MS. BLEED: By 2004. On all the

NRDs?

MR. DAN SMITH: Yes.

MS. BLEED: That's right. Now I remember. They were all metered by 2004. We still hadn't worked out all the quirks of the database but --

MR. BARFIELD: So through 2002 they were -- they are estimates based on power records?

MS. BLEED: Right.

MR. BARFIELD: Subsequent to that in the Upper, they were based on meters?

MS. BLEED: They were based on meter records throughout the whole period for the Upper because they had meters in from 1998 on. Or they had meters in before that, but for all years here, they're based on meter records for the Upper.

MR. BARFIELD: Okay. All right. Next slide. It is interesting to note that your base period is the highest period of record there but --

MS. BLEED: Well, you have to remember what we're using the base period for, primarily to allocate the allowable depletions

among the NRDs. We did look at the base period to figure out what kind of reduction needed to be made in the future, but the actual reduction didn't matter. If the base period was high and we needed to reduce 30 percent to meet the Compact, it would have been 30 percent.

MR. BARFIELD: Okay. Next slide. You can keep rolling I guess.

Okay. This is your voluntary plans. The EQIP program, how long are those retirements for?

MS. BLEED: Some of those retirements are permanent retirements. Some of them are short-term retirements. And one of the things we're looking into is how to transfer some of those short-term retirements into permanent retirements. We're well aware that the EQIP program is not a long lasting program for many of the producers.

The -- this is anecdotal conversation, but my understanding is a number of the people in the EQIP program probably won't go back to irrigation once EQIP is done. That's not to say that's true for everyone.

MR. BARFIELD: Do you have any

estimates of how many acres were added post-2002, post-settlement through -- you know, wells that were drilled and then completed after the settlements? I've heard estimates of tens of thousands of acres.

MS. BLEED: We can get you estimates. I don't think it's tens of thousands of acres, but we can -- what I would like, Dave, is -- we're getting a lot of questions. I think maybe within the next few days, if Kansas and if Colorado has questions, if you could write them down and send them to us so we can make sure we get all your questions addressed, that would be very helpful.

MR. BARFIELD: When we look at the model data sets, there's something over 200,000 acres that was added post 2000 so -- but I haven't looked to see what they were in this period, but I know --

MS. BLEED: Well, part of the problem is until we actually certified acres, we did not have a really good record of what acres were, in fact, being irrigated. I expect you have found out what Nebraska has found out, you think in numbers such as the number of acres

irrigated in a county would be easy to come by, but it isn't. And we've had many discussions over the ag statistics, the NASS acres and whether they're -- I see Scott shaking his head yes -- how they're developed. A lot of them are based on harvested acres, which may or may not reflect what was irrigated that year. It's just a very, very difficult statistic to get your arms around. And that's why the NRDs went to great lengths to actually certify what was being irrigated.

MR. BARFIELD: Okay. I don't have any comments on this one. Yeah. I don't have any comments on this that I probably haven't already said.

MR. KNOX: David, excuse me. Ann, did you have a chance to get those numbers for the costs from that last --

MS. BLEED: I have not looked them up yet, Ken. We will get those to you.

MR. KNOX: Okay. Thank you.

MR. BARFIELD: You know, again, surface water purchases, again, will it be there in the future. We certainly want to continue to be involved in those discussions to make sure

that they achieve their desired end, because I'm not sure they fully have so -- in the past.

MS. BLEED: Well, we will certainly in the future know whether or not they achieved their desired end because we'll be looking, as we have in the past, at whether or not we achieved Compact compliance. We are concerned too to make sure that if we're relying on surface water purchases that we have agreements in place that will allow that to happen and that the surface water will be available. If it isn't, obviously we're going to have to take other steps to be in compliance.

MR. BARFIELD: I mean, obviously the timeliness of notice is important to us. This last year, we just -- we were told too late to really make effective use of this resource.

MS. BLEED: And I understand that, Dave. And one of the things we're trying to do, because it's also a problem for our irrigators, we would like to get some longer term leases in place so that people have a much better understanding of when we would want to lease surface water and under what conditions, etc.

MR. BARFIELD: You know, obviously the carryover provisions and the order they have to be used is a big issue as well so --

MS. BLEED: Uh-huh.

MR. BARFIELD: Do you think with a change in legislation that now requires that if -- if a district takes a buyout, you know, sells their surface water, they can use their wells is going to impact future acquisition, make it more difficult?

MS. BLEED: Clearly, if you can't use your wells and it's a willing seller/willing buyer issue, it makes it more difficult to raise the funds necessary to compensate at a level that would be satisfactory to the irrigator. I do have to tell you that one of the bills in the legislature now is to remove that restriction so that whoever is irrigating -- negotiating with an irrigation district can negotiate the price based on whether or not they use their wells or do not use their wells. I don't know what's going to happen to that bill in the legislature. You never know what the legislature's going to do with bills, but that is in there.

MR. BARFIELD: Okay. Next slide. This is your LB701 provisions, right?

MS. BLEED: (Nods head.)

MR. BARFIELD: Okay. Yeah, we all know -- I guess there's a lawsuit pending on 701. What's the current status of that? Is it still working?

MS. BLEED: I'll let Justin address that one.

MR. LAVENE: It's still at the district court level, state process. So no decision on that case yet.

MR. BARFIELD: Right. Again, 701 doesn't require those tools to be used, they just provide tools?

MS. BLEED: That's correct.

MR. BARFIELD: So again, it's how they're used that's what's important to compliance, as everybody knows here I hope. Okay.

Augmentation planning. So you hope to have a plan in place by next summer. Is that what that says?

MS. BLEED: (Nods head.)

MR. BARFIELD: Or you hope to

have something operational next summer?

MS. BLEED: No. We hope to have a plan.

MR. BARFIELD: Okay.

MS. BLEED: You know, we're going to try to do that as quickly as we can obviously.

MR. BARFIELD: I'll encourage you to bring the details as they unfold here. I'll chide Colorado tomorrow about the lateness of their company, but anyway.

MS. BLEED: Yes. And we certainly understand that we need to do that and we will do that as soon as we can.

MR. BARFIELD: And we'll work with you all as we'll talk about tomorrow. But I mean, there is a lot in this issue that needs to be considered so -- I guess that's all I have on that one right now.

All right. Well, I appreciate all that clarification in terms of what you've put together here. I don't know to what extent it covers most of what's in this notebook you gave us.

MS. BLEED: Everything that we've

discussed on the slides has a section in the notebook. And I guess what would be very helpful to us is after you've had time to look at the notebook, and this goes for Colorado too, if you have specific questions, if you could send those to us in writing, and we will do our very best to get answers to you as quickly as possible.

MR. BARFIELD: It looks like -- I mean, obviously we haven't been through the notebook yet, but it looks like you covered the topics. There aren't things in here that we haven't at least talked about; is that correct?

MS. BLEED: I believe that's correct. The integrated management plans are in here with all the rules and regs, so you can look at those.

MR. BARFIELD: These were the ones that were recently adopted?

MS. BLEED: These are the recently adopted plans.

MR. BARFIELD: Okay.

MS. BLEED: Well, are there any other questions? What I think would be good to do now -- we're going to be talking about

Colorado's augmentation plan and augmentation plans tomorrow. But what I'd like to do now is -- picking up where we started this afternoon's conversation -- the first step is that each state is going to look through and if we have further questions, get them in writing.

What we'd like to do is figure out what the next step should be to resolve the dispute as best we can and maybe get some target schedules involved to get that done. I can't say strongly enough, and I'll repeat it again, I really think it's important for us to get together in the future, particularly the Engineering Committee to work through some of the details on a face to face basis.

I really do think that there's been some miscommunication based on written correspondence, and that's just inherent when you're dealing with this kind of complexity of data and everything else. It's a lot easier if you can sit across the table and say, Well, I don't understand this, explain it instead of trying to craft a letter that you hope explains it and then discover two weeks later that it really didn't.

So I'd like to -- if we get the questions to each other, we can try to respond to those questions. I guess part of my thought right now is do we want to try to respond in writing? Do we want to get the questions together and meet again? Do we want to respond in writing first and then try to meet? Dave, you mentioned getting together as an Engineering Committee. I think that's an excellent idea. Ken?

MR. KNOX: Commissioner, if I may make a suggestion, I would recommend that people provide their written questions one week prior to the first meeting of the Engineering Committee and they will be addressed at that meeting. That's the courtesy of letting folks know in writing ahead of time and then we can all sit down in a windowless room --

MS. BLEED: With cookies.

MR. KNOX: Yes, ma'am. But I do believe that would help advance the issue rather than correspondence going back and forth.

MS. BLEED: I think Nebraska would certainly go along with that suggestion. I'm looking at my people who do all the work.

MR. BARFIELD: Well, I guess I'd like to -- you know, we have a couple days of meetings scheduled here and so maybe -- you know, this has been a helpful dialogue to have the last couple hours here. I guess I'd like to confer with my team in terms of the next steps, you know, that we might suggest.

Obviously, you know, the Engineering Committee work will move forward, and there's a pile of these issues that go there. You know, the broader question of what we do with the noncompliance issues is what I need to kind of visit with my team about in terms of what we think the next steps might be there but --

MS. BLEED: So what you are suggesting, Dave, that we take this topic up tomorrow or --

MR. BARFIELD: Yeah.

MS. BLEED: Okay. I'm just trying to think of -- I have a lot of questions about what you mean when you say that, but it's probably better to ask those questions tomorrow after you've conferred with your team. I think that's something that we've been all struggling with in preparing for the meeting and today is

just what is the best way of moving forward.

MR. BARFIELD: Right.

MS. BLEED: And again, I will echo what Colorado said, we are very, very interested in doing whatever we can to move forward with understanding among all three states of how we're going to comply with the Compact. Nebraska's very serious about complying with the Compact.

And so I'm hoping tomorrow -- if this is all we're going to say on this subject tonight, I mean, I think it is unless Colorado has something more to add -- we really need to think seriously about what is the best way of making the Republican River Compact Administration work so that the three states can move forward.

I must admit that on the North Platte, as you all know, we were in litigation with Wyoming. Colorado got dragged into that one as well. And we worked -- after 12 -- let's see, 1986 to 2000 -- years of litigation, we did settle that. And since then, we've had a very good working relationship with Wyoming. It's not to say we don't have disagreements, we do,

but I think the North Platte Decree Committee is working very well because we have been able to sit down and work out those agreement -- disagreements and come to a resolution. And we did this in spite of very, very dry years when it was extremely difficult for both Wyoming and Nebraska.

I would hope that that's what we can do in the Republican basin and resolve the issues within the Compact Administration and show that three states can get along and share equitably the resources of the Republican River. With that, unless there's something else we should do today --

MR. WOLFE: What time do we start tomorrow?

MS. BLEED: That was going to be my next question. I would suggest since we've got some time this afternoon yet for caucusing to go on that why don't we start at 8:00 tomorrow morning.

MR. WOLFE: That's good for us.

MR. BARFIELD: That's fine with us.

MS. BLEED: Okay.

MR. BARFIELD: Thank you very much.

MS. BLEED: Thank you all very much. And thanks for the patience of everybody who listened to this exciting debate. We're adjourned for today.

(Proceedings concluded at 3:43 p.m.)

CERTIFICATE

I, Jean M. Crawford, a Certified Court Reporter, do hereby certify that I appeared at the time and place first hereinbefore set forth, that I took down in shorthand the entire proceedings had at said time and place, and that the foregoing constitutes a true, correct, and complete transcript of my said shorthand notes.

_____

JEAN M. CRAWFORD, CCR No. 954, RPR

ATTACHMENT C

TRANSCRIPT

SPECIAL MEETING OF THE
REPUBLICAN RIVER COMPACT ADMINISTRATION
VOLUME II, PAGES 127-182

MARCH 12, 2008
KANSAS CITY, MISSOURI

SPECIAL MEETING OF THE

REPUBLICAN RIVER COMPACT ADMINISTRATION

VOLUME II

PAGES 127-182

DATE: MARCH 12, 2008

PLACE: HOLIDAY INN/KCI EXPO CENTER
11730 NW AMBASSADOR DRIVE
KANSAS CITY, MISSOURI

REPORTER: JEAN M. CRAWFORD
CCR NO. 954, RPR

APPEARANCES

Ms. Ann Salomon Bleed
Mr. James R. Williams
Mr. James Schneider
Mr. Justin D. Lavene
Mr. Brad Edgerton
Mr. Ron Theis
Mr. Paul Koester
Mr. John B. Draper
Mr. Scott Ross
Mr. David W. Barfield
Mr. Leland E. Rolfs
Mr. Peter J. Ampe
Mr. Dick Wolfe
Mr. Kenneth W. Knox
Ms. Megan A. Sullivan

(Proceedings commenced at 8:07 a.m.)

MS. BLEED: Good morning, everybody. I know you all came for an 8:00 meeting. At least we have refreshments. A slight change in schedule. We are going to actually convene at 8:30. There's some business that needs to be conducted I believe by Kansas at this point, so I'll blame Kansas a little bit for the delay. But we will convene at 8:30 as opposed to 8:00, but feel free to eat doughnuts and drink coffee.

MR. WOLFE: And we'll do our presentation at 8:30.

MS. BLEED: And the presentation by Colorado will be at 8:30. So sorry for the inconvenience and we'll see you in a bit.

(Recess.)

(Proceedings resumed at 8:37 a.m.)

MS. BLEED: Thank you for being patient with us. What we're going to do now is Colorado give us a presentation on the pipeline augmentation plan that they are proposing. I'll just turn it over to Commissioner Wolfe.

MR. WOLFE: Thank you, Commissioner Bleed. Good morning, everyone.

Again, for the record, my name is Dick Wolfe, State Engineer for Colorado. What we'd like to do here this morning is do a presentation, kind of a -- three of us jointly present Colorado's compliance efforts. And first I'd like to just start out and thank a number of people who participated in getting us here today.

Certainly first and foremost, the staff of the Division of Water Resources, and particularly Ken Knox who is going to be doing part of the presentation. I think he's -- if I think back when he actually came from Montrose on the west slopes to the Denver office about ten years ago, I'm not sure he realized what all he was getting into in terms of not dealing with well issues on the west slope of Colorado and coming into the east side and certainly been doing this for ten years as far as the Republican goes. So I appreciate all of the effort he's done over the years on this. It's been tremendous. And I know the district really appreciates his efforts.

Certainly Megan Sullivan, who's here with us today, has assisted Ken in that effort.

And Pete Ampe from our Attorney General's office has worked tremendously on this. And I know there's a number of folks who have preceded me in this effort as well, and certainly before Pete is Carol Angel and others from his office and Hal Simpson, my predecessor, have certainly got us to this point and a framework for us to work in, so I appreciate all their efforts.

I certainly want to thank the Republican River Water Conservation District. I think you'll see from the number of folks who are here today representing the district, it's a testament of their sincerity in trying to find a solution to our Compact compliance on the Republican River. And I know they've been working long and hard over the last four years to get us to this point.

And certainly we've got to thank the water users in our basin in certainly all the states but particularly in the Republican water basin. This has not been an easy issue to get us to this point, and certainly we have ongoing issues still of trying to address some in state issues with some of our surface water users. But there's been a lot of sincere effort on a

lot of people's part to get us here. So I appreciate everyone's efforts in that so --

I'm just going to kind of outline kind of the four steps that we've taken to date to kind of come into Compact compliance and -- to date and into the future. And then certainly Ken will pick up and talk about some of the details as well as Dennis Coryell. And I'll get to that here in just a minute.

I guess I kind of characterized it into a couple of areas in terms of how we're coming into Compact compliance. One is in terms of some conservation matters. The first part of that is land retirement. We as well as some of the other states have worked on some conservation programs with CREP and EQIP. That's been ongoing up to, as I understand, and these are just some rough numbers, up to about 30,000 acres. Not all of that's been committed in CREP and EQIP programs to date.

I know the district is working on a second measure on that starting in 2008 for potentially up to another additional 30,000 acres to take out of production and retire that permanently. So conceivably upwards

of 60,000 acres that could be in those two programs. And obviously we're facing the same issues as the other states as commodity prices are up for grains. It makes some of those other programs maybe less -- you know, it's an option for them as being viable if they're doing good and making money growing crops so --

The other part of our conservation program we're doing is promulgation of well measurement rules. I will be going forward with those measurements rules this year. We anticipate within the next couple three months to have that process underway. We're still doing some internal processing of those draft rules that came out last year.

They will basically affect about 4,000 irrigation wells in the Republican River basin. And we -- we've seen from our efforts of measurement rules in the Rio Grande basin in Colorado that just that measure alone, by putting on and utilizing flow meters or using PCC's for well pumping that we can see a 10 to 15 percent decrease in pumping just due to the installation of those measurement devices.

And the way the rules read at this

point, if -- that they will be effective for the 2009 irrigation season, and if those wells do not have a means for measurement on them, they will not be allowed to pump in 2009 and beyond.

The next measure that we're looking at is kind of -- kind of a belt and suspenders approach to this, I guess is the best way that I can describe it, but is in regards to our Compact rule making authority. And there's been a draft set of these rules that came out in September of 2007. And I know Ken and Pete and others have worked really hard in getting those draft rules out there.

And basically, what our goal with those Compact rules are is that, you know, we'll promulgate those rules but in hopes that our augmentation plan with the Compact compliance pipeline that Ken and Dennis will be describing today will be effective that we will not actually have to implement those rules, because there's curtailment requirements in those rules in regards to not only well users but surface water users in the basin if the compliance pipeline is ineffective at meeting our goals for Compact compliance.

I'm now still reviewing the comments that we've received on those rules, and I may still take additional comments depending what happens over the next few months in terms of our efforts with the other states on Compact compliance. But there's a lot of factual and legal issues that, you know, require some thoughtful and deliberate consideration. So I'll be continuing to look at those.

And lastly, as part of our efforts in Compact compliance as regards to an augmentation plan, and we'll be asking approval of that augmentation plan and the related accounting procedures under subsection III.B.1.k of the final settlement stipulation. Ken Knox will be providing the technical presentation of that Compact compliance pipeline today basically describing the number of wells, the efforts we're doing on historic consumptive use analysis, the location of those wells in the pipeline and proposed accounting procedures.

Following that, Ken's going to -- or Dennis Coryell with the Republican River Water Conservation District will provide an introduction of the district and its function,

what they've done in establishment of the use fees and impact of the project on the water users in the basin. And I think at that point we -- you know, we want to acknowledge -- have you acknowledge that we have submitted all that information. We know it was late coming, but we think we have submitted all of that information. And if we are still lacking anything, we want to make sure that you ask for that, and we'll certainly provide it.

And after Dennis is done, I basically would just do a wrap-up of where we plan to go from there. So lastly, I think I just -- and this will be reiterated possibly by Ken and Dennis as well, but we need to really emphasize the importance of this pipeline. It's a $71 million project. $1 million will be spent on pipeline design between now and June, and a component of that $71 million is $50 million for purchase of water rights that will be done by July.

And my understanding is that the district has already spent $5 million -- I don't know if I want to characterize it as earnest money or whatever -- that they can't get back.

And so the district has made a huge commitment on this Compact compliance pipeline. And we're very interested in keeping that moving along in a timely fashion. And they'll certainly highlight the time frames that we'd be working under. The goal is to try to start construction in October, and so there's a need to do bids for this project by August and have that pipeline completed and have water flowing in the summer of 2009. So at this point, I'd like to turn it over to Ken and let him do his presentation.

MR. KNOX: Good morning, folks. Commissioner Bleed, I would like to thank you and your colleagues for the wonderful fixings that you provided for us. Very gracious of you to do that. Mostly like to thank you folks that came. We're quite appreciative and proud of the fact that we have members of the Board of the Republican River Water Conservation District, the Colorado Corn Growers Association and others that took the time to be here, local county commissioners that took the time to come to Kansas City. So thank you for doing so.

What we'd like to do is just going to go through a brief introduction, if you will, of

the Compact compliance pipeline. The -- and again, just for foundation, what we have -- we sent to you a CD last week to Commissioner Bleed, Commissioner Barfield. Did you receive those?

MS. BLEED: I did.

MR. KNOX: Okay. And what those do, just for the folks in the audience, what that information includes on those CDs is first of all some maps for descriptive illustrations of what we're talking about, a summary consumptive use of 55 well permits, a summary of the crop irrigation requirement, the contract with Cure Land that Commissioner Wolfe referred to, alternate points of diversion applications and variances thereto, a spreadsheet used to calculate historical consumptive use, and also a PDF and a memo, if you will, that will describe what the methodology was that employed in that calculation, it will include the tables, the figures, in other words, the full consumptive use and analysis. And that's provided for you to help guide you through a plethora of a bunch of files and data. And there's also some background supplemental information. So that's

been provided. We also sent by electronic mail the application that Commissioner Wolfe referred to as well as the feasibility study performed by the contracting engineer.

Folks, the purpose of this pipeline is rather simple but yet so important. Colorado recognizes her abilities and obligations to comply with the Republican River Compact. And that is the purpose of this augmentation plan that we're proposing today as well as the pipeline itself. And it's brought to you in collaboration by the State of Colorado and the Republican River Water Conservation District, specifically the Water Enterprise.

Okay. The foundation for this is found in the final settlement stipulation in Kansas v. Nebraska and Colorado, No. 126 original, specifically subjection article III.B.1.k. Bless your heart, I'm not going to read that to you, but what I want to do, please, is just emphasize some of the wording that's important.

We recognize that wells acquired for the purpose, the sole purpose of offsetting stream depletions in order to comply with the Compact and we recognize this must function so

that there not be any new net depletions to the stream annually or the long term. This plan accomplishes that. Further, we recognize that it will be made in accordance with existing tools, the groundwater model that we all are familiar with. And further, that this plan shall be approved by the Compact Administration prior to implementation. This is why we are here.

Okay. This map -- please excuse the size of it, if you will, but that does not belie the fact that it's 7,761 square miles in northeastern Colorado of the Republican River Water Conservation District. And what we have, that was created -- President Coryell will talk about that -- through legislation in 2004, Senate Bill 235, and appointed a 15 member board. What's important to recognize is the composition of that board is made up by men and women who live in the community, farm, understand the issues in detail and candidly represent the constituents and themselves who are paying for this project. And further, how they're doing that, they have self-assessed fees starting in 2004, $5.50 per irrigated

groundwater irrigated land. Recently, it's been increased to $14.50. So they're shouldering that responsibility themselves.

And what we have also is in part to help finance this, they've secured, through the State of Colorado, preliminary approval of a $60.6 million loan with the Colorado Water Conservation Board -- it's at 2 percent interest for a 20 year term -- that is pending legislation in House Bill 1346, Mr. Draper, always a man known for good detail. There is a hearing on that today. All signs appear very favorable, but it is something we need to make sure folks understand is working through the process.

Okay. Please bear with me a bit. This map -- and, yes, I'm going to get some spectacles on here a bit -- is a general description of the basin itself in Colorado. Okay. What you have, the South Fork, Bonny Reservoir. What we have are the Arikaree and the North Fork. But I know it's difficult, and we will show a bit more smaller scale so it's easier to see, but we have the North Fork in this region to the state line. This is the

pipeline. 12.7 miles.

Okay. What I really want to do is put this in context of the geographic scale. Why the pipeline is where it is at. It has been done and constructed with thoughtful, thorough analysis. Specifically, what we have, especially those that are familiar with the area, is the Sand Hills region, blessed with the best geologic high recharge area in the Republican River basin within Colorado, the source of water supply.

We thoughtfully and carefully looked at alternative sites, many different sites on the Arikaree, on the South Fork, upstream of this area on the North Fork. But for a consortium of reasons, based upon sound geology, hydrology, we have a live river system and candidly economics. That is why this location was selected as the preferred alternative.

Okay. The pipeline itself will have an initial capacity, it will be river water through gravity of 15,000 acre feet per year. It has been constructed in such a manner, and this is looking for the potential for long term if necessary, but through installation of pumping

stations can be increased to 25,000 acre feet per year.

One of the other attributes, we have looked at the water quality itself. The Ogallala is, candidly, a pristine source of water supply. And the water that would be inserted into the point of compliance in the North Fork, the water delivered is a higher quality than that required or promulgated by the Colorado Water Quality Control Commission, the water quality standards, if you will, for the North Fork.

And all of this has been encapsulated within, first of all, a preliminary feasibility study. The district, through the state also, has expended $50,000 just to get to this point to date. And as Commissioner Wolfe referred to, this is going to be part of a $1 million further design.

Okay. Now, as to the source of the water itself -- this is what we engineers do, we like tables and we like spreadsheets, so please bear with us. But I want to describe the historical consumptive use. These are part of the information that was included in the

application itself that was sent to our colleagues in Nebraska and Kansas but was also described in detail in this CD.

What we have here is -- historic consumptive use is determined through the physical parameters, the irrigation systems, pumping efficiencies, power records and for crop records as well in the Republican Basin within Colorado for a period of 1998 through 2007. That's a representative ten-year period that's consistent with any type of change of water right application under Colorado law.

The Compact compliance wells. Again, they will have no new net depletion, new or long term. And that pumping, that source of water is limited to the historic consumptive use. That's why we're spending so much time on that factor. Now, what we have done is submitted an application -- that's part of the CD as well -- for a change in use and to allow alternate points of diversion.

The district on behalf of their engineers submitted that to the State of Colorado working through the body of law on the Colorado Groundwater Commission on February 25th

of this year. It has these components. Change in use of the water rights to using the designated groundwater from irrigation to Compact compliance. We have a total of 58 wells that we will be addressing. 47 are included in this. We are still finalizing, and we'll provide that information for those remaining wells soon.

Second is -- excuse me, of those 58 wells, I want to draw attention, that represents 66 well permits. There are some structures that have multiple permits per well, so in case there's any ambiguity on the difference in numbers. Variance requests which will change the location from these 66 permits to 15. What we're trying to do is minimize the spiderweb, if you will, of the collection gallery to construction of up to 15 wells and/or inclusion of existing wells just for operational efficiency.

So we will also have a total of applications and variance requests for these 15 Republican River Compact Administration wells. This is the bottom line. And for those that are in the back, what it represents is acreage of

approximately 10,000, 9,500 acres with just under 15,000 acre feet of consumptive use. So when I use the terms in general of 10,000 acre retired under permanent dedication towards this Compact compliance and 15,000 acre feet, this is where we are driving those figures.

Don, excuse me for the small type in the back. What this is is just -- just the estimated project cost. And again, as Commissioner Wolfe stated, we have about $71 million in rough numbers for the total project. $50 million is dedicated toward the acquisition, permanent acquisition of those water rights. The other -- the balance, the $21 million as described in the engineering, construction and design of the project.

There are some key points I'd like to bring out from this. First of all -- and we're going to talk about this -- 1 million gallon storage tank for a cost of $500,000. One of the things we recognize also -- oh, and as Commissioner Wolfe referred to, the million dollars for the design is in there as well. The different costs of the piping, etc.

But part of this process, part of

Compact Administration and approval today but operation in the future is accurate accounting recording verification. We recognize that. I've had the privilege of working with Commissioner Barfield a few times. This is important and justifiably so to the State of Kansas. That's why there's an expenditure of $100,000 for monitoring the SCADA system to provide accurate, timely information.

Okay. The pipeline -- I need to work on my slides. I apologize for this. But the pipeline itself -- I'm just going to try to describe it. It is in 12.7 miles. Part of the justification or the reasoning also for why this site was selected was the clustering effect of the wells that were available. You can see the opportunity that was presented through this area.

12.7 miles, follows a preferred route that takes advantage of easements and gravity and it will deliver water to the North Fork above the Compact gage near the Colorado/Nebraska state line about 1,400 feet upstream. Okay. 12.7 miles. They are looking still at the different type of materials,

whether it be concrete, steel or PVC. At this juncture, it appears PVC may be the preferred alternative. That's part of the final design. It is designed to deliver up to 27.6 cubic feet per second. Operationally, it -- we are thinking about 25.

Okay. The million gallon storage tank will be constructed at the head of the pipeline. Why? Two reasons. First of all, power interruptions sometimes happen. Okay. We recognize that. By the capacity of this, this will still allow full-time operation for two hours at two-thirds of the capacity, so it provides that flow.

But the second important aspect of it is it provides structural protection. If some -- in Alamosa, we had old radiator heaters, and I know what a water hammer is in a small home. Picture that in a 12.7-mile pipeline. To obviate the potential for negative pressures or damage, if you have this constant head at the top of the pipeline, that provides structural protection as well. Okay. We talked a bit about the discharge point of view as far as its location, but it will also be through a baffled

concrete structure that will dissipate the energy.

The well field itself. Let me use this slide, please. This is zooming in if you will. Again, my apologies. But those with red circles surrounded by black with numbers attached to them succinctly, there are eight primary wells referred to with the letter A that will be the primary source. There are seven additional wells, B as in perhaps for backup, that may come on line if necessary to meet the structural deficiencies. So we have eight primary wells by A, seven signified by B. All will be metered, part of the SCADA system that we talked about, as well as there will be an ultrasonic flow meter approximately 30 feet below the storage tank.

The pumping operations for this plan for augmentation will be limited to the historic consumptive use of the existing groundwater rights as determined by the Groundwater Commission, and they will do that pursuant to their rules and regulations. Pumping from the wells will be input to the Republican River groundwater model, and we will follow the same

process for those that are interested in the accounting procedures described in subsection article 3 -- I don't want to get these transposed, III.D.1. The augmentation discharge will be determined and measured, be subtracted from the North Fork stream flows measured at the Compact gage. Once those are determined, they will, like all other depletions, stream flows accounting, be run through, inserted into the Republican River Compact Administration accounting and reporting procedures. These augmentation credits will offset the depletions to the stream flow. They will be considered as an augmentation credit against Colorado's computed beneficial consumptive use.

This is the time frame. This is quite aggressive. Why is it aggressive is because Colorado recognizes her opportunity and her responsibilities for compliance with pipeline. The design -- as you can see, January 1st, 2008 -- has already begun. Completion of 90 percent of the design -- this is the structural aspects of the pipeline itself -- by mid July. Finalized contract documents, August 15th. Bids will be issued, same day, mid

August. And recognize, the district is working proactively ahead of all these dates to accomplish these facts by those dates. It's not that they will begin that date, but they will be accomplished by that time. Award the construction contract. Begin construction mid November. Again, very aggressive. Complete the construction by June 15th of 2009. And then begin full water delivery.

So that is why we are here today before the Compact Administration, the State of Colorado as well as the Republican River Water Conservation District Water Activity Enterprise, requesting that this body approve this augmentation plan, perhaps in conceptual form, and the related accounting procedures as described under subsection article III.B.1.k of the final settlement stipulation for this Republican River Compact compliance pipeline.

Thank you. Commissioner Bleed, would you like to go and have Mr. Coryell follow?

MS. BLEED: Please.

MR. KNOX: Thank you, ma'am.

MR. CORYELL: As Ken indicated, my name is Dennis Coryell. I'm the President of

the Republican River Water Conservation District. I thank you for the opportunity to be here and to speak on behalf of our district, and I want to take this time to introduce some of our board.

As you probably have noticed, we have quite a contingent that has come out here basically to fortify the thought that this is very important to us. First of all, I'd like to introduce our district manager, Stan Murphy right here in front. Our vice president Kim Kellan, she represents Yuma County -- or, I mean, Phillips County, I'm sorry. Mr. Rick Seedorf is our treasurer, and he does represent Yuma County.

Also, we have Mr. Greg Terrell who represents the Arikaree groundwater management district. Mr. Bruce Latoski, he represents the Central Yuma Water Conservation District -- or Groundwater Management District. Mr. Gary Kramer represents the Frenchman district. And Mr. Greg Larson -- Greg is going to -- he's going to be our newest board member. He's not actually officially on yet, but he's going to be representing Logan County. Also, I'd like to

introduce Mr. Jim Slattery. Where is Jim at? He is our district engineer, Aqua-- I mean Slattery Aqua Engineering. And Mr. Dennis Montgomery, our legal representative representing Hill and Robbins. Also, Ken mentioned that we have some -- a county commissioner from Yuma County, Mr. Robin Wiley is here. Also Mr. Byron Weathers from Yuma County, and he is with the Colorado Corn Growers. And also, one other I wanted to -- is Bethleen here? Bethleen McCall represents CAPA, which is Colorado Association -- Agricultural Preservation Association. Excuse me. That's a mouthful.

As Ken mentioned, we are the sponsors of this project. The Water Conservation District was formed in 2004. Ken, if you want to go to that first slide, please. We were -- our first meeting actually was on August 10th of 2004. We were created by Senate Bill 235, and we were charged with assisting Colorado to gain Compact compliance on the Republican River.

Our district is made up of kind of a unique combination. And both of those combinations actually address different issues.

One, county representatives which represent the economic base within the district, and then the groundwater management district representatives who really deal with the more pertinent water issues throughout the basin. And then I'm -- it's a 15 member board. That's only 14. I am the liaison from the Colorado Groundwater Commission and deal with communication as far as the Northern High Plains designated basin, which almost entirely forms the Republican River basin.

We were given powers through Senate Bill. We can issue revenue bonds, special assessments, property tax, sales tax use fees. Shortly after becoming a Water Conservation District, we began to focus on how we were going to provide revenue for the things that we needed to do. And we formed a Water Activity Enterprise. And in Colorado, a Water Activity Enterprise, one of the things that it does is it allows us to issue -- to assess use fees and not have to actually go to the voters and seek approval for that. Because of the contentious issues of water in our state, and I'm sure as well in your states, we zeroed in on that really

quick and we assessed a fee of $5.50 per irrigated acres. We also assess municipal wells based on that. Actually, they measure their water, so that was based on per acre feet, and then also commercial wells likewise.

Next slide, Ken.

There are 570,000 irrigated acres approximately within the basin providing somewhere in the vicinity of $3.5 billion of value to the state's economy. And I want to focus right now on the purpose of the district. This was not from our -- within ourselves. This was basically assigned to us from the state. That is to -- in establishing the Water Conservation District, the state legislature recognized the conservation of the Republican River, its tributaries and a portion of the Ogallala Aquifer underlying the district were of vital importance to the growth and development of the entire area and the welfare of all of its inhabitants. So basically, to maintain the economic engine that keeps our small communities thriving in northeast Colorado. And the second purpose was to -- that the Republican River basin must comply with its interstate Compact

requirements. Not optional. It's a requirement.

Next slide, Ken.

So likewise then, we basically tried to pick out very simple goals as a Water Conservation District to match what the state gave us as a purpose: To have continued growth and development of the basin's agricultural based economy, first off. And then secondly, to -- compliance of the Republican River Compact by 2007.

As you know from looking at the data, we are not in compliance as of 2007. Early on, we hoped that through primarily the water retirement programs that Mr. Knox talked about that we would be able to be in compliance by initiating those similar programs that your states have initiated. It didn't take long, especially in the middle of a drought, to determine that we were not going to be able to get into compliance through voluntary well retirements. So because of that, we had to come up with other plans.

As you know in looking at the model and the accounting procedures, you can either reduce

your consumptive use or increase your stream flows. Our retirement programs sought the first one. And in not being able to do that, we began very quickly to focus on how we could increase stream flows. I'm sure that you recognize that things are different in Colorado than they are in Nebraska and Kansas, but I'm specifically talking about water. And our streams, our tributaries of the Republican River are not nearly as close as they are in Kansas and Nebraska. Our lag depletions are even greater than they are for you folks.

So hoping that mother nature would provide abundant rainfall -- and by the way, we get a lot less of that than you two do. So it quickly became apparent that we were going to have to look to some kind of an artificial means to increase stream flow. Through the analysis of our engineering for the district, we recognized that in effect if we did not take some kind of artificial means, we would not be able to get into Compact compliance even if we -- we only have one reservoir within the basin, we drained it, we dried up all the surface water rights, shut down most of the

wells along the tributaries, we would not be able to get into Compact compliance.

So as a district board, we began focusing on the pipeline. I know you've referred to it as an augmentation plan, and truly that's what it is, but we focused real quick on the fact that because it was our only means of getting into Compact compliance, we began to label it as "a Compact compliance pipeline."

Next slide, Ken.

And this of course is our basin. Need to back up just a little bit. The seven counties you see that comprise part of the basin here. And the next slide, Ken. These are the seven groundwater management districts that lie within the basin. Along with our retirement programs that we initiated, we also had independently on our own -- and this coming strictly from our own district funds -- have vigorously sought to buy up surface water rights on the three tributaries. Currently, we've been very, very aggressive on the South Fork and have been quite successful. So we hope that that in the long run will help as well.

Commissioner Wolfe mentioned earlier the measurement rules. In 2009, with those measurement rules in place, we are quite confident that that will help the situation. One thing, it will be a more accurate means of determining the actual consumptive use within the basin. And, secondly, it will provide a means where we can actually implement conservation measures in the future.

Dealing specifically with the pipeline -- of course this is farmer terms, this is delivering wet water and, you know, reducing consumptive use for farmers is paper water. I'm sure you've heard that from water users within your district as well. So the pipeline really allows us to be able to actually put wet water in there and actually deliver the physical means to get into Compact compliance.

As Mr. Knox mentioned, we went out and purchased 15,000 -- approximately 15,000 acre feet of water. We actually did not begin that process until mid October. So in a matter of somewhere around 100 days, we went out as a district and signed contracts to purchase that water. For those of you who are in water rights

acquisition, that's a -- an extraordinary feat to be able to do that. And the only reason I mention that is to assure to you that our commitment to do what we want to do and what we are committing to do.

As Mr. Knox mentioned, it's very important the actual location of our well field. The delivery means, a 36-inch pipeline, approximately 12 1/2 miles long. The cost of the pipeline itself, approximately $21 million, as you can see from the spreadsheet that was presented.

One of the things that we're working on currently right now is the design phase of that pipeline. And once again, it is a huge commitment on our part to assume and to count on that this project will be allowed to complete. We will spend approximately $1.5 million by the time we actually get to the point where we're breaking ground. We've contracted with GEI to actually do the design phase. They actually did the feasibility study where we tried to determine if this was actually going to be feasible and whether we could accomplish that.

Of course, we plan on breaking ground

this fall. Mr. Knox indicated November. We would like to streamline the process and actually break ground in October. And then of course we would like to deliver water in June or July of 2009. If we can do that, if we can deliver water during the summer of 2009, we can be in compliance with our Compact obligations by December of 2009.

I've talked about everything except for who's going to pay for this project. We would just love for the State of Colorado to pick up the tab on that. But at this point, and moving so quickly, it was determined that we wanted to go ahead and assure that this project was going to be completed, so we bit the bullet and we decided that we would fund this project solely of our own.

As I mentioned, we had a fee assessment of $5.50 per acre. We increased that in January at our January board meeting to $14.50 per irrigated acre. We are collecting within the basin approximately $7.2 million each year beginning in January '09 to accomplish this project. We have worked with the Colorado Water Conservation Board to acquire a loan at a low

interest rate to be able to do that. It's a 20-year loan, so we're committed for the next 20 years to pay off that loan. And I think Mr. Knox mentioned that's actually happening today back in Colorado. And two of our board members and our other legal representation are there today going ahead and taking care of that -- that process, excuse me.

That $14.50 of course is not solely to the pipeline project. We have administration costs for the district. Our retirement programs are still ongoing. We are anticipating -- we have actually application right now before Department of Agriculture an additional 30,000 CREP acre program. I need to mention for conservation purposes, our CREP program I think is unique, even in comparing it to other water retirement programs. Our CREP program is permanent. None of the water rights that we acquire through the CREP program will ever be used again. As it was mentioned, we have approximately 24,000 acres in application. We anticipate that within the next year that CREP program, the initial one, will be filled up. That's why we sought additional ones.

Now I want to talk to you a little bit more on a personal level. There's approximately 2,500 family farms within our basin. I can't speak for all of those, but I can speak for my farm. We're probably what you might call a small to medium sized farm, approximately 3,000 acres of dry land and irrigated corn, wheat, soybeans, sunflowers.

On a per circle, 128 center fitted circle, we'll be assessed $1,740 per irrigated circle. For my operation, I will pay somewhere in the vicinity of $18,000 per year to fund this pipeline project and the associated projects that we have for our basin.

You know, my son graduated from CSU in December of 2003. 2004, the Water Conservation District was formed. And when I told him that we were going to assess $5.50 per acre, he wasn't real thrilled and questioned, Are you sure this is going to work? Are you sure you're going to be able to do the things that you need to to get us into Compact compliance? And of course I, as any dad would, I assured, Oh, yeah, yeah, we're going to get there. Well, you can imagine his reaction when I told him that we

were increasing the fee to $14.50 per acre. For young farmers, it's a huge commitment to be able to do that. He's purchased irrigated lands of his own. He has to meet those requirements.

My daughter is the economic development director for the City of Burlington. Main street in our communities has a stake in this. Our local economies are dependent upon irrigated agriculture. And I know I'm speaking to the choir. I know that you three commissioners have heard these kind of talks before. But I just want you to know that it's not just the Water Conservation District. It's not just the state that has a stake in this. It's individual farmers and their families.

So I just want to urge you to move as rapidly as you can to approve this project. It's our money that we're spending. We're committed to it. We'll complete the project if you'll allow us to.

I want to close by saying if we have not given you any information that you need, ask and we'll get it to you. Thank you. Dick.

MR. WOLFE: Are there any other questions that any of the representatives from

Colorado can answer for Ken or Dennis or myself?

MR. KOESTER: Yes, I'm just wondering, are you going to pump an average amount every year or are you going to look at like the crop need for those lands every year and then pump according to that?

MR. WOLFE: Ken, can you respond to that one? Did you hear the question?

MR. KOESTER: What the crop need would be based on those acres, or would you pump like an average consumptive use from the past per year, or is that going to vary from year to year?

MR. KNOX: Paul, I'd characterize it as -- it's not necessarily an average of the consumptive use. That goes into the calculation of how much of the source water is available. This pipeline will be operated not based upon what the existing consumptive use is of that year but to meet our Compact obligations. That is the target, if you will. How much and when the window of opportunity to maximize the operations and the delivery system, it's typically going to be during a nine-month period to meet our Compact obligations. Once we

have the consumptive use, which we believe is accomplished, that tells us how much, but then the operations are solely for Compact compliance operations.

MS. BLEED: I really want to thank Commissioner Wolfe and Ken Knox and Dennis Coryell and all the people from your district that came here. We appreciate the presentation.

Are there any other questions from Kansas at this point?

MR. BARFIELD: Well, yes. Just some initial ones, I guess, and comments. And obviously, we'll have to dig into the details of all that you've presented here. And I guess the CD wasn't there when I left the office yesterday, but I'm sure it's there on its way so -- and I too appreciate what we've heard today and all the hard work that's gone into what you're embarking on here so -- and we'll be diligent about reviewing it and getting back to you with additional information that we might need and questions and comments as we work through this, this process. It's something we haven't done before.

The settlement does provide for this

augmentation plans and credits and -- so -- but we haven't done it before. And Nebraska's talking about it. We need to make sure we do it right. And I don't know what level of questions we want to get into today in this forum. You know, maybe -- obviously we need to dig in and have those discussions I guess maybe after we do that. But there are lots of questions.

You know, the modeling, how it would be formed of not only the withdrawals but also how it would be informed about the water you're putting in the river, how that would be done. I haven't seen in my cursory review of your materials. I haven't seen the CD either yet. The CDU analysis, obviously I didn't see in the printed material, but I understand that's on its way. That will be a pretty important aspect of it.

I'm just making sure we understand how all the accounting and modeling fits together. We'll work through that, Ken, I know. You know, operationally what happens to this water when it hits Nebraska? You know, what happens to it? Does it -- who gets to use it is something we'll have to work through as well. But I do

appreciate the efforts.

I guess there's just one other significant question that I have. The Nebraska media -- not anyone here at this meeting -- falsely reported a couple weeks ago that we -- that I had approved your plan.

MR. KNOX: Thank you, sir.

(Laughter.)

MR. WOLFE: It must be true. He said it again today.

MR. BARFIELD: I said falsely reported.

MR. AMPE: We'll take care of that.

MR. WOLFE: We can redact that part.

MR. BARFIELD: And since that event occurred, I've been getting a number of e-mails and letters from Cheyenne County, Kansas, expressing their dissatisfaction with that approval. Not that they -- you know, not that they necessarily oppose the Compact pipeline, but, I mean, there's one piece of compliance I think that I don't see addressed here that in addition to the overall state-wide

tests that are part of the settlement, there are tests for Kansas and Colorado on the individual tributaries that basically ensure that an upstream state does not use the water specifically allocated to a downstream state.

That's a specific five-year running average test that we have to do on each of our individual tributaries as well as the State of Colorado. And on the South Fork, Colorado is using, you know, around 5 to 6,000 acre feet more -- its consumptive use is 5 to 6,000 acre feet more than its allocation, and then on the North Fork, it's, you know, 7, 8,000 acre feet, you know, if we look at these 2003 to 2006 numbers we have in front of us. So you're overusing on both tributaries.

You know, your proposal proposes to do all the replacement on the North Fork, and so that leaves the South Fork short. And that's the concerns of our water users in Cheyenne County on the South Fork is why is none of this replacement being done there. And how is the State of Colorado going to address its use of our South Fork allocation. I guess that's the -- that's the piece that -- that's missing

here.

But again, I mean, the concept of an augmentation pipeline, you know, is a good concept I think from everything I've seen. Again, we've got to work through all the details, and there's lots of questions we need to address, so we're not -- we're not here opposing your pipeline. I guess we're here saying how is the South Fork going to be addressed? So that's -- I guess that's what I'm -- again, there's a lot of details I think we'll just come to in the course of events here as they unfold.

MS. BLEED: Thank you. Do you want to respond at all?

MR. WOLFE: Sure. And Commissioner Barfield, as we discussed before, we've understood that's been a concern of Kansas in regards to the South Fork. And as we've talked this morning, the three of us, about potential timelines in terms of addressing not only our Compact compliance pipeline but also the dispute between Kansas and Nebraska, that we hope to achieve resolution to that issue over the next couple of months as part of the

contemplated proposal I think we're going to talk about after this in terms of trying to reconvene a Compact Commission meeting again by June 1. So we certainly hear you and will certainly be part of our discussions as we go forward to try to address your concerns.

MS. BLEED: From Nebraska's point of view, we obviously will be looking at the information that was sent to us by Colorado. And we will do whatever we can to make sure that this gets resolved in a speedy manner. I did hear Mr. Coryell and Mr. Knox's concerns about the fact that you are moving ahead, and we'd like to make sure that this gets addressed one way or the other. And we're optimistic that we can work things out.

One concern Nebraska has involves the Pioneer Irrigation District. We -- I have received a number of letters from irrigators in the Nebraska portion of that district, and they are very concerned about the impact of the pipeline and continued pumping upstream on their water supply. We have mentioned this before to Colorado, and I think that is a concern that we will be looking to see just how that is

addressed in the future. Nebraska would like to make sure that that irrigation district is kept whole while at the same time Colorado is working on the pipeline to comply with the Compact.

And I don't have any further questions at this point in time. We look forward to working with Colorado on this issue. Did you --

MR. BARFIELD: One other thing I guess. Again, as we've talked about, you know, depletions from groundwater pumping to stream flow are not something you can turn on and off. And again, part of this will be I think it's a necessary component to tell the model there's more water here now than -- because the model isn't going to be informed of that otherwise so -- anyway, so we just need to figure out how to do that and what all the implications are so --

MR. WOLFE: And I guess just not -- hopefully not to mischaracterize what I've heard both of you say though, and so it will give the district some comfort in terms of where they've moving forward on this, recognizing we want final approval hopefully by June, I understand that in concept you're not

opposed to this pipeline.

We understand there's some of these details we need to answer, but I think what the district here and the representatives here want to hear that confirmation that in essence in concept, this is something that we can continue to pursue, because they've obviously got some very critical needs in terms of funding and so forth that they've got to commit to. And certainly we know we want final approval here in the near future.

But just so you're not misquoted in the paper and I'm not mischaracterizing your position on this, if you could comment on that, I would appreciate that.

MS. BLEED: Go ahead, Dave.

MR. BARFIELD: Well, I do think this is the type of project that is contemplated in the provision of the settlement that you referenced. And so in concept, I think we're supportive. We just, you know, need to work through the details.

MS. BLEED: And Nebraska is the same. We are certainly supportive of the concept of augmentation. And as you heard

yesterday, we are hoping to develop our own augmentation program. So absolutely, in concept, we're supportive of what you are doing. I expect that we need to just sit down and work through the details to make sure that we get it right, as Mr. Barfield said earlier.

MR. BARFIELD: I would have liked more time because --

MR. WOLFE: I understand.

MR. BARFIELD: -- this has not been done before. And hopefully we can meet your time schedule but it's going to -- there's a lot of details to work out here so -- but again, we appreciate, you know, what you've brought today.

MR. WOLFE: Well, we appreciate your understanding. You know, as Mr. Coryell pointed out, the timing -- we wish we would have been, you know, a number of years ago on this. But as they looked at various options, this is something that came out in the end and just the last 100 days or so. And we hope it is a model that certainly maybe Nebraska could use. I think they've done a great job in showing how it can be successful, and hopefully it will be a

model for folks in your state to piggyback on.

MS. BLEED: We are looking forward to learning from your experience.

MR. WOLFE: Well, talk to those folks over there (indicating). They're the ones who've borne the burden of doing this. And it's a local solution to a local problem there. And the state is certainly 100 percent behind supporting their efforts of getting this pipeline completed.

MS. BLEED: Thank you. Anything else on the Colorado pipeline augmentation?

What I would like to do now, if I may, is a couple of housekeeping items. First of all, we would like to submit the notebook that we put together for the special meeting to be a part of the record. I am assuming that would be okay with Colorado and Kansas?

MR. BARFIELD: Yes.

MS. BLEED: And the other thing, I promised Mr. Knox yesterday some figures on how much was spent on purchasing surface water. And I want to thank you, Ken, for asking that question because in the process of looking up those numbers, I realized when I was putting

these slides together this weekend that I had grabbed the wrong total number of surface water that was actually purchased for 2007. I said it was 51,000 acre feet. In fact, because we ended up getting more water than we had originally planned because we had good rains, we ended up with 62,830 acre feet of diverted water that we paid irrigators not to divert. The total cost for 2006 -- this was a cost paid by the state as well as the Natural Resources Districts -- was $3,064,500. And in 2007 -- and I do need to point out that again, this was a cost paid for by both the Natural Resources Districts and the State of Nebraska -- it was $14,266 -- $14,266,000. So the total cost for the two years was $17,330,500.

MR. KNOX: Thank you, ma'am.

MS. BLEED: With that, what I would suggest -- it's about quarter of 10:00. I think a number of people need to check out, have other business to take care of. We will take a break and reconvene. Is 10:00 a good time to reconvene or --

MR. BARFIELD: No. That's too quick.

MS. BLEED: That's too quick. Okay.

MR. BARFIELD: Why don't we just say 10:30 because --

MS. BLEED: 10:30. All right. Let us reconvene at 10:30 to finish up whatever remaining business we have. Thank you.

(Recess.)

(Proceedings recommenced at 12:18 p.m.)

MS. BLEED: I want to thank you all for your patience. We were commenting before that when we get into negotiating complex issues like we're dealing with today, this is not an unusual occurrence to have caucuses and other meetings. We did however come to an understanding of how to move forward on these issues, and I will try my best to make sure I articulate this correctly.

I've asked Commissioner Wolfe and Commissioner Barfield -- I'll make sure he's at the table -- to correct me if I don't get it exactly right. But before something very important, I do need to announce, lunch buffet is glazed ham, mashed potatoes and gravy, green beans, salad and dessert for $9 plus tax.

Okay. What we have resolved is that we will continue this meeting of the RRCA to meet again with a meeting before that of the Engineering Committee until no later than April 11th. My expectation is that most of that will be an Engineering Committee meeting followed by a report to the RRCA of what the Engineering Committee is doing.

Kansas has reserved the right to bring the dispute to arbitration at any point in time past today. And we have agreed to -- that after April 11th, all three states acknowledge that Kansas may invoke arbitration at any point after that point in time.

We're also going to be assigning all the issues that were raised at this meeting yesterday and today by Nebraska and Kansas to -- for the dispute resolution, assign those issues to the Engineering Committee along with an assignment to the Engineering Committee to review Colorado's proposed augmentation plan, which I will clarify is not a disputed issue at this point in time but needs to be clarified. And the expectation is that the Engineering Committee will meet as necessary to in good

faith try to get these issues addressed. And their first meeting shall be no later than April 11th. We would like to see them meet earlier.

And then finally, we are also scheduling an Engineering Committee meeting to be followed by a Republican River Compact Administration meeting for May 15th and 16th. Is there anything that Colorado or Kansas would like to add to that?

MR. WOLFE: The meetings will be in Kansas City?

MS. BLEED: The meetings will be in Kansas City. We don't know exactly when and where, but they will be in Kansas City.

MR. BARFIELD: No. I have nothing to add.

MS. BLEED: Okay. Is there anything that anybody else needs to add before we -- I won't say adjourn but call the meeting today to a close to be continued on or before April 11th?

MR. BARFIELD: Appreciate you hosting the meeting.

MR. WOLFE: I'd like to move that

we continue the meeting until April 11th.

MR. BARFIELD: All right. I'll second that.

MS. BLEED: All those in favor say aye.

MR. BARFIELD: Aye.

MR. WOLFE: Aye.

MS. BLEED: Aye.

Okay. The meeting will be continued to April 11th. I want to thank you all for your interest and for coming to the meeting. It's been very good to meet all of you, and some of you are old friends, some of you I expect will be new friends. I hope that we can remain as friends in the future. And so for the time being, we will adjourn until on or before April 11th.

MR. WOLFE: Did you want to mention about the Engineering Committee?

MS. BLEED: I was just about ready to do that.

MR. WOLFE: Okay. Sorry.

MS. BLEED: What I would request is that the members of the Engineering Committee convene up front here for a few minutes so we

can have the Engineering Committee get a schedule that would be workable for them. Again, thank you all for coming.

(Proceedings concluded at 12:23 p.m.)

CERTIFICATE

I, Jean M. Crawford, a Certified Court Reporter, do hereby certify that I appeared at the time and place first hereinbefore set forth, that I took down in shorthand the entire proceedings had at said time and place, and that the foregoing constitutes a true, correct, and complete transcript of my said shorthand notes.

_____

JEAN M. CRAWFORD, CCR No. 954, RPR

ATTACHMENT D

AGENDA

SPECIAL MEETING OF THE RRCA

APRIL 11, 2008
KANSAS CITY, MISSOURI

DRAFT

PROPOSED AGENDA

Special Meeting of the Republican River Compact Administration
8:00 a.m. (Central Daylight Time) April 11, 2008

Holiday Inn/KCI Expo Center
11728 & 11730 NW Ambassador Drive
Kansas City, MO
(816) 801-8400

I. Introductions

II. Review Agenda

III. Status of Preliminary Compact Accounting due April 15, 2008

IV. Technical Questions and Responses
- A. Nebraska's Response to Questions
- B. Kansas' Response to Questions
- C. Colorado Response to Questions

V. Discussion of Proposed Augmentation Plans
- A. Nebraska
- B. Colorado

VI. Future Actions to Resolve Disputes and Discuss Issues
- A. Accounting for Imported Water Supply Credit and ground water Computed Beneficial Consumptive Use
- B. Allocation of evaporative loss from Harlan County Lake
- C. Accounting for evaporation from non-federal reservoirs below Harlan County Lake
- D. Return flow from canals fed by Bureau of Reclamation projects
- E. Haigler Canal issues:
  1. Diversion accounting,
  2. Field return flows, and
  3. Wasteway return flows
- F. Discrepancies between basin descriptions and the accounting point locations for surface water and stream depletions due to ground water consumptive use
- G. Riverside canal issues
- H. Augmentation Plans
- I. Kansas proposed remedy

VII. Future Meetings

VIII. Adjourn

ATTACHMENT E

TRANSCRIPT

SPECIAL MEETING OF THE RRCA
VOLUME I, PAGES 1-26

APRIL 11, 2008
LINCOLN, NEBRASKA

SPECIAL MEETING OF THE

REPUBLICAN RIVER COMPACT ADMINISTRATION

VOLUME I

PAGES 1-26

DATE: APRIL 11, 2008

PLACE: HOLIDAY INN/KCI EXPO CENTER
11730 NW AMBASSADOR DRIVE
KANSAS CITY, MISSOURI

REPORTER: JEAN M. CRAWFORD
CCR NO. 954, RPR

APPEARANCES

Mr. Brian P. Dunnigan
Mr. James R. Williams
Mr. James Schneider
Mr. Justin D. Lavene
Mr. Brad Edgerton
Mr. Ron Theis
Mr. Paul Koester
Mr. John B. Draper
Mr. Scott Ross
Mr. David W. Barfield
Mr. Dale Book
Mr. Peter J. Ampe
Mr. Dick Wolfe
Mr. Kenneth W. Knox
Ms. Megan A. Sullivan

EXHIBITS

Sign-in sheets attached

(Proceedings commenced at 8:14 a.m.)

MR. DUNNIGAN: Good morning. We'll get started -- it's a little later than we wanted to. We have a lot to do today, but welcome. My name is Brian Dunnigan, and I'm the acting director for the Nebraska Department of Natural Resources and the chairman of the RRCA for this year.

This is a continuation of the RRCA meeting of March 11th and 12th. And we have an agenda, a proposed agenda that's out right now. And I would take a motion to accept that agenda or to change that agenda.

But before we do that, I do want to make sure that we introduce people around the table, and I'll start down at that end, please.

MR. BARFIELD: All right. Yeah. I'm Dave Barfield, Compact Commissioner for Kansas. And -- anyway, I guess we'll let each person introduce themselves. Is that what you want me to do? Well, I'll introduce -- to my left is Dale Book, president of Spronk Water Engineers and engineering consultant for Kansas. To my right here is Scott Ross, our water commissioner from the Stockton Field Office. To

his right is John Draper, lead counsel for the state of Kansas and interstate litigation. So those are the ones around the table.

MR. DUNNIGAN: I'll start with Ron.

MR. THEIS: Ron Theis, Department of Natural Resources, Nebraska.

MR. KOESTER: Paul Koester, groundwater modeler for Nebraska.

MR. LAVENE: Justin Lavene, Nebraska attorney general's office.

MR. SCHNEIDER: Jim Schneider, DNR Nebraska.

MR. EDGERTON: Brad Edgerton, DNR Nebraska.

MR. DUNNIGAN: I'd also like to recognize three of our NRD managers that are in the audience, Dan Smith, Mike Clemons and Jasper Fanning.

MR. WOLFE: Dick Wolfe, Colorado commissioner.

MR. KNOX: Ken Knox, State of Colorado.

MR. AMPE: Peter Ampe, Colorado attorney general's office.

MS. SULLIVAN: Megan Sullivan, State of Colorado.

MR. DUNNIGAN: Okay. Did we all get the agenda, the proposed agenda? Any comments on that agenda?

MR. BARFIELD: Well, again, my comment, and I think actually here what's reflected is today's meeting I think for the most part was intended to be a meeting of the Engineering Committee to review all the data analysis that we've exchanged, ask questions and so forth. So I guess I would just have the record note that that's sort of the intention of the day is -- the list of topics I think are appropriate and sort of what we agreed to, but I guess just a recognition that the majority of the agenda will be discussed in the Engineering Committee, and then we'll reconvene the Administration at the end of the day.

MR. WOLFE: We'll concur with that.

MR. DUNNIGAN: Okay. Should we have a motion then to take a recess from the RRCA meeting and convene the Engineering Committee?

MR. WOLFE: I would make a motion that we recess into the Engineering Committee meeting and that portion of the meeting would be held off the record.

MR. DUNNIGAN: Very good.

MR. BARFIELD: I second.

MR. DUNNIGAN: Thank you. All in favor?

MR. BARFIELD: Aye.

MR. DUNNIGAN: Aye.

MR. WOLFE: Aye.

MR. DUNNIGAN: Okay. We will recess and we will convene a meeting of the Engineering Committee.

MR. BARFIELD: That's fine. And I guess we probably just need to discuss time frames for the meeting just to make sure we get everything done. I understand we have some 4:30 flights out of here, so we will want to end everything at no later than 3:00 I would guess.

MR. DUNNIGAN: Okay.

MR. BARFIELD: So shall we have a target time to end the Engineering Committee portion to make sure we have time to have the ending Administration piece as well as to get

you all on your flights?

MR. WOLFE: Well, I think part of that may depend on how much we need to convene underneath the actual commission meeting, but certainly we need to end by 3:00. So if we try to target 2:30 or 2:00, somewhere in that time frame to --

MR. BARFIELD: Okay.

MR. WOLFE: I guess we'll just see how it goes after lunch and maybe evaluate that.

MR. BARFIELD: Okay.

MR. DUNNIGAN: That will be a good target.

MR. BARFIELD: All right. Very good.

MR. DUNNIGAN: Thank you.

(Off the record at 8:19 a.m.)

(Proceedings resumed at 2:17 p.m.)

MR. DUNNIGAN: We're ready to get started. I'd like to reconvene the Special Meeting of the Republican River Compact Administration. After discussions with the commissioners, we're going to continue this meeting May 15th and 16th in Lincoln, Nebraska.

And basically, we would be referring the items discussed this morning, which roughly amount to the agenda item item 6 and anything else to the Engineering Committee for further discussion and exchange of information as needed.

We had previously requested some damage information from Kansas, and we will be waiting for some information back on that when you have it.

MR. BARFIELD: Yeah. Let me acknowledge that. I did get a letter from Brian this morning, he handed it to me, just kind of laying out some of those expectations. And we will be working on that and getting back to you starting the first part of next week --

MR. DUNNIGAN: Thank you.

MR. BARFIELD: -- on some of those issues that you raised in your letter so --

MR. DUNNIGAN: Thank you.

MR. BARFIELD: Mr. Chairman, do you think we need a motion relative to continuing the meeting?

MR. DUNNIGAN: Yes, I think we probably do.

MR. BARFIELD: Why don't I offer that.

MR. DUNNIGAN: Okay.

MR. BARFIELD: I move that we continue this Compact Administration to May 15, 16 in Lincoln, Nebraska, sort of under the same conditions that we continued to this meeting and that we assign the Engineering Committee to continue its deliberations on those issues outlined.

MR. DUNNIGAN: Second?

MR. WOLFE: Second.

MR. DUNNIGAN: All --

MR. WOLFE: I guess just as a comment before we officially continue, I just want to put something in the record that I talked to you about before. I don't know if we need to do that before we vote on the motion. I guess technically have it in the record before we continue it to the next meeting.

MR. DUNNIGAN: I won't adjourn the meeting until you have it in the record so --

MR. WOLFE: Okay. Just wanted to make sure.

MR. DUNNIGAN: All in favor?
MR. BARFIELD: Aye.
MR. WOLFE: Aye.
MR. DUNNIGAN: Aye. Commissioner Wolfe?
MR. WOLFE: Yes. I'd just like the record to reflect, I did deliver to Commissioners Dunnigan and Barfield a letter dated April 11th under my signature basically just pursuant to Section VII.A.3 of the final settlement stipulation, wanted to just raise that the following issue before the RRCA is a fast-track issue in regards to Colorado's request for approval of our Compact compliance pipeline as part of our augmentation plan.

Again, this is solely just to preserve our position in terms of timing. It's not our intent to initiate fast-track mediation at that point but just recognize that timing is very critical for Colorado at this point in terms of our representing our water users and the district that there's several million dollars at stake at this point to move this pipeline project forward. And we just wanted to make sure we preserve all our positions in terms of

timing to keep this project ongoing.

We recognize that we just delivered the last information a day or two ago in terms of the request by Kansas and questions that they had for us. We recognize that that was just recently delivered and they still have time that they need to look at that. And we will -- it's our intent to provide all the ample time they need. And we hope that we can have all of those questions answered by May 15th, 16th.

And if we feel that, you know, we're not there, we're going to continue to provide all that information as timely as possible in terms of answering not only Kansas's questions, but if Nebraska continues to have questions as part of our pipeline project. So I just wanted the record to reflect that you did receive that letter today so --

MR. DUNNIGAN: I acknowledge receipt.

MR. BARFIELD: Yeah. I'd certainly will be willing to acknowledge I received your letter today and the information yesterday. You know, it is a complex proposal, as I talked about in the past, and one -- you

know, we understand your desire to move forward with the project and what's at stake here, and we'll work as quickly as we can, but recognize that, you know, there's a lot of complex issues at stake here. So with respect to the -- the dispute resolution process and how this all works, I might defer to John on that issue.

MR. DRAPER: Mr. Chairman, if I might say a few words.

As I discussed with Colorado counsel, we recognize the need to obtain RRCA approval under Section III.B.1.k of the final settlement stipulation. And as I see it, we're working towards that -- that event as quickly as possible. However, I -- we do not see this as an issue that is appropriate for dispute resolution treatment.

There are a number of instances where the RRCA as an interstate body is required to do certain things. And if you submit something to dispute resolution, it is under the assumption that if those preliminary procedures in that process do not work that the Supreme Court of the United States is authorized to enter an order forcing the resolution of that dispute.

And I do not believe that the Supreme Court considers itself to have the authority to order an interstate body such as the RRCA to take certain action. And so we would not -- we are going to continue to review your plans, and we look forward hopefully to resolving any concerns that we have.

We also have the South Fork issue that we need to address between the two states in a constructive way. But if -- if those are not successful, we do not believe that the RRCA approval that is required in Section III.B.1.k of the final settlement stipulation is something that could be forced by the Supreme Court to happen, and therefore is not appropriate for submission to the dispute resolution process.

So I don't know that these statements by us requires any action by you. We recognize we've received this letter, wanted to make it very clear what our position is on that. And in the meantime, we'll look forward to working constructively with Colorado on their pipeline plan.

MR. AMPE: If I might, Mr. Chairman. Peter Ampe for State of Colorado.

Mr. Draper, we did discuss this earlier. I think you and I perhaps disagree on the legal interpretation of it. But nevertheless, I think we both agreed we'd go forward, and hopefully that issue won't be necessary to resolve as we can resolve it amicably. And we certainly understand that by acknowledging receipt of the letter, you are not waiving any rights in the future as to any views you wish to bring forward regarding what the dispute resolution or the United States Supreme Court can or can't do.

MR. DRAPER: Thank you Mr. Ampe, and thank you, Mr. Chairman.

MR. LAVENE: Justin Lavene for the State of Nebraska attorney general's office. Just to weigh in on this issue a little bit, I think we're in somewhat of agreement with Colorado in that this can be submitted to the RRCA dispute resolution process underneath the settlement agreement. And just as a point of clarification, I think at this point in time that although we feel that we have added additional issues to the dispute that Kansas brought forward identifying various accounting issues that the State of Nebraska would like to

have resolved by the RRCA through a dispute resolution process that we will probably be also in the very near future sending out a letter clarifying our position that those accounting issues will be requested to be also through the fast-track dispute resolution process and potentially into arbitration also if need be.

So just wanted to clarify that and let you know that that would also be coming. We'd hoped to have that out to you by next week. And once again, as just a -- in an abundance of caution, based upon our conversation, that we'll just be identifying those issues that we also want to make sure are included as we go through this process. So --

MR. DRAPER: Mr. Chairman, if I may.

MR. DUNNIGAN: Sure.

MR. DRAPER: We recognize your statement on that, and here we would also say, and I think it's consistent with my previously stated position, that when you go to accounting issues like the ones you mentioned, the accounting procedures are in the appendices of the final settlement stipulation. And it's

specifically provided that those can be changed only by action of the RRCA.

And again, for the same reasons I stated with respect to the pipeline issue, we do not believe that the Supreme Court or any other court is in a -- feels it's in a position to require certain action to be taken by an interstate body like the Republican River Compact Administration.

MR. LAVENE: And I think as Mr. Ampe previously stated, we know that you won't waive any rights by accepting that letter that you should be receiving next week, and we can deal with that as we proceed through the process so --

MR. DRAPER: Thank you very much.

MR. LAVENE: Thank you.

MR. DRAPER: Thank you, Mr. Chairman.

MR. DUNNIGAN: Yes. Commissioner Barfield, would you like to add anything else to this afternoon's discussion?

MR. BARFIELD: I don't believe so.

MR. DUNNIGAN: Commissioner

Wolfe?

MR. WOLFE: Yeah. Just maybe one last statement to make sure that the record reflects that the engineering advisors committee meeting that we had preceding coming back to this meeting was not an executive session. It was open to the public, and interested people did attend that session.

MR. DUNNIGAN: If there's nothing else, I would take a motion to adjourn.

MR. WOLFE: I make a motion -- did you have a statement?

MR. BARFIELD: Just a second.

MR. WOLFE: Okay.

MR. BARFIELD: I guess there's two points I'd like to ask, I guess, before we adjourn here, sort of reflected in our discussions at the meeting. And one is on the Harlan County evaporation split. Again, that's one of the issues that's on the list. And our discussions seemed to indicate that -- that proposal's sort of been on the table for a few months now. And I guess I would just ask if Nebraska's going to be prepared to respond on that issue at our next Engineering Committee

meeting?

MR. DUNNIGAN: We can discuss it further now.

MR. LAVENE: Well, no, at the Engineering Committee meeting.

MR. DUNNIGAN: At the Engineering Committee meeting.

MR. BARFIELD: On May 1st and 2nd?

MR. DUNNIGAN: Yes.

MR. BARFIELD: You will be prepared to provide some feedback? We'd appreciate that.

MR. DUNNIGAN: (Nods head.)

MR. BARFIELD: I guess maybe your letter will reflect this, I don't know, the other issue that we discussed at our Engineering Committee meeting was with respect to agenda item 6A on the accounting for imported water supply credit and groundwater computed beneficial consumptive use. And I guess -- I guess I just wanted to put in the record that it -- it appears that Nebraska does not have a specific proposal on the table. I guess another way to ask that is, you sent us a -- a document

in the manual that you provided at the last meeting that had a -- what looked like a specific proposal to me, but statements today indicate that you don't have a specific proposal on the table. Is that true?

MR. SCHNEIDER: I think -- like I said before, those -- those papers were meant to -- to clarify the problem. I would say that the last paper we had did present an alternate method of accounting and just leave it at that.

MR. LAVENE: And I guess along with that, I mean, whether or not Kansas agrees or disagrees that there is a problem that needs to be addressed at all or whether or not agrees or disagrees that what we presented is, in fact, accurate at this stage in the game. I mean, it was something to present to Kansas to say this is an issue, there's a discrepancy there, an accounting issue that needs to be resolved.

I think to this point, we haven't received any feedback with questions on that specific issue with regards to, you know, are we right? Are we wrong? Do you agree there is a problem? Is there not a problem? Does this need to be further looked at and examined.

Things of that nature. So I mean, we're working towards that end to see if the RRCA needs to look at that and make changes if need be if Kansas and Colorado agree that there is an outstanding problem.

MR. DRAPER: If I might, our understanding of the situation is that this alternative accounting method has been discussed, but at this point, Nebraska is not proposing a specific resolution to it. It may do so soon, but at this point, we don't have a specific proposal as to how that accounting issue should be handled. Is that correct?

MR. LAVENE: I think it's correct to the point of Nebraska hasn't stated that it absolutely has to be one way, meaning my understanding of the problem is that there are multiple ways that you can run the scenarios and you get different results. We're presenting that as a problem and saying, is there a best result. And that is something that the commission needs to examine and look at.

And I guess an identification from Kansas of a first step with that issue is to say, yes, we understand that by running these

various scenarios and interchanging them, you get different answers to the same question that you're asking. That is a problem for the -- for the commission to deal with. And I guess that would be the first question, you know, for us as Nebraska to ask Kansas and Colorado.

If we identify that there is a problem out there, then I think jointly as a commission we need to move forward to get a resolution to that problem. If need be, Nebraska should be prepared in the near future to identify what we feel our best -- or the best resolution of that issue would be. But at this point in time, we haven't received clarification from Kansas or Colorado that, yes, there is a problem that needs to be worked on.

MR. DRAPER: Well, if I may respond, we do not -- we do not believe there is a problem. If Nebraska, after further analysis, decides that there is, I would ask that they present a specific proposal to the RRCA which we would be glad to consider at that time.

MR. LAVENE: Okay. And I think that's appropriate, and I think we'll be prepared to do so. As stated, I think what we

prepared to up to this point is that Nebraska's presenting to the commission that there is an issue that needs to be dealt with, and we are working towards a more in-depth analysis of that and potential solution to that problem, which we will get to the commission as soon as we can.

MR. DRAPER: Very good. Thank you.

MR. LAVENE: Yep.

MR. WOLFE: Chairman, just real quick, I want confirmation that it's our understanding that the May 1st, 2nd meeting in Denver that that's just the engineering advisor committee and there will be no attorneys there? That's not my request, I'm just assuming that that's the case.

MR. DRAPER: You're going to hurt our feelings.

MR. KNOX: Okay. It's my request.

(Laughter.)

MR. DUNNIGAN: I mean, it was scheduled as an Engineering Committee meeting.

MR. WOLFE: Okay. Just wanted --

MR. LAVENE: And I guess, just

for my purposes, if that does change, the -- we'll let everybody know.

MR. AMPE: Of course.

MR. WOLFE: That's why we just wanted to make notice of that now, that that was the intent. These are some engineering issues that were still being resolved at that meeting.

MR. LAVENE: But that also the commissioners would be at the Engineering Committee meeting also, correct?

MR. BARFIELD: I will be there.

MR. LAVENE: Okay.

MR. WOLFE: I -- I can make myself available, and I think I have planned to be there, but I think not as an engineering advisor. That's -- Mr. Knox takes that role from Colorado's standpoint, so I may be there just because it's in Denver listening in but --

MR. LAVENE: Okay.

MR. BARFIELD: I mean, really, what we're saying is this is an Engineering Committee meeting, not a meeting of the Administration.

MR. LAVENE: Right, right.

MR. WOLFE: Right.

MR. BARFIELD: It is still -- I mean, we're not going to bar attorneys, are we?

MR. LAVENE: Don't want us there, you don't want us there.

MR. BARFIELD: I mean, can we do that?

MR. AMPE: I'm not prepared to answer that at the -- I think it would be fine that if the Engineering Committee wants to meet without attorneys, they can do so. If for some reason you would want one of your attorneys there, just please let Nebraska and Colorado know. But for right now, I don't plan on being there.

MR. DRAPER: I think that's the important thing. We all do the same thing. We're either all there or we're not.

MR. AMPE: Yes.

MR. DUNNIGAN: Very good. I'll look out again and see if there are any other questions or comments.

MR. BARFIELD: I would move adjournment.

MR. WOLFE: Second.

MR. DUNNIGAN: All in favor?

MR. BARFIELD: Aye.

MR. WOLFE: Aye.

MR. DUNNIGAN: Aye. Meeting adjourned.

(Proceedings concluded at 2:36 p.m.)

CERTIFICATE

I, Jean M. Crawford, a Certified Shorthand Reporter, do hereby certify that I appeared at the time and place first hereinbefore set forth, that I took down in shorthand the entire proceedings had at said time and place, and that the foregoing constitutes a true, correct, and complete transcript of my said shorthand notes.

_____

JEAN M. CRAWFORD, CCR No. 954, RPR

ATTACHMENT F

STATEMENT REGARDING AGENDA

SPECIAL MEETING OF THE RRCA

MAY 16, 2008
LINCOLN, NEBRASKA

An agenda was neither discussed nor approved during the May 16, 2008 meeting of the Republican River Compact Administration

PROPOSED AGENDA FOR SPECIAL MEETING

OF THE

REPUBLICAN RIVER COMPACT ADMINISTRATION

Holiday Inn Downtown
Lincoln, Nebraska
1:00 – 5:00 p.m., May 15, 2008

1. Introductions

2. Status and Action of Pending Issues

    a. Nebraska concern regarding use of the ground water model, imported water supply, and consumptive use

    b. Evaporation from non-federal reservoirs below Harlan County Lake

    c. Waste way return flows from canals fed by Bureau of Reclamation projects

    d. Haigler Canal issues:

        i. Diversion accounting,
        ii. Field return flows, and
        iii. Waste way spillback flows and Arikaree sub-basin accounting

    e. Discrepancies between basin descriptions and the accounting point locations for surface water and stream depletions due to ground water consumptive use

        i. Guide Rock accounting point
        ii. Groundwater model accounting points matching sub-basin surface water accounting points

    f. Riverside canal issues

    g. Colorado augmentation proposal

    h. Kansas remedy for Nebraska

    i. Allocation of evaporative loss from Harlan County Lake

3. Other business

4. Work assignments and follow-up actions

5. Adjourn

ATTACHMENT G

TRANSCRIPT

SPECIAL MEETING OF THE RRCA

MAY 16, 2008
LINCOLN, NEBRASKA

MEETING OF THE

REPUBLICAN RIVER COMPACT ADMINISTRATION

May 16, 2008

Holiday Inn Downtown
141 North 9th Street
Lincoln, Nebraska

MEMBERS PRESENT

FOR NEBRASKA: Commissioner Brian Dunnigan
Brad Edgerton
Paul Koester
Justin Lavene
Jim Schneider
Jim Williams

FOR COLORADO: Commissioner Dick Wolfe
Peter Ampe
Ken Knox
Megan Sullivan

FOR KANSAS: Commissioner Dave Barfield
John Draper
Lee Ross
Scott Ross

REPORTER'S CERTIFICATE:

State of Nebraska)
) ss.
County of Lancaster)

I, WENDY C. CUTTING, reporter for GENERAL REPORTING SERVICE, certify that I reported the proceedings in this matter; that the transcript of testimony is a true, accurate, and complete extension of the recording made of those proceedings.

IN TESTIMONY WHEREOF, I have hereunto set my hand at Lincoln, Nebraska, this _____ day of May, 2008.

_____
Reporter

- - -

PROCEEDINGS:

CHAIRMAN DUNNIGAN: Good morning. I apologize for the delayed start. My name is Brian Dunnigan and I'm the Acting Director of the Department of Natural Resources and the Chairman of the RRCA for this year. This is a special meeting of the RRCA and is a continuation of meetings that were held on March 11th and 12th and April 11th, 2008.

I'd like to take a moment to introduce the people from Nebraska up at the table, and then I would ask Chairman Barfield and Chairman Wolfe to do the same. To my left is Brad Edgerton, Jim Williams, Justin Lavene from the Attorney General's Office, Jim Schneider, and Paul Koester. I'd also like to recognize our NRD managers in the audience, Dan Smith, John Thorburn, Jasper Fanning, and Mike Clements. I'd also like to recognize Senator Carlson. Thank you for being here.

At this point I'll turn the floor -- table over to Chairman Barfield.

CHAIRMAN BARFIELD: All right, Dave Barfield, State Engineer for Kansas -- Chief Engineer for Kansas, excuse me. And I will introduce those at the table here. To my right is Scott Ross. He's our Engineering Committee representative. That's to my left. To this left is Lee Ross, Attorney with the Department of Agriculture, and to my right is John Draper, counsel for the State of Kansas.

CHAIRMAN DUNNIGAN: Thank you, Chairman Barfield.

Chairman Wolfe.

CHAIRMAN WOLFE: Good morning, thank you. Dick Wolfe, State Engineer, State of Colorado. And I'd like to first thank Nebraska for hosting the meeting today and the accommodations, we do appreciate that. And then, I'd like to introduce some of the staff we have here today for Colorado. Ken Knox, Deputy State Engineer to my immediate right; Peter Ampe, with the Attorney General's Office in Colorado; and Megan Sullivan, a staff engineer with the Division of Water Resources.

CHAIRMAN DUNNIGAN: Thank you. I'll just say a few words. I'm very appreciative for the meetings that we've held since March 11th, including the March 11th meeting and the time that we've had to meet with the Engineering Committees and go forward with this process. It's been very helpful to us and I think it's been helpful to the other states.

CHAIRMAN BARFIELD: Okay, let me just make a few remarks, then, related to sort of maybe recounting a little bit of the history and sort of my reflections on our process, as well, and where we're at today. And then later on, I think we'll have a resolution of the matter.

This series of sort of special meetings has sort of been driven by Kansas' concerns with Nebraska's

non-compliance with the Compact and the settlement. The accountings clearly show that Nebraska violated the Compact and settlement for the water-short year 2006, that accounts for both years 2005 and 2006 of roughly just under 80,000 acre-feet of water. As a result of that, on December 19th, I wrote a letter to Ann Bleed, former Director, basically proposing our remedy for those violations and provided Nebraska with 45 days to review and ask questions and so forth, and to say whether they agreed with that or not. And I received a letter stating that Nebraska did not agree with that proposed remedy, and so on February 8th, I wrote a letter, again to Ann, formally submitting the matter to the RRCA and sort of starting that process.

We met March 11 and 12 in Kansas City. Nebraska provided a fair amount of -- a notebook here with responses and analysis and so forth. And Kansas agreed -- the states agreed to spend the last two months sort of really digging into the details of the Nebraska analyses and concerns and so forth. And, as Brian indicated, I think it's been a helpful process to take some time to look at all that. I think we've sort of discovered that we can all run the model the same way, that the dispute that we have isn't centered in not being able to run the model correctly and so forth. And so we exchanged analyses and data and confirmed that our dispute is really more fundamental to just underlying

assumptions about what the settlement requires as opposed to not being able to model the same.

So, I think it's been helpful. I think we understand better what Nebraska's proposing to get into compliance. We just don't agree that it's sufficient. You know, the NRD planned under the IMPs. We've sort of looked at those and they continue to allow an increase in groundwater depletions. They give authority, but they don't seem to give responsibility to act, and there's no certainty, I guess, in what's been proposed. So we continue to find that the plan is not acceptable. But, again, I think it's been helpful to have this dialog to make sure that we understand each other well.

I think that's probably all I need to say at this point unless there's questions. Again, we have a resolution to this matter that we'll discuss later.

CHAIRMAN DUNNIGAN: Thank you.

Chairman Wolfe.

CHAIRMAN WOLFE: Yes, thank you very much. I'd just like to make a few introductory comments and first thank my staff for all their efforts that have gotten us to this point. We couldn't have gotten here without all their tremendous hours and time that they put in to getting this here. So, appreciate that. And also, I'd like to recognize the Republican River Water Conservation District for their

efforts. There's a number of their board members here today, as well as their counsel and engineering consultant. They have done a tremendous job of helping Colorado to achieve Compact compliance in terms of their efforts on conservation programs through CREP and EQIP, their pipeline proposal that we're seeking approval by the Commission, as well as their efforts in terms of retiring many of the surface water rights in many of the tributaries in the Basin. So, I appreciate all of their efforts.

And along that line, I'd like to note that the Colorado Legislature did approve, just recently, a $60.6 million loan to the Republican River Water Conservation District as part of their $71 million package -- loan package for construction and operation of the pipeline that we've been discussing before the Commission.

In addition to that, we've also just recently filed with the Secretary of State in Colorado for promulgation of well measurement rules in the Republican River Basin. That hearing will be held in Wray, Colorado, on July 2nd and 3rd, if needed the second day, to seek approval for rules that I will be promulgating requiring measuring devices on all these high capacity wells in the Republican River Basin. The intent of the rules are if they're not -- in essence have some type of measuring device or method in place by irrigation season 2009, that they will

not be allowed to operate. Our efforts there is that we believe and have shown in Colorado that with these well measurement rules in place, that it does create some additional conservation, reduction of consumptive use in those basins, so, again, another effort by Colorado to try to bring this into sustainable situation for Compact compliance.

You know, we've certainly come a long ways in terms of our efforts, in terms of Compact compliance. I know that both the states of Nebraska and Kansas have done likewise. And Colorado's certainly hopeful that we get timely approval of our Compact Compliance Pipeline to help Colorado come into Compact compliance as soon as possible, and I want to recognize Dave and Brian for your efforts and willingness to explore solutions to, you know, the flexibility that we want in terms of the operation of that. And I think that certainly provides certainty to all the states to help us stay in Compact compliance. I thank you for that.

CHAIRMAN DUNNIGAN: Thank you, Commissioner.

At this point, I'd like to turn to Jim Williams to report out from the Engineering Committee.

MR. WILLIAMS: Thank you, Commissioner Dunnigan. My name is Jim Williams and I'm the current chair of the Engineering Committee of the Republican River Compact. I

would like to speak to three items that will be discussed in our annual Engineering Committee Report when we present that at the August Annual Meeting. The first item would refer to return flows from canals fed by Bureau of Reclamation projects. And this is -- on this subject, the State of Nebraska is going to proceed with putting meters or better metering equipment at two locations and will study that further. It's our intent to put that in place to catch those flows this irrigation season, and the Engineering Committee has agreed to take a look at those return flows and determine how to use them.

I believe that currently, correct me if I'm wrong, Brad, but we are using some standardized percents and formulas and we would like to know exactly what those return flows are waste ways, spillback, return flows. And so there's no real decision in that area, but just an agreement that we'll study that one further.

We have two additional agreements where the Engineering Committee was in agreement. First of all, the groundwater model cell representing the accounting point at the Guide Rock Diversion Dam is going to be moved upstream two miles to match the location of the Guide Rock Diversion Dam. We are currently metering surface water at two locations in that area, at the diversion dam and there's also a gauge at Guide Rock on the bridge. It's about two

miles apart. And the groundwater model cell that we were reporting from matched the downstream meter and we're going to, in the future, take a look at groundwater model results at the upstream measurement point instead, because that's the surface water measurement that actually goes into our accounting.

Secondly, on the Riverside Canal, a portion of the return flows from the fields goes back into the Frenchman Creek sub-basin above the gauge, the stream gauge there and a portion goes into the main stem of the Republican River. And it's about half and half. And so the Engineering Committee has agreed that those return flows should be accounted for in the proper basin. And that percentage is going to be based on the portion of lands above the gauge and in the main stem. And those will be listed in greater detail, as I mentioned, in the Engineering Committee Report, which we'll be producing in the next three months.

Chairman Dunnigan?

CHAIRMAN DUNNIGAN: Thank you.

Any comments on the Engineering Committee report?

CHAIRMAN BARFIELD: I just have a couple comments. I appreciate the work of the Engineering Committee. On this last point, I guess, the accounting procedures are actually rules of the Compact, so the Engineering Committee should actually provide the Administration with an amended version

of the accounting procedures to adopt at the meeting. So, put that on your list of things that we need to get done, please.

CHAIRMAN DUNNIGAN: Is there other business?

CHAIRMAN BARFIELD: Yes. The states have agreed to -- have sort of discussed the three items that each of us have respectively presented the RRCA to resolve, and prepared a motion, I guess, to adopt to sort of determine what to do with those. Chairman, I think you have a copy of that resolution? I guess I would -- I don't actually have a copy of it, so I'd like you to read it and move that we adopt that resolution.

CHAIRMAN DUNNIGAN: I'll read that resolution. "Resolution of the RRCA, May 16, 2008. WHEREAS, each of the Compact States has submitted a dispute to the RRCA pursuant to Section VII of the Final Settlement Stipulation (FSS) entered as part of the Decree in Kansas v. Colorado and Nebraska, No. 126 Original, United States Supreme Court; and WHEREAS, each dispute has been pending before the RRCA for at least 30 days; IT IS HEREBY RESOLVED that: Each of the following disputes has been addressed by the RRCA as required by the FSS, Subsection VII.A; no resolution of the following disputes has been reached; and each dispute, including whether any disputes are subject to dispute resolution, may be taken to the next step in the dispute

resolution process. No. 1, Kansas' submittal to the RRCA by Commissioner Barfield's letter to Commissioners Bleed and Wolfe, dated February 8, 2008, attached hereto, including subsequent correspondence; 2, Nebraska's submittal to the RRCA by Commissioner Dunnigan's letter to Commissioners Barfield and Wolfe, dated April 15, 2008, attached hereto, including subsequent correspondence; 3, Colorado's submittal to the RRCA by Commissioner Wolfe's letter to Commissioners Barfield and Dunnigan, dated April 11th, 2008, attached hereto, including subsequent correspondence.

The States have reserved any arguments or objections that were or could have been raised to the RRCA." And the signatories are Brian P. Dunnigan, David Barfield, and Dick Wolfe.

CHAIRMAN BARFIELD: Mr. Chairman, I would move the RRCA adopt that resolution.

CHAIRMAN WOLFE: I second that motion.

CHAIRMAN DUNNIGAN: All in favor?

Aye.

CHAIRMAN WOLFE: Aye.

CHAIRMAN BARFIELD: Aye.

CHAIRMAN DUNNIGAN: Motion passes.

I did want to comment that --

CHAIRMAN WOLFE: I'd like to offer the following resolution for consideration by the RRCA that reads as

follows: "Pursuant to Subsection VII.C.2 of the FSS, the RRCA hereby affirms that CDR Associates of Boulder, Colorado, remains the person or entity that will select an arbitror or arbitrors if the states cannot agree on an arbitror or arbitrors pursuant to the dispute resolution process of the FSS."

CHAIRMAN BARFIELD: I would second that.

CHAIRMAN DUNNIGAN: All in favor?

Aye.

CHAIRMAN WOLFE: Aye.

CHAIRMAN BARFIELD: Aye.

CHAIRMAN DUNNIGAN: The last order of business that I have on --

CHAIRMAN BARFIELD: So, Brian, the motion passes, right?

CHAIRMAN DUNNIGAN: Motion passes, thank you.

The last order of business I have is to discuss arrangements for the August 12th-13th regular meeting of the RRCA, and the plans are to have that meeting here in Lincoln at the Holiday Inn on August 12th and 13th, and we'll finalize those arrangements in the future, but we will be here.

CHAIRMAN WOLFE: I just want to -- Is the meeting both days or is the 12th, like the Engineering Committee meeting?

CHAIRMAN DUNNIGAN: The 12th is usually the Engineering Committee and the regular meeting of the RRCA will be the 13th.

CHAIRMAN WOLFE: Okay, thank you.

MR. WILLIAMS: Actually, the 12th has expanded beyond just the Engineering Committee meeting. They call it the working session and we have long reports from the Conservation Committee, the USGS, perhaps the Corps, and the Bureau.

CHAIRMAN BARFIELD: Correct. Yeah, the first day is usually sort of a -- right, the working session is what we call it, of the Administration and Engineering Committee, and then the regular meeting will be that next morning, I presume.

I appreciate Nebraska's hosting the meeting.

CHAIRMAN DUNNIGAN: I would ask for any other business.

CHAIRMAN BARFIELD: I have no other business.

CHAIRMAN DUNNIGAN: Seeing none, I'd ask for a motion to adjourn.

CHAIRMAN WOLFE: I move that this meeting be adjourned.

CHAIRMAN BARFIELD: I second.

CHAIRMAN DUNNIGAN: All in favor?

CHAIRMAN BARFIELD: Aye.

CHAIRMAN WOLFE: Aye.

CHAIRMAN DUNNIGAN: Aye. Motion carries. Thank you.

(Whereupon, at 10:03 a.m., on May 16, 2008, the proceedings were concluded.)

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ATTACHMENT H

RESOLUTION OF THE RRCA

MAY 16, 2008

Resolution of the RRCA
May 16, 2008

WHEREAS, each of the Compact States has submitted a dispute to the RRCA pursuant to Section VII of the Final Settlement Stipulation (FSS) entered as part of the Decree in Kansas v. Colorado and Nebraska, No. 126 Original, United States Supreme Court; and

WHEREAS, each dispute has been pending before the RRCA for at least 30 days;

IT IS HEREBY RESOLVED that: Each of the following disputes has been Addressed by the RRCA as required by the FSS, Subsection VII.A; no resolution of the following disputes has been reached; and each dispute, including whether any disputes are subject to dispute resolution, may be taken to the next step in the dispute resolution process:

1. Kansas' submittal to the RRCA by Commissioner Barfield's letter to Commissioners Bleed and Wolfe, dated February 8, 2008, attached hereto, including subsequent correspondence;

2. Nebraska's submittal to the RRCA by Commissioner Dunnigan's letter to Commissioners Barfield and Wolfe dated April 15, 2008, attached hereto, including subsequent correspondence;

3. Colorado's submittal to the RRCA by Commissioner Wolfe's letter to Commissioners Barfield and Dunnigan dated April 11, 2008, attached hereto, including subsequent correspondence.

The States have reserved any arguments or objections that were or could have been raised to the RRCA.

Brian P. Dunnigan
Commissioner for Nebraska

David Barfield
Commissioner for Kansas

Dick Wolfe
Commissioner for Colorado

Attachment 1

KANSAS
DEPARTMENT OF AGRICULTURE

Kathleen Sebelius, Governor
Adrian J. Polansky, Secretary

www.ksda.gov

By Email and U.S. Mail

February 8, 2008

Ann Bleed, P.E.
Chairman and Nebraska Commissioner
Republican River Compact Administration
Director
Nebraska Department of Natural Resources
301 Centennial Mall South, 4th floor
P.O. Box 94676
Lincoln, Nebraska 68509-4676

Dick Wolfe, P.E.
Colorado Commissioner
Republican River Compact Administration
Colorado State Engineer
Colorado Division of Water Resources
1313 Sherman St. Rm. 818
Denver, CO 80203

Subject: Submission of dispute to the Republican River Compact Administration

Dear Commissioners Bleed and Wolfe,

Kansas hereby submits to the Republican River Compact Administration (RRCA) the dispute between Kansas and Nebraska concerning the proposed remedy for Nebraska's violations of the Republican River Compact and the Final Settlement Stipulation, as described in my letter to Commissioner Bleed of December 19, 2007. My December 19, 2007, letter, including Attachments (with Attachment 5 as revised January 4, 2008) is attached. Nebraska's response, dated February 4, 2008, rejecting the remedy proposed in my December 19 letter, is also attached. This submittal is made in accordance with the Dispute Resolution procedures of Article VII of the Final Settlement Stipulation approved by the United States Supreme Court.

Kansas requests that the dispute be addressed by the RRCA within 30 days as a "fast track" issue, or in the alternative, Kansas would agree to address the dispute at the

proposed March 11, 2008, RRCA special meeting, if that is agreeable to Nebraska and Colorado. I would ask that you both let me know promptly that addressing the dispute at the proposed March 11, 2008, meeting is acceptable.

My letter of December 19, 2007, includes a specific definition of the disputed issue and supporting materials. Also attached is an adjusted Designated Schedule for Resolution that assumes the dispute will be addressed at the March 11, 2008, meeting.

Sincerely,

David W. Barfield, P.E.
Chief Engineer
Kansas RRCA Commissioner

Pc

Kansas Attorney General Stephen N. Six
Aaron M. Thompson, U.S. Bureau of Reclamation
Colonel Roger Wilson, Jr., U.S. Army Corps of Engineers
James J. DuBois, U.S. Department of Justice

Attachments

Commissioner David Barfield's letter of December 19, 2007 (with attachments as revised January 4, 2008)
Commissioner Ann Bleed's letter of February 4, 2008
Designated Schedule for Resolution (February 8, 2008)

KANSAS
DEPARTMENT OF AGRICULTURE

Kathleen Sebelius, Governor
Adrian J. Polansky, Secretary

www.ksda.gov

December 19, 2007

Ann Bleed, P.E.
Nebraska Commissioner,
Republican River Compact Administration
Director, Nebraska Department of Natural Resources
P.O. Box 94676
Lincoln, NE 68509-4676

Subject: Remedy for Nebraska's violation of the Decree in *Kansas v. Nebraska & Colorado*, No. 126, Original, U.S. Supreme Court

Dear Commissioner Bleed:

The State of Nebraska is in violation of the May 19, 2003 Supreme Court Decree in *Kansas v. Nebraska & Colorado*, 538 U.S. 720 (2003). The Decree approved the Final Settlement Stipulation ("FSS"), which had been filed with the Special Master on December 16, 2002. The FSS requires compliance on a five-year running average, and, when Water-Short Year Administration is in effect, compliance is also calculated on a two-year running average unless Nebraska submits an Alternative Water-Short Year Administration plan to the Republican River Compact Administration ("RRCA"). Appendix B to the FSS provides the FSS Implementation Schedule, which sets the first normal compliance year as 2007 (5-year running average for 2003-2007) and the first Water-Short Year Administration compliance year as 2006 (2-year running average for 2005-2006) if water supply conditions for Water-Short Year Administration are present.

Pursuant to the Implementation Schedule and water supply conditions, Water-Short Year Administration began in 2006. Data for the year 2006 was received in 2007. Analysis of that data and data for 2005 shows the 2-year running average of Nebraska's Computed Beneficial Consumptive Use above Guide Rock for 2005-2006 to be 41,430 acre-feet per year in excess of Nebraska's allocations above Guide Rock, contrary to Subsection V.B.2 (a) of the FSS. For the two years, Nebraska's total overuse of water in violation of the FSS amounts to 82,870 acre-feet. See Attachment 1 hereto. For comparison, this amount is more than a city in Kansas of 100,000 population consumes in 10 years. It is also more than twice the amount of water that would be consumed per year under full supply conditions on all the acreage authorized to be irrigated in the Kansas Bostwick Irrigation District in the Republican Basin.

Kansas began to express its concerns in the 1980s that Nebraska was violating the Compact. Despite continued complaints by Kansas and attempts at mediation, Nebraska allowed further significant increases in water development and use by its water users. Consequently, Kansas was forced to file *Kansas v. Nebraska & Colorado*, No.126, Orig., in 1998. After rulings by the Special Master and the Supreme Court, the States agreed to the FSS in December 2002 as noted above. Since then Kansas has complied with all of its obligations under the FSS in good

faith. The State of Nebraska, on the other hand, has seriously neglected its obligations under the FSS. Actions by the State of Nebraska have been grossly insufficient and unrealistic, resulting in injury to Kansas and its water users. As was the case when David Pope wrote his letter of January 24, 2007, actions apparently being discussed by the State of Nebraska will continue to be insufficient and ignore growing river depletions due to past groundwater pumping.

It is now five years since the FSS was agreed to by Nebraska. But again, the State of Nebraska has failed to meet its obligations to the State of Kansas under the Republican River Compact, and Kansas' water users have continued to suffer as a result. Although there are disagreements between Kansas and Nebraska on certain portions of the final accounting for 2005 and 2006, Nebraska is significantly out of compliance for this first period of Water-Short Year Administration regardless of which State's methodology is used. Further, although the accounting for 2007 is not yet available, it is clear that Nebraska will not be in compliance for the statewide five-year accounting period 2003 through 2007. The cumulative Nebraska overuse for 2003 through 2006 is 143,840 acre-feet. See Attachment 2 hereto. This is the amount that Nebraska needed to make up in 2007 in order to be in compliance for 2003-2007, an unlikely event. In addition, 2007 was also a Water-Short Year Administration year, and it is highly unlikely, as well, that Nebraska will meet the Water-Short Year Administration requirements for that year.

In light of the foregoing, Kansas proposes the remedy set out in Attachment 3 to this letter. The remedy includes: (1) entry of an order by the Supreme Court finding Nebraska in violation of the Court's Decree; (2) Kansas' damages for the years 2005-2006 or Nebraska's gains, whichever are greater, plus compounded interest and attorneys fees and costs, together with any additional relief that may be considered appropriate by the Court; and (3) (a) shutdown of wells and groundwater irrigation in Nebraska within 2 ½ miles of the Republican River and its tributaries, (b) shutdown of groundwater irrigation of acreage added after the year 2000 throughout the Republican River Basin in Nebraska and (c) such further reductions of net consumptive use in the Basin in Nebraska necessary to maintain yearly compliance, or the hydrologic equivalent of the foregoing. In addition, if Nebraska continues to be unable or unwilling to control its water users, further relief, including a Court-appointed River Master, may be necessary.

Supporting Materials

Although the most urgent need is to bring Nebraska into compliance, sanctions for the 2005-2006 violations are also appropriate. Kansas' preference is for repayment in water, but repayment in water by Nebraska appears to be impractical, given the overwhelming deficit that has been accumulated by Nebraska. Therefore, monetary payment is proposed, equal to the gains reaped by Nebraska as a direct result of violating the Court's decree, or Kansas' damages, whichever are greater. This should reduce Nebraska's incentive to violate the Court's Decree in the future.

During recent years, Nebraska's groundwater consumptive beneficial use has been approximately 200,000 acre-feet per year. Even with purchase of surface water and other actions by Nebraska, however, Nebraska has been significantly short of Compact compliance. Kansas' attached analysis demonstrates that Nebraska must reduce its annual groundwater consumptive use (depletions of the surface waters of the Republican River Basin in Nebraska) to 175,000 acre-feet per year, or otherwise achieve the hydrologic equivalent, to dependably meet its 5-year compliance test. See Attachment 4 hereto.

The stipulated RRCA Ground Water Model has been used to determine the extent to which ground water pumping must be curtailed in order to reduce and maintain river depletions caused by groundwater pumping in Nebraska down to 175,000 acre-feet per year. See Attachment 5 hereto. That analysis indicates that a reduction in groundwater irrigated acreage of approximately 515,000 acres is required of 1,201,000 irrigated acres assumed in the future case. As is demonstrated in Figure 4 of Attachment 5, failure to address groundwater depletions in a substantive way will result in continued loss of streamflow. Without this reduction in groundwater pumping, significantly less surface water will be available for existing irrigation projects and/or to assist in achieving Compact compliance. Immediate additional actions by Nebraska are also necessary to achieve near-term compliance. In the long term, further actions will likely be needed, especially in Water-Short Year Administration years.

Designated Schedule for Resolution

Kansas is proposing the foregoing remedies to address the past and continuing violations of the Supreme Court Decree in order that you may consider whether you can agree to these remedies. This situation comes as no surprise to you. Nebraska has been aware that its consumptive use has exceeded allocation every year since 2003. At the 2006 and 2007 Republican River Compact Administration meetings, for instance, Kansas pointed to the increasing likelihood that Nebraska would be out of compliance as soon as the data became available. In addition, by letter of January 24, 2007, Kansas specifically addressed the inadequacy of actions then being proposed in Nebraska as a means of bringing Nebraska into compliance.

Please review this proposal and respond to me within 45 days with regard to whether Nebraska is willing to agree to the proposed remedy. If we do not reach an agreement within that time period, Kansas will submit the dispute to the RRCA. If the dispute is not resolved by the RRCA, we will submit the dispute to the RRCA as a "fast track" issue and will proceed pursuant to the FSS Dispute Resolution procedure according to the schedule set out in Attachment 6 hereto, unless otherwise agreed.

Very truly yours,

David W. Barfield

David W. Barfield, P.E
Kansas Chief Engineer
Kansas RRCA Commissioner

cc: (w/encl.) (Via Email & U.S. Mail)
Kansas Attorney General Paul Morrison
Dick Wolfe, Colorado RRCA Commissioner
Aaron M. Thompson, U.S. Bureau of Reclamation
Col. Roger Wilson, Jr., U.S. Army Corps of Engineers
James J. DuBois, U.S. Department of Justice

Attachments:

Attachment 1 – Nebraska's Violations of the Final Settlement Stipulation: 2005-2006

Attachment 2 – Nebraska's Statewide Allocation and Computed Beneficial Consumptive Use: 2003-2006

Attachment 3 – Proposed Remedy for Violations of the Court's Decree

Attachment 4 – Engineering Report: Requirements for Nebraska's Compliance with the Republican

Attachment 5 – Report: RRCA Groundwater Model Analysis

Attachment 6 – Designated Schedule for Resolution

Attachment 1

Nebraska's Violation of Water-Short Year Administration Requirement 2005 and 2006

Table 5C Nebraska's Compliance During Water-Short Year Administration (from App. C of the FSS p. C65)*								
Year	Allocations			Computed Beneficial Consumptive Use (CBCU)			Credits from Imported Water	Difference Between Allocation and Consumptive Use Minus Imported Water Supply above Guide Rock
Column	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8
	State Wide Allocation	Allocation below Guide Rock	State Wide Allocation above Guide Rock	State Wide CBCU	CBCU Below Guide Rock	State Wide CBCU Above Guide Rock	Credits above Guide Rock	Col 3 – (Col 6 – Col 7)
2005	199,450	4,586	194,864	253,740	4,052	249,689	11,965	(42,860)
2006	189,180	3,615	185,565	240,850	3,064	237,786	12,214	(40,010)
Average	194,320	4,100	190,210	247,300	3,560	243,740	12,090	(41,430)

*All average and total values are rounded to the nearest 10.

For 2005, two accountings were approved by the RRCA. The difference was caused by dispute over the inclusion or exclusion of evaporation from non-federal reservoirs in Nebraska below Harlan County Reservoir. The values displayed are from the accounting includes all non-federal reservoir evaporation in Nebraska, as proposed by Kansas.

For 2006, no accounting was approved by the RRCA. Only input data for the accounting was approved. The values displayed are from an accounting consistent with Kansas position on accounting inclusive of (1) all non-federal reservoir evaporation in Nebraska and (2) a Harlan County Reservoir evaporation assignment method that assigns evaporation to both Kansas and Nebraska when only one State takes water from Harlan County Storage.

The totals for 2005 and 2006 from table 5C are below:

Year	Allocations			Computed Beneficial Consumptive Use (CBCU)			Credits from Imported Water	Difference Between Allocation and Consumptive Use Minus Imported Water Supply above Guide Rock
Column	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8
	State Wide Allocation	Allocation below Guide Rock	State Wide Allocation above Guide Rock	State Wide CBCU	CBCU Below Guide Rock	State Wide CBCU Above Guide Rock	Credits above Guide Rock	Col 3 – (Col 6 – Col 7)
Totals	388,630	8,200	380,430	494,590	7,120	487,470	24,180	(82,870)

Attachment 2

Nebraska's Five-Year Running Average Allocation and Computed Beneficial Consumptive Use for Determining Compact Compliance 2003 through 2006

Table 3C: Nebraska's Five-Year Average Allocation and CBCU (from App. C of the FSS p. 62)*				
	Col. 1	Col. 2	Col. 3	Col. 4
Year	Allocation	Computed Beneficial Consumptive Use	Credits from Imported Water Supply	Difference between Allocation and Computed Beneficial Consumptive Use minus Imported Water Supply
2003	227,580	262,780	9,782	(25,418)
2004	205,630	252,650	10,386	(36,640)
2005	199,450	253,740	11,965	(42,325)
2006	189,180	240,850	12,214	(39,456)
2007				
Average	205,460	252,510	11,090	(35,960)

*All average and total values are rounded to the nearest 10.

The values for years 2003 and 2004 were approved by the Republican River Compact Administration.

For 2005, two accountings were approved by the RRCA. The difference was caused by dispute over the inclusion or exclusion of evaporation from non-federal reservoirs in Nebraska below Harlan County Reservoir. The values displayed are from the accounting includes all non-federal reservoir evaporation in Nebraska, as proposed by Kansas.

For 2006, no accounting was approved by the RRCA. Only input data for the accounting was approved. The values displayed are from an accounting consistent with Kansas position on accounting inclusive of (1) all non-federal reservoir evaporation in Nebraska and (2) a Harlan County Reservoir evaporation assignment method that assigns evaporation to both Kansas and Nebraska when only one State takes water from Harlan County Storage.

The totals of table 3 C are below:

Year	Allocation	Computed Beneficial Consumptive Use	Credits from Imported Water Supply	Difference between Allocation and Computed Beneficial Consumptive Use minus Imported Water Supply
Totals for 2003 to 2006	821,840	1,010,020	44,350	(143,840)

Attachment 3

Proposed Remedy for Violation of the Court's Decree
in
Kansas v. Nebraska and Colorado,
No. 126, Orig., U.S. Supreme Court
Decree of May 29, 2003, 538 U.S. 720

1. Order of Supreme Court finding Nebraska in violation of the Court's Decree and imposing the following remedy.

2. For 2005-2006 violation of the Final Settlement Stipulation (FSS), Nebraska shall pay to Kansas the following:

   A. Kansas' damages or Nebraska's gains, whichever are greater;

   B. Prejudgment interest compounded from the date of Nebraska's overuse;

   C. Attorneys fees and costs; and

   D. Such further relief as may be considered appropriate by the Court to address fully the Decree violation by Nebraska.

3. To achieve compliance with the FSS in the future, Nebraska shall:

   A. Immediately (a) shut down wells and groundwater irrigation in Nebraska within 2 ½ miles of the Republican River and its tributaries, (b) shut down groundwater irrigation of acreage added after the year 2000 throughout the Republican River Basin in Nebraska and (c) such further reductions of net consumptive use in the Basin in Nebraska necessary to maintain yearly compliance. This will reduce groundwater consumptive use to approximately 175,000 acre-feet per year. Nebraska is invited to submit an alternative remedy that is the hydrologic equivalent in quantity and timing;

   B. Further reduce Nebraska's Computed Beneficial Consumptive Use to the extent necessary to keep Nebraska (1) within its Compact allocation until the effects of the reduction of groundwater pumping brings Nebraska into compliance with the Compact and the FSS, and (2) in compliance when the actions listed above in are insufficient, especially in Water-Short Year Administration years;

   C. Be subject to preset damages, costs, attorneys' fees, and additional sanctions for any failure to comply with the Court's order in the future.

Attachment 4

Requirements for Nebraska's Compliance with the Republican River Compact

Report to

David Barfield

Kansas Department of Agriculture, Division of Water Resources

from

Spronk Water Engineers, Inc.

Dale E. Book, P.E.

December 18, 2007

Introduction

This report describes the analysis made to determine the reductions in Groundwater Computed Beneficial Consumptive Use (CBCU) necessary in Nebraska to achieve compliance with the Republican River Compact as implemented by the Final Settlement Stipulation (FSS). Nebraska's CBCU exceeded the allocation above Guide Rock for the two-year water short year test applied to 2005 and 2006. The expected result for the five-year period of 2003 through 2007 is that Nebraska's statewide CBCU will exceed its corresponding allocation. For the four years of 2003 through 2006, Nebraska's statewide CBCU has exceeded allocations by a total of 143,840 acre-feet using the Kansas methodology.

The analysis described in this report is intended to estimate the level of Groundwater CBCU that could occur within Nebraska's allocation to achieve compliance with the five-year test. Compliance with the Water Short year standard would require that additional reduction of surface water CBCU or equivalent offset be supplied. This analysis was intended to quantify the level of groundwater CBCU that could occur within Nebraska's allocation. The RRCA Groundwater model was used to determine reductions in pumping that would be necessary to achieve this level of CBCU (see Attachment 5).

This analysis relies on the data for the period of 2002 - 2006 to compare CBCU with the allocation under the Republican River Compact. This comparison provides the amount of groundwater CBCU that can occur, in combination with the limited surface water CBCU of this period, to achieve compliance with the FSS for this period. The amount of groundwater CBCU that can occur is a reduction from recent levels of groundwater CBCU of approximately 200,000 acre-feet/year. The RRCA groundwater model was used to quantify the projected groundwater depletions in Nebraska resulting from reductions in pumping as well as changes to Imported Water Supply Credits that would occur with the reduced groundwater pumping. The projected effects of these reductions on surface water CBCU and compliance with the FSS over this period were estimated.

Criteria and Assumptions

The level of groundwater CBCU that would allow the total CBCU to be within the allocation over the five-year period of 2002 through 2006 was determined as follows. The increased streamflow caused by a proposed level of pumping reduction would increase the supply available for surface water use in Nebraska and increase supply available to Kansas. The net change of Nebraska use was estimated assuming that additional water would be consumed by the surface water users as a result of the increased supply.

The level of groundwater depletion that would provide compliance with the five-year statewide standard in Nebraska was determined by estimating the change in groundwater CBCU, surface water CBCU, and Imported Water Supply Credits and then comparing the resulting net total CBCU to the allocation for the five-year period. The analysis is based on the following criteria and assumptions:

- CBCU should not exceed the statewide allocation, over a five-year period.
- The Imported Water Supply Credit was estimated from analysis with the RRCA Groundwater Model
- Reductions in CBCU necessary to achieve compliance are assumed to be accomplished from reductions in groundwater irrigation pumping, as represented in the groundwater model simulation.
- Surface water CBCU in Nebraska would be increased due to increased streamflow.
- Compliance with the two-year standard for water short conditions may require reduction in surface water use, in addition to the pumping reductions.
- The time required for groundwater CBCU, as predicted with the RRCA Groundwater model, to decline to the necessary level will be several years. Until CBCU is reduced to that level, other reductions will be needed to achieve compliance.

Description of Analysis

The analysis computes the change in statewide CBCU corresponding to a reduced level of groundwater depletions. It is necessary to reduce the groundwater depletions by more than the actual deficit, since additional surface water consumptive use would be expected to occur, as a result of the increased streamflow resulting from less depletion to streamflow from groundwater pumping.

Using available compact data, the five-year average statewide allocation over the period of 2002 - 2006 was 212,000 acre-feet/year. Table 1 shows the actual FSS accounting for this period. The overuse averaged 32,000 acre-feet/year for this period.

The amount of increased surface water consumptive use in Nebraska was estimated, based on the location of the changes in groundwater depletions. For the storage conditions in effect during these years, it was assumed that the increased flows would be largely diverted for irrigation, with some additional reservoir evaporation. The amount of additional streamflow that would be consumed by surface water uses in Nebraska was estimated to be 45%. Table 1 shows the adjusted CBCU and the comparison with the allocation.

The Imported Water Supply Credit was estimated using the RRCA Groundwater Model, with the projected future level of pumping determined from this analysis. The credit was estimated to be approximately 30,000 acre-feet/year. Actual credit would of course depend on the amounts of continued importation of Platte River water into the basin.

Results of Analysis

1. The average annual allocation for Nebraska for 2002 - 2006 was 212,000 acre-feet/year. The actual use, including both surface and groundwater, averaged 254,000 acre-feet/year. After adjusting for the Imported Water Supply Credit, the Computed Beneficial Consumptive Use exceeded the allocation by 32,000 acre-feet/year.

2. When the groundwater CBCU is reduced to 175,000 acre-feet/yr, average surface water CBCU is estimated to increase from 55,000 to 67,000 acre-feet/year. Imported Water Supply Credits increase to approximately 30,000 acre-feet/year.

3. The total CBCU that could occur within the Nebraska's allocation is 242,000 acre-feet/yr, after applying the estimated Imported Water Supply Credit.

4. The Groundwater CBCU must be reduced to 175,000 acre-feet/yr to achieve a balance with the statewide allocation over the five year period.

Conclusions

The Nebraska beneficial consumptive use has exceeded the statewide allocation for each of the years 2002 - 2006. The five-year total for the period of 2003 - 2007 is expected to exceed the allocation over that period, given the status of the accounting through 2006. Based on the five-year allocation through 2006, it would be necessary to reduce the total CBCU to approximately 242,000 acre-feet/year for Nebraska to be in compliance with the FSS.

A reduction of stream depletions due to groundwater pumping in Nebraska from 200,000 to 175,000 acre-feet was estimated to be necessary to provide compliance with the five-year test of the FSS over a period of similar water supply conditions. This would result in a balance between CBCU and allocation. This level of groundwater depletions corresponds to the pumping reductions described in Attachment 5.

To achieve compliance with the Water-short year periods, additional reductions to CBCU beyond those described above will be necessary. It would be necessary to limit surface water consumptive use or provide equivalent offsets from alternate sources.

Table 1

Estimated Effect on Compliance from a Reduction in Nebraska's Pumping: 2002 - 2006

(1000 acre-ft)

Table 3C: Nebraska's Five-Year Average Allocation and CBCU					
Year	Actual				
	Statewide Allocation	Ground Water CBCU	Surface Water CBCU	Imported Water Supply Credit	Allocation - (CBCU - IWS Credit)
2002	237	180	85	14	-15
2003	228	204	59	10	-25
2004	206	213	40	10	-37
2005	199	203	51	12	-42
2006	189	198	42	12	-39
Average	212	200	55	12	-32

Year	Adjusted				
	Ground Water [1] CBCU	Effect on [2] Nebraska's Surface Water CBCU	Surface Water [3] CBCU	Imported Water [4] Supply Credit	Allocation - [5] (Adjusted CBCU - IWS Credit)
2002	175	2	88	30	4
2003	175	13	72	30	11
2004	175	17	57	30	4
2005	175	13	63	30	-9
2006	175	11	53	30	-9
Average	175	11	67	30	0

[1] Nebraska's projected amount of Ground Water CBCU

[2] 45% of the difference between the actual Ground Water CBCU and adjusted Ground Water CBCU

[3] Adjusted Surface Water CBCU = the actual surface water CBCU plus the Effect on Nebraska's Surface Water CBCU

[4] Nebraska's projected Imported Water Supply Credit

[5] Adjusted compliance = Nebraska's allocation - (the adjusted Ground Water CBCU + the adjusted Surface Water CBCU - the adjusted imported water supply credit)

Attachment 5: RRCA groundwater model analysis (revised)
Impact of Nebraska pumping and proposed remedy

Samuel P. Perkins[1] and Steven P. Larson[2]
January 4, 2008
(see Appendix A for an explanation of revisions)

[1]Civil Engineer, Interstate Water Issues, Kansas Dept. Of Agriculture, Div. of Water Resources;
[2]S. S. Papadopulos & Associates, Inc., Bethesda, MD.

Introduction

The analysis described in Attachment 4 has shown that annual groundwater consumptive use in Nebraska must be reduced to 175,000 acre-feet in order to achieve sustained compliance with the compact. The approved RRCA groundwater model was used to determine the reduction in pumping necessary for Nebraska to meet this requirement and thereby achieve sustained compliance with the Republican River Compact. This memo describes the basis for the projected depletions computed by the groundwater model under both status quo and reduced pumping scenarios.

In order to reach and then sustain a groundwater consumptive use of 175,000 acre-feet (AF) needed to comply with the Compact over the next 50 years, the proposed remedy case imposes the following conditions on future groundwater pumping for irrigation within the Republican River basin in Nebraska: first, a no-pumping zone for irrigation is imposed within 2.5 miles of RRCA groundwater model stream cells; second, groundwater irrigation area is held at 2000 levels at distances greater than 2.5 miles from stream cells; third, commingled irrigation area is held at 2006 levels at all distances from stream cells within the Republican River basin in Nebraska. Under this scenario, future groundwater irrigation area in Nebraska is reduced by 514,610 acres, including 350,970 acres within the no-pumping zone and 163,640 acres outside the no-pumping zone. For comparison, Nebraska's reported groundwater irrigated acreage within the Republican River basin has increased by 211,000 acres since 2000 and by 309,900 acres since 1990.

The proposed remedy is intended to allow recovery of streamflow as quickly as groundwater response will allow by focusing on groundwater pumping near the Republican River and its tributaries. The groundwater model was used to represent impacts of Nebraska groundwater pumping on Republican river streamflow and of imported water supply from the Platte River. Model scenarios were run to represent both status quo conditions and the proposed remedy. Projected Nebraska impacts for a 51-year future time period, as well as computed Republican River streamflow, are presented here under both scenarios.

Projected average annual impacts over 51 years (2007-2057) on Republican River streamflow under status quo conditions are 268,000 acre-feet per year (afy) for Nebraska groundwater pumping, reduced by 11,700 afy for imported water supply credit from Platte River imports, for a net impact of 256,300 afy. The corresponding impacts under the reduced pumping scenario are 164,700 afy for Nebraska pumping, reduced by 27,600 afy for imported water supply credits, for a net impact of 137,100 afy. Compared with the base case scenario, the proposed remedy scenario shows an average decrease in pumping impact of 103,300 afy and increase in imported water supply credit of 16,000 afy, for a reduction in Nebraska's net impact of 119,300 afy. However, the net impact under the proposed remedy shows an initial decline followed by an upward trend for years 2015-2057, indicating a possibly larger net impact beyond the simulated time period.

Using a sequence of historical years to represent futures

Model datasets for historical years 1990-2006 were used to construct future scenarios. These years were chosen initially because of the higher quality of Kansas water use reporting data beginning in 1990. The sequence of historical years 1990-2006, beginning with year 1990, was repeated three times to represent future scenarios for years 2007-2057. Median annual precipitation for years 1990-

2006, spatially averaged over the groundwater model domain, is 19.58 inches/year. Compared against the model's years of record 1918-2006, this corresponds to a probability of 54.5 percentile, which is slightly above median rainfall of 19.28 in/yr for years 1918-2006. This indicates that the sequence is a reasonable projection, at least with respect to the historical record. Additionally, the sequence consists of a relatively wet period (1990-1999) followed by a relatively dry period (2000-2006).

Hydrologic conditions for future years were represented by the conditions of the historical sequence of years. These conditions include mean monthly streamflow and reservoir elevations at the end of each month, both of which are specified for the stream (STR) package, and evapotranspiration (for the EVT package) as input to Modflow (mf2k). Groundwater recharge, pumping and irrigated area are also based on conditions of the historical sequence of years, but with adjustments to specify conditions for the specific cases as input files to the pumping (WEL) and recharge (RCH) packages. Irrigated area is a consideration due to the dependence of precipitation recharge on whether or not the land is irrigated. Input files to Modflow were assembled by the preprocessor programs mketff (EVT package), mkstrff (STR package) and rrppf (RCH and WEL packages) [version: rrppf_v519].

Status quo scenario

Recharge and pumping for the status quo scenario were represented by historical conditions with adjustments as follows.

Kansas data for irrigated area, groundwater pumping and return flow in future years were based on corresponding historical years' data, but with adjustments to reflect 2006 conditions with respect to return flow (based on improvements in irrigation systems), metering and development.

Data for irrigated area served by groundwater and commingled pumping as reported in 2006 by Colorado and Nebraska were used to represent all future years under base case conditions. Irrigated area served by surface water in future years was represented by data for the corresponding historical years. For Colorado, 2006 groundwater irrigated area was substituted for the corresponding historical years' area as a correction to the Colorado dataset from authorized area, as specified in years 1990-2000, to reported area used for irrigation, as specified in years 2001-2006. No corresponding adjustment was made to groundwater pumping for Colorado.

In the case of Nebraska, 2006 groundwater and commingled irrigated area were substituted for corresponding historical years' data in order to represent continued development through 2006. Groundwater pumping by Nebraska in future years was represented by reported pumping in the corresponding historical years to reflect hydrological conditions. To reflect the change in development associated with irrigation from a given historical year to the year 2006, historical pumping corresponding to each grid cell was multiplied by the ratio of total groundwater and commingled irrigated area in 2006 to the total area for the corresponding historical year. In order to reflect differences in development across Natural Resource Districts in Nebraska, this ratio was calculated for each NRD within the groundwater model domain, and applied to total reported pumping and groundwater return flow for each model grid cell within the corresponding District. NRD boundaries are shown in Figure 1.

The assumptions of historical conditions for the Nebraska dataset that are projected into the future include return flow from groundwater pumping for irrigation, which is assumed to be 20 percent. This is considered to be a generous assumption, even for recent historical years, and may warrant revision for scenario refinements, especially if allocations imposed by Natural Resource Districts are to be incorporated.

Proposed remedy case: reduced Nebraska pumping scenario

Conditions for the reduced Nebraska pumping scenario are summarized above in the Introduction. The conditions are explained in greater detail as follows.

No-pumping zone

The no-pumping zone was specified in terms of model grid cells as an approximation of an actual zone, which would likely be independent of the model grid; for example, it might reference a boundary based on the Public Land Survey System. The grid-based approximation has the advantage of allowing the affected pumping in Nebraska to be selected from datasets previously prepared by Nebraska for the model, including groundwater pumping, recharge and irrigated area. Additionally, defining the no-pumping zone with reference to model stream cell centers is intended to be consistent with prior decisions made during model development to represent the stream network.

Figure 1 shows the extent of the proposed no-pumping zone on Nebraska groundwater pumping for irrigation within the Republican River basin as gray-shaded grid cells. Model cells representing streams and federal reservoirs (turquoise) are included in the no-pumping zone. By selecting model grid cells whose centers lie within two miles of stream cell centers, the resulting no-pumping zone applies to groundwater diversions within 2.5 miles of the stream. The model grid cells corresponding to the no-pumping zone were selected in GIS and converted into a "mask", i.e., an array of 1's and 0's that was written to a text file for input to a preprocessor to identify grid cells for which pumping is to be excluded.

2000 irrigated area

Outside the no-pumping zone, groundwater irrigation area for the year 2000 was substituted for corresponding historical years' data to hold development at 2000 levels. Groundwater pumping by Nebraska in future years was represented by reported pumping in the corresponding historical years to reflect hydrological conditions, multiplied by a factor to reflect the change in irrigated area, given by the ratio of groundwater irrigated area in 2000 to groundwater irrigated area in the corresponding historical year. Ratios were calculated for each Natural Resource District (NRD) and applied to corresponding pumping within the NRD.

An implicit assumption of the above conditions for the proposed remedy scenario is that pumping within the no-pumping zone cannot be transferred outside the zone.

The combined effects of imposing the no-pumping zone and fixing irrigated area at 2000 elsewhere in the Republican River basin are to reduce groundwater irrigated area within the Republican River basin by 514,600 acres, or 43 percent, from 1,200,600 acres under the status quo scenario to 686,000 acres under the proposed remedy.

Commingled irrigated area

In applying the proposed remedy, the condition to hold groundwater irrigation area to 2000 levels is not applied to commingled irrigation area, which is instead held at 2006 levels for all of Nebraska within the RRCA groundwater model domain. Within the no-pumping zone, commingled irrigation area is retained, under the assumption that commingled area could be irrigated if surface water is available. Total 2006 commingled irrigated area in Nebraska was 119,000 acres. Within the no-pump zone, 2006 commingled irrigation area was 11,040 acres; Within the Republican River basin and outside the no-pump zone, 2006 commingled area was 2,230 acres.

Evaluation of impacts of Nebraska pumping under status quo and reduced pumping conditions

In order to compute Nebraska impacts of both groundwater pumping and imported water supply, three additional cases were run for comparison against the status quo and reduced pumping cases, above. Conditions for the third case specify no groundwater pumping in Nebraska for the entire simulation

period, beginning in 1918, but are otherwise the same as conditions for the base case. Similarly, conditions for the fourth case specify no imported water supply from the Platte River in Nebraska for the entire simulation period, beginning in 1918, but are otherwise the same as conditions for the base case. The fifth case is identical to the reduced pumping cases (above), except for the assumption that future imported water supplies from the Platte River are excluded.

Based on these five future scenario runs, impacts of Nebraska pumping and imported water supply were evaluated with respect to both baseline and reduced pumping conditions. First, the impact of Nebraska pumping under status quo conditions was evaluated as the difference given by computed Republican River flows for the "no Nebraska pumping" case minus corresponding flows for the status quo case. Second, the impact of Nebraska pumping under the proposed remedy is evaluated as the difference given by computed Republican River flows for the "no Nebraska pumping" case minus corresponding flows for the proposed remedy case. Similarly, imported water supply credits were evaluated twice: first, with respect to status quo conditions, and then with respect to reduced pumping conditions under the proposed remedy case.

Results: impacts of Nebraska pumping and imported water supply from Platte River

The reduction in groundwater irrigated area of 514,600 acres within the Republican River basin under the proposed remedy results in a groundwater pumping reduction of 619,900 acre-feet/year. Impacts of this reduction on streamflow are presented here.

Table 1 lists computed annual impacts of Nebraska pumping on Republican River streamflow and of imported water supply under both the status quo and reduced pumping scenarios for years 2007-2057, and averages over the same period. The rightmost column of Table 1 lists the reduction of impacts achieved under the reduced pumping scenario.

Table 1 shows that projected average annual impacts over 51 years (2007-2057) on Republican River streamflow under baseline, conditions are 268,000 acre-feet/per year (afy) for Nebraska groundwater pumping, reduced by 11,700 afy for imports from the Platte River, for a net impact of 256,300 afy. The corresponding impacts under the reduced pumping scenario are 164,700 afy for Nebraska pumping, reduced by 27,600 afy for imported water supply for a net average impact of 137,100 afy. Compared with the base case scenario, the proposed remedy scenario shows an average decreased pumping impact of 103,300 afy, and an increase in imported water supply credit of 16,000 afy, for an average net Nebraska impact reduction of 119,300 afy. However, the net impact under the proposed remedy shows an initial decline followed by an upward trend for years 2015-2057 that indicates a possibly larger net impact beyond the modeled time period.

Nebraska impacts on Republican River streamflow are shown graphically in Figures 2 and 3. Figure 2 shows the separate impacts of Nebraska pumping and imported water supply credit under both scenarios. Figure 3 shows the net sum of pumping impact and imported water supply credit for each scenario.

Figure 2 shows historical impacts of Nebraska pumping on Republican River streamflow and imported water supply credit according to the RRCA groundwater model for years 1960-2006. The historical impact of Nebraska pumping reached peak levels of 212,900 acre-feet/year in 2001 and 213,100 acre-feet/year in 2004, and was 198,400 acre-feet/year in 2006. Figure 2 also shows projected impacts of Nebraska pumping on Republican River streamflow and imported water supply credit under both the status quo scenario and the reduced pumping scenarios for years 2007-2057.

The impact of Nebraska pumping on Republican River streamflow in future years under the status quo scenario shows greater variability than under the reduced pumping scenario because of the greater magnitudes of the pumping under the status quo scenario. Projected pumping impacts under both scenarios appear to have upward trends, although impacts under status quo conditions show a

decreasing rate of change. Imported water supply credits under the proposed remedy are greater and show less variability than do those under status quo conditions.

Table 1. Projected impacts of Nebraska pumping and Platte River imports under both status quo conditions and the proposed remedy (acre-feet/year)

year	Status quo conditions			Proposed remedy			Impact reduction
	pumping	imports	Net impact	pumping	imports	Net impact	
2007	206,685	15,945	190,740	189,290	17,476	171,814	18,926
2008	228,723	10,519	218,204	185,972	18,160	167,812	50,392
2009	232,212	10,058	222,154	184,619	24,438	160,181	61,973
2010	268,248	28,216	240,032	188,316	28,869	159,447	80,585
2011	234,826	18,396	216,430	167,740	23,517	144,223	72,207
2012	257,288	16,004	241,284	169,116	25,785	143,331	97,953
2013	279,390	19,589	259,801	170,714	27,116	143,598	116,203
2014	253,960	20,178	233,782	161,514	25,630	135,884	97,898
2015	239,184	13,010	226,174	153,278	24,317	128,961	97,213
2016	259,639	12,697	246,942	162,518	27,757	134,761	112,181
2017	235,315	12,933	222,382	149,632	23,936	125,696	96,686
2018	249,836	11,921	237,915	151,570	26,762	124,808	113,107
2019	220,215	8,478	211,737	137,938	20,590	117,348	94,389
2020	239,380	9,005	230,375	151,122	25,655	125,467	104,908
2021	249,061	9,087	239,974	155,209	27,349	127,860	112,114
2022	248,073	9,400	238,673	152,490	25,855	126,635	112,038
2023	232,745	9,054	223,691	148,589	26,396	122,193	101,498
2024	241,650	9,967	231,683	150,586	25,203	125,383	106,300
2025	260,704	8,756	251,948	158,291	26,119	132,172	119,776
2026	261,893	9,493	252,400	159,352	27,569	131,783	120,617
2027	310,470	20,000	290,470	168,124	29,958	138,166	152,304
2028	266,199	17,524	248,675	157,838	27,737	130,101	118,574
2029	288,790	11,750	277,040	161,625	29,072	132,553	144,487
2030	315,741	13,507	302,234	167,204	30,214	136,990	165,244
2031	281,880	17,106	264,774	161,227	29,113	132,114	132,660
2032	268,225	9,908	258,317	155,858	27,867	127,991	130,326
2033	287,840	10,699	277,141	165,875	30,366	135,509	141,632
2034	260,095	9,511	250,584	155,124	27,216	127,908	122,676
2035	275,704	9,444	266,260	157,893	29,493	128,400	137,860
2036	240,324	7,342	232,982	146,034	23,234	122,800	110,182
2037	253,962	8,401	245,561	159,222	28,213	131,009	114,552
2038	268,318	8,603	259,715	163,913	29,615	134,298	125,417
2039	272,377	9,011	263,366	161,569	28,314	133,255	130,111
2040	254,226	8,699	245,527	158,492	28,645	129,847	115,680
2041	262,968	8,440	254,528	160,150	27,552	132,598	121,930
2042	281,574	8,280	273,294	169,229	28,218	141,011	132,283
2043	282,715	9,153	273,562	170,738	29,665	141,073	132,489
2044	340,444	14,502	325,942	180,788	32,343	148,445	177,497
2045	285,259	15,373	269,886	168,711	29,938	138,773	131,113
2046	310,820	9,985	300,835	173,741	31,303	142,438	158,397
2047	339,785	11,229	328,556	180,301	32,442	147,859	180,697
2048	302,494	15,013	287,481	174,016	31,491	142,525	144,956
2049	286,563	8,973	277,590	167,400	29,872	137,528	140,062
2050	305,555	10,562	294,993	179,129	32,415	146,714	148,279
2051	278,614	8,926	269,688	167,245	29,129	138,116	131,572
2052	293,521	9,281	284,240	170,714	31,589	139,125	145,115
2053	250,743	6,952	243,791	156,746	24,702	132,044	111,747
2054	265,943	8,337	257,606	171,879	29,872	142,007	115,599
2055	280,141	8,709	271,432	176,507	31,446	145,061	126,371

2056	287,984	8,969	279,015	174,543	30,068	144,475	134,540
2057	270,883	8,707	262,176	169,789	30,174	139,615	122,561
2007-2057	268,023	11,678	256,345	164,696	27,643	137,053	119,292

Figure 2 shows that the impact of Nebraska pumping under the proposed remedy is projected to fall below 175,000 acre-feet/year for the first time in 2011, or in the fifth year of the future scenario, and then occasionally exceeds 175,000 acre-feet/year beginning in 2044. Based on linear trends for years 2011-2057, the impact of Nebraska pumping increases by 394 acre-feet/year under the proposed remedy, and by 1,055 afy under status quo conditions.

Figure 3 shows that the net impact of Nebraska pumping and imported water supply under the proposed remedy is projected to fall below 150,000 acre-feet/year for the first time in 2011, and then stay below 150,000 acre-feet/year for the remaining years of the simulation. Based on linear trends for years 2011-2057, the net impact of Nebraska pumping and imported water supply increases by 261 acre-feet/year under the proposed remedy, and by 1,179 afy under status quo conditions.

Figure 4 shows computed Republican River flows contributed by groundwater for the historical period 1960-2006 and for the two scenarios 2007-2057. Under status quo conditions, computed annual flows for years 1960-2057 diminish at an average rate of 2.5 percent per year, based on an exponential trend for years 2011-2057, as shown in Figure 4. Under the proposed remedy scenario, computed flows after 2006 show relatively rapid recovery during the first few years, followed by an average rate of decline of 0.23 percent per year, based on an exponential trend for years 2011-2057.

Future hydrologic conditions

It is important to keep in mind that the projections, particularly on an annual basis or in the short term, are dependent on the hydrological conditions of the assumed sequence of years. Because of this, the time required to reduce the impact of Nebraska pumping to less than 175,000 acre-feet/year, and the net impact of Nebraska pumping and imported water supply to less than 150,000 acre-feet/year, will be influenced by future and unknown hydrological conditions.

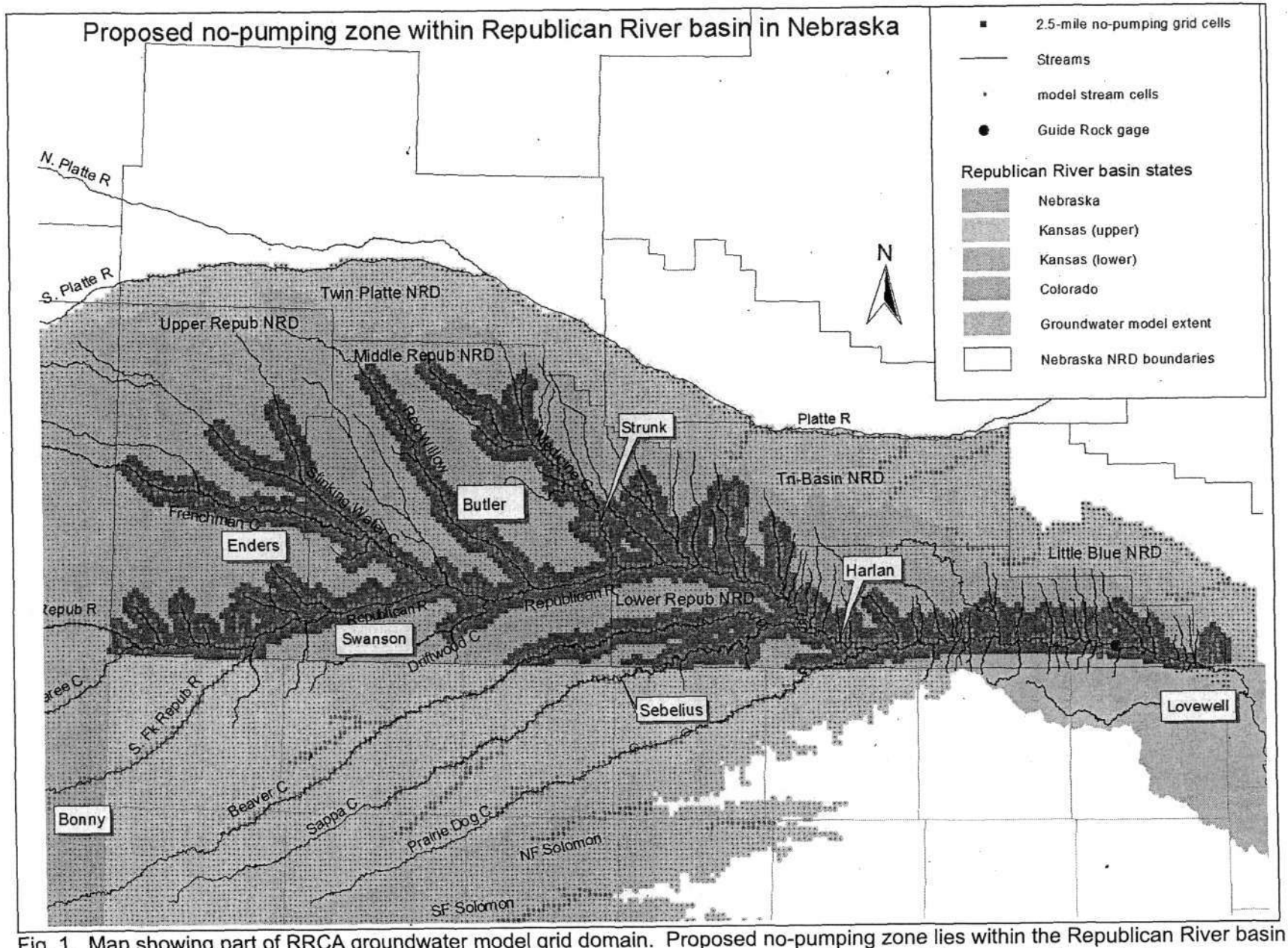

Fig. 1. Map showing part of RRCA groundwater model grid domain. Proposed no-pumping zone lies within the Republican River basin in Nebraska. Grid cells shaded dark gray are those whose centers lie within two miles of centers of stream cells (turquoise).

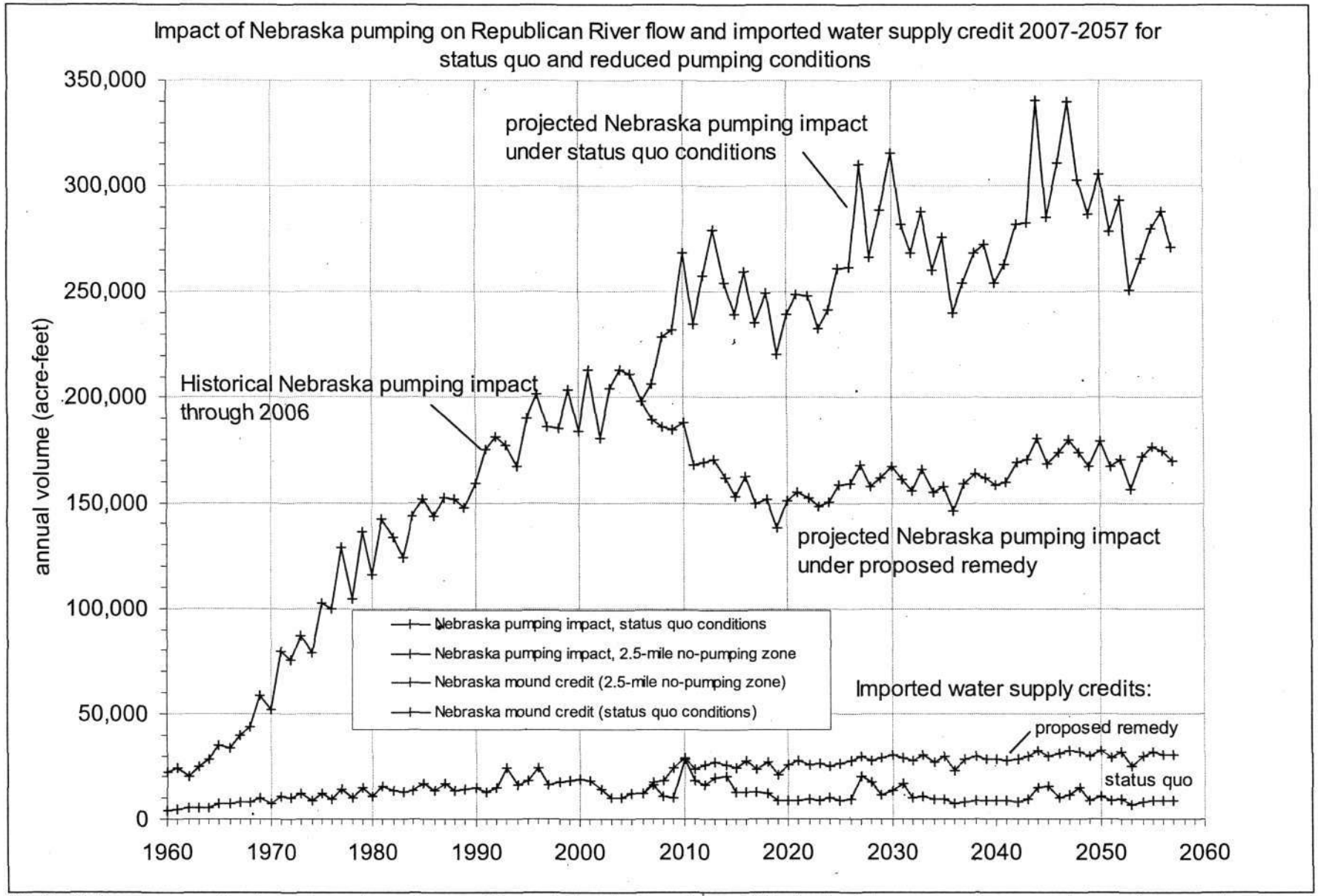

Fig. 2. Nebraska pumping impact on streamflow and imported water supply credit for both status quo and proposed remedy scenarios.

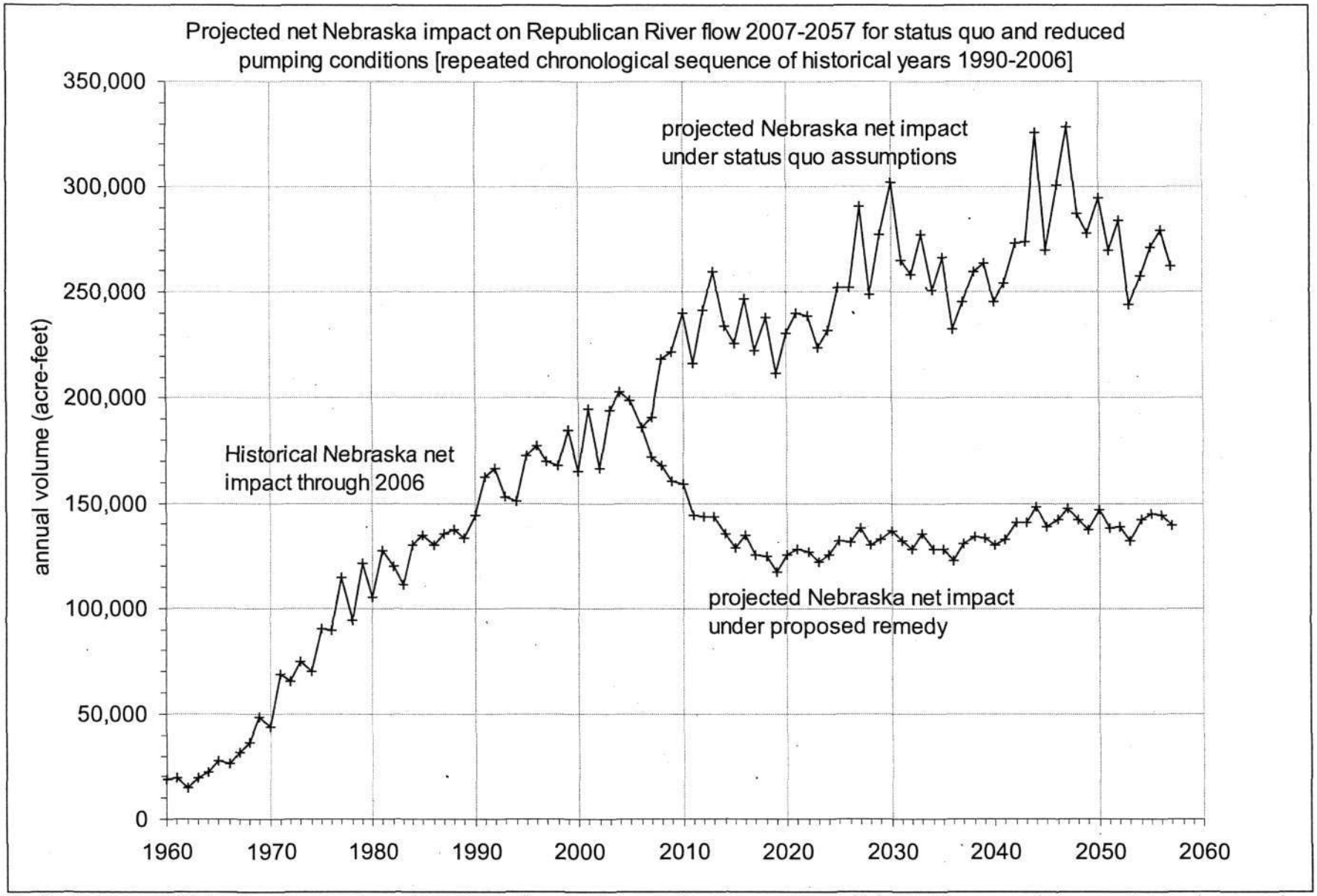

Fig. 3. Net sum of Nebraska pumping impact on streamflow and imported water supply credit for status quo and proposed remedy scenarios.

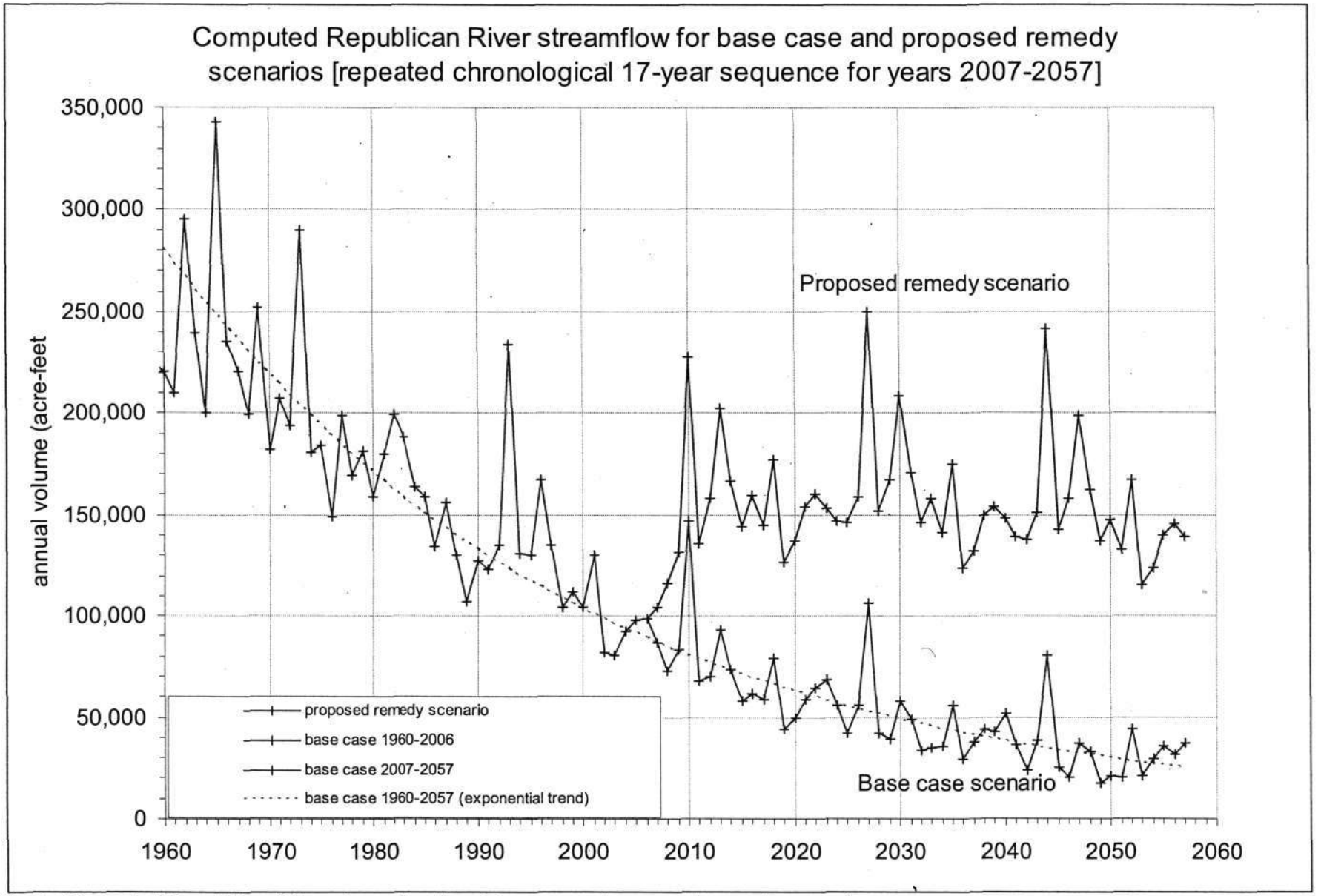

Fig. 4. Computed Republican River streamflow for status quo and proposed remedy scenarios.

Appendix A. Revisions to Attachment 5: RRCA groundwater model analysis
Impact of Nebraska pumping and proposed remedy

Samuel P. Perkins[1] and Steven P. Larson[2]

[1]Civil Engineer, Interstate Water Issues, Kansas Dept. Of Agriculture, Div. of Water Resources;
[2]S. S. Papadopulos & Associates, Inc., Bethesda, MD.

Four revisions were made to the future scenario model runs and their effects are described here. The first three of these are related to groundwater or commingled irrigation area, which mostly affect results for the status quo scenario and have a much smaller effect on the proposed remedy scenario. Annual changes in impacts of the first three revisions are shown in Table A1. Annual impacts and computed streamflow under the status quo and proposed remedy scenarios as originally reported and with revisions 1-3 are compared in Figures A2-A4. The fourth revision has to do with output control and has negligible effects on results, as shown in Table A3. The first three revisions are as follows.

1. Hold commingled irrigated area at 2006 levels under both future scenarios.
In applying the proposed remedy, the condition to hold groundwater irrigation area to 2000 levels was also applied to commingled irrigation area. This was revised so that commingled irrigation area is held instead at 2006 levels for all of Nebraska within the RRCA groundwater model domain. This change had a slight effect on Nebraska impacts under the reduced pumping scenario.

2. Scale groundwater pumping according to changes in groundwater irrigation area within each NRD.
Groundwater pumping scaling factors for the status quo scenario were based on statewide irrigation area ratios instead of NRD-specific irrigation area ratios, which were used for the reduced pumping scenario. Status quo cases were re-run using NRD-specific irrigation area ratios. This change affected impacts under only the status quo scenario.

3. Exclude commingled irrigation area from sums for the purpose of scaling groundwater pumping.
Sums of irrigation area that were used to compute scaling factors for groundwater pumping included both groundwater and commingled irrigated area. In order to represent increased development of groundwater irrigation correctly, these sums should have included only groundwater irrigation area. This change affected impacts under both scenarios, but more significantly under the status quo scenario. The sums of groundwater irrigated area within NRDs for years 1990-2006 that were used to calculate groundwater pumping scaling factors under the status quo and reduced pumping scenarios are listed below in Tables A4 and A5, respectively.

Effects of revisions 1-3: calculated impacts on computed streamflow

Under "Results," the original version of Attachment 5 stated: "The reduction in groundwater irrigated area of 514,600 acres within the Republican River basin under the proposed remedy results in a groundwater pumping reduction of 564,400 acre-feet/year." With the above revisions, average annual groundwater pumping under the proposed remedy is reduced by 619,900 acre-feet/year.

Table A1 summarizes calculated impacts on computed streamflow as originally reported in Attachment 5 ("Original impacts"), impacts after incorporating the first two revisions, impacts after incorporating the all three revisions, and the net effects of the three revisions on calculated Nebraska impacts. Under the status quo scenario, the revisions have the effect of increasing the net Nebraska impact on Republican River streamflow by 9,700 afy, whereas, under the proposed remedy scenario, the revisions increase the net Nebraska impact by 1,300 afy. Table A1 also shows the reduction in Nebraska's net impact under the proposed remedy was 110,800 afy as originally reported and 119,200 afy with revisions, for an increase of 8,400 afy in the proposed remedy's reduction in Nebraska's net impact. Table A2 lists the annual differences between the revised and original versions of Table 1 in Attachment 5. Figures A2 through A4 superimpose the original and revised graphs of computed impacts and flows shown in Figures 2-4 of the respective versions of Attachment 5.

Table A1. *Summary of how revisions 1-3 affect Nebraska impacts on Republican River streamflow.*

	Status quo scenario			Proposed remedy scenario			Reduction in net NE impact
	Pumping impact	Import credit	Net NE impact	Pumping impact	Import credit	Net NE impact	
Original impacts	259,900	13,300	246,600	163,500	27,700	135,800	110,800
Impacts with revisions 1 and 2	263,300	12,500	250,800	165,000	27,600	137,500	113,400
Impacts with revisions 1-3	268,000	11,700	256,300	164,700	27,600	137,100	119,200
Effect of revisions (1-3)	8,100	-1,600	9,700	1,200	-100	1,300	8,400

As noted above, the revisions have a much greater effect on impacts under the base case scenario. This can be seen by comparing computed Republican River flows under the base case scenario in Figure 4 with the same figure in the original version of Attachment 5. With the revisions, note that the exponential trend line for these flows appears to fall below 50,000 afy in 2030, which is about eight years earlier than that shown in Figure 4 of the original Attachment 5. On the other hand, computed flows under the proposed remedy scenario show a relatively small decrease, corresponding to the increase in net Nebraska impact of 1,300 afy with the revisions.

4. Output control file for revised runs specify that cell-by-cell flows for all budget terms be written for the second time step of each stress period instead of the first.

For final versions of future scenario cases, output control was specified by file TS2_88yrs.oc, which specifies that cell-by-cell flows are to be written only at the end of each stress period. This is consistent with the original historical simulations for years for years 1918-2000, and is considered sufficiently accurate for the future scenarios. TS2_88yrs.oc is a version of file 11_thru_2005.oc, which was constructed for a 1918-2005 run, and which begins with a steady-state stress period, whereas the future runs are continuations of transient runs. The second and third lines of file 11_thru_2005.oc were deleted to create file TS2_88yrs.oc. Output control files for the historical RRCA model runs beginning with year 2001 specify that cell-by-cell flows are written at the end of each time step, or twice per stress period. This distinction is recognized in specifying input to versions of the postprocessor readccf to read and summarize cell-by-cell flows.

Future scenario cases preceding the final versions of Dec 28, 2007 were run using file 11_thru_2005.oc, which had the unintended consequence of writing out the cell-by-cell flows at the end of the first time step of each stress period instead of the second time step, i.e., flows for the first half of each stress period instead of the second half. This is because the above file includes lines for the steady-state period, but there is no corresponding steady-state period for the future scenario runs. Consequently, model results for these cases will not appear exactly the same as they would be if based on flows at the end of each stress period. However, the resulting differences should be very small, and comparisons between cases should be only negligibly affected. Model results would be more accurately represented by writing out cell-by-cell flows for every time step, as they are for the annual historical runs 2001-2006, although this would be only a slight improvement in accuracy and would have a negligible effect on comparisons.

By referencing the output control file 11_thru_2005.oc (above), all previous comparisons of model budgets for reduced pumping scenarios against the base case scenario have been made on the basis of cell-by-cell flows for the first time step of each stress period. To verify that differences between model results based on one or the other time step are small, a previous version of the status quo scenario was run both ways, using either of the output control files named file 11_thru_2005.oc or TS2_88yrs.oc to specify that cell-by-cell flows are written for either the first or the second time step of each stress period, respectively. Model budget flows for the two versions of the base case, denoted TS1 and TS2, were also averaged to represent flows based on both time steps, TSavg = (TS1 + TS2)/2. Differences between budget flows based on the first time step and those based on the average of both time steps were calculated as [TS1 – TSavg], summed over the Republican River basin component of the model domain.

Table A2. Changes in Table 1, "Projected impacts of Nebraska pumping and Platte River imports under *both status quo conditions and the proposed remedy (acre-feet/year)*"

year	Status quo conditions			Proposed remedy			Impact
	pumping	imports	Net impact	pumping	imports	Net impact	reduction
2007	1,845	-127	1,972	106	3	103	1,869
2008	4,211	-731	4,942	115	6	109	4,833
2009	3,887	-349	4,236	548	-176	724	3,512
2010	5,877	-1,609	7,486	1,205	100	1,105	6,381
2011	7,051	379	6,672	651	-42	693	5,979
2012	7,929	-2,466	10,395	864	-22	886	9,509
2013	9,589	-3,953	13,542	1,207	26	1,181	12,361
2014	6,647	1,576	5,071	1,023	-17	1,040	4,031
2015	6,591	-1,658	8,249	847	-23	870	7,379
2016	6,740	-1,312	8,052	1,201	11	1,190	6,862
2017	6,695	-1,615	8,310	875	-50	925	7,385
2018	7,926	-1,602	9,528	1,038	40	998	8,530
2019	7,116	-1,711	8,827	826	-26	852	7,975
2020	6,182	-842	7,024	976	-88	1,064	5,960
2021	5,385	-757	6,142	1,316	8	1,308	4,834
2022	5,331	-739	6,070	1,201	-14	1,215	4,855
2023	4,773	-668	5,441	1,219	11	1,208	4,233
2024	7,021	-1,811	8,832	1,040	-15	1,055	7,777
2025	7,157	-918	8,075	1,167	-46	1,213	6,862
2026	7,357	-719	8,076	1,369	-44	1,413	6,663
2027	11,434	-5,412	16,846	1,729	19	1,710	15,136
2028	8,910	-1,155	10,065	1,183	-46	1,229	8,836
2029	10,670	-2,636	13,306	1,397	-39	1,436	11,870
2030	12,432	-4,688	17,120	1,680	-7	1,687	15,433
2031	10,015	-2,846	12,861	1,393	-46	1,439	11,422
2032	9,180	-2,183	11,363	1,159	-55	1,214	10,149
2033	8,311	-1,054	9,365	1,529	-14	1,543	7,822
2034	9,221	-2,327	11,548	1,145	-49	1,194	10,354
2035	9,784	-1,591	11,375	1,292	-6	1,298	10,077
2036	7,907	-1,140	9,047	1,000	-47	1,047	8,000
2037	7,924	-1,102	9,026	1,214	-127	1,341	7,685
2038	7,324	-1,062	8,386	1,552	15	1,537	6,849
2039	7,274	-964	8,238	1,374	-12	1,386	6,852
2040	6,475	-836	7,311	1,392	-3	1,395	5,916
2041	7,466	-910	8,376	1,191	-17	1,208	7,168
2042	8,150	-1,094	9,244	1,361	-58	1,419	7,825
2043	9,265	-978	10,243	1,546	-41	1,587	8,656
2044	13,059	-5,464	18,523	1,928	14	1,914	16,609
2045	10,210	-2,690	12,900	1,292	-56	1,348	11,552
2046	11,231	-2,218	13,449	1,539	-41	1,580	11,869
2047	12,581	-3,377	15,958	1,849	-16	1,865	14,093
2048	11,694	-3,390	15,084	1,513	-65	1,578	13,506
2049	9,500	-1,495	10,995	1,237	-65	1,302	9,693
2050	9,256	-1,038	10,294	1,689	-19	1,708	8,586
2051	9,082	-1,121	10,203	1,181	-66	1,247	8,956
2052	10,084	-1,226	11,310	1,351	-20	1,371	9,939
2053	8,543	-1,348	9,891	1,021	-53	1,074	8,817
2054	8,661	-1,104	9,765	1,210	-116	1,326	8,439
2055	8,251	-873	9,124	1,584	14	1,570	7,554
2056	7,897	-1,078	8,975	1,413	-18	1,431	7,544
2057	7,809	-840	8,649	1,354	12	1,342	7,307
2007-2057	8,135	-1,586	9,721	1,218	-27	1,245	8,476

Model budget flows, averaged over years 2007-2057, are listed in Table A3. The line labeled "TSavg" in Table A3 shows the average of the first two lines (TS1 and TS2) for each budget term. The fourth line ("TS1 – Tsavg") shows the difference in acre-feet/year between the first line and the third. The fourth line shows these differences as fractions of the average values in line 3. The small differences, expressed either in acre-feet (line 4) or as fractions (line 5) and confirm that differences in model budget flows based on one or the other time step (TS1 or TS2) are negligible.

Table A3. Average model budget flows (afy) based on first and second time steps of each stress period.

time step	STO	CHD	EVT	WEL	DRN	RCH	STR
TS1	870353	-3013	-378322	-2231932	-2178	1692805	-58308
TS2	865473	-3013	-372438	-2231932	-2178	1692805	-59342
TSavg	867913	-3013	-375380	-2231932	-2178	1692805	-58825
TS1 – TSavg	2440	0	-2942	0	0	0	517
TS1 – TSavg / TSavg	0.0028	-0.000025	0.0078	0	0.000016	0	-0.0088

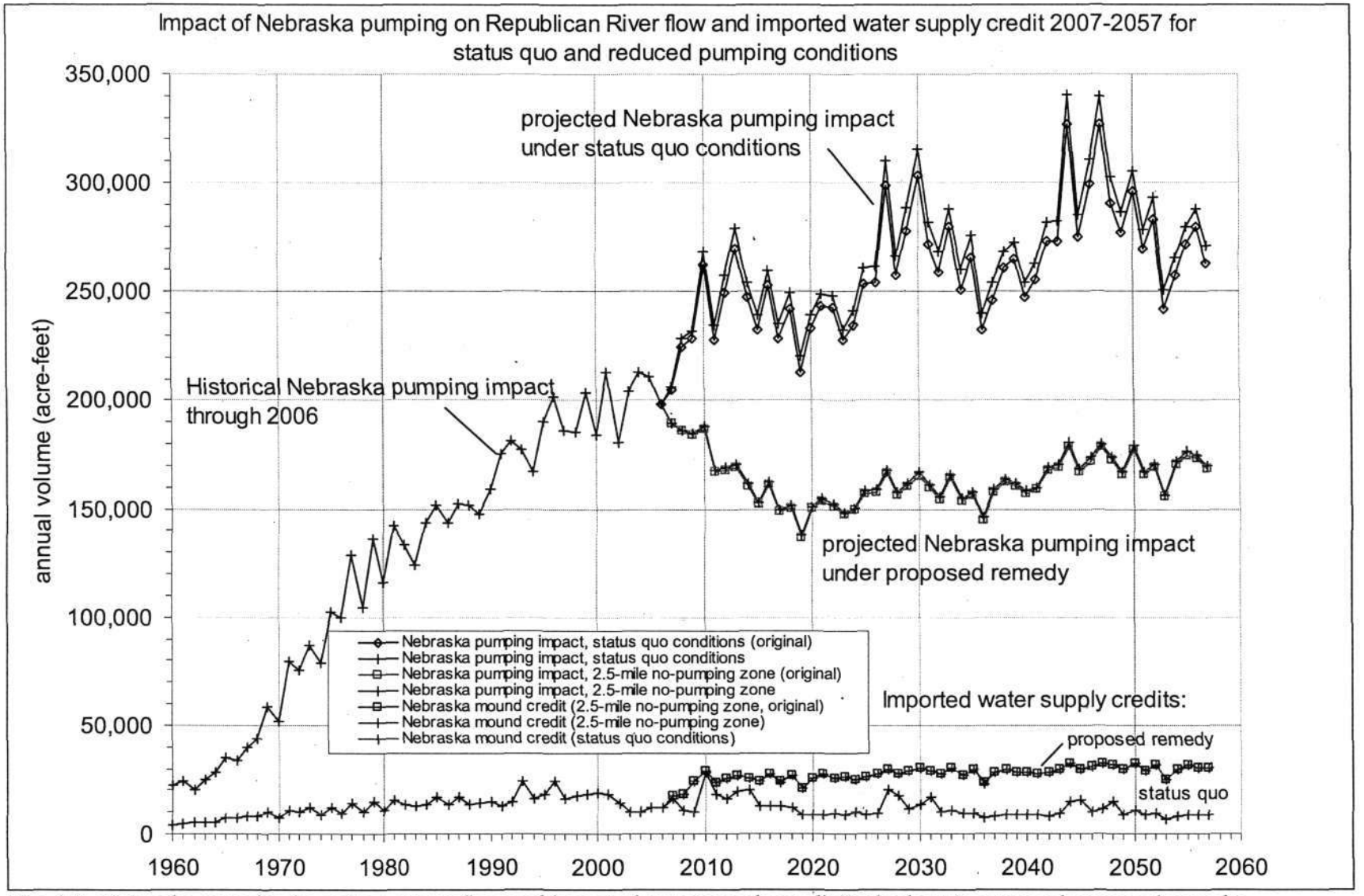

Fig. A2. Nebraska pumping impact on streamflow and imported water supply credit for both status quo and proposed remedy scenarios. Comparison of revised flows with originals shown in Fig. 2, Att. 5, Dec 18, 2007.

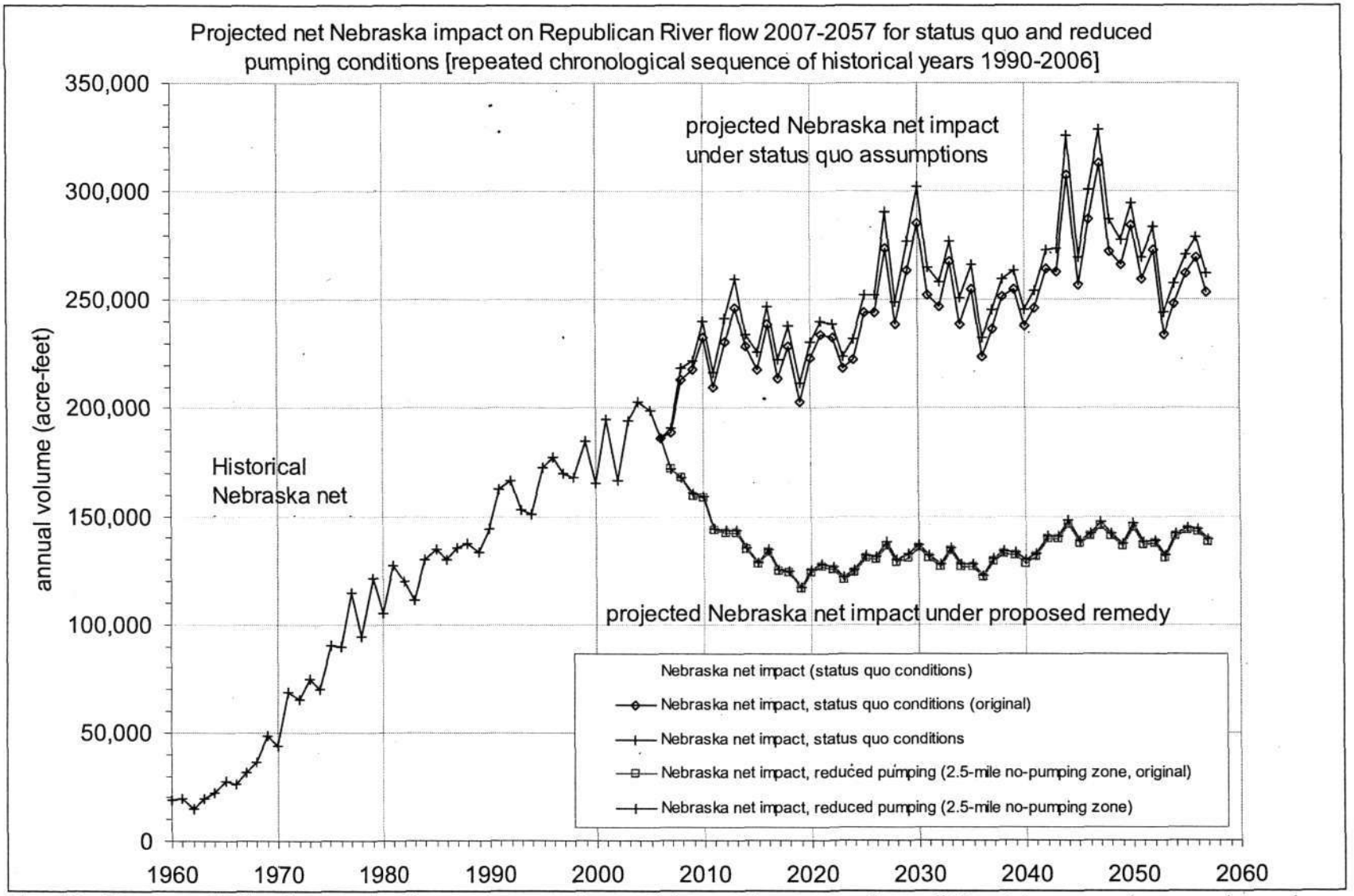

Fig. A3. Net sum of Nebraska pumping impact on streamflow and imported water supply credit for status quo and proposed remedy scenarios. Comparison of revised flows with originals shown in Fig. 3, Att. 5, Dec 18, 2007.

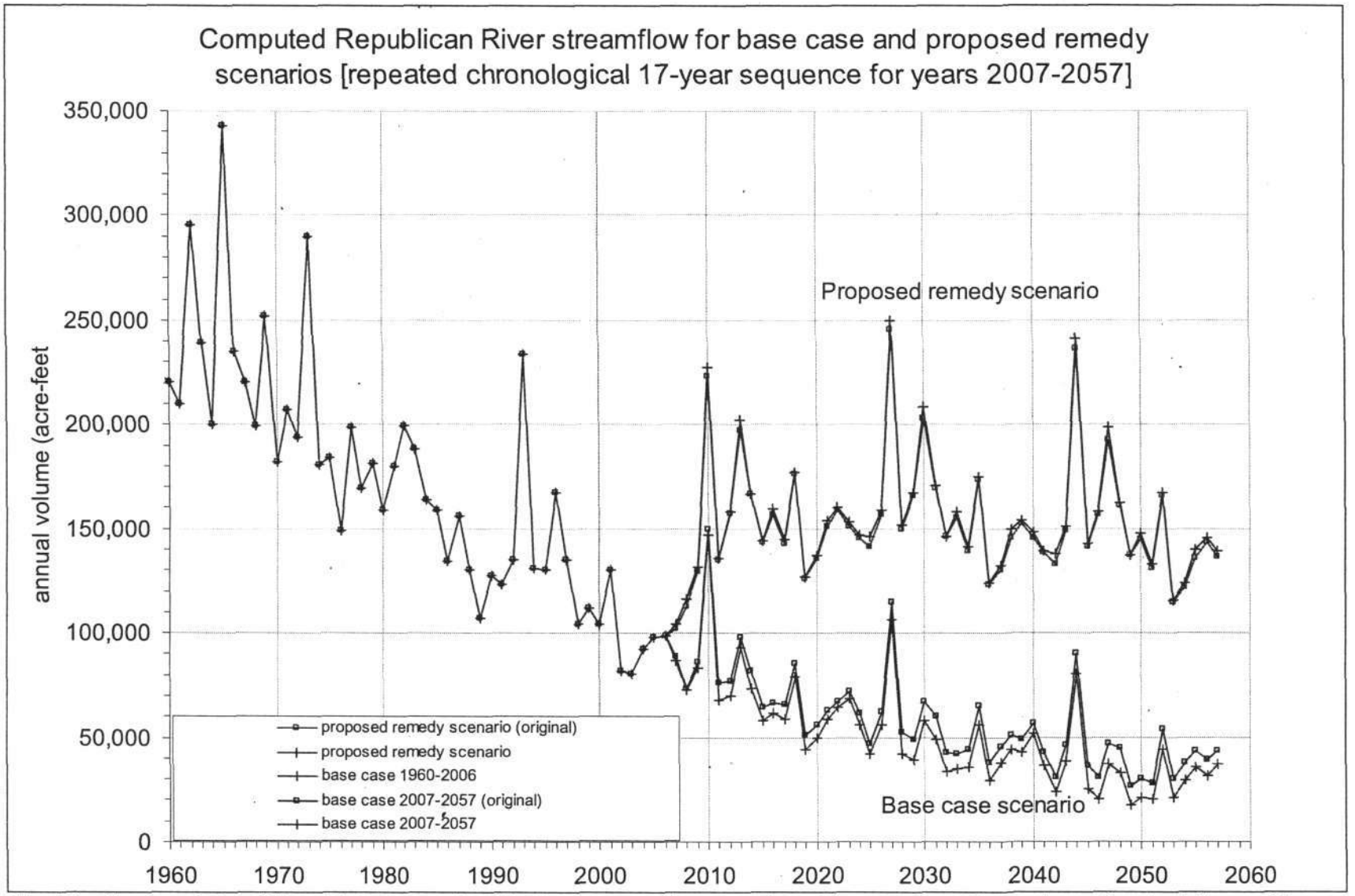

Fig. A4. Computed Republican River streamflow for status quo and proposed remedy scenarios. Comparison of revised flows with originals shown in Fig. 4, Att. 5, Dec 18, 2007.

Table A4. Sums of reported groundwater irrigation area within each state and each Natural Resource District in Nebraska 1990-2006; used to calculate groundwater pumping scaling factors under the status quo scenario.

year	CO gw Ac	KS gw Ac	NE gw Ac	Little Blue	South Platte	Twin Platte	Central Platte	Upper Repub	Middle Repub	Lower Repub	TriBasin
1990	673353	393706	1275917	42798	3282	90060	33273	355654	186740	188242	376017
1991	673632	395998	1304917	44722	3282	92992	33813	369960	187687	188066	384542
1992	673575	372655	1284484	44829	3277	90133	31189	368184	187152	186954	372903
1993	673587	374311	1218625	43464	3274	84523	31305	360123	169446	179631	346982
1994	673824	401827	1313617	45599	3276	92357	33070	369022	185585	193217	391628
1995	673797	391913	1287157	44630	3334	94187	32032	374808	172750	186606	378942
1996	673876	409561	1350855	46054	3278	105124	32890	384993	191323	193731	393597
1997	673885	418548	1370984	46281	3279	104292	32855	377365	196208	214664	396180
1998	673849	416564	1369353	49553	3280	108293	34310	371790	198687	211661	391912
1999	673840	413896	1371085	52792	3218	104779	35811	369231	195683	209422	400274
2000	673893	427428	1429348	52170	3216	108335	37174	384207	204587	223689	416119
2001	569357	412397	1510096	52083	3456	110615	36621	442733	219727	220605	424370
2002	569383	421964	1523417	52078	3452	109198	35774	443940	227604	223038	428462
2003	568630	424564	1565018	50562	3005	113183	34906	449725	240150	250007	423647
2004	568686	422715	1630667	53663	2855	124460	38821	441583	250351	280484	438583
2005	579368	417095	1639947	53188	2777	123911	38000	474615	239845	270383	437343
2006	573501	416729	1682593	52051	2853	113438	42218	459849	277778	292087	442442

Table A5. Sums of reported groundwater irrigation area within each state and each Natural Resource District in Nebraska 1990-2006, but excluding groundwater irrigation area within the proposed no-pump zone shown in Figure 1; used to calculate groundwater pumping scaling factors under the reduced pumping scenario.

year	CO gw Ac	KS gw Ac	NE gw Ac	Little Blue	South Platte	Twin Platte	Central Platte	Upper Repub	Middle Repub	Lower Repub	TriBasin
1990	673353	393706	1000929	42711	3282	90060	33273	269602	115627	91813	354562
1991	673632	395998	1025485	44628	3282	92992	33813	279076	117121	91832	362741
1992	673575	372655	1009142	44734	3277	90133	31189	279796	116258	91747	352009
1993	673587	374311	958557	43377	3274	84523	31305	274431	105511	89356	326781
1994	673824	401827	1036816	45507	3276	92357	33070	281974	116387	94148	370097
1995	673797	391913	1021193	44538	3334	94187	32032	287112	110830	91264	357897
1996	673876	409561	1068337	45952	3278	105124	32890	293536	122175	93869	371514
1997	673885	418548	1076867	46188	3279	104292	32855	286644	123839	106296	373475
1998	673849	416564	1079082	49443	3280	108293	34310	285366	126900	103703	367786
1999	673840	413896	1086754	52668	3218	104779	35811	283808	125743	104102	376624
2000	673893	427428	1125750	52074	3216	108335	37174	294682	132068	107259	390942
2001	569357	412397	1175475	51890	3456	110615	36621	323261	141222	110761	397650
2002	569383	421964	1181320	51882	3452	109198	35774	323841	144033	111551	401589
2003	568630	424564	1213099	50370	3005	113183	34906	347124	146019	122964	395527
2004	568686	422715	1256648	53470	2855	124460	38821	343812	152324	132343	408564
2005	579368	417095	1262877	53017	2777	123911	38000	370276	143745	126436	404715
2006	573501	416729	1331586	51867	2853	113438	42218	362774	182938	162804	412696

Attachment 6

Kansas v. Nebraska & Colorado,
No. 126, Orig., U.S. Supreme Court

Designated Schedule for Resolution

December 19, 2007	Kansas provides proposed remedy to Nebraska with copies to Colorado and United States.
February 4, 2008	If agreement is not reached, Kansas submits dispute to the Republican River Compact Administration (RRCA) as a "fast-track" issue.
March 5, 2008	By this date, the RRCA meets to resolve the dispute.
March 20, 2008	If the RRCA fails to resolve the dispute, Kansas invokes nonbinding arbitration.
April 3, 2008	Kansas or Nebraska may amend the scope of the dispute to address additional issues.
April 17, 2008	Kansas and Nebraska submit names of proposed arbitrators and qualifications to each other.
April 28, 2008	Kansas and Nebraska representatives meet in person or by telephone to confer and agree on arbitrators; if agreement cannot be reached, the selection is submitted to CDR Associates of Boulder, Colo.
May 1, 2008	Arbitrators engaged.
May 12, 2008	Initial meeting/scheduling conference of Kansas and Nebraska before the arbitrators.
November 12, 2008	Deadline to complete arbitration and render decision.
December 12, 2008	Kansas and Nebraska give written notice whether they will accept the arbitrators' decision.
Thereafter	If the dispute is not resolved, Kansas makes the appropriate filings in the U.S. Supreme Court.

Attachment 2

STATE OF NEBRASKA

Dave Heineman
Governor

DEPARTMENT OF NATURAL RESOURCES
Brian P. Dunnigan, P.E. [redacted]
Acting Director

April 15, 2008

IN REPLY TO:

VIA E-MAIL AND U.S. MAIL

Mr. David Barfield, P.E.
Kansas Commissioner, Republican River Compact Administration
Kansas Chief Engineer
Kansas Department of Agriculture
109 S. W. 9th Street
Topeka, KS 66612

Mr. Dick Wolfe
Colorado Commissioner, Republican River Compact Administration
Director, State Engineer
Office of the State Engineer
1313 Sherman Street, Suite 818
Denver, CO 80203

Re: Fast-Track Issues Submittal to the
Republican River Compact Administration

Dear Commissioners Barfield and Wolfe:

Pursuant to Section VII.A.3 of the Final Settlement Stipulation (FSS), Kansas v. Colorado and Nebraska, No.126 Original (December 15, 2002), the State of Nebraska hereby raises the following issues for Republican River Compact Administration (RRCA) determination as *fast-track* issues. Each of the issues identified below are matters of Actual Interest, as defined in the FSS, to the State of Nebraska:

- **Estimation of Beneficial Consumptive Use of Nebraska's Virgin Water Supply.** Nebraska believes the current accounting procedures are insufficient to correctly assess the Calculated Beneficial Consumptive Use and the Imported Water Supply Credit and therefore this issue needs to be addressed and resolved.

- **Division of Evaporative Loss from Harlan County Lake When Only One State Utilizes Reservoir Storage for Irrigation.** Kansas believes that the FSS and currently approved accounting procedures did not anticipate the condition in which only one state utilizes the reservoir storage for irrigation and therefore the accounting procedures should be changed to recognize this condition. Nebraska believes this issue should be resolved.

- **Non-Federal Reservoir Evaporation below Harlan County Lake.** Nebraska has requested that the Accounting Procedures should be resolved to eliminate the evaporation

from non-federal reservoirs below Harlan County Lake from the calculations of Computed Beneficial Consumptive Use as prescribed in Section VI.A. of the Final Settlement Stipulation (FSS).

- **Return Flow.** The field and canal loss that returns to the stream is currently set at 82% (or an 18% loss). During our negotiations that resulted in the FSS Nebraska stated that amount of water returning to the stream should be higher. This concern and the need for further study of the issue was codified in a footnote on Attachment 7 of the Accounting Procedures and Reporting Requirements of the Republican River Compact. Nebraska wants the rate re-examined and adjusted.

- **Haigler Canal Diversion/Arikaree Return Flows.** This issue was raised during the negotiations of the FSS. The footnote on page 26 of the Accounting Procedures and Reporting Requirements of the Republican River Compact, which codifies this discussion states that "*The RRCA will investigate whether return flows from the Haigler Canal diversion in Colorado may return to the Arikaree River, not the North Fork of the Republican River, as indicated in the formulas. If there are return flows from the Haigler Canal to the Arikaree River, these formulas will be changed to recognize those returns.*" Nebraska wants resolution of this matter.

- **Haigler Canal Computed Beneficial Consumptive Use Calculations for Nebraska.** The calculation to compute Nebraska's Haigler Canal diversion should be corrected to the following formula: *Stateline diversions minus Spillback diversions equal Nebraska diversions.* This change is needed to accurately calculate the actual diversion to the Haigler Canal.

- **Arikaree Sub-basin Virgin Water Supply Calculations.** Nebraska wants the accounting procedures to reflect that any imported water supply from the North Fork Republican River Sub-basin should be subtracted from the Virgin Water Supply of the Arikaree Sub-basin.

- **Discrepancies Between the Accounting Points for Surface Water Computed Beneficial Consumptive Uses and Ground Water Beneficial Consumptive Uses Used in the Accounting Procedures for Calculating Sub-basin Virgin Water Supplies and Beneficial Consumptive Uses.** In a number of instances Nebraska has noted that the accounting point to assign a surface water Computed Beneficial Consumptive Use to a sub-basin does not match the accounting point used to assign a ground water Computed Beneficial Consumptive Use to the sub-basin. Nebraska wants accounting points adjusted to more accurately reflect CBCU on the following sub-basins:

    - **Driftwood Creek**
    - **Frenchman Creek**
    - **Guide Rock Diversion Dam**
    - **North Fork Republican River**
    - **South Fork Republican River**

- **Riverside Canal Issues.** A portion of the return flows from the Riverside Canal drain back into the Frenchman Creek sub-basin below the gaging station for the sub-basin. The return flows should be added to the stream gage in the accounting, and the Main Stem accounting should be modified accordingly.

The above issues, with the exception of the Riverside Canal return flow issue, were previously submitted to the RRCA via then-Commissioner Ann Bleed's letter addressed to Colorado and Kansas dated February 22, 2008. All of the issues were submitted to discussion of the RRCA in a binder provided by the State of Nebraska at the March 11 and 12, 2008 Special Meeting of the RRCA.

I, as Commissioner to the RRCA for the State of Nebraska, shall bring the above fast-track issues to be addressed by the RRCA after Reasonable Opportunity to investigate and act on this request at the previously scheduled May15-16, 2008 Special Meeting of the RRCA. As stated above, the State of Nebraska has previously provided the above issues and supporting documentation to the RRCA and such previously provided documents are incorporated into the above matter. Upon receipt of this letter by the Commissioners of Kansas and Colorado this matter shall be deemed Submitted to the RRCA.

I am formally raising these issues at this time solely to protect the interests of Nebraska water users and to assure that these issues are addressed by the RRCA in a timely manner. It is important to resolve these issues in a timely manner in order that current compliance may be properly accounted for and future depletions to the stream may be accurately estimated.

I, and my staff, remain ready to discuss any remaining issues with the States of Kansas or Colorado at any time and I am prepared to consider a different schedule for the RRCA to address this matter, however I am not willing to commit to other than a fast-track schedule at this time. If you have any questions regarding these matters please call me at (402) 471 – 2366.

Sincerely,

Brian P. Dunnigan

Brian P. Dunnigan, P.E.
Acting Director

Cc: Justin Lavene, Nebraska Attorney General's Office
Aaron Thompson, U.S. Bureau of Reclamation
James DuBois, U.S. Department of Justice
Colonel Roger Wilson, Jr., U.S. Army Corps of Engineers

Attachment 3

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER RESOURCES

Bill Ritter, Jr.
Governor

Harris D. Sherman
Executive Director

Dick Wolfe, P.E.
Director/State Engineer

April 11, 2008

David Barfield, P.E.
Kansas Commissioner, Republican River Compact Administration
Kansas Chief Engineer
Kansas Department of Agriculture
109 S.W. 9th Street
Topeka, KS 66612-1280

Brian P. Dunnigan, P.E.
Chairman and Nebraska Commissioner, Republican River Compact Administration
Acting Director
Nebraska Department of Natural Resources
301 Centennial Mall South, 4th floor
P.O. Box 94676
Lincoln, Nebraska 68509-4676

VIA HAND DELIVERY

Re: Fast-Track Issue Submittal to the RRCA

Pursuant to Section VII.A.3 of the Final Settlement Stipulation, *Kansas v. Colorado and Nebraska*, No. 126 Original (December 15, 2002), the State of Colorado hereby raises the following issue for RRCA determination as a "fast-track" issue:

> Pursuant to Section III.B.1.k of the Final Settlement Stipulation, approval of the State of Colorado's plan to offset stream depletions by introducing water directly to the stream.

I, as Commissioner to the RRCA for the State of Colorado, shall bring the above fast-track issue to be Addressed by the RRCA after Reasonable Opportunity to investigate and act on this request at the previously scheduled May 15 – 16, 2008 Special Meeting of the RRCA. The State of Colorado has previously provided the above plan and supporting documentation to the RRCA and such previously provided documents are incorporated into the above matter. Upon receipt of this letter by the Commissioners of Kansas and Nebraska this matter shall be deemed Submitted to the RRCA.

April 11, 2008
Commissioner Barfield
Commissioner Dunnigan

As you are both aware, the RRCA has had productive discussions with Nebraska and Kansas regarding this plan and I look forward to a continuing dialog on the outstanding issues regarding this plan. I am formally raising this issue at this time solely to protect the interests of Colorado water users and to assure that this complex issue is Addressed by the RRCA in a timely manner. I remain confident that Colorado can address all remaining issues through our continuing discussions among the States prior to the May 15 – 16, 2008 meeting. I, and my staff, remain ready to discuss any remaining issues with the States of Kansas or Nebraska at any time and I am prepared to consider a different schedule for the RRCA to address this matter, however I am not willing to commit to other than a fast-track schedule at this time.

Thank you for your consideration of this issue and, as always, please contact myself or members of my staff with any additional questions or concerns you may have regarding this plan in advance of the May 15 – 16, 2008 meeting so we can respond in a timely matter to allow the RRCA a Reasonable Opportunity to investigate and act upon this request.

Sincerely,

Dick Wolfe
Colorado Commissioner
Director / State Engineer

cc: Jim Duboise, via U.S. Mail

ATTACHMENT I

AGENDA

ANNUAL MEETING OF THE RRCA

AUGUST 13, 2008
LINCOLN, NEBRASKA

AGENDA FOR

48TH ANNUAL MEETING OF THE REPUBLICAN RIVER COMPACT ADMINISTRATION

August 13, 2008, 8:30 AM-12:00 NOON
Downtown Holiday Inn, Lincoln, Nebraska

1. Introductions
2. Modification and Adoption of the Agenda
3. Approval of Previous Annual Meeting Minutes from August 15, 2007
4. Report of Chairman and Commissioner's Reports
    a. Nebraska
    b. Colorado
    c. Kansas
5. Federal Reports
    a. Bureau of Reclamation
    b. U.S. Army Corps of Engineers
    c. U.S. Geological Survey
6. Committee Reports
    a. Engineering Committee
        i. Assignments from 2007 Annual Meeting
        ii. Committee Recommendations to RRCA
            1. Proposal for redistributing return flows from Riverside Canal
            2. Proposal for moving groundwater model cell accounting point near Guide Rock
        iii. Other matters
        iv. Recommended assignments for Engineering Committee
    b. Conservation Committee
    c. Arbitration Process Update
7. Old Business
    a. Legal issue: RRCA regulation regarding the approval of a diversion in one state that is used in another state
    b. Lower Republican Feasibility Study
8. New Business and Assignments to Compact Committees
    a. Action on Engineering Committee Report and assignments
    b. Additional Items
9. Remarks from the Public
10. Future Meeting Arrangements
11. Adjournment

ATTACHMENT J

TRANSCRIPT

ANNUAL MEETING OF THE RRCA

AUGUST 13, 2008
LINCOLN, NEBRASKA

48TH ANNUAL MEETING OF THE
REPUBLICAN RIVER COMPACT ADMINISTRATION

Downtown Holiday Inn
Lincoln, Nebraska

Convened, pursuant to notice at 8:47 a.m.

on August 13, 2008,

BEFORE:

CHAIRMAN BRIAN DUNNIGAN, Acting Director (NE); COMMISSIONER DAVID BARFIELD,(KS), and COMMISSIONER DICK WOLFE (CO).

A P P E A R A N C E S

For the State of Nebraska: Justin Lavene
Assistant Attorney General
2115 State Capitol
P.O. Box 98920
Lincoln, NE 68509

For the State of Colorado: Pete J. Ampe
First Assistant Attorney General
Office of the Attorney General
1525 Sherman Street,
7th Floor
Denver, CO 80203

For the State of Kansas: John M. Cassidy
Assistant Attorney General
Office of Attorney General
120 SW 10th Avenue
2nd Floor
Topeka, KS 66612-1597

- - -

Kelly S. Horsley, CERT-ER
ACE Reporting, NE
(402) 416-4882

OTHERS PRESENT FOR NEBRASKA:

Brad Edgerton, Republican River Basis Field Office Supervisor; James R. Williams, Republican River Coordinator.

OTHERS PRESENT FOR KANSAS:

Scott Ross, Water Commissioner, Stockton Field Office.

OTHERS PRESENT FOR COLORADO:

Kenneth W. Knox, Ph.D., Engineering Advisor; Megan A. Sullivan, Engineering Advisor.

- - -

Kelly S. Horsley, CERT-ER
ACE Reporting, NE
(402) 416-4882

I N D E X

REPORTERS CERTIFICATE:

I, KELLY S. HORSLEY, reporter for ACE REPORTING, certify that I reported the proceedings in this matter; that the transcript is a true, accurate and complete extension of the recording made of those proceedings.

IN TESTIMONY WHEREOF, I have hereunto set my hand at Lincoln, Nebraska, this _____day of August, 2008.

_____

_____Reporter

- - -

PROCEEDINGS:

CHAIRMAN DUNNIGAN: Welcome to Lincoln. At this time I'd like to call the 48th Annual Meeting of the Republican River Compact Administration to order.

My name is Brian Dunnigan, and I'm the Acting Director of the Department of Natural Resources and serve this year as the Chairman of the Republican River Compact Administration.

Before I introduce my staff, I want to recognize some of our Nebraska partners in the audience, NRD managers: John Thorburn, Jasper Fanning, Mike Clements and Dan Smith. I would also like to recognize some of our irrigation district managers: Roy Patterson, representing the Frenchman-Cambridge Irrigation District; Don Felker, Frenchman Valley and H&RW; and Jim Miller, Nebraska Boswick. Thank you for coming.

I'll introduce our staff here at the table, and then I will look for Commissioners Wolfe and Barfield to introduce their staff.

To my immediate left is Justin Lavene from the Attorney General's Office. To my immediate right is Brad Edgerton and Jim Williams.

Commissioner Barfield?

COMMISSIONER BARFIELD: My name is Dave

Barfield. I'm chief engineer with the Division of Water Resources and Compact Commissioner for Kansas. To my immediate left is Scott Ross, our engineering committee member; and to his left is John Cassidy, with our Attorney General's Office, who sort of represents us with the ad hoc legal committee such that it exists, and it does not exist. And also for Kansas, we have David Pope, our former chief engineer; Dale Book, our engineering consultant in Denver; Lee Rolfs, attorney for -- well, former attorney with the Department of Agriculture. And, let's see. George Austin is back there somewhere, consultants; Sam Perkins on my staff; and Mark Billinger, with our field office.

CHAIRMAN DUNNIGAN: Commissioner Wolfe?

COMMISSIONER WOLFE: Thank you, and good morning. Dick Wolfe, state engineer for the state of Colorado.

I would like to welcome representatives from the state of Colorado here today. To my immediate right, Ken Knox and Megan Sullivan, engineering advisors for the State of Colorado; Peter Ampe, far right, from the Attorney General's Office, State of Colorado. We've also got representatives, some of our consultants here. One of them, William

Schreuder, who's in the back, a consultant for the state of Colorado. I would also recognize the folks from the Republic River Water Conservation District: Dennis Coryell, Tim Pautler and their counsel, David Robbins. I would also like to recognize some other water user interest from Colorado. They're here today. Mike Adamson, who's with the Pioneer Irrigation District; Tony Magnus, from South Fork; Roger Brenner and some of his board members from the Arikaree Ground Water Management District. And I think that's all I would like to recognize at this point. I hope I didn't miss anybody.

CHAIRMAN DUNNIGAN: Okay. I think we have enough time this morning, and I think the group's small enough. I would like to just take a minute and maybe go around the audience for those that have not been introduced. I would like you to stand up and introduce yourself and who you representing, and I'll start with Aaron.

(Introduction of people in audience.)

CHAIRMAN DUNNIGAN: Thank you. There were agendas as you came in the door. If you didn't pick one up, please feel free to pick up an agenda.

Agenda Item 2, I would ask for any modifications to the current agenda.

COMMISSIONER BARFIELD: Mr. Chairman, I don't have any changes, just clarification. So, as I understand it, we will discuss the follow up and next steps related to our disputes regarding remedies of Nebraska's violations for water short year, 2005/2006, under item 6c, the arbitration process update, is that correct?

(No response.)

That's where -- you know, last year and through the course of this year, we spent a lot of time working on the violations that Kansas alleges, and that's where that item will be discussed, is that correct?

CHAIRMAN DUNNIGAN: Commissioner Barfield, I was actually thinking that that might be under item 8(b). The arbitration process update was going to be by the attorneys that --

COMMISSIONER BARFIELD: No. I understand it's going to be by the attorneys, but we'll be talking about last year's violations at 6(c). And, again, the attorneys will provide that update --

CHAIRMAN DUNNIGAN: Yes.

COMMISSIONER: -- because of where it is. And then I will be addressing the new violations under item 8(b), just to make clear how the agenda is

going to flow.

CHAIRMAN DUNNIGAN: Thank you. So noted.

I would ask for a motion to approve the agenda.

COMMISSIONER BARFIELD: I would move we approve the agenda.

COMMISSIONER WOLFE: Second.

CHAIRMAN DUNNIGAN: All in favor?

COMMISSIONER WOLFE: Aye.

COMMISSIONER BARFIELD: Aye.

CHAIRMAN DUNNIGAN: Agenda approved.

I would move to prove the annual minutes -- annual meeting minutes from the August 15th, 2007, meeting.

COMMISSIONER BARFIELD: I would second that motion.

CHAIRMAN DUNNIGAN: All in favor?

COMMISSIONER WOLFE: Aye.

COMMISSIONER BARFIELD: Aye.

I would note that we brought some extra copies and have just put them back, a limited number of extra copies back at the entrance of the room.

CHAIRMAN DUNNIGAN: Agenda Item 4 is report of the chairman and the commissioners' report. Nebraska will start, followed by Colorado, then

Kansas.

During 2007 and 2007 Nebraska has made significant progress toward compliance with the Republican River Compact. The citizens of the state have worked together with natural resources districts, surface water irrigation districts and the Department of Natural Resources to decrease consumptive use in the water in the basin. These efforts have been aided by high rainfall during both 2007 and 2008, and we have seen stream flow recover as a result.

New integrated management plans have been approved in the Lower, Middle and Upper Republican Natural Resources Districts. Allocations were decreased in all three districts and additional measures were put in place to ensure compliance by decreasing the consumptive use.

The State of Nebraska and the three primary natural resources districts paid substantial amounts during 2007 for the leasing of water rights within the Republican Basin. These purchases were described during the annual meeting last year. We estimate that dry-year leasing of surface water decreased Nebraska's consumptive use by more than 50,000 acre-feet during 2007 and provided more than 39,000 acre-

feet that was available for use by Kansas.

Nebraska is pleased to report that Water-Short Year Administration was not in effect in the Republican River Basis during 2008. While not required by the Final Settlement Stipulation, Nebraska carried out the following measures in order to ensure avoidance of a water short year during 2008 and make more water available for downstream use.

The Riverside Canal Company agreed to forego diversion from Frenchman Creek during the 2008 irrigation season. The diversion is immediately above the confluence of Frenchman Creek and the Republican River. That action ensured maintaining 2,000 acre-feet in the river above Harlan County Lake, which would have otherwise been diverted into Riverside Canal. This significantly reduced Nebraska's consumptive use of water in the Frenchman sub-basin.

A second agreement above Harlan County Lake was made with Frenchman Valley Irrigation District. The district's Culbertson Canal diverts from Frenchman Creek above the Riverside Canal head gate near Palisade, Nebraska. An estimated 8,000 acre-feet remained in the river above Harlan County Lake, which would have otherwise been diverted into the

Culbertson Canal. This will also reduce Nebraska's consumptive use of water in the Frenchman sub-basin. Frenchman Cambridge Irrigation District also agreed to not divert water to the Cambridge Canal until June 22, 2008, in order to increase water stored in Harlan County Lake prior to June 30th, 2008. An estimated additional 5,000 acre-feet were therefore available for storage in Harlan County Lake that would have otherwise been diverted. All together these measures have done more than avoid water short year status. As of early August, 2008, more than two cubic feet per second of purchased Frenchman Creek water was arriving at Guide Rock for delivery to Kansas.

Funds for dry-year leasing of surface water totaling about $1.63 million during 2008 were provided by the Nebraska Legislature through the Water Resources Cash Fund created by LB 701 in 2007 and replenished by the Legislature -- legislative appropriation. LB 701 was a comprehensive water law previously reported to the Republican River Compact Administration, which also enabled the Natural Resources District to levy additional taxes for direct local support of measures to be taken for compact compliance.

A lawsuit challenging the taxation

authority provided by LB 701 was immediately filed hampering payments for contracts for $9 million made by natural resources districts with surface water irrigators to obtain rights to reduce consumptive use of water in the basin in 2007.

The Legislature responded with the passage of LB 1094 in 2008 creating a mechanism for ensuring immediate payment with the $9 million of state funds for those obligations made in 2007 by the Natural Resources District for the purposed of compact compliance.

Should the challenge to LB 701 prove successful, we anticipate the Legislature will take immediate action to provide a viable local funding option to implement the authorities of the IMP. While the current IMPs are sufficient to meet the current needs, with the challenge to LB 701, the Department and NRDs feel that it is important to investigate other options and further regulations that can be incorporated into future plans addressing water short years.

A comprehensive planning approach for riparian vegetation was put in place by LB 701 in 2007. The law created a task force committee and included $2,000,000 per year for management of

invasive species in the state. The task force contracted for $1.58 million of services in 2008 to remove excessive phreatophytes along the Republican River and provide public education efforts in the basin for assisting and improving water flow. While the program has been in place for only one year, the initial results have been excellent.

The State continues to participate in a number of other activities reported in prior years. These activities include continuing to participate in the Conservation Reserve Enhancement Program and the Environmental Quality Incentives Program, which have removed almost 38,000 acres from production in the Republican River Basin. The State continues to explore stream augmentation. The State, together with the Republican Basin Natural Resources Districts, has devoted approximately $1,000,000 in funding for stream flow augmentation plans and engineering. Nebraska continues to take an active role with the compact administration engineering committee and is working with other states to develop more accurate accounting methods.

Nebraska will comply with the Republican River Compact. The State has a comprehensive multifaceted approach to reduction of water

consumption in the basin and will continue to work together with Colorado and Kansas to resolve issues on the Republican River.

At this point, I would like to turn to Brad Edgerton to give the water administration activities in Nebraska for calendar year 2007.

MR. EDGERTON: Thank you, Brian.

On August 25th, 2006, the Bureau of Reclamation placed a call on all appropriated reservoirs located above Swanson Lake, Enders Reservoir, Hugh Butler Lake and Harry Strunk Lake. This call continued into 2007.

Harry Strunk Lake filled in March, 2007, and those junior reservoirs upstream of Harry Strunk Lake were opened. On March 8, 2007, letters were sent to all junior permit holders between Harlan County Lake and Guide Rock Diversion Dam informing them of the potential for water short year administration during 2007.

Shortly after a high water event on Frenchman Creek, the Department of Natural Resources declared the dam at Champion Lake to be unsafe. On June 15th, 2007, an order was issued to evacuate all the storage water in that facility. That order remains in effect today.

On June 30th, 2007, the irrigation supply in Harlan County Reservoir was estimated by Reclamation to be less than 130,000 acre-feet. On July 4th, 2007, senior permits were regulated and closing notices were issued to all permits junior to February 26, 1948, located between Harlan County Lake and the Guide Rock Diversion Dam as provided by the Republican River Compact Final Settlement Stipulation. This order was lifted on August 25, 2007.

Pioneer Irrigation District irrigated with a limited supply during 2007. Meeker-Driftwood, Culbertson extension, Red Willow and Bartley canals did not divert due to a shortage of storage water.

Surface water irrigators on Culbertson, Riverside, Cambridge, Naponee, Franklin, Franklin Pump, Superior and Courtland Canal were compensated not to irrigate in 2007. The estimated consumptive use portion of Culberton and Riverside Canal's natural flow was protected through Harlan County Lake. A total of 26,000 acre-feet was released from Harry Strunk Lake during the irrigation season and the estimated consumptive use portion of that water was protected to Harlan County Lake. The State of Nebraska leased the rights to 12,500 acre-feet of

Nebraska Bostwick's storage water supply. This water was available for use by Kansas Bostwick Irrigation District. In addition to the 12,500 acre-feet of storage water, all of the natural flow available at Guide Rock Diversion Dam was made available to Kansas Bostwick. All natural flow permits located upstream of Harlan County Reservoir and downstream of Guide Rock Diversion Dam were regulated to their legal limit during 2007. Thank you.

CHAIRMAN DUNNIGAN: Thank you, Brad.

Commissioner Wolfe?

COMMISSIONER WOLFE: Thank you, Commissioner.

First, I would like to just update folks on the -- some of the hydrologic conditions that occurred in Colorado in 2007 and then briefly talk about some of the activities that are going on in the basis that I previously provided to you in prior meetings and then some efforts that are underway by Colorado, in terms of meeting compact compliance.

First, in some of the hydrologic conditions that occurred in the basin in 2007, just to put some of these in perspective, total recorded stream flow in the North Fork state line was 20,560 acre-feet. This is 10,420 acre-feet less than the 1935 to 2006

annual average of 30,980 acre-feet.

Total recorded stream flow in the South Fork in 2007 near Benkelman was 674 acre-feet, an improvement over the previous three years when there was no recorded flow. And for context, the 1938 to 2006 annual average is 27,000 acre-feet.

Total recorded stream flow on the Arikaree state line was 1,330 acre-feet, which is a significant decline from the 12,920 acre-foot annual average for the period 1933 to 2006. Active storage in Bonny Reservoir as of Sunday, August 10th, 2008, was 10,030 acre-feet. For context, the capacity at the top of the conservation pool was 41,340 acre-feet, and the reservoir is designed to hold 170,160 acre-feet at the top of the flood pool at full capacity.

I would like to give a little update in regards to the Pioneer Ditch litigation that I briefed you on previously. Just a brief overview of this again. The plaintiffs initiated this action alleging injury to their senior surface water rights requesting curtailment of wells in the Northern High Plains Basin. The motion for summary judgment and request for determination of law was brought before the Colorado Ground Water Commission, which was

subsequently referred to the Yuma District Court. On July 23, 2007, Judge Connie Peterson remanded the matter back to the Commission for an evidentiary hearing in conclusions and findings consistent to meet her order.

The hearing officer, Joseph Grantham, scheduled a three-week hearing that was commenced on this matter in June of 2008. However, it is my practice to seek mutually acceptable resolutions whenever possible. And I believe one could be achieved in this matter if all the responsible parties were willing to discuss their respective positions in an open format.

The parties to the lawsuit and others representing major water user interest within the Republican River Basin in Colorado agreed, and we participated in a multi-day negotiations that successfully completed in a brokered interim agreement that prompted a stay in the hearing.

It is an interim agreement in the sense that the majority of the surface watered versions in the North Fork of the Republican River flooding that portion of the Pioneer Ditch for use within in Colorado were leased and the water diversions were curtailed in these structures as of June 5th, 2008,

for the remainder of the irrigation year.

The Yuma County water authority and others are currently working towards the long term and permanent purchase of the surface water rights that were described to the RRCA commissioners in my June 6th, 2008, letter.

The leaders in Yuma County are seeking to pass a bond issue within the county to generate sufficient funds to purchase the surface water rights. And the Pioneer case has been stayed until February of 2009 to allow sufficient time and opportunity to conclude this matter.

As far as actions that Colorado has taken towards compact compliance, first, I would like to report on the efforts in the part of land use retirement programs that's sponsored through the CREP and EQIP with the state of Colorado in cooperation with the Republican River Water Conservation District. In 2007 there was multiple parts of this program. I'll just report the respective acres as regards to the three-year, five-year and permanent lease programs. As far as the three-year lease program under the E, there were 1,203 acres; as part of the five-year lease program, 2,258 acres; and part of permanent retirement underneath the EQIP program

in 2007, there were 6,177 acres.

As part of the CREP program in 2007, this is all part of the efforts with the Republic River Water Conservation District to have a permanent dry-up of these acres. In 2007 there were 17,194 acres.

A couple of other programs that the district has and part of some lease programs for conservation measures, there was a one-year lease for 206 acres in 2007. And then as I mentioned as part of the Pioneer Laird lease, that resulted in an additional 1830 acres conservation dry-up during 2007.

The district in Colorado is seeking to complete the 30,000 acres originally in the CREP program and filed for an addendum for an additional 30,000 acres. And all of this is within four miles of the stream system.

The second effort measures that are ongoing in regards to compact compliance by Colorado is regards to our Republican River Compact rules. The Office of the State Engineer initiated the process to promulgate rules and regulations governing the diversion, use and control of water resources in the Republican River Basin for compliance within the Republican -- with the Republican River Compact. The

rules, if necessary, will assist water administration officials in meeting Colorado's obligations under the Republican River Compact through curtailment of surface water diversion, groundwater pumping and out of priorities reservoir storage. At this juncture I continue to receive comments on the rules and will thoughtfully consider what the next steps may be in the context of moving forward with these compact rules or holding them in abeyance in perspective of our other efforts that included land retirement in the augmentation planning currently under consideration by the RRCA.

As far as the measurement rules, we continue to progress on adopting rules to govern the measurement of groundwater diversions in the Republican River Basin within Colorado. The rules will assist in securing accurate groundwater pumping information and authorize need to make and enforce such regulations with respect to deliveries of water as will enable the state of Colorado to meets its compact obligations. The draft rules were completed and a public hearing was held on July 2nd, 2008, in Ray, Colorado.

After receiving testimony and considering the evidence, the hearing officer adopted the rules

on July 14th, 2008, and essentially required the installation of a flow measuring device on all wells greater than 50 gallons per minute within the Republican River Basin by March 1st of 2009.

We are currently in the process of building the staff and resources to implement and enforce these rules by the next irrigation season.

As far as the augmentation plan compact compliance pipeline that I briefed you on in our previous meetings, the Final Settlement Stipulation in Kansas v. Nebraska and Colorado No. 126 original authorizes the state of Colorado to develop an augmentation pipeline that may be used to offset consumptive use. The principal of the augmentation or compact compliance pipeline is to permanently retire groundwater irrigated lands that are located several miles distant from the near stream and convey the groundwater pump from those wells via pipeline to a compact gaging station.

On March 12, 2008, in a special meeting before the Republican River Compact Administration, the state of Colorado offered a proposed augmentation plan and accounting procedures for approval by the compact administration.

We have participated in several

informational and technical meetings with our colleagues from Kansas, Nebraska. Since then have provided you with information you requested to the best of our abilities including as of recently as yesterday.

I would like to mention that we've offered representatives from within Colorado to participate in these negotiation meetings to seek their buy-in as part of this process. And we appreciate the effort and support of the Republican River Water Conservation District in that matter, as well as other water users who have agreed to participate in that -- in those negotiation discussions.

The augmentation plan and compact compliance pipeline is a long term solution to aid in meeting the compact obligations of Colorado. We continue to ask for approval of the augmentation plan and will continue to work with you towards a successful conclusion of this matter.

In summary, Colorado, in cooperation with other entities such as the Republican River Water Conservation District, is implementing a series of several discreet actions that will collectively serve to meet our obligations under the Republican River Compact. The actions are, one, promulgation and

adoption of rules that require installation of measuring devices on groundwater wells; secondly, the implementation of the irrigation land retirement programs, including the Pioneer Laird acreage that I described; three, construction and operation of the compact compliance pipeline that will operation in performance with the augmentation plan hopefully approved by the RRCA; and, fourth, proposed operations of Bonny Reservoir to achieve compact compliance.

All of these actions are being done in collaboration and cooperation of the affected state holders, including federal, state and local entities. Our goal is to seek and achieve buy-in of all the water users in the basin. As you can see by the number of water user interest here today, we stand united to solve Colorado's compact compliance issues in a timely manner. We appreciate the cooperation by Kansas, Nebraska in helping us achieve this goal.

Thank you. That's my report.

CHAIRMAN DUNNIGAN: Thank you, Commissioner.

Commissioner Barfield?

COMMISSIONER BARFIELD: Thank you. Let me start by just brief references to sort of climatic

conditions in Kansas, which are sort of similar as well after years of drought over much of our state and very unusual weather in 2007 that included a severe winter storm, an FI tornado that devastated Greensburg, Kansas, and severe floods in southern and southeastern Kansas. 2008, by comparison, has been somewhat milder and near normal. Precipitation in Kansas ranged quite widely though with the southeast part of our state in very wet conditions in southwest Kansas and parts of western Kansas still having significant deficits in terms of precipitation.

Stream flow and reservoir levels are currently near normal to above average through much of our state, again, with the western part still being somewhat dry.

It's been a practice to provide a bit of a legislative update, and so I would like to just report on three items from our legislature.

One bill that's got a lot of attention is related to something we call intensive groundwater use control areas. In parts of our state where the amount of appropriation exceeds recharge and we're seeing declines, this particular provision of statute allows for a hearing process and what are called corrective control provisions to sort of improve

management of those particular areas. Over the last two sessions, as well as an interim session, there's been a lot of discussion about potential ways to improve some of the processes related to the hearing and so forth. The Legislature, again, this last session in 2008, was unable to pass a bill between the two chambers. As a result, I am in the process of promulgating administrative regulations to codify much of the agreement of the legislative bodies related to improved processes for intensive groundwater use control areas or IGUCAs, as we call them.

That senate bill 89 was passed by the Legislature this past year. It deals with how any money that would be recovered as a result of the litigation with respect to violations of the Republican River Compact and how they would be utilized. This is similar to a legislative bill passed in 1997 where our legislature looked ahead and saw the potential for recovery of damages on the Ark River litigation. And the Legislature desired that if that would occur that the money would not go just into our general fund but it would be utilized for specific purposes and specifically to provide a degree of relief and improve water management in the

affected areas. And our legislature decided they wanted to do the same thing in the case of the Republican, and so they passed this bill that would prescribe, if money is recovered from either Colorado or Nebraska, that -- where that money would go and how it would be utilized. Again, that's our house -- senate bill 89.

And another very interesting bill, our house bill 2860 that is a result of a municipality, specifically, a public wholesale water supply district seeking to use eminent domain to obtain water. And that got the attention of area landowners because we limit our appropriations to sort of a sustainable yield on that area. And they were quite concerned about an entity outside coming in to secure water. That bill would prohibit the chief engineer, myself, from approving an application in that area for two years to give the Legislature an opportunity to review the use of eminent domain for such purposes.

Update on litigation, Kansas v. Colorado on the Ark River. We've been reporting on this a long time. It's been near concluding for what seems like decades now. We've been saying it's almost done, but on January 31st, 2008, the Special Master submitted

his fifth and final decree. He made it very clear that it was his final submittal to the U. S. Supreme Court. That basically proposed the final decree that summarizes basically the case and how we will determine compliance, how the HI model will be run and so forth. Hopefully, when the Court adopts that, it will conclude our lengthy, costly litigation between the two states that started in 1985. The Court, as is there -- well, as they frequently do, invited the states to fill exceptions to the Special Master's report, and there was only one exception, which is not to the actual decree that is included in the Special Master's report, but to -- how costs were awarded. The Supreme Court has indicated it will hear that before the end of the year. And so, hopefully, at the next annual meeting, we can report the conclusion of that litigation.

In addition, under litigation, the Kickapoo Tribe, in northeast Colorado, in 2006 filed suit against several federal, state and local units of government for failing to build a reservoir on Plum Creek within the reservation. The tribe feels strongly that reservoir is needed for a reliable water supply. The watershed district was not able to condemn properties to construct that reservoir, and

so the tribe filed litigation. While our department is not named in the suit, we likely will play an important role, if quantifying the tribe's water right is a part of the settling of that case, which may be the case. So, that would be our first settlement of a tribal water right if, in fact, that occurs.

In terms of Republican River matters, you know, Kansas proposed northwest Kansas to new surface water rights and alluvial groundwater rights in 1984 and has had a very restrictive policy with regard to new rights elsewhere in the basin as well. So, we have not had to take a lot of action, in terms of curtailing use, because of -- because that action has kept us within our compact allocations.

We are also working on improving our measuring, as you all are reporting on. While we required all surface water users on alluvial groundwater users to be metered in 1987, we're currently in the third year of a four-year program with our northwest Kansas groundwater management District No. 4 to meter all high capacity wells. We are over 80 percent of those points of diversion being metered and checked at this point.

We are also using a new state program

that's similar to CREP and EQIP. We use the acronym water TAP. It stands for the Water Right Transition Assistance Program. It's a pilot program authorized in 2006 by House Bill 2710. That creates voluntary incentive base to retire water rights. And we're targeting the Prairie Dog Creek for that program just, again, to provide additional buffer in terms of our compliance. The program has not had a lot of use in the agency to sort of -- responsible for administering that program. It's looking into ways to improve participation in that program at this time.

So, that concludes my report.

CHAIRMAN DUNNIGAN: Thank you, Commissioner Barfield.

Moving on to Agenda Item No. 5, Federal Reports. I would ask Aaron Thompson from Reclamation to give that report. And if you would come up to the seat here by the court reporter. We'll also provide another mike for you to give your report. Thank you.

MR. THOMPSON: Thank you, Commissioner.

My name is Aaron Thompson. I'm here with the Bureau of Reclamation.

THE REPORTER: Spell your name, please.

MR. THOMPSON: A-a-r-o-n T-h-o-m-p-s-o-n.

We have previously introduced the other reclamation folks with us.

I would just like to give a brief update on some studies and some drought assistance relief that we've provided.

Lower Republican feasibility study, this is a study that was requested and supported by the states of Nebraska and Kansas through their congretional delegations. I want to thank you for your support and your continued effort to obtain funding, which is necessary to initiate the study.

The Frenchman Valley appraisal study, this is a study to evaluate the alternatives in the basin for water demands, a key to availability.

The draft schedules -- the draft appraisal study report is to be mailed to our partners: DNR, NRDs, irrigation districts, Nebraska Game and Park on August 15th. Final report is scheduled for October 1st, 2008.

In our drought program, legislation that was passed in 2006, which is extending the drought program authority to 2010; Kansas drought assistance from 2007 and '08. We provided funding to assist Kansas water office for 10 additional automated weather stations in Kansas.

In Nebraska drought assistance from '07 to '08, we provided funding for flow meter cost share. Funding assistance to North Platte, South Platte, Upper Niobrara White NRDs to cost share on flow meter installations to improve data collection.

We also had drought assistance for municipal wells for the city of Mason City and Stockville, $160,000 each. Installation is expected in the fall of 2008.

Our water 2025 programs, currently the Bostwick Irrigation District in Nebraska and Kansas Bostwick Irrigation District No. 2 are just over the million dollar mark for varied laterals.

Our water conversation programs, we continue to have demonstration projects, limited irrigation demonstration projects with UNL extension across Nebraska led by Steve Melvin. Field days are being held in August and September.

And I would also like to highlight our water for America initiative. Starting in October of 2008, reclamation in the USGS world partner in implementing this new initiative which will address increasing demands on limited water supplies. The focus points will be a plan for our nation's water future and expand project in conservation water for

the future. There is a draft letter that was issued by our commissioner on July 17th to our external customers requesting comments by August 18th.

For our hydraulic data, I'll turn the mike over to Marv Swanda from our McCook field office.

CHAIRMAN DUNNIGAN: Marv, before you start, I want to make sure that we have -- that people can hear in the back. It seems that the mike is working. Can everybody hear the speakers?

(Affirmative gesture.)

CHAIRMAN DUNNIGAN: Okay, thank you.

MR. SWANDA: Thank you. My name is Marv Swanda.

THE REPORTER: S-w-a-n-d-a?

MR. SWANDA: Yes, just like it sounds.

And I would like to give a report on -- I'll kind of go over the 2007 operational data on the reservoirs in the basin, federal reservoirs, and then touch on where we are in 2008. And most of this -- and more information is contained in this report that I think we shared with the front table here, and there's handouts over there on the table coming in.

Anyway, in 2007, precip in the Republican River Basin varied from 90 percent normal at Bonny Dam to 130 percent of normal at Enders Dam. And

total precip at the dams ranged from around 15-and-a-half inches at Bonny to over 31 inches at Lovewell. Our inflows varied from 68 percent of most probable forecast for Bonny to 191 percent of the most probable at Harry Strunk Lake.

Irrigation district, the leverage in 2007, there were just three different canals that were operated; most did not, for various reasons, also, because of short water supplies. The ones that did was Almena delivered around one inch of water. And Kansas Bostwick, above Lovewell, delivered just over five inches; and below Lovewell, around seven inches.

In 2007 Bonny started the year 21 feet below the top of conservation. Below normal in flows reported -- were reported during every month of the year. We released 1359 acre-feet to the river from May 22nd through June 5th, as directed by the state of Colorado. And we also released around 87 acre-feet to the Hale Ditch for irrigation purposes. A new historical low reservoir elevation was reached in December of 2007. And at the end of the year, we finished 23-and-a-half feet or so before the top of conservation.

At Enders we started the year in 2007 over 26 feet below the top of conservation. Storage water

was not released from Enders for either Frenchman Valley or H&RW irrigation districts. This was the sixty consecutive year for the H&RW not to deliver water. Frenchman Valley also did not divert water in 2007.

At Swanson we started the year with reservoir 20 feet below full. Hugh Butler was 18-and-a-half feet below full; and Harry Strunk, just about 8 feet below the top of conservation. Releases were not made from Swanson or Hugh Butler Lakes to the Meeker-Driftwood units or Red Willow canals. This is the fifth consecutive year for those two. Harry Strunk Lake reached the top of conservation on April 23rd and peaked with an elevation that was about 6 foot -- 6 feet into the flood pool on June 3rd. There was big storm events that occurred towards the end of May in 2007. Frenchman-Cambridge Irrigation District entered into an agreement with the Republican River Basin Coalition to purchase 26,000 acre-feet of water in 2007.

At Keith Sebelius Lake, the lake elevation at the beginning of the year was 18 feet below the full level. Irrigation releases were made from the lake in 2007. And in July of 2007, the Kansas Department of Wildlife and Parks and the district

entered into an agreement to maintain a minimum pool at the lake.

At Harlan County in 2007, the beginning elevation was 19 feet below the top of conservation. Inflow for the year total, just over 198,000 acre-feet. Irrigation diversions were not made for the Nebraska Irrigation District in 2007. There was an agreement with the Nebraska Department of Natural Resources with the district to purchase the water supply for 2007. Reclamation did project a water-short year. That would put administration in effect. That was on June 30 with available irrigation supply of 111,700 acre-feet.

For Lovewell, the reservoir started six-and a half feet below the full level. The reservoir failed on April 25th. And at the end of the year, we finished just a foot-and-a-half down in 2007.

Currently, I'll kind of go through the same reservoirs and quickly touch on each one of them.

At Bonny Reservoir, the reservoir is about 21 feet below the top of full. We're about 1 foot above where we were last year at this time.

At Swanson, the lake is currently 14-and-a-half feet from the full level. We're about 1.2 feet above last year at this time. The precip we've had,

about 108 percent of normal out there. Frenchman-Cambridge Irrigation District is not irrigating this year from Swanson Lake. This is the sixth consecutive year due to the low water supply available from there.

And Enders, the lake level at the current time is 20.5 feet below the full level. The reservoir level is 3.8 feet below where we were last year at this time. Due to the short water supply, H&RW Irrigation District is not irrigating for the seventh year in a row. And for the fifth year in a row, Frenchman-Valley is not taking storage water from the lake.

Hugh Butler storage in the Hugh Butler Lake is about 6-and-a-half feet below full level at this point. We've had about 18 inches of precip out there at this point this year, which is 143 percent of normal. The lake is just three-tenths below where we were last year at this time. We are making irrigation releases from Hugh Butler for diversion into Red Willow Canal. That is the first time Red Willow Canal has delivered since 2002.

At Harry Strunk, we are currently less than a foot below the top of conservation. The lake filled towards the end of April, and we increased

almost 8 feet into the flood pool by May 25th due to big storms occurring from May 22th through the 24th. Frenchman-Cambridge is irrigating from Harry Strunk taking water into the Cambridge Canal. And for the first seven months of the year, we are at about 140-some percent of normal there also.

Keith Sebelius, we are currently about 11 feet below the full level. The lake is 5.3 feet above where we were last year at this time. Irrigation releases began this year on July 13th.

Harlan County, the current water level is only about two-tenths of a foot below the full point. We are about 15-and-a-half feet above where we were last year at this time. Harlan has received about 100 percent of normal precip at this time. And the available irrigation supply that Reclamation projected on June 30th was 210,000 acre-feet which would indicate that water short year administration would not be in effect for this year. Bostwick Irrigation District in Nebraska is irrigating from Harlan County for the first time since 2003.

At Lovewell, the reservoir level is currently about one-and-a-half feet below the full level. The reservoir filled on April 26th and peaked at about 4.7 feet into the flood pool with late

storms occurring in May and June. Irrigation releases began on May 27.

I might mention, we will be doing -- or are attempting to do some maintenance work above the gate structures down there starting in mid-September. We will be removing sediment, that kind of thing, out of there. And our hope is we need to have the reservoir down four-and-a-half to five feet, so we're kind of higher at this point than we normally anticipate and historically have been. So there may be some releases made to the river to get the reservoir depending how we go through this month, precipwise and everything out there.

Just to mention just briefly in the safety of dams area, Norton Dam, we did complete a safety of dams project out there in 2007. And there will be some additional work that we still need to do out there, and that'll be completed in early in 2009, hopefully.

Enders, a small depression was discovered in 2004. We are continuing to investigate that and Reclamation currently conducting what's called a corrective action study. This should be completed by October 1 and hopefully some remediation efforts will be done by late 2008 and probably some more

additional unidentified work will need to be done out there.

At Red Willow Dam, we've had an issue with a drain problem out there, under drains. And we are in the process of a corrective action study also on that out there, and that study should also be completed by October 1. And, hopefully, we'll be doing some work to address that in early 2009.

And that would conclude my report. If there's any questions, I would be happy to try to answer those.

CHAIRMAN DUNNIGAN: Thank you, Marv.

The Corps of Engineers' report, Jim Pennaz.

MR. PENNAZ: Commissioner, thank you for inviting the Corps of Engineers to give a presentation here.

My name is James Pennaz. I'm the chief of the hydrologic engineering branch at the Kansas City District Army Corps of Engineers.

I'm here to give you a presentation on two items. The first one is the Harlan County Dam Safety Study, and the second is our Lovewell Water Manual Revision.

The Lovewell Water Manual Revision is going to be in support of irrigation where we would be

providing up to two feet of flood storage for irrigation.

The Harlan County Dam Safety Study has -- Currently we have three components of concern in that dam. No. 1 is the spillway gate design. We're looking at rehabilitating and strengthening the spillway gates on that project. We also have now some changes in our design criteria for extreme flood events. And what we're looking at doing as part of the dam's safety study is to potentially provide additional freeboard with the crest flood wall. It's a wall across the top of the dam to provide additional freeboard to prevent overtopping of that structure.

We also have an issue with spillway stability during extreme flooding events. There are 3 of 30 segments, concrete segments on that dam that are areas of concern during high pools. The proposal that we're looking at today is to provide additional foundation anchors in the concrete spillway to stabilize those three units.

At this time we have an interim operating plan where we are altering our operations during large flood events. We're doing this to maintain safe operation of the dam.

We're going to have our study report ready in early 2009, which will have a discussion of these issues in that report.

Now repairs of the dam are dependent upon national priorities in the operation and maintenance program for the Corps of Engineers. Our O and M budgets have not been very robust lately. In fact, we faced a cut this year for emergency dredging on the Mississippi River mouth, so our budgets are not very robust.

We are doing a draft environmental assessment, which will be released with the report in early 2009. At this time we have not done a downstream impact of dam failure. However, we will be doing this, and it's still being evaluated. That is not releasable yet at this time.

The second issues I'm addressing today is Lovewell, and we're looking at a deviation from our Water Control Manual in support of irrigation at that structure.

There was no request for irrigation water in 2008 because Harlan County water storage was over 119 acre-feet.

The proposal for Lovewell, and the manual revision that we're looking at, would take 2 feet of

the water -- 2 feet of the storage in the flood control pool and use that for irrigation support. That would be done only if our Harlan County reservoir had less than 109 acre-feet storage through 30 June, so the revisions are time dependent.

There would be no storage in Lovewell for irrigation supply when Harlan County water storage was over 119 acre-feet.

At this time, the Corps and the Bureau of Reclamation are working towards a water control manual revision, and we just have started this study.

And that concludes my report.

CHAIRMAN DUNNIGAN: Thank you, James.

Any questions?

(No response.)

Thank you.

I believe Phil Soenksen from the USGS is going to be here to give the USGS report is still here, or is anybody here from Co-op -- excuse me, from the USGS?

(No response.)

Seeing none, we'll skip that report.

Moving on to Agenda Item 6, the committee reports. Jim Williams will provide the engineering committee report.

MR. WILLIAMS: Thank you, Chairman Dunnigan.

I would, first of all, like to recognize a new member of our committee from the state of Kansas, Scott Ross, who is now a representative, and he joins myself and Megan Sullivan from Colorado as the official members from the states on the committee. We certainly don't work in a vacuum. We have a number of technical staff that join us for our meetings, our consultants. And our meetings are open. And so we are often joined by the Bureau of Reclamation personnel and members from various irrigation districts or natural resources districts.

The engineering committee and technical representatives from the states of Colorado, Kansas and Nebraska participated in numerous collaborative work and activities, phone conferences, and prior to yesterday. Six face-to-face meetings, and seven in all this year. That included in September, 2007, in Denver, Colorado; January, in Denver; March 11th and April 11th in Kansas City, Missouri; May 1st and 2nd in Denver, Colorado; and May 15, in Lincoln, Nebraska.

There were four assignments from the compact administration to the engineering committee.

The first assignment was to complete the users manual for accounting procedures and provide a resolution for its adoption. This assignment was not completed.

Secondly, complete the accounting for 2007 using the preliminary information provided by April 15, 2007.

And the final exchange of data by July 15th, 2008.

And there's a number of items under this. Each state exchanged this model date during April of 2008 or shortly thereafter for the most part.

There were some missing pieces that were noted by the various states that provided that after that time, changes or updates.

A preliminary run of the RRCA groundwater model was developed by Willem Schreuder from Principia and posted on the RRCA website that he maintains for the administration.

The states then exchanged final model data sets and supporting data by August 7th, 2008, and Principia Mathematica completed the final run after all the states' final data were delivered to him. Data sets were collected by the committee for streamflow, climate information diversion records and

reservoir evaporation records of the three states in cooperation with the U.S. Geological Survey, Bureau of Reclamation and the Corps of Engineers. The engineering committee has not agreed to a final accounting for 2007.

On August 1st of 2008, the Kansas commissioner wrote a letter to Nebraska outlining questions related to Nebraska's date of submittal and requesting additional data for its review. As a result of Kansas' questions related to the Nebraska data submittal and insufficient time to review that data, the committee was unable to finalize the information exchange. The accounting of the virgin water supply the computed water supply, and the beneficial consumptive uses of the Republican Basin was not completed at this time due to disputes in the following matters.

First, non federal reservoir evaporation below Harlan County Lake.

Second, division of evaporated loss from Harlan County Lake when only one state utilizes reservoir storage for irrigation.

Third, Nebraska believes that Computed Beneficial Consumptive Use and the Imperial Water Supply Credit are not correctly calculated using the

current RRCA accounting procedures.

Fourth, Nebraska believes that consumptive use and virgin water supply on the mainstem and the Arikaree sub-basin are being incorrectly calculated due to incorrect accounting of return flows from the Haigler Canal.

Fifth, Nebraska believes that the cells used as accounting points for outputs from the groundwater model should match the location of the respective sub-basins as defined in the RRCA accounting procedures.

The third assignment given to the committee was to continue to work to resolve different recharge and return flow methods. And for the most part, the engineering committee was unable to work on this assignment.

The fourth and final assignment was to retain Principia Mathematica to perform maintenance of the groundwater model. And each state did, in fact, separately contracted with Principia Mathematica for groundwater model surfaces.

There was a fifth item that was worked on by the committee. They spent some considerable time reviewing the Colorado augmentation plan proposal. The state of Colorado presented a plan to use

existing groundwater consumptive use to increase stream flow in the North Fork Sub-Basin. This method is still unresolved.

The committee was able to resolve two matters and would recommend to the Republican River Compact Administration that they approve two changes for the accounting procedures. First, the committee agrees with the proposal for distributing estimated return flows from Riverside Canal. The proposal is attached as Attachment A to the engineering committee report.

Second, the committee has agreed to relocate the groundwater model accounting cell in the vicinity of Guide Rock to match the surface water stream gage located at the Guide Rock Diversion Dam. And the details are included as Attachment B to the engineering committee report.

The committee has six suggested assignments that could be given to the committee by the compact administration.

The committee recommends first finalized work on the users manual for the RRCA accounting procedures and provide a recommendation to the administration for adoption at next year's annual meeting.

Second, by September 15, 2008, Nebraska will provide data responding to Kansas' August 1, 2008, letter to Nebraska. In addition, Colorado will provide a final meter report by September 15, 2008. Comments and additional questions will be due by October 1, 2008, and the information is to be reviewed by the states by October 31, 2008.

The third assignment proposed would be to exchange by April 15, 2009, the information listed in section 5 of the Republican River Compact Administration accounting procedures and reporting requirements and other data required by that document. By July 15th, 2009, the states will exchange any updates to these data.

The fourth proposed assignment is to continue efforts to resolve concerns related to methods of estimated groundwater and surface water irrigation recharge and return flows within the Republic River Basin and related issues.

The fifth proposed assignment is to continue to review Colorado's augmentation proposal.

The sixth assignment is to retain Principia Mathematica to perform ongoing maintenance of the groundwater model and periodic updates requested by members of the engineering committee for the calender

year 2008. The billable costs shall be limited to actual costs incurred not to exceed $15,000 in total and will be apportioned to equal one-third amounts of the states of Colorado, Kansas and Nebraska, respectively.

And my final comment is that the engineering committee report and the exchange data will be posted on the internet at www.republicanrivercompact.org.

CHAIRMAN DUNNIGAN: Thank you, Jim.

Conservation committee, Scott?

COMMISSIONER BARFIELD: Mr. Chairman, do we want to move adoption of the report at this time?

COMMISSIONER WOLFE: Do we need to accept the report? I would like to move that --

CHAIRMAN DUNNIGAN: We were going to do that later.

COMMISSIONER WOLFE: Do you want to do that later? Okay.

COMMISSIONER BARFIELD: Adopting the report later or dealing with the assignment?

CHAIRMAN DUNNIGAN: We had it as an Item 8a.

COMMISSIONER BARFIELD: Okay. We'll adopt it there. That's fine.

COMMISSIONER WOLFE: Okay, we can do it at that point. Thank you.

MR. GUENTHNER: Good morning. I'm Scott Guenthner. I'm with the Bureau of Reclamation out of our regional office in Billings. I'm here this morning on behalf of the conservation committee to present to you the fourth annual status report of the conservation study. You should have received an electronic copy of this at the end of July. And then some time last week, you should have been provided a hard copy.

I might mention that this report has only, at this point, been demonstrated to the compact administration and to members of the conservation committee, so it has not had wide distribution.

This study was approved by the compact administration at your meet in 2004. The study was identified in the Final Settlement Stipulation, and it is to study of impacts of non-federal reservoirs and land terraces on the basin water supplies. And by non-federal reservoirs, we're generally talking about reservoirs in the basin that are 15 acre-foot or greater.

This study was approved four years ago, so this status report marks the fourth year of the

study, and this is a five-year study. It is expectation of the conservation committee that we'll have a report to you at this meeting next year with some more definitive results of the study. I won't go through this report in detail. You can review this at your convenience. I might mention, just briefly, what the report contains.

The states are doing some of the work on this study, primarily monitoring 32 small reservoirs around the basin. This report contains some examples of the water level information that was collected at these reservoirs. Also, much of the research level work is being done by the University of Nebraska in Lincoln. They're responsible in this study for collecting field data. They're then massaging that data and processing it so that it can be used as input to the water balance model. We're using a water balance model to estimate and quantify the impact. The modeling effort is being conducted by personnel from Kansas State University. So the report contains several items of interest. It has the water level data from some of these small reservoirs, and that information was used to develop some examples of the water balance. What we're really trying to do in this study is you take

precipitation that falls in the basin, some of that goes to infiltration, some goes to runoff. Some of that runoff ends up as streamflow and some of that runoff ends up as perculation into the ground water. So, the goal of this study is to kind of partition that precipitation into its different components and to figure out where its going. So there's some examples of that in the report. Much of the -- There's some examples of some of the field data that has been collected and there's some examples that show for terraces, for example, how much of that water is going into the contributing area of the terrace and how much of that water is ending up in the terrace channel. Then there's sort of a companion water balance that will identify some of the fate of that water. Those are the types of information that will be provided next year in our results report.

This study was originally envisioned to be about a million dollar study. And right now we have spent approximately a million dollars. So, the study, with expenses this next year, will exceed that million dollars and will probably be in the range of $1.1 to $1.2 million. We're able to do that primarily because Reclamation has been able to

acquire funding through our science and technology program to supplement the money we appropriated for this particular activity.

I might mention that the conservation committee is currently considering some funding requests from both Kansas State and the University of Nebraska so that we can complete the important components of this study within this next year. Our major efforts in this next year will be to continue collecting data, probably collect data up and through May of next year. We are continuing on a terrace condition assessment, which is a critical component. We need to know of all the terraces in the basin, what kind of shape are they in as compared to what they were like when they were new. We will continue development and application of the model so we can get results.

And then, finally, we'll be attempting to produce a summary report for you some time next year.

That concludes my report and would take any questions, if you have any.

CHAIRMAN DUNNIGAN: Thank you, Scott.

Are there any questions?

CHAIRMAN BARFIELD: Yeah. I actually -- at least have some comments or suggestion. Scott,

appreciate that and also the presentations by Dr. Koelliker and Dr. Martin yesterday on the status of the work. You were asking yesterday that perhaps some guidance on the work products that are necessary would be helpful. We have a year. And the settlement doesn't provide an extension capability for the administration. It's a pretty hard deadline to have the work done and the report completed.

I would suggest the conservation committee meet within in a month, call or whatever, and sit down and look very hard at the work that needs to be done and come up with the advice that the committee seeks, I guess, or needs to figure out what work products needs to be done to meet that deadline.

So, I don't have the specific advice you were seeking, but I think we need to sit down within a month and have that discussion to make sure we can get it done. So, I don't know if we need a motion or if we -- if that suggested plan is acceptable for everybody concerned.

MR. ROSS: I think that's good advice, and I think that's sort of the conclusion we have sort of come to. We need a sit-down type of meeting or conference call to deal with that issue.

COMMISSIONER BARFIELD: Very good. Thanks

for your report.

MR. ROSS: Thank you.

CHAIRMAN DUNNIGAN: Thank you. At this time I'd like to move -- and after Pete's done, we will have a 15-minute break, and I do mean a 15-minute break. I'm going to hold everybody to that so we can keep going and get finished this morning.

Pete, please, on the arbitration process update.

MR. AMPE: Thank you, Mr. Commissioner.

Good morning, Commissioners. As you may recall, there have been various disputes between Kansas and Nebraska over the past several years. Kansas provided a letter to Nebraska dated December 19, 2007, regarding Kansas's concerns with Nebraska's compact compliance. Nebraska provide a letter to Kansas dated February 4th, 2008, regarding Nebraska's concerns with the RRCA accounting procedures.

The RRCA assigned these issues to either the standing engineering committee or the ad hoc legal committee for resolution; however, neither of those committees were able to resolve these differences.

Kansas issues were then submitted to the RRCA in a letter dated February 4, 2008. Nebraska

also submitted its issues to the RRCA in a letter dated April 15, 2008.

On May 16, 2008, the RRCA passed a resolution indicating that the dispute submitted by the states had been addressed by the RRCA as required by the Final Settlement Stipulation and that no resolution had been reached on any of the matters and that they needed to be taken to the next step in this resolution process.

The states then again did non-binding arbitration process to attempt to resolve the disputes.

Now, as you know, this is the first time that the nonbinding arbitration process required by the Final Settlement Stipulation has an implement date, so the states do not have an existing standards or procedures to rely on as we move through the arbitration process. Of course, I think you're all aware that they're vitally important to all the states that we select an arbiter with a wide range of skills and knowledge acquired to properly address all the issues raised by Kansas and Nebraska. And, of course, individuals with this wide range of skills are relatively rare. For this reason, all three states have been working cooperatively to identify

potential arbiters and work toward securing the services of an arbiter and develop a time line that will establish hard deadlines for each part of the arbitration process. We expect to have an arbiter under contract scheduled for submission and resolution of any dispute and the actual process underway within approximately 30 days.

CHAIRMAN DUNNIGAN: Thank you for your report.

We are going to take a 15-minute break, and I am going to hold you to that. Please be back in your seat at 10:20, and we'll continue on with the meeting. Thank you.

(A recess was taken from 10:05 a.m. to 10:20 a.m.)

CHAIRMAN DUNNIGAN: I think we're ready to resume. It is 10:20. I would like to recognize Senator Tom Carlson who walked in a little while ago. I want to make sure he was recognized.

And we're going to have a little break in our agenda right now and have the report from the USGS, Phil Soenksen. Phil, please.

MR. SOENKSEN: I have some handouts, probably not enough for everyone. This is a complete presentation. And then I have -- I'll just set these

over there. This is a summary sheet that -- There's not enough of those --

First of all, I would like to apologize. I had written on my calendar that the meeting was at 10 o'clock.

UNIDENTIFIED VOICE: Can't hear you.

MR. SOENKSEN: I don't know where I got that but --

MR. AMPE: Use the microphone.

MR. SOENKSEN: Can everybody hear now?

(Affirmative gesture.)

MR. SOENKSEN: I apologize. I had written on my calender the meeting was at 10 o'clock. And I was even late for that. I was about 15 minutes late, but I do apologize. I thought you were just all socializing before the meeting started.

My name is Phil Soenksen, P-h-i-l S-o-e-n-k-s-e-n. I'm the data chief with the U.S. Geological Survey in Lincoln, Nebraska. And we operate a number of gaging stations in the Republican Basin. Ten of them are what we call compact stations that we get federal funding for. A couple others we operate in conjunction with the Corps of Engineers and Bureau of Reclamation and Department of Natural Resources. And then we also review records on five stations -- four

or five stations that the Department of Natural Resources operates that we check and review and publish.

The results of that are in the summary results. There's the single-page handout that has the results from 2007 water year in it. And then the rest of the presentation highlights what I call the compact stations, the 10 that we get federal funding for.

So this was designed to be a power point, but I didn't bring my laptop. I was hoping there would be one here. I didn't want to lug it. But we can do it with just the handouts.

So, on the first -- or the second page there you'll see the handout, and that is what we could go over briefly. It has the -- I won't go over all the numbers. I mean, everybody can read that for themselves. I'll kind of summarize it. They're in three groups. And for those that have the full presentation, a better copy is on the back of the -- stapled on the back or in the back of the ones that I handed out to the states.

They're in three groups. The first 10 are the ones that I call the compact stations that are funded by the National Streamflow Information

Program. We get direct federal funding for those.

The next two are the ones that we operate in conjunction with other agencies.

And then the next four are the ones that are operated by the Department of Natural Resources, by the state, and then we check and review those records and publish them. So we publish all of the data from here. So all of the data for any of these sites can be downloaded. And there are some web addresses, several web addresses where you can get various things, various kinds of data. And my phone number is over on the right, lower right. So if you have any questions as to how to get that data, feel free to give me a call.

I guess the main thing to look at is the color-coded things to show if it -- The figures for 2007, if it's green, that means it's greater than either last year or greater than the long-term mean. So, the first column has colors in it, if it's green, it's greater than the long-term mean. And you'll see that there's one station, Courtland Canal, at the Nebraska-Kansas state line, that actually had flow last year greater than the long-term mean.

The second column is a ranking of last year compared to all the other periods -- or all the other

years of records. And the green there means that it's simply greater than last year. So, there's improvement over 2006 for all of them but one, but all except one was, you know, still below the long-term mean.

And that's basically the summary of that. It has the actual data there, the average for the year and the long-term mean in the other columns.

Now, I'll go through, just real quickly, the rest of the presentation, just to highlight a few things and look at some of the trends for the 10 stations.

So, there's going to be some summary charts of each of those. There'll be, first of all, a map showing the location of it. So, for instance, the Arikaree river at Haigler, you'll see a little map there and a couple of pictures just to show the gaging site, in case you're ever driving out that way, and then, generally, one of the channels, so you can see how the Arikareee River, very vegetation-choke channel. There's not much open channel there.

And then a couple of graphs for each site. The first one is a bar graph that shows for the period of record all the annual flows with a line showing the long-term mean, and then some data up in

the text box.

The second graph shows the same data as far as the annual mean flow is plotted as squares within a moving average from the period of record. So, for, you know, the first year of record, the average was obviously that year. The second year average is in the -- you know, the second point average is in the next one and so on. So, you can see the trend of the mean, as well as the median. The median value is -- the value of that is -- half a date is above it, half a date is below it, and so it tends to not be quite as influenced by extreme events. So, you can see on the Arikaree River at Haigler, the large event in 1935 held the mean up, you know, pretty high for a long time, just because it's affected by that value all the way through. So you can then just look at the trends. I won't go through and say anything other than I'll just flip through them quickly and then answer any questions.

The next one -- And these proceed in what we call downstream order. the North Fork Republican River at the Colorado-Nebraska state line, and that one I'll say a little bit more about later. We put in a new control there at considerable expense with the help of the state of Colorado.

And Buffalo Creek near Haigler, that one sits on a culvert. And that one also has a problem with tumbleweeds in it, clogging the channel, makes it difficult to gage.

And the next one is Rock Creek at Parks. That one also -- All the states within the extreme southwest corner of the state, we have problems with vegetation and tumbleweeds, partly because the flows have been quite low and then the tumbleweeds come in and clog the channels. And pretty much all of them show, you know, a declining trend.

South Fork Republican River near Benkelman, this last week there was a big rain in Colorado and Kansas. I think they measured like 1600 cfs at the --I believe at the state line with Colorado, between Colorado and Kansas. It took days for that water to show up and not very much. You know, not near that amount of water showed up at the state line gage. We had guys waiting there for it. It took a long time. So a lot of that never made it to the Nebraska state line.

I guess, 2007, for Benkelman, for the first time in -- the three years prior to 2007, we had absolutely no flow the entire year, and we finally had a little bit of flow. All of the stations showed

generally, except for the one, showed an increase in flow last year.

Frenchman Creek at Culbertson, again, almost up to the long-term mean. And Frenchman Creek at Culbertson, there's several of them. You'll see a break in the line on the long-term mean. That's because there was a reservoir that went into effect. And so I analyzed the data separately prior to the dam and after the dam.

Driftwood Creek near McCook, in 2007, had an increase in flow. They had a pretty big event there in 2007.

Red Willow Creek at Red Willow, again, it's downstream of the reservoir, and so you'll see a break in the long-term mean values.

Sappa Creek near Stamford, is another one I'll talk about in just a little bit. We moved the gage. You can see on the map we moved it three miles upstream. And I have since talked to folks in Nebraska and Kansas, and we're considering moving that gage back, if we can. There was some reasons we moved it for safety, and you'll see that in some of the pictures near the end. And, again, we had a little bit of increase in flow there over the previous year.

Courtland Canal is the only one that actually had flow above the long-term mean.

Okay. Now I'll just quickly go through the stations that have had some changes to them.

Sappa Creek near Stamford, there's a picture showing the old site. It's a poured concrete structure. It shifts between the stream and the railroad tracks. And it's several hundred feet downstream of the bridge. It's difficult to service. We actually have a bubbler gage in there, which means we have to put a nitrogen cylinder in there. Very hard to service the gage. Hard to have a reference gage to check the inside gage because there's no bridge right there. When we make measurements, of course, we have to measure off the bridge. And the bridge that is there is a pony truss bridge, very difficult to measure off of. And so for safety reasons, we looked at moving it. I should have checked with the station. And I alone apologize for that. It was my decision to move the gage because I -- but I should have checked ahead of time before moving that gage. And so we will look at moving it back or at least to another site downstream. And then there's a picture showing where we did move it to, a nice open-deck bridge where we can put a

reference gage in to check the inside gage.

The big work this year was on the state line gage on the North Fork Republican. This shows a picture of the old double-weir control. It's two weirs to create a pool between the weirs for the intake to the stilling well. But they were extremely old and it was in very bad shape. The state of Colorado wanted to make sure we had good records coming out of there and they put up some money to help us refurbish it. We decided that we were going to actually gage upstream at the culvert, but we needed to stabilize the weirs to make sure that the culvert didn't wash out. And there you see a back hoe pulling some of the rift raft out of there so that they can put the sheet piling in. But in the process of putting the sheet piling, the weir collapsed, and then we had to go to a lot of extra expense. We had to dig a bypass channel around. And the state of Colorado also -- or the irrigation district funneled water away from the site. But we bypassed the flow and then put in a whole new control. And so we had to put in some emergency funding to be able to do that. But we now have a good control that should give us good records for that site. And so the last shot there shows the

water back -- you know, flowing back over that new control.

Then the other site, Republican River near Orleans, it shows the old bridge. You see how narrow it is. And again with the overhead steel, it makes it very hard to measure, the high flows. And the state -- or this bridge was recently replaced. I don't have any pictures of the new bridge. But we had to move the gage temporarily and then move it to the new bridge when it was done.

And with that, I'll entertain any questions.

(No response.)

CHAIRMAN DUNNIGAN: Are there any questions for Phil?

(No response.)

CHAIRMAN DUNNIGAN: Thank you, Phil.

Moving on to Agenda Item 7, Old Business, the first issue is the RRCA regulation regarding approval of a diversion in one state that is used in another state.

Commissioner Barfield?

COMMISSIONER BARFIELD: And actually I meant to talk to Pete in the break and didn't get to him.

Let me -- Basically, I'm wanting to get an update on the status of this and the plan for moving forward. But just to provide some background, we had this discussion for actually a number of years. The FS prescribes that the consumptive use be charged for the state, where the water is used, not necessarily where it's diverted. And we have some examples where water is diverted to one state and put to use in another. And the concern was expressed that the state sort of getting to see U-charge needed to have some ability to monitor those activities and really the desire was to sort of have a mutual approval of both states, both the diversion and the use in the other state.

And we went through several gyrations of looking at different alternatives to -- for the two states, whichever they may be, to sort of work through that process together. And, I guess, I don't know the current status, I'm just sort of requesting somebody to sort of help me understand where we're at and then the administration to sort of come up with a plan for where we go from here.

Pete, can I look to you for an update?

MR. AMPE: Yes, Commissioner Barfield.

Since this issue was assigned to the ad hoc

legal committee, we met several times. That resulted in some draft language, which was then critiqued, shall we say, within the committee. We continued to look into some of these issues. And there are a lot of very unique circumstances, issues, that this question brings up that we have not finally resolved within the committee. I would suggest that under Agenda Item 8b, the RRCA affirm that the ad hoc legal committee should continue looking into this question and provide a report at some time in the future, if we're able to reach a final resolution. Until that time, I would suggest that the states continue with their cooperation in working with the other states when this type of issue occurs or they think it will occur.

COMMISSIONER BARFIELD: Okay, that's acceptable. Let's do it that way. It will be under Agenda Item 8 in terms of acting.

CHAIRMAN DUNNIGAN: Thank you.

The second item under Old Business is the Lower Republican Feasibility Study. Commissioner Barfield, if you could brief us on that?

COMMISSIONER BARFIELD: Sure, and Aaron mentioned this in his report. Again, the settlement has a provision in it that the states will cooperate,

and particularly the states of Nebraska and Kansas, along with the Federal Government, in terms of looking at alternatives for better utilization of water, again, particularly in the lower part of the basin where at times there's extra water. And the states, at the time of the settlement, and the Bureau conducted an appraisal level study to look at various alternatives for additional storage in the lower basin, improve the operation of canals and the like. And the appraisal level study was completed. And it envisioned a feasibility study to sort of look at some of the best alternatives and do a detailed study by which a decision could be made in terms of actually constructing one or more of the projects. That requires a congressional authorization and funding for the Bureau's part of that and, of course, the states of Kansas and Nebraska to fund their part. And so the states have been working through their congressional delegations to see that happen. And this year Congress did authorize the feasibility study. Now the next step is to get the appropriation secured, and that's the current status.

I guess my suggestion is that we consider drafting a letter to the Bureau and to the commissioner and to our congressional delegations,

just updating them on the status of the matter of, you know, thanking them for -- Congress for getting the authorization done and encouraging their securing of the funding for the study.

And then, again, I think some of our congressional delegation have been very helpful in getting us so far, again, encouraging us to continue to work with our delegations to see that happen.

I guess I would make a motion that the administration -- I'll go ahead and volunteer myself -- that the administration ask that I would draft that letter and, you know, have you all review it. And ultimately, once we've got the approval of all the commissioners to send it on our behalf, encouraging the funding of this study.

COMMISSIONER WOLFE:: I second your motion.

CHAIRMAN DUNNIGAN: Any discussion?

(No response.)

CHAIRMAN DUNNIGAN: Seeing none, all in favor?

COMMISSIONER BARFIELD: Aye.

CHAIRMAN DUNNIGAN: Aye.

COMMISSIONER WOLFE:: Aye.

CHAIRMAN DUNNIGAN: Opposed?

(No response.)

CHAIRMAN DUNNIGAN: Motion carries.

COMMISSIONER BARFIELD: Thank you.

CHAIRMAN DUNNIGAN: That takes us to Agenda Item 8, New Business and Assignments to Compact Committees, action on the engineering committee report and assignments. I would entertain a motion to approve the engineering report and their assignments for the coming year.

COMMISSIONER WOLFE:: So moved.

CHAIRMAN DUNNIGAN: Is there a second?

COMMISSIONER BARFIELD: I would second.

CHAIRMAN DUNNIGAN: Discussion?

COMMISSIONER BARFIELD: Actually, there is some discussion here. First of all, there's a couple of -- one correction that I would like to note that the committee could make, page 2, related to the work completed; No. 2, those dates should reflect 2008 -- April 15, 2008, and July 15, 2008. I would like to suggest the committee correct that.

On the assignments, recommended assignment No. 6, it is to retain Principia Mathematica to perform ongoing maintenance of the model and periodic updates requested by members of the engineering committee. I would like to suggest that be requested by the engineering committee as a whole, if that's

acceptable.

COMMISSIONER WOLFE:: Okay.

COMMISSIONER BARFIELD: Yeah, that's -- With that, I'm fine with adopting the report. I've got a couple of follow up after we adopt the report.

CHAIRMAN DUNNIGAN: With those corrections noted, all in favor?

COMMISSIONER BARFIELD: Aye.

COMMISSIONER WOLFE:: Aye.

CHAIRMAN DUNNIGAN: Aye.

Motion carries.

COMMISSIONER BARFIELD: Okay. So that's to adopt the report and the assignments for next year?

CHAIRMAN DUNNIGAN: Yes, it is.

COMMISSIONER BARFIELD: If I might, I have just a couple of follow ups here.

As I sort of noted or alluded to on the report, you know, Kansas is not completely satisfied with the data exchanges, in terms of timeliness and completeness. And I just want to note for the record the FSS is quite clear, both in the FSS itself in Section 4, as well as the accounting procedures we adopted in Section 5, that it's the duty of each state to make a full exchange of their model data sets, accounting data, supporting data by April 15th.

Now, the administration has made allowance for improvements of the data after that date. But on April 15th, we're supposed to have a full exchange of the data so that everybody can sort of know where they were at for the previous year, and that's just our duty. And I want to make it clear that's sort of the expectation that we should have.

And in that regard, I would like to suggest an additional assignment for the engineering committee, and let me read it to you.

And that would be -- you know, the assignment currently in the recommendations we just adopted was to exchange the data by April 15th as is required by the FSS.

I would like to suggest that within a week of that date, by April 22nd, that the engineering committee review an inventory of the data exchange between the states pursuant to that requirement and compile a listing of any deficiencies of that data exchange and provide a report of its findings to the Compact Commissioners.

Again, you know, the exchange happens on April 15th and, you know, within a week, the committee would review that exchange and just prepare a report as to whether the exchange was complete or

not. So I would like to offer that as a motion for an assignment.

CHAIRMAN DUNNIGAN: We can sure consider that, Commissioner Barfield, and some time in the future we can agree to that.

COMMISSIONER BARFIELD: I'm posing that as a motion for an assignment.

COMMISSIONER WOLFE:: I'll second your motion.

CHAIRMAN DUNNIGAN: We have a second. Any additional discussion?

COMMISSIONER BARFIELD: Again, let me just clarify. This is just on the data exchange and its completeness so ...

CHAIRMAN DUNNIGAN: All in favor?

COMMISSIONER WOLFE:: Aye

COMMISSIONER BARFIELD: Aye.

CHAIRMAN DUNNIGAN: Opposed?

Aye.

Motion fails.

COMMISSIONER BARFIELD: One other -- Well, I hope, despite that there is a motion, that the states will work to do that. I know if the committee cannot work cooperatively, then Kansas will do what's necessary. It is just to document the sufficiency of

that or not, but I hope we can work cooperatively on that so ...

I would also note in the engineering committee assignments, recommendations, that for the first time we have not requested the committee to actually prepare an accounting using the data that is exchanged under the FSS. And, again, I believe, if we read the language of the FSS, that it is the duty of the RRCA and the engineering committee to construct such an accounting pursuant to its adopted procedures, and I don't see this as a sort of optional activity. I recognize we have disputes. And I think the previous actions by this administration to develop an accounting to the full extent possible is really the right action, and I think that's what we should be doing.

So, I'll just -- hold on a second.

Well, in keeping with that, I want to, again, make a motion that we add to the engineering committee an assignment to prepare, as we have in the past, an accounting with the data that's exchanged with whatever caveats the committee wishes to put on that accounting or multiple accounts, if necessary, pursuant to the accounting procedures and any -- well, pursuant to the accounting procedures of the

administration.

COMMISSIONER WOLFE:: Just so I'm clear, is this a clarification that's already required, or are you suggesting a new assignment, just to make sure I understand your discussion here.

COMMISSIONER BARFIELD: My motion is for us to add to the engineering committee's assignments the language that we've traditionally had in the assignment for the committee to prepare an accounting, based on the currently adopted accounting procedures.

COMMISSIONER WOLFE:: Second that motion.

CHAIRMAN DUNNIGAN: Further discussion?

(No response.)

CHAIRMAN DUNNIGAN: I would just like to say that in the spirit of cooperation, Nebraska agrees with the motions, but these issues were not brought up as things yesterday in the working session that would be brought up, so we just need time to go back and discuss it with our team and decide on how we'll react to that.

The motion is on the table. All in favor?

COMMISSIONER WOLFE:: Aye.

COMMISSIONER BARFIELD: Aye.

CHAIRMAN DUNNIGAN: Opposed?

Aye.

Motion fails.

COMMISSIONER BARFIELD: Okay. That's it with respect to the engineering committee report.

COMMISSIONER WOLFE:: Just if I could, Commissioner, for clarification of the record in regards Commissioner Barfield's first motion, in terms of the information that Colorado has provided this year in terms of the inputs for the accounting that -- We just want to make it clear if there was any dispute by either of you that Colorado did not provide that information timely to you and that it has been provided. So we just want to make that you are in agreement to that or not.

COMMISSIONER BARFIELD: Yeah, I think the deficiency -- The only deficiency noted is the meter records, and I think that was noted in the assignments that you would provide that by a certain date. So, the settlement --

COMMISSIONER WOLFE:: Okay. And that's not accounting, but that's just the records that you need, yeah.

COMMISSIONER BARFIELD: It's part of the supporting documentation that the FSS requires, yes.

COMMISSIONER WOLFE:: Right, yes. Okay.

CHAIRMAN DUNNIGAN: That leaves us to Agenda Item 8b, additional items.

And I would entertain a motion for the ad hoc legal committee to continue on their assignment as previously discussed.

COMMISSIONER BARFIELD: I would make a motion that the -- that we request the ad hoc legal committee to continue their discussions on this matter of approval of diversion in one state when used in another and provide the administration with a report on their findings and/or recommendations by -- let's just say by November 15th of this year.

COMMISSIONER WOLFE: Seeing no objection, I second that motion.

CHAIRMAN DUNNIGAN: Any further discussion?

(No response.)

CHAIRMAN DUNNIGAN: All those in favor?

Aye.

COMMISSIONER BARFIELD: Aye.

COMMISSIONER WOLFE: Aye.

CHAIRMAN DUNNIGAN: Opposed?

(No response.)

CHAIRMAN DUNNIGAN: Motion carries.

Under this additional items, I would ask Commissioner Barfield if he has any closing remarks?

COMMISSIONER BARFIELD: Thank you, Mr. Chairman. Yes, I do.

I do want to make note of sort of a status of compliance this year. As we heard, the engineering committee did not develop an accounting. There was data exchanged that is largely complete. Again, Kansas has requested some supporting data in some cases, but the data exchange is largely complete.

And I sort of want to report on our sort of view of the world at this point.

2007 represents -- the year we just looked at -- sort of the first year in which the settlement is sort of -- its obligations are complete.

The settlement provided sort of a phase-in period of sorts. It provided the first water short year compliance test would be for the years 2005, 2006, and the first normal accounting period would be for the period 2003 to 2007.

So, we're reporting this year, exchanging data and so forth for the year 2007, so it represents the first test of compliance for Colorado and the first normal accounting period of test and the second water short year test for the states of Nebraska and Kansas.

Kansas recognizes, as you have heard today, that Colorado and Nebraska are making efforts to come into compliance with the requirements of the settlement, and we appreciate those efforts. But, as has also been reported in the past, and I'm required to report today, the states of Nebraska and Colorado are not in compliance with those tests of compliance that we have agreed to. And we've -- I'll give those particulars in a minute. And, of course, we've seen it manifested in a number of ways: the Bureau of Reclamation report, in terms of the projects that have been significantly sort of watered, both in Nebraska and in Kansas, you know, the gage flows that we were just looking at and how significantly they are depleted.

You know, Nebraska and Colorado have been aware of the nature of those obligations since the end of 2002 when the FSS, the Final Settlement Stipulation, was signed by all three states. It included, as I mentioned, a clear implementation schedule and clear test of compliance. You know, compliance with these is not optional and the test of compliance are very clear.

I provided the other commissioners with the results of our accounting for the period 2003 to

2007. We've taken the data inputs that had been exchanged between the states and the current accounting procedures and our interpretation of the disputed matter with respect to the non federal reservoir evaporation below Harlan and the Harlan County split and increased numbers that represent Kansas's view of compliance. And, again, I just want to provide the audience with a brief summary of those tabulations.

The first -- We have a Table 3 in our accounting procedures that provides for the normal five-year compliance test. Again, this is the first opportunity to have that for the state of Colorado. And according to our accounting then, Colorado has overused its allocation for 52,600 acre-feet for those first five years.

And, again, according to our accounting, Nebraska has violated this test of compliance, overusing its allocation by 117,790 acre-feet, again, for that five-year period, 2005 -- 2003 to 2007.

Table 4(a) provides what is called the sub-basin non impairment compliance test. And this is a test for the state of Colorado, as well as the state of Kansas, and it is done by tributary. And it shows that the state of Colorado overused its -- or

violated this test by 12,370 acre-feet for the five-year period, 2003 through 2007. This test basically shows that Colorado used our specifically -- our specific allocation of water in this tributary to South Fork.

Table 5(a) of the accounting procedures provides Colorado's compliance during water short year administration. During water short year administration, Colorado is not allowed to use Beaver Creek to offset -- under use on Beaver Creek to offset other basins. That test shows that Colorado overused its allocation under that test by 57,850 acre-feet for the five-year period, 2003 to 2007.

And, finally, Table 5(c) provides for the Nebraska compliance during water short year administration for the year 2006/2007. And it shows, according to our accounting, Nebraska violated that test of compliance overusing its allocation by 26,150 acre-feet.

The tables also show that Kansas is in compliance with the various tests.

As I detailed last year, and I won't repeat here this year, as a result of these overuses, Kansas has not received its water and its users have been significantly shorted of water during the period.

You know, the settlement, in our view, clearly deals for range of flows, from wet to dry, and specifically allocates that water and is designed to ensure that each of the states get to use their allocation in wet years and as well as dry. And Kansas has not got its equitable share.

Again, we call on the states to continue their actions. Those actions have not been sufficient to date. And we would urge the states to take the additional actions necessary to come into compliance with the settlement.

Again, for the state of Nebraska, I would want to sort of reiterate last year's comments, that, in our view, one of the primary causes -- the primary cause in Nebraska's overuse is groundwater pumping. These depletions. as shown by the model, continue to grow. And any plan to come into compliance, we believe, must deal with this problem.

We provided an analysis in April at one of our special meetings that looked at the current reduced NRD allocations under the integrated management plans. And our analysis anyway says that those plans do not reduce consumptive use of groundwater but allow them to continue to grow into the future, thus, complicating Nebraska's compliance

in the future.

Again -- So I'm reporting today essentially on new violations of the compact, separate and apart from last year's. And both the state of Nebraska and Colorado can expect to hear from Kansas in the near future about these violations.

So, that's sort of the conclusion. If you have any comments or questions on what I've presented, I would be happy to entertain those.

CHAIRMAN DUNNIGAN: Thank you, Commissioner Barfield.

Any questions?

(No response.)

CHAIRMAN DUNNIGAN: No questions.

Commissioner Wolfe, any closing remarks?

COMMISSIONER WOLFE: None at this time. Thank you.

CHAIRMAN DUNNIGAN: I would like to offer the following resolution, a resolution of the Republican River Company Administration honoring Ann Salomon Bleed. I'll read the proposed resolution.

Whereas, Ann Salomon Bleed, Lincoln, Nebraska, has resigned her position as Director of the Nebraska Department of Natural Resources, and, thus, the Nebraska Commissioner of the Republican

River Compact Administration, after having served faithfully in that position and others for over 20 years and, whereas, as the Nebraska Commissioner to the RRCA and the Director of the Nebraska Department of Natural Resources, Ann has diligently representative the Compact's interest of the state of Nebraska and the residents in the Republican River Valley in Nebraska. And, whereas, while diligently representing the state of Nebraska and its constituents, Ann exhibited professionalism, integrity and provided leadership and guidance toward addressing the complexities of water administration and compact compliance issues, continually reaching out to the states of Colorado and Kansas to compile the most accurate accounting possible of the waters of the Republican River and to reach fair and reasonable solutions to the many issues associated with the Republican River Compact.

Whereas, as Ann's expertise of water matters, conscientiousness, diligence, positive attitude and cooperative temperament have been an asset to the RRCA and the State of Nebraska.

Now, therefore, be it hereby resolved that the Republican River Compact Administration does hereby express its sincerest gratitude and

appreciation to Ann Bleed for her dedicated service to the RRCA in her position of Nebraska Commissioner and others and extends its best wishes to Ms. Bleed in all her future endeavors.

Be it further resolved that the RRCA honors Ms. Bleed's service by including this resolution and appropriate dedicatory remarks in the RRCA Annual Report for Compact year 2000 and hereby instructs the Nebraska Commissioner to send copies of this resolution to the Bleed family and the Governor of the State of Nebraska.

Entered this 13th day of August, 2008, at the Annual Meeting of the RRCA in Lincoln, Nebraska.

COMMISSIONER BARFIELD: I would second the motion.

CHAIRMAN DUNNIGAN: Second?

All in favor?

COMMISSIONER WOLFE: Aye.

COMMISSIONER BARFIELD: Aye.

CHAIRMAN DUNNIGAN: Motion carries. Thank you.

COMMISSIONER BARFIELD: Mr. Chairman, I have one small correction to note to my statement. I noted that -- at least Scott mentions or notes that I -- when I was mentioning the Kickapoo Tribe that I

said it was in northeast Colorado, it is not in northeast Colorado; it is in northeast Kansas. So, I would like the record to be corrected on that matter.

CHAIRMAN DUNNIGAN: It will be corrected.

Agenda Item 9, remarks from the public. We would welcome any remarks from the public. If you have remarks, please come up to the table. We'll have a microphone. And if you'd give your name and spell your name for the reporter, it would certainly help. Any remarks from the public?

(No response.)

CHAIRMAN DUNNIGAN: Seeing none, we'll move to Agenda Item 10, Future Meeting Arrangements.

The next annual meeting will be held again in Nebraska hosted by Nebraska. The tentative dates that we're looking at right now are August 11th and 12th. We will further look at those dates and after the discussion on the specifics of that meeting in the year to come.

Agenda Item 11 is Adjournment. Motion to adjourn?

COMMISSIONER WOLFE: I would like to first comment maybe on August 11th and 12th, maybe we can have the meeting at the Colorado state -- or Nebraska-Colorado line and see the water from the

Republican River Compact compliance pipeline pending there's water in the river so ...

CHAIRMAN DUNNIGAN: We'll take that under consideration.

COMMISSIONER BARFIELD: Well, I would like to express our appreciation for Nebraska hosting this year, and I would like to move adjournment of this annual meeting.

COMMISSIONER WOLFE: Second.

CHAIRMAN DUNNIGAN: All in favor?

COMMISSIONER BARFIELD: Aye.

COMMISSIONER WOLFE: Aye.

CHAIRMAN DUNNIGAN: I move the meeting adjourned. Thank you.

(Whereupon, on August 13, 2008, at 11:06 a.m., the meeting was adjourned.)

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ATTACHMENT K

BUREAU OF RECLAMATION
OPERATION AND MAINTENANCE REPORT

RECLAMATION

Managing Water in the West

OPERATION

AND

MAINTENANCE

REPORT

REPUBLICAN RIVER

COMPACT MEETING

LINCOLN, NEBRASKA

U.S. Department of the Interior
Bureau of Reclamation
Great Plains Region
Nebraska-Kansas Area Office

August 13, 2008

REPUBLICAN RIVER COMPACT MEETING
August 13, 2008
Lincoln, Nebraska

2007 Operations

As shown on the attached Table 1, precipitation in the Republican River Basin varied from 90 percent of normal at Bonny Dam to 134 percent of normal at Enders Dam. Total precipitation at Reclamation dams ranged from 15.43 inches at Bonny Dam to 31.52 inches at Lovewell Dam.

Inflows varied from 68 percent of the most probable forecast at Bonny Reservoir to 191 percent of the most probable forecast at Harry Strunk Lake. Inflows into Bonny Reservoir totaled 8,094 AF while inflows at Harlan County Lake totaled 198,528 AF.

Average farm delivery values for each irrigated acre were as follows:

District	Farm Delivery
Frenchman Valley	0.0 inches
H&RW	0.0 inches
Frenchman-Cambridge	
- Meeker-Driftwood, Red Willow	0.0 inches
- Bartley Canal	0.0 inches
- Cambridge Canal	0.0 inches
Almena	0.8 inches
Bostwick in NE	
- Franklin, Franklin Pump, Naponee, Courtland	0.0 inches
- Superior Canal	0.0 inches
Kansas-Bostwick	
- Above Lovewell	5.2 inches
- Below Lovewell	7.1 inches

2007 Operation Notes

Bonny Reservoir--Started the year 21.3 feet below the top of conservation. Annual computed inflow of 8,094 AF. Below normal inflows were recorded during every month of the year. About 1,359 acre-feet was released to the river (May 22 through June 5) as requested by of the State of Colorado and about 87 acre-feet was released to Hale Ditch (June 5 through June 13) for irrigation purposes. A new historical low reservoir elevation of 3648.39 feet was reached on December 2nd. The end of year elevation was 23.6 feet below the top of active conservation.

Enders Reservoir--Started the year 26.7 feet below the top of conservation. The 2007 inflow of 13,258 AF was between the dry- and normal-year forecasts. Storage water was not released from Enders Reservoir for either Frenchman Valley or H&RW irrigation districts. This was the sixth consecutive year that H&RW Irrigation District did not divert water due to the extremely low water supply. Frenchman Valley Irrigation District did not divert water into Culbertson Canal in 2007. The end of the

year elevation was 19.7 feet below the top of conservation.

Swanson, Hugh Butler, and Harry Strunk Lakes—Swanson, Hugh Butler and Harry Strunk lakes started the year 20.2 feet, 18.6 feet and 7.7 feet below the top of conservation. Due to the low water supply, releases were not made from Swanson or Hugh Butler lakes into Meeker-Driftwood and Red Willow canals (fifth consecutive year). Harry Strunk Lake reached the top of conservation pool (2366.1 feet) on April 23rd and peaked with an elevation of 2372.19 feet (6.1 feet into the flood pool) on June 3rd due to storm runoff. Frenchman-Cambridge Irrigation District entered into a Memorandum of Agreement (MOA) with the Republican River Basin Coalition to purchase 26,000 acre-feet of the district's water supply for the 2007 irrigation season. As a result of the MOA, approximately 26,000 acre-feet was released from the dam. Releases began on June 10th and were continued until August 13th. At the end of the year, Swanson Lake was 17.0 feet below the top of conservation, Hugh Butler Lake was 5.5 feet below and Harry Strunk Lake was 0.3 foot below.

Keith Sebelius Lake—The Lake elevation at the first of the year was 2286.2 feet (18.1 feet below full). The annual inflow of 7,801 AF was slightly above normal-year forecast. The reservoir level peaked at elevation 2290.56 feet on June 19th. Irrigation releases were made from the lake in 2007 (1,099 AF diverted into Almena Canal). In July of 2007, the Kansas Department of Wildlife and Parks and the Almena Irrigation District entered into a Memorandum of Agreement (MOA) to maintain a minimum pool elevation in the reservoir for ten years. The MOA provides for no irrigation releases when the reservoir level is below 2288.5 feet. The reservoir ended the year 16.2 feet below conservation.

Harlan County Lake—The Lake elevation at the beginning of 2007 was 19.0 feet below the top of conservation. Inflow for the year totaled 198,528 AF. Irrigation diversions were not made into Franklin, Naponee, Franklin Pump, Superior, or Courtland Canal in Nebraska in 2007. Bostwick Irrigation District in Nebraska and the Nebraska Department of Natural Resources entered into a Memorandum of Agreement (MOA) to purchase the district's water supply for the 2007 irrigation season. "Water-Short Year Administration" was in effect. The lake level at the end of the year was 1941.08 feet (4.7 feet below full). A ten year summary of Harlan County Lake operations is shown on Table 3.

Lovewell Reservoir—The Reservoir elevation was 6.4 feet below the top of conservation at the beginning of the year. Inflows from White Rock Creek and diversion of Republican River flows via Courtland Canal combined to fill the reservoir conservation pool (elevation 1582.6 feet) on April 25th. The water surface elevation at the end of the year was 1.5 feet below the top of conservation at 1581.07 feet.

Current Operations

Table 2 shows a summary of data for the first seven months of 2008.

Bonny Reservoir – The reservoir level is approximately 21.0 feet below the top of conservation. Bonny Dam has recorded 10.88 inches of precipitation during the first seven months of the year with reservoir inflows remaining at or near historic lows. The reservoir level is about one foot above last

year at this time.

Swanson Lake – The lake level is **c**urrently 14.5 feet from full and is 1.2 feet above last year at this time. Precipitation for the year is 108% of normal (14.55 inches). Frenchman-Cambridge Irrigation District is not irrigating from Swanson Lake for the sixth consecutive year due to the low water supply.

Enders Reservoir - The reservoir level of Enders Reservoir is currently at 3091.8 feet (20.5 feet below full). The reservoir level is 3.8 feet below last year at this time. Enders Dam recorded 13.77 inches of precipitation during the first seven months of the year. Normal precipitation during this period is 12.92 inches. Due to the water supply shortage, H&RW Irrigation District is not irrigating for the seventh year in a row. This is the fifth consecutive year that Frenchman-Valley Irrigation District has not received storage water for irrigation.

Hugh Butler Lake – Storage in Hugh Butler Lake is currently 6.5 feet below full (2575.3 feet). The precipitation total so far this year is 18.31 inches (143% of normal). The lake level is .3 foot below last year at this time. Irrigation releases are being made from Hugh Butler Lake this year for diversions into Red Willow Canal. This is the first time since 2002 that Frenchman-Cambridge Irrigation District has delivered water from Red Willow Canal.

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Harry Strunk Lake – Storage in Harry Strunk Lake is currently .9 foot below the top of conservation. The lake filled on April 29th (elevation 2366.1 feet). The reservoir level increased to elevation 2373.83 feet on May 25th as a result of runoff from storms that occurred above the lake from May 22nd through the 24th. Frenchman-Cambridge Irrigation District is irrigating from Harry Strunk Lake this year. Precipitation at the dam during the first seven months of the year was 19.82 inches (144% of normal).

Keith Sebelius Lake – Currently 10.9 feet below full. Lake level is 5.3 feet above last year at this time. Irrigation releases began on July 13th. Precipitation at the dam during the first seven months of the year was 16.53 inches (102% of normal).

Harlan County Lake – The current water surface level of the Harlan County Lake is 1945.5 feet (only .2 foot below full). The lake level is 15.5 feet above last year at this time. Storage in Harlan County Lake is approximately 57,000 AF greater than at the beginning of the year. Harlan County Dam has recorded 14.82 inches of precipitation so far this year. The available irrigation supply from Harlan County Lake on June 30th was 210,000 AF, indicating that "Water-Short Year Administration" would not be in effect. Irrigation releases began on June 25th. Bostwick Irrigation District in Nebraska is irrigating from Harlan County Lake for the first time since 2003.

Lovewell Reservoir – The reservoir level of Lovewell Reservoir is currently at 1581.0 feet (1.6 feet below the top of conservation). Lovewell Dam recorded 19.26 inches of precipitation during the first seven months of the year. The reservoir filled on April 26th with inflows from White Rock Creek. The reservoir level peaked at 1587.31 feet on June 4th as a result of late May and early June storm runoff. The Corps of Engineers allowed storing 5 percent in the flood pool (elevation 1583.4 feet) just prior to the irrigation season. Irrigation releases began on May 27th. Kansas Bostwick Irrigation District expects to deliver 12 inches below Lovewell.

<u>Other Items</u>

Inspections

Periodic Facility Reviews were conducted at Box Butte, Enders, and Trenton Dams during 2007. Annual Site Inspections were conducted at Davis Creek, Bonny, Red Willow, Medicine Creek, Norton, Webster, and Cedar Bluff Dams in 2007.

Safety of Dams

Norton Dam – Construction of a filter drain system to collect seepage through the left abutment and the outlet works was completed in the fall of 2007. Another minor seep was discovered during drain construction that will require some additional remediation. Reclamation is currently evaluating options and anticipates scheduling construction activities early in calendar 2009.

Enders Dam - A small depression was discovered near the outlet works stilling basin in August 2004. The depression has been attributed to a failure of the basin underdrain system. Plugs were installed in the drain outlets to prevent any movement of material through the drains. Reclamation installed additional instrumentation in the area and has collected additional data on water levels around the basin. Additional weight was added to the basin in June 2007 to increase the stability of the outlet basin after a 10 ft rise in lake elevation. Reclamation is currently conducting a Corrective Action Study scheduled for completion by October 1. Initial remediation efforts are tentative scheduled for late calendar year 2008. Additional work will also be required that is yet to be scheduled.

Red Willow Dam – The river outlet works stilling basin was dewatered and inspected in July 2005. During the inspection a small quantity of fine clean sand was discovered near the right basin under drain system outlet indicating that material was being transported through the basin under drain system. It has since been determined that there is most likely a failure of the basin under drain system and plugs were installed in the drain outlets to prevent any further movement of material. Reclamation is currently conducting a Corrective Action Study scheduled for completion by October 1. Initial remediation efforts are tentative scheduled for early in calendar year 2009.

Davis Creek Dam – A sinkhole was discovered adjacent to the outlet works structure in May 2007. A video of the under drain system showed a significant amount of material located in the left drain outlet. A significant amount of material had also been deposited in the left bay of the stilling basin. Davis Creek Dam was placed on internal alert. Plugs were installed in the drain outlets in October 2007 to prevent the further movement of material. Reclamation completed a grouting operation and the addition of an auxiliary drainage system to correct the problem in March of 2008.

Emergency Management Operations

Orientation Meetings are held annually to discuss the Emergency Action Plan (EAP)

for all NKAO dams. Federal, state, county and local organizations that would be impacted by an emergency at NKAO dams are invited to attend. Radios which contact the downstream 24-hour warning points are tested monthly.

Functional exercises were held for the Bonny Dam Emergency Action Plan (EAP), Enders Dam EAP, Kirwin Dam EAP and Cedar Bluff Dam EAP in 2007.

Standing Operating Procedures

The Standing Operating Procedures (SOP) for Trenton Dam was republished in 2007. All NKAO SOP's have been updated based on the current guidelines.

Water Conservation

Reclamation continues to provide technical and financial assistance for water conservation projects through the Water Conservation Field Services Program, the Water 2025 Challenge Grant Program, and the new Water for American Program. Past assistance has included on-farm irrigation efficiency demonstrations, improved water measurement, replacement of open ditch laterals with buried pipe, remote monitoring installations, canal automation projects, and educational and training opportunities for local, state, and other federal water management personnel.

Security

Security at all Reclamation dams has increased since September 11, 2001. We have installed or are installing security fencing around the critical facilities at nearly all of the NKAO dams and maintaining close communication with local law enforcement at all sites. Site security plans for Box Butte, Merritt, Bonny, Enders, Red Willow, Medicine Creek, Norton, Kirwin, Webster, and Cedar Bluff Dams were finalized and published in 2007. Site security plans for Virginia Smith and Davis Creek Dams will continue to be developed in 2008.

TABLE 1
NEBRASKA-KANSAS PROJECTS
Summary of Precipitation, Reservoir Storage and Inflows
CALENDAR YEAR 2007

Reservoir	Total Precip. Inches	Percent Of Average %	Storage 12-31-06 AF	Storage 12-31-07 AF	Gain or Loss AF	Maximum Content AF	Storage Date	Minimum Content AF	Storage Date	Total Inflow AF	Percent Of Most Probable %
Box Butte	13.06	77	5,081	5,895	814	11,444	JUN 21	3,204	AUG 13	11,674	73
Merritt	26.76	132	61,100	60,831	-269	67,720	MAY 30	31,230	SEP 6	174,371	94
Calamus	35.96	152	107,326	111,215	3,889	129,253	APR 16	79,922	SEP 16	263,302	100
Davis Creek	32.81	135	10,712	9,684	-1,028	30,289	JUN 29	9,608	SEP 17	50,424	106
Bonny	15.43	90	9,935	7,947	-1,988	13,048	MAY 2	7,874	DEC 2	8,094	68
Enders	25.39	134	11,074	16,885	5,811	21,577	JUN 18	11,081	JAN 1	13,258	93
Swanson	21.20	106	36,310	45,211	8,901	51,925	JUN 22	36,310	JAN 1	21,582	57
Hugh Butler	22.36	114	13,105	24,993	11,888	27,824	JUN 22	13,123	JAN 1	19,478	132
Harry Strunk	27.41	133	23,751	34,153	10,402	47,271	JUN 3	22,941	JAN 1	67,732	191
Keith Sebelius	24.66	101	8,115	9,732	1,617	12,256	JUN 19	8,132	JAN 1	7,801	103
Harlan County	26.92	119	116,299	255,393	139,094	255,393	DEC 31	116,761	JAN 1	198,528	166
Lovewell	31.52	115	19,605	31,273	11,668	43,809	JUN 28	19,688	JAN 1	56,895	93
Kirwin	29.49	126	19,394	24,096	4,702	32,379	JUN 4	19,473	JAN 1	21,000	109
Webster	30.04	128	8,562	17,720	9,158	19,715	JUN 24	8,587	JAN 1	15,574	96
Waconda	26.39	103	125,621	142,983	17,362	146,709	AUG 8	146,710	AUG 8	68,767	56
Cedar Bluff	20.76	99	85,357	86,517	1,160	94,761	JUN 24	85,357	JAN 19	17,303	122

TABLE 2
NEBRASKA-KANSAS AREA OFFICE
Summary of Precipitation, Reservoir Storage and Inflows

JANUARY - JULY 2008

Reservoir	Precip. Inches	Percent Of Average %	Storage 7/31/2007 AF	Storage 7/31/2008 AF	Gain or Loss AF	Inflow AF	Percent Of Most Probable %
Bonny	10.88	93	9,552	8,558	(994)	5,032	59
Enders	13.77	107	19,852	16,191	(3,661)	3,250	38
Swanson	14.55	108	49,902	53,986	4,084	16,208	54
Hugh Butler	18.31	143	26,918	26,506	(412)	8,944	91
Harry Strunk	19.82	144	31,286	34,942	3,656	54,708	232
Keith Sebelius	16.53	102	10,662	16,996	6,334	11,489	205
Harlan County	14.82	100	249,777	319,446	69,669	156,505	183
Lovewell	19.26	112	31,715	35,576	3,861	48,728	200
Kirwin	22.08	146	27,168	57,908	30,740	45,839	316
Webster	20.98	137	19,143	39,609	20,466	26,923	212
Waconda	15.26	94	135,097	225,518	90,421	142,970	155
Cedar Bluff	16.47	119	92,964	86,436	(6,528)	9,549	92

HARLAN COUNTY LAKE

Year	Inflow (AF)	Outflow (AF)	Gross Evap. (AF)	Precip. (Inches)	Precip. (% of Average) (22.76 inches)	Rep. Basin Reclamation Dams (% of Average)	End of Year Content (AF)	**Projected Irrig. Water Supply On June 30th (AF)**
1998	155,772	129,555	41,929	23.12	102%	91%	269,952	**174,500**
1999	164,141	99,304	42,472	24.74	109%	95%	292,312	**186,700**
2000	134,191	166,484	45,006	23.20	102%	87%	215,004	**174,400**
2001	157,844	87,346	40,833	27.97	123%	109%	242,853	**152,600**
2002	60,094	98,518	43,988	16.86	74%	60%	160,463	**116,100**
2003	48,430	51,237	34,307	16.70	73%	93%	113,346	**62,000**
2004	25,099	0	30,601	22.83	100%	111%	107,050	**0**
2005	53,682	0	32,620	22.51	99%	107%	128,111	**14,100**
2006	30,077	12,280	29,609	20.62	91%	101%	116,299	**14,400**
2007	198,528	21,237	38,197	26.92	118%	114%	255,393	**111,700**

*NOTE: On **June 30, 2008** Projected Irrig. Water Supply was 210**,000 AF**.

RECLAMATION
Managing Water in the West

ATTACHMENT L

ENGINEERING COMMITTEE REPORT

Engineering Committee Report
Republican River Compact Administration

August 13, 2008, Lincoln Nebraska

ASSIGNMENTS

At the August 15, 2007 Annual Meeting of the Republican River Compact Administration, the Commissioners assigned the Engineering Committee the following tasks:

1. Finalize work on a user's manual for the Republican River Compact *Accounting Procedures and Reporting Requirements* (RRCA Accounting Procedures, dated July 27, 2005) and provide a recommendation to the Administration for adoption at next year's annual meeting.
2. Exchange by April 15, 2008 the information listed in Section V of the RRCA Accounting Procedures, and other data required by that document, and use these data to complete the preliminary accounting of the virgin water supply, the computed water supply, and the beneficial consumptive uses in the Basin for the calendar year 2007. By July 15, 2008 exchange any updates to these data to complete the final accounting of the virgin water supply, the computed water supply, and the beneficial consumptive uses in the Basin for the calendar year 2007.
3. Continue efforts to resolve concerns related to varying methods of estimating ground and surface water irrigation recharge and return flows within the Republican River Basin and related issues.
4. Retain Principia Mathematica to perform on-going maintenance of the ground water and periodic updates requested by members of the Engineering Committee for calendar year 2007. The billable costs shall be limited to actual costs incurred, not to exceed $12,000.00 in total and will be apportioned in equal 1/3 amounts to the States of Colorado, Kansas, and Nebraska respectively.

WORK ACTIVITIES RELATED TO THESE ASSIGNMENTS AND OTHER ISSUES

The Engineering Committee and technical representatives from the States of Colorado, Kansas, and Nebraska participated in numerous collaborative work activities, phone conferences, and the following face-to-face meetings:

- September 20, 2007, in Denver, Colorado,
- January 30, 2008, in Denver, Colorado,
- March 11 and 12, 2008, in Kansas City, Missouri,
- April 11, 2008, in Kansas City, Missouri,
- May 1 and 2, 2008, in Denver, Colorado, and
- May 15, 2008, in Lincoln, Nebraska.

The following assignments and work activities were completed:

1. **Complete the user's manual for accounting procedures and provide a resolution for its adoption.** The assignment was not completed; the assignment should be continued next year.

2. **Complete the accounting for 2007 using the preliminary information provided by April 15, 2008 and the final exchange by July 15, 2008.**

    a. Each state exchanged its model data sets by April 15 or shortly thereafter. A preliminary run of the RRCA groundwater model was developed by Willem Schreuder and posted on the RRCA web site he maintains for the Administration.

    b. The states exchanged final model data sets and supporting data by August 7, 2008 and Principia Mathematica completed a final run after all the states' final data were delivered to him.

    c. Data sets were collected by the Committee for stream flow, climate information, diversion records, and reservoir evaporation records of the three states in cooperation with the U.S. Geological Survey, U.S. Bureau of Reclamation, and U.S. Army Corps of Engineers for 2007.

    d. The Engineering Committee has not agreed to a final accounting for 2007. On August 1, 2008 Kansas Commissioner wrote a letter to Nebraska outlining questions related to Nebraska's data submittal and requesting additional data for its review. As a result of Kansas' questions related to the Nebraska data submittal and insufficient time to review that data, the committee was unable to finalize the information exchange. The accounting of the virgin water supply, the computed water supply, and the beneficial consumptive uses in the Republican Basin was not completed at this time due to disputes regarding the following matters:

        i. Non-federal reservoir evaporation below Harlan County Lake. Nebraska believes that Section VI.A. of the Final Settlement Stipulation prescribes that only non-federal reservoir evaporation above Harlan County Lake should be included in the annual accounting. Kansas disagrees and believes non-federal reservoir evaporation should be included for the entire basin. At last year's annual meeting the matter was referred to the Engineering Committee to resolve the issue. The matter is still unresolved.

        ii. Division of Evaporative Loss from Harlan County Lake when only one state utilizes reservoir storage for irrigation. Kansas believes that the FSS and currently approved accounting procedures did not anticipate this condition and therefore do not provide clear and fair guidance on the split in this case. Nebraska believes that the current accounting methods take into account the situation where only one state utilizes reservoir storage for irrigation. Last year the Administration asked the Engineering Committee to seek a resolution to the matter prior to October 15, 2007. The matter is still unresolved.

iii. Nebraska believes that Computed Beneficial Consumptive Use (CBCU) and the Imported Water Supply credit are not correctly calculated using the current RRCA Accounting Procedures. The matter was discussed during several meetings, and Nebraska proposed an alternative method of calculating these values in a paper titled *Analysis of Current Methods Used to Calculate Groundwater Impacts for the Republican River Compact,* dated August 6, 2008. The matter is still unresolved.

iv. Nebraska believes that consumptive use and virgin water supply on the Main Stem and Arikaree Sub-basin are being incorrectly calculated due to the incorrect accounting of return flows from the Haigler Canal. Investigations conducted by Nebraska suggest that a portion of the return flows from the Haigler Canal Diversion in Colorado return to the Arikaree River, and not solely to the Main Stem Republican River as indicated in the formulas. The results from this investigation were made available to the other states in March 2008. The matter is still unresolved.

v. Nebraska believes that the cells used as accounting points for outputs from the groundwater model should match the location of the respective Sub-basins as defined in the RRCA Accounting Procedures. The committee was able to reach agreement regarding one location (at Guide Rock, as described below) but was not able to reach agreement for the following locations:

1. Driftwood Creek – Colorado and Kansas disagree with Nebraska
2. Frenchman Creek – Colorado and Kansas disagree with Nebraska
3. North Fork Republican River – Kansas agrees with Nebraska that the accounting cell location should be moved to the Colorado – Nebraska state line, in accordance with the definition of the Main Stem Republican River
4. South Fork Republican River – Colorado and Kansas disagree with Nebraska

3. **Continue to work to resolve different recharge and return flow methods.** The Engineering Committee was unable to work on this assignment.

4. **Retain Principia Mathematica to perform maintenance of the groundwater model.** Each state separately contracted with Principia Mathematica for the groundwater model services.

5. **Colorado augmentation plan proposal**. The State of Colorado presented a plan to use existing ground water consumptive use to increase stream flow in the North Fork sub-basin. The matter is still unresolved.

COMMITTEE RECOMMENDATION

The Committee was able to reach agreement on the following issues:

1. The committee agrees with the proposal for distributing estimated return flows from Riverside Canal. The proposal is included as Attachment A.
2. The committee has agreed to relocate the groundwater model accounting cell in the vicinity of Guide Rock to match the surface water stream gage location at the Guide Rock diversion. Details are included as Attachment B.

RECOMMENDED ASSIGNMENTS FOR THE COMING YEAR

The Engineering Committee recommends the Republican River Compact Administration assign the following tasks:

1. Finalize work on a user's manual for the RRCA Accounting Procedures and provide a recommendation to the Administration for adoption at next year's annual meeting.
2. By September 15, 2008 Nebraska will provide data responding to Kansas' August 1, 2008 letter to Nebraska. In addition, Colorado will provide a final meter report by September 15, 2008. Comments and additional questions will be due by October 1, 2008. The information is to be reviewed by October 31, 2008.
3. Exchange by April 15, 2009 the information listed in Section V of the RRCA Accounting Procedures and Reporting Requirements, and other data required by that document. By July 15, 2009 the states will exchange any updates to these data.
4. Continue efforts to resolve concerns related to varying methods of estimating ground and surface water irrigation recharge and return flows within the Republican River Basin and related issues. Nebraska will continue to improve methods of estimating return flows from using spillback gages on surface water irrigation canals.
5. Continue to review Colorado's augmentation proposal.
6. Retain Principia Mathematica to perform on-going maintenance of the ground water model and periodic updates requested by the Engineering Committee for calendar year 2008. The billable costs shall be limited to actual costs incurred, not to exceed $15,000 in total and will be apportioned in equal 1/3 amounts to the States of Colorado, Kansas, and Nebraska respectively.

The Engineering Committee Report and the exchanged data will be posted on the web at www.republicanrivercompact.org.

ATTACHMENTS

A. Riverside Canal proposal
B. Proposal to move the groundwater model accounting cell at Guide Rock

SIGNED BY

Scott E. Ross
Engineer Committee Member for Kansas

Megan A. Sullivan
Engineer Committee Member for Colorado

James R. Williams
Engineer Committee Member for Nebraska

ATTACHMENT A

RIVERSIDE CANAL PROPOSAL

Republican River Compact Accounting
Riverside Canal Return Flows

Republican River Compact Administration
August 12 and 13 2008
Lincoln, Nebraska

Nebraska has been investigating the methods in which the return flows from canal projects in Nebraska are calculated with respect to the RRCA "Accounting Procedures and Reporting Requirements", and discovered several errors concerning the Riverside Canal. Currently, the accounting formulas that are used to compute the virgin water supply (VWS) for the Frenchman Creek assumes that 100% of the return flow drains into Frenchman Creek above the Frenchman Creek Sub-basin gaging station; this assumption is incorrect. Figure 1 shows the Frenchman Sub-basin gaging station 06835500, the Riverside Canal, the Riverside Canal gaging station and the permitted acres (both above and below the gaging station) associated with the Riverside Canal.

Nebraska's review of the permitted acres associated with Riverside Canal suggests that 78% of the return flows generated from irrigation within the service area served by the Riverside Canal drain into the river below the Frenchman Sub-Basin gaging station 06835500. In other instances in the accounting procedures where return flows from diversions from a sub-basin return to the river below the sub-basin gage, to calculate the VWS of the sub-basin those return flows are added to the flows at the sub-basin gage and are subtracted from the mainstem VWS. Similarly 78% of return flows from the Riverside Canal should be added to the VWS for the Frenchman Sub-basin, and subtracted from the Main Stem Sub-basin. To account for these factors, the following changes are suggested for the Frenchman Subbasin and Main Stem calculations in the RRCA "Accounting Procedures and Reporting Requirements":

Current RRCA Accounting Procedures:

Frenchman Sub-Basin

VWS = Frenchman Creek in Culbertson, Nebraska Gage Stn. No. 06835500 + CBCUc + CBCUk + CBCUn + 0.17 x Culbertson Diversion RF + Culbertson Extension RF + ΔS Enders Reservoir – IWS

Proposed RRCA Accounting Procedures:

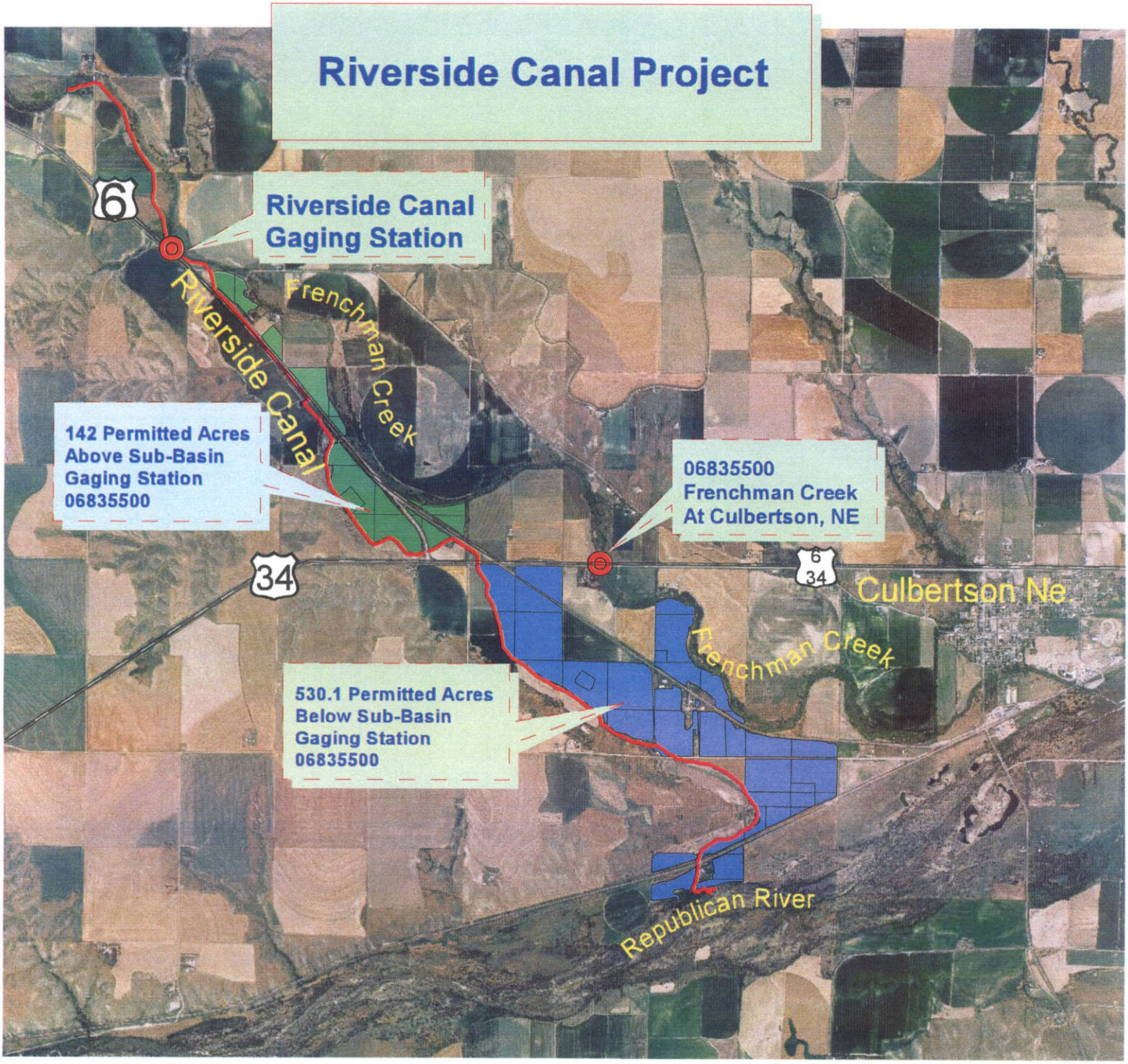
Frenchman Sub-Basin

VWS = Frenchman Creek in Culbertson, Nebraska Gage Stn. No. 06835500 + CBCUc + CBCUk + CBCUn + 0.17 x Culbertson Diversion RF + Culbertson Extension RF **+ 0.78 x Riverside Diversion RF** + ΔS Enders Reservoir – IWS

Main Stem

Main Stem VWS =
Republican River near Hardy Gage Stn. No. 06853500
- North Fork of the Republican River at the State Line, Stn. No. 06823000
- Arikaree Gage at Haigler Stn. No. 06821500
- Buffalo Creek near Haigler Gage Stn. No. 06823500
- Rock Creek at Parks Gage Stn. No. 06824000
-South Fork Republican River near Benkelman Gage Stn. No. 06827500
- Frenchman Creek in Culbertson Stn. No. 06835500
- Driftwood Creek near McCook Gage Stn. No. 06836500
- Red Willow Creek near Red Willow Gage Stn. No.06838000
- Medicine Creek below Harry Strunk Lake Gage Stn. No.06842500
- Sappa Creek near Stamford Gage Stn. No. 06847500
- Prairie Dog Creek near Woodruff, Kansas Stn. No. 68485000
+ CBCUc
+ CBCUn
+ 0.6 x Dk
+ % x Pk
+ 0.5 x M&Ik
+ EvNFRk
+ Harlan County Lake Ev charged to Kansas
+Amount of transportation loss of the Courtland Canal above the Stateline that does not return to the river, charged to Kansas
- 0.9 x Red Willow Canal CBCU
- 0.9 x Hugh Butler Ev
- Harry Strunk Ev
+ 0.6 x Dn below Medicine Creek gage
+ % x Pn below Medicine Creek gage
+ 0.5 * M&In below Medicine Creek gage
+ EvNFRn below Medicine Creek gage
+ 0.6 x Dn below Beaver Creek gage
+ % x Pn below Beaver Creek gage
+ 0.5 * M&In below Beaver Creek gage
+ EvNFRn below Beaver Creek gage
+ 0.6 x Dn below Sappa Creek gage
+ % x Pn below Sappa Creek gage
+ 0.5 * M&In below Sappa Creek gage
+ EvNFRn below Sappa Creek gage
+ 0.6 x Dn below Prairie Dog Creek gage
+ % x Pn below Prairie Dog Creek gage
+ 0.5 * M&In below Prairie Dog Creek gage
+ EvNFRn below Prairie Dog Creek gage
+ Change in Storage Harlan County Lake
+ Change in Storage Swanson Lake
- Nebraska Haigler Canal RF
- 0.78 x Riverside Canal RF **(Proposed Change)**

- 0.17 x Culbertson Canal RF
- Culbertson Canal Extension RF to Main Stem
+ 0.24 x Meeker Driftwood Canal RF which returns to Driftwood Creek
- 0.9 x Red Willow Canal RF
+ Courtland Canal at Kansas-Nebraska State Line Gage Stn
No. 06852500
- Courtland Canal RF in Kansas above Lovewell Reservoir
-IWS


Riverside Canal Project
6
Riverside Canal Gaging Station
Riverside Canal
Frenchman Creek
142 Permitted Acres Above Sub-Basin Gaging Station 06835500
06835500 Frenchman Creek At Culbertson, NE
34
6
34
Culbertson Ne.
Frenchman Creek
530.1 Permitted Acres Below Sub-Basin Gaging Station 06835500
Republican River
2
0
2 Miles
Gaging Stations
Riverside Canal
142 Permitted Acres
530.1 Permitted Acres
N
W
E
S

ATTACHMENT B

PROPOSAL TO MOVE THE GROUNDWATER MODEL ACCOUNTING CELL AT GUIDE ROCK

Republican River Compact Accounting
Guide Rock Ground Water Model Accounting Point

Republican River Compact Administration
August 12 and 13 2008
Lincoln, Nebraska

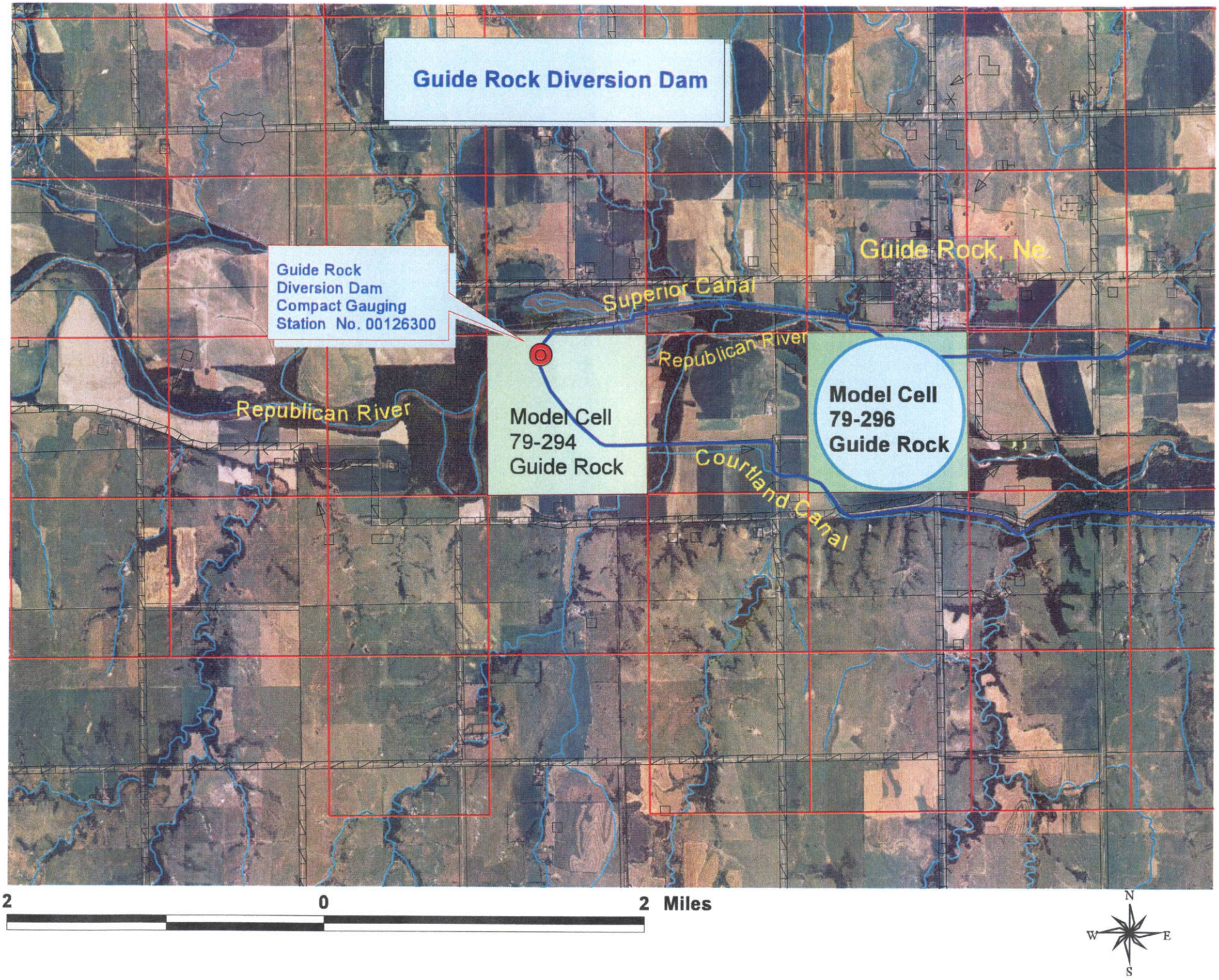
The RRC Ground water model currently calculates the GW CBCU at Guide Rock two miles downstream of the approved Appendix C location; this location is described below.

> **Guide Rock:** a point at the Superior-Courtland Diversion Dam on the Republican River near Guide Rock, Nebraska; the Superior-Courtland Diversion Dam gage plus any flows through the sluice gates of the dam, specifically excluding any diversions to the Superior and Courtland Canals, shall be the measure of flows at Guide Rock;

The RRCA Accounting Procedures require Nebraska to measure compliance at Guide Rock during water short year administration and refer to the Guide Rock location described above:

> **III. Basic Formulas**
> **H.** Calculation of Computed Water Supply, Allocations and Computed Beneficial Consumptive Use Above and Below Guide Rock During Water-Short Administration Years.
>
> For Water-Short-Administration Years, in addition to the normal calculations, the Computed Water Supply, Allocations, Computed Beneficial Consumptive Use and Imported Water Supply Credits shall also be calculated above Guide Rock as shown in Table 5C. These calculations shall be done in the same manner as in non-Water-Short Administration years except that water supplies originating below Guide Rock shall not be included in the calculations of water supplies originating above Guide Rock. The calculations of Computed Beneficial Consumptive Uses shall be also done in the same manner as in non-Water-Short Administration years except that Computed Beneficial Consumptive Uses from diversions below Guide Rock shall not be included. The depletions from the water diverted by the Superior and Courtland Canals at the Superior-Courtland Diversion Dam shall be included in the calculations of Computed Beneficial Consumptive Use above Guide Rock. Imported Water Supply Credits above Guide Rock, as described in Sub-section III.I., may be used as offsets against the Computed Beneficial Consumptive Use above Guide Rock by the State providing the Imported Water Supply Credits.

To correct the GW model's Guide Rock measuring point Nebraska recommends the current model cell 79-296 (segment-reach 253-6) be replaced with model cell 79-294 (segment-reach 251-3). See the attached map for more detail.


Guide Rock Diversion Dam
Guide Rock
Diversion Dam
Compact Gauging
Station No. 00126300
Guide Rock, Ne.
Superior Canal
Republican River
Republican River
Model Cell
79-294
Guide Rock
Model Cell
79-296
Guide Rock
Courtland Canal
2
0
2 Miles
N
W
E
S

ATTACHMENT M

CONSERVATION COMMITTEE REPORT

REPUBLICAN RIVER BASIN

Fourth Annual Status Report

STUDY ON THE IMPACTS OF NON-FEDERAL RESERVOIRS AND LAND TERRACING ON BASIN WATER SUPPLIES

Prepared by

The Republican River Compact Settlement Conservation Committee
for
The Republican River Compact Administration

July 31, 2008

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

INTRODUCTION

On May 26, 1998, Kansas filed suit in the U.S. Supreme Court complaining that the State of Nebraska had violated the Republican River Compact. On January 19, 1999, the Court accepted the lawsuit and assigned Vincent L. McKusick as Special Master. The three original parties to the Compact; Kansas, Nebraska and Colorado became parties to the case and the United States entered the case as *amicus curiae.* In December 2001, the Special Master granted a stay to allow the parties time to attempt to negotiate a settlement. On March 28, 2002, the negotiation teams for Kansas, Nebraska and Colorado signed a Statement of Settlement stating they had negotiated an Agreement in Principle to settle the Kansas v. Nebraska and Colorado litigation. On December 15, 2002, the states completed a Final Settlement Stipulation and the Special Master approved the stipulation in February 2003. The United States Supreme Court, by decree dated May 19, 2003, approved the Final Settlement Stipulation.

The Stipulation required the States, in cooperation with the United States, form a Conservation Committee by January 31, 2003. Further the stipulation required the Conservation Committee to develop a proposed study plan by April 30, 2004, to determine the quantitative effects of Non-Federal Reservoirs and land terracing practices on water supplies in the Republican River Basin above Hardy, Nebraska, including whether such effects can be determined for each of the Designated Drainage Basins (refer to Section VI of the Final Settlement Stipulation).

In January of 2003 each state and the United States appointed individuals to represent them on the Conservation Committee. The Conservation Committee members participated in a series of meeting and conference calls to develop a study plan to quantify the effects of Non-Federal Reservoirs and land terracing practices on water supplies in the Republican River Basin above Hardy, Nebraska. The study plan was transmitted to members of the Republican River Compact Administration (RRCA) on April 30, 2004. A Memorandum of Understanding was also provided with the study plan to identify the responsibilities of each party for funding and completing the study.

Representatives of the Conservation Committee attended the annual Republican River Compact meeting in Burlington, Colorado, on June 8 and 9, 2004, and presented the study plan to the RRCA. The RRCA verbally approved the study plan during the meeting and the signature process for the Memorandum of Understanding formally approving the study proposal was completed on July 27, 2004. July 27, 2004 is the official beginning date for the 5-year study.

STUDY PLAN SUMMARY

The study relies primarily on soil water balance models to simulate the impact of terraces and Non-Federal Reservoirs on surface water supply. The study consists of four primary components: 1. Evaluation and modification of existing models, 2. Development of databases, 3. On-the-ground verification, and 4. Application of the water balance and GIS models. A thorough description of the study plan is provided in the Republican River Basin Study Plan proposal on the Impacts of Non-Federal Reservoirs and Land Terracing on Basin Water Supplies dated April 28, 2004.

PROGRESS SINCE APPROVAL OF STUDY PLAN

A status report describing the progress made in completing the four primary phases of the study follows:

1. Evaluation and Modification of the Existing Models: KSU is serving as the lead for the portion of the Research Project related to the development of the selected water balance model and for its application to land terraces and Non-Federal Reservoirs in the basin. Components of three computer simulation models, POTYLDR, SWAT, and CROPSIM were considered for integration into one model for simulation of the impacts of land terraces and Non-Federal Reservoirs.

   The model will consist of four parts:

   1. A GIS pre-processor will generate input data for the water budget simulation model hydrology response units (HRUs),
   2. A unit area water budget simulation model will retrieve input data and will produce daily, monthly and annual water budgets for each HRU. Operation of a terraced field will be done as a HRU,
   3. A water budget simulation model of a small reservoir using daily outputs from the HRUs, and
   4. A GIS post-processor to combine results of the HRU and reservoir simulation models to produce monthly and annual recharge and runoff amounts for the subwatershed. Post processing will include adjustments for transmission losses that are expected to occur between amounts of upstream runoff predicted from the aggregate of the HRUs and reservoir simulation models and the stream flow at the outlet of the subwatershed.

   Interactions and interfacing for data handling are in progress.

   The overall POTYLDR model will serve as the basic operational framework for the water budget simulation model to operate the HRUs. The model runs on a daily water budget of the inputs of precipitation and outputs of evaporation, transpiration, surface runoff and recharge and the resulting daily change in water amounts in the interception account, soil water volume, and snow storage accounts for each combination of conditions at the various locations within the basin.

   A more precise method to simulate terraces has been developed. The POTYLDR original model used the RCN Method for the entire field using the upslope contributing area and the terrace channel area. The new approach uses a three-area system to model the operation of a terrace – the upslope area, a flat-bottom section representing the terrace channel, and a second flat bench section that is higher in elevation than the terrace bottom to represent the sloping sides of the terrace channel. These three defined areas allow for a more complete water balance calculation for the terraced area by operating a separate water balance for each of the areas

In the case of small reservoirs in a sub-basin, a separate simulation sub-model is being developed to simulate the operations of the reservoir. It uses the reservoirs stage-storage-area-discharge relationships, to simulate the operation of the reservoir. Where information is available for particular reservoirs, it will be used directly. For those reservoirs without sufficient information to simulate them directly, they will be represented by a "typical reservoir" and results scaled to account for the reservoirs in the sub-basin.

A more detailed discussion of the water balance model and modeling approach was included in the Third Annual Status Report, August 2, 2007, and additional information is included in Appendix F of this report.

2. Development of Databases: Initial work was started to collect data and develop databases for Non-Federal Reservoirs and land terracing in the Republican River basin. Each state has completed an inventory of the Non-Federal Reservoirs in their portion of the basin. These inventories include data related to reservoir location, size, date constructed, dam height and other reservoir characteristics. The inventories prepared by each state are included as Appendix A.

   GIS mapping of terraced fields within the Republican River basin in Nebraska and within the Sappa Creek Basin in Kansas were previously prepared by the University of Nebraska. The mapping of terraced fields in Nebraska is being updated to current images. Digitized mapping provides a database of location and size of each of the terraced fields located within this portion of the basin. A comparable GIS mapping for the Republican River basin in Colorado and the remaining portion of the Republican River basin in Kansas above Hardy, Nebraska was completed in May 2007. Maps of the terraced lands in the basin are included as Figure 1 and Figure 2 in Appendix E.

   Soils data from the SSURGO database have been downloaded for all counties in the Republican River Basin and processed to provide data for input to the POTYLD model. The data are currently being overlaid with watershed boundaries to develop characteristics for the hydrologic response units used to simulate the hydrology of selected subwatersheds. Data from the automated weather data network (AWDN) operated by the High Plains Regional Climate Center have been downloaded and processed to provide daily values of reference crop evapotranspiration for weather stations in Nebraska. Those data were used to calibrate the Hargreaves method on a monthly basis to use in simulating the water balance of subwatersheds over longer periods. Data from the cooperative program operated by NOAA and the National Weather Services has also been assembled for the period from 1949 through 2006. These data only include air temperature and daily rainfall. They will be used with the calibrated Hargreaves method to provide reference evapotranspiration data across the watershed and daily rainfall at selected weather stations. Datasets from the National Hydrograph Dataset have been downloaded and will be used to delineate watershed boundaries. Landuse datasets have been downloaded from the USGS and NASS. Tillage practices have been investigated for each county using the CTIC database. This information will be used to define conditions in hydrologic response units. A more detailed discussion of the development of databases is included in Appendix G.

3. On-the-Ground Verification: Initial study efforts were to establish sample monitoring sites in the field for both reservoirs and terraces as a part of the on-the-ground verification. The monitoring sites consist of monitoring at one reservoir and five terrace sites for detailed data collection and monitoring and a larger sample of 32 reservoir sites for continual remote monitoring and recording of reservoir water levels and water surface area over the study period.

   Reservoirs

   Two levels of investigation are needed for the non-federal reservoirs: (1) monitoring of a sample of reservoirs to characterize how and when these reservoirs fill and drain and (2) an investigation at one reservoir to better understand evaporation from these small reservoirs. There are 716 non-federal reservoirs in the basin as reported by the States, Appendix A. There are 6 non-federal reservoirs in Colorado, 148 in Kansas, and 562 in Nebraska.

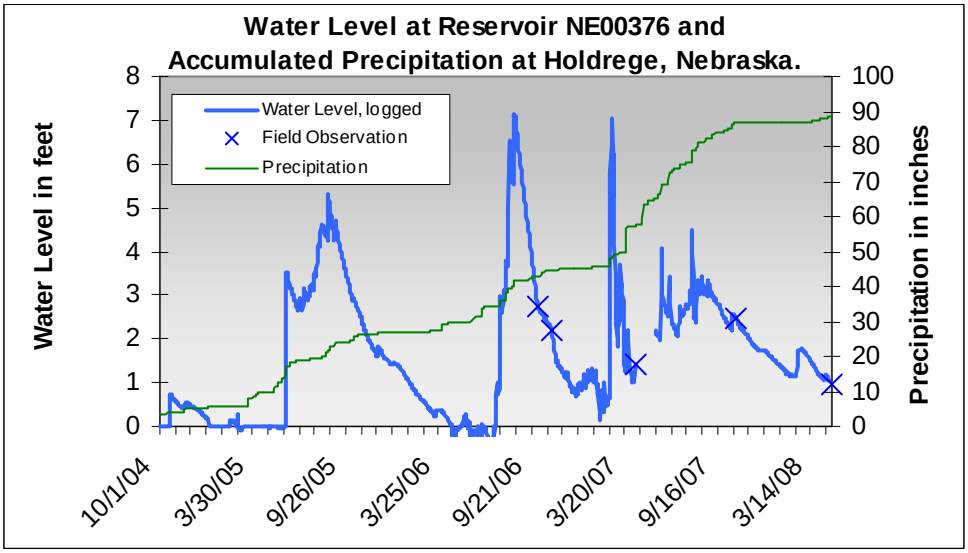
   (1) Larger Sample of 32 Reservoirs Sites: Colorado, Kansas, and Nebraska were responsible for selecting representative sample reservoir sites for the continuous monitoring of reservoir water level. The sample of 32 reservoir sites was proportioned among the states based on the estimated total number of Non-Federal Reservoirs in the Republican River Basin compared with number of these reservoirs in each respective state. Based on these proportions, 1 reservoir sites were assigned to Colorado, 11 to Kansas, and 20 to Nebraska.

   Conservation Committee members and other Reclamation and State personnel met in McCook, Nebraska, on September 13, 2004, to begin installation of equipment and data collection at the reservoir sites. State and Reclamation staff continued installation of monitoring equipment as time allowed through the fall of 2004 and early spring of 2005. Monitoring equipment has been installed at a total of 32 sites. Initially plans were to install equipment at 35 sites, however, after reviewing the completed inventories for each of the states it was found that a much smaller number of reservoirs existed in Colorado than earlier estimated. Because of this, the 4 sites earlier planned for Colorado were reduced to one. Appendix C contains samples of this information for three reservoir sites; one in Kansas, one in Nebraska and one in Colorado. A list of the 32 reservoir sites being monitored is included in Appendix B.

   The States will continue to make periodic site visits during the course of the study to retrieve water level data, determine reservoir surface area at corresponding water levels, and document overall conditions at the reservoir sites. Weather conditions resulted in very little runoff to most of the reservoirs between the fall of 2004 and the fall of 2006. Fifteen of the 32 reservoirs were dry during at least 2 of the 3 or 4 site visits prior to the fall of 2006. Runoff occurred at some monitored reservoirs during the fall of 2006 and the spring of 2007. Site visits during March and April, 2007, found that 20 of the 32 reservoirs had water stored. Site visits to the Kansas reservoirs in mid-June, 2007 showed that all eleven reservoirs had stored water, many of them during a runoff event on or about April 24. Site visits to the 20 reservoirs in Nebraska during the week of April 21, 2008 found that 11 of the reservoirs were dry. However, site visits to the 11 reservoirs in Kansas during early June 2008 found only

two dry reservoirs. Important information is being collected regarding how water levels fluctuate in these small reservoirs.

Figure 1 is an example of water level fluctuations for a reservoir in Nebraska. This reservoir is located west of Holdrege, Nebraska. The October 2004 through April 2006 precipitation totaled about 28.7 inches, 76 percent of average. Precipitation improved over the next two years. The May 2006 through May 2008 precipitation totaled about 66 inches, nearly 8 inches in April 2007, and 120 percent of average. Maximum storage occurring in this reservoir during the observation period was estimated at about 14 acre-feet during August 17, 2006. Similar information on three other reservoirs, one in each State, is included in Appendix C.



Note: Provisional data used for chart.

Figure 1. Example of Water Levels and Accumulated Precipitation for a Reservoir in Nebraska.

Kansas and Nebraska have set up ftp sites to archive the data and to make it available to the Conservation Committee. Kansas has also agreed to archive the data for the Colorado reservoir on their ftp site.

This aspect of the study is essentially on schedule and no anticipated problems are expected at this time.

(2) Field Research at a Single Reservoir Site: Some initial work has been done using the data collected at the small reservoirs to partition the water lost from the small reservoirs between evaporation and seepage. The research team had planned on using a Bowen Ratio system at one reservoir site to measure evaporation from a small pond. This approach has been abandoned because of difficulty in finding a small reservoir in which to install this expensive equipment. The research team will instead focus on using a process-based model for reservoir evaporation with calibration data from a reservoir in an arid watershed in central

Kansas. Both modeling and measurements will be used to improve the predictions for the POTYLDR model.

The research team has been concentrating on estimating seepage from the reservoirs, an important, but unquantified part of the daily water balance. Examination of the water level records from the ten sites in Kansas shows that during most of the time between September 2004 when measurements began and April 2007 these reservoirs had little water in them. One reservoir, DPL Hogan near Long Island, Kansas, has had two periods where there was enough good information to allow for estimates of seepage and overflow from the reservoir.

During a 3-hour period on April 5, 2005, overflow occurred. The total amount of runoff on this date was about 6.67 acre-feet (80 acre-inches) or about 1.0 inch from the 82 acre watershed. See Appendix F of the Third Annual Status Report for more information about estimating seepage from the non-Federal reservoirs. The overall water balance for the April 5 through August 22, 2005 period is shown in Table 1:

Table 1. – Water Balance for a Non-federal Reservoir in Phillips County, Kansas.

Water Balance parameter	*Water Volume, in acre-feet*	*Water Volume, in acre-inches*
Runoff	7.39	+ 88.7
Rainfall	0.35	+ 4.2
Overflow	2.33	- 28.0
Estimated Evaporation	0.52	- 6.2
Estimated Seepage	4.81	- 57.7
Change in Storage	0.08	+ 1.0

Additional analysis of data on DPL Hogan reservoir through March 2008 shows that it follows the same relationship between daily seepage rate and depth of water as determined from the previous analysis.

Land Terracing

Three separate levels of investigation are needed for land terracing: (1) an overall inventory to determine the number, location and size of all terraced fields in the Republican River basin above Hardy, Nebraska; (2) a survey of a sample set of terraced fields in the basin to acquire information on terrace type, condition and other physical characteristics; and (3) a monitoring program for 5 sample terraced fields for detailed water balance studies.

(1) Terrace Inventory: Nebraska completed the mapping of terraced lands in Nebraska and in the Sappa Creek Basin in Kansas prior to this study. UNL is presently updating that mapping. Mapping of terraced lands in Colorado and the remaining portion of the Republican River basin in Kansas above Hardy, Nebraska was completed by Reclamation in May 2007. Initial estimates from the mapping identified 2,309,559 acres in the Republican River Basin above Hardy, Nebraska with 220,335 acres in Colorado, 893,263 acres in Kansas, and 1,195,961 acres in Nebraska.

Maps of the terraced lands are included as Figure 1 and Figure 2 in Appendix E. Appendix E also contains a tabulation of terraced land acreages by county and sub-basin. The ArcGIS files of the mapping for Colorado and Kansas have been provided to UNL for inclusion in the study database.

(2) Survey of Sample Set of Terraced Fields: It was initially believed that a sample set of 20-25 terraced fields in each county was needed to provide an adequate sample of the variation in characteristics between the terraced fields. An investigation form identifying data that should be collected during the field investigations of the terraced fields is included in Appendix D.

The Conservation Committee made a recommendation to the RRCA at the July 27, 2005, annual meeting that a request for the Natural Resources Conservation Service (NRCS) assistance would be beneficial in assessing the condition of terraces. The RRCA agreed and sent a letter of request for assistance to the NRCS. In response to that request for assistance, the NRCS and the Conservation Committee developed a plan for a pilot study to assess terrace condition. The pilot study examined terraces in the Medicine Creek basin in Frontier County, Nebraska and in Prairie Dog Creek basin in Decatur County, Kansas. The Conservation Committee identified 15-20 potential terraced fields in each county, listed in Appendix D, and the NRCS completed an office assessment of 10 of these terraced fields per county, and field checked 2-3 of the sites per county. This assessment identified the as-built condition of the terrace and determined the present condition. Based on the results of the pilot study, a revised plan to assess terrace storage condition was developed. The revised plan prescribes site investigation of about 200 terraced fields. UNL is serving as the lead in this part of the study. The terrace condition assessment study plan is include in Appendix D.

The survey is being conducted through the use of a survey-grade GPS system that was loaned to the project by the Kansas Department of Water Resources. The GPS system was installed on an all terrain vehicle to allow for rapid surveying of terraces and field boundaries. The survey-grade GPS provides accurate spatial and vertical resolution of the field topography. The GPS system logs the horizontal location and the elevation within the field. The system is being used to define field boundaries and to develop estimates of the storage capacity of two terraces within each field that is surveyed. Figure 2 is an example of the type of topographic map that results from the survey of a 35 acre field with seven terraces. For this specific example field, one terrace would store 0.89 inches of runoff from the contributing drainage area, and one terrace would store 1.05 inches of runoff. A more detailed description of the survey process and utilization of the data is presented in Appendix G.

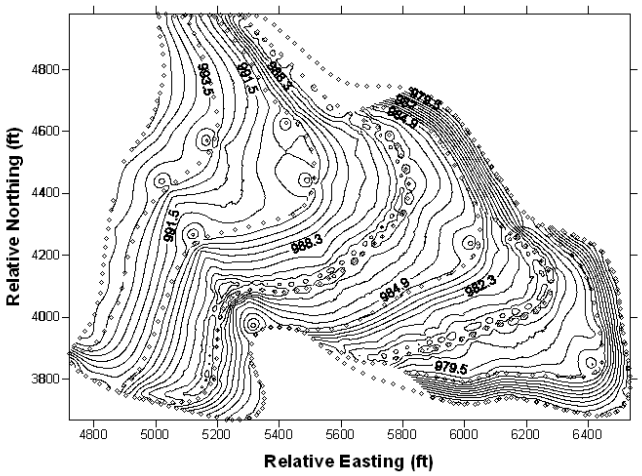


Figure 2. Topographic map of terraced field produced from field survey.

(3) Field Research at 5 Terraced Sites: Five sites were selected for the field research on the impact of terraces. The sites include conservation bench terrace systems located near Culbertson, Nebraska and Colby, Kansas; level terrace systems with closed ends located near Curtis, Nebraska and Norton, Kansas; and a level terrace system with open end(s) located near Stamford, Nebraska (Figure 1 of Appendix G).

Data collection equipment has been installed at the five field research terraced sites. Equipment has been installed to measure and record precipitation and reference evapotranspiration at each site. Water level information is also collected in the terrace channel. Volumetric water content of the soil is being collected at various depths in both the contributing area above the terrace channel and in the terraced channel. Soil moisture data is also being collected using matric potential sensors in both the contributing area and in the terrace channel. Soil temperatures are also being collected. Figure 3 indicates the relative location of the contributing area and the terrace channel. The five terraced fields have been monitored for two growing seasons.

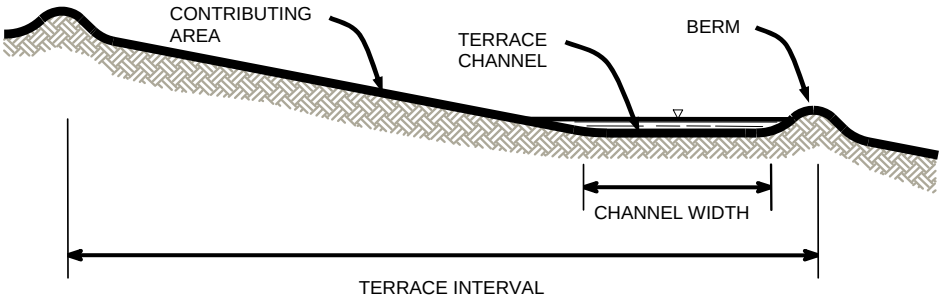


Figure 3. Cross Sectional View of Typical Terraced Land.

A more thorough description of monitoring at the terrace sites and an overview of the data collected has been presented in the Second and Third Annual Report so it is not repeated in this report.

The field measurements provide data on the characteristics of the water balance for the terrace channel and the contributing area. However, it is very difficult to directly measure either ET or deep percolation on small areas. A process-based model was used to simulate crop growth and the water balance for each area. The model provides estimates of all aspects of the water balance including ET and deep percolation

The process-based model was calibrated using measurements from the field sites. Initial calibrations were made and the model used to simulate some initial results for a limited number of conditions. Table 2 has the results of the simulated water balance at the Norton, Kansas site. Our goal is to improve the partitioning of water into runoff, deep percolation, and ET.

Table 2. Simulated water balance for the cooperator's field near Norton, Kansas, for the period January 1, 2005 through December 31, 2007.

	Contributing Slope	*Terrace Channel*
Precipitation (cm)	165	165
Runoff (cm)	3.88	0.00
Run-on (cm)	0	325
ET (cm)	157.7	186.8
Deep Percolation (cm)	28.2	310.0
Change in Storage (cm)	-24.8	-6.7

The simulated deep percolation from the terrace channel is about ten times the amount for the contributing area for the two-year period from 2005 through 2007 at the Norton site. The evapotranspiration from the terrace channel over the two-year period was about 30 cm more than for the contributing area.

The accuracy of partitioning precipitation into runoff, deep percolation or evapotranspiration from the contributing area and partitioning in the terrace channel depends on estimating the rate of infiltration. The infiltration rate depends on the hydraulic conductivity of the soil which in turn depends on the tillage practices employed. The POTYLD model used to simulate the water balance of cropping practices depends on the curve number method to estimate infiltration. Routines were developed to adjust the curve number for the POTYLDR model based on hydraulic conductivity and tillage practices to improve simulation of the water balance for the terraced fields.

The resulting hydraulic conductivity-curve number relationship is shown in Figure 4. As illustrated the curve number could range from a low of 60 to a maximum value of 85.

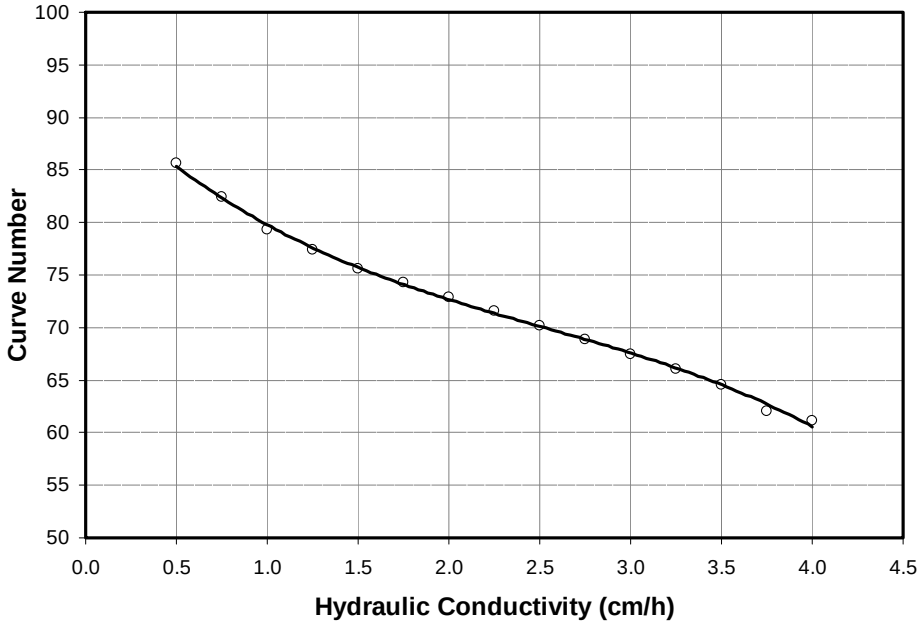


Figure 4. Effect of change in hydraulic conductivity on the curve number.

Model simulations were used to determine the variability of hydraulic conductivity from eco-fallow cropping systems. The pattern for the curve number for a three-year period for an eco-fallow system is shown in Figure 5. The curve number for the three-year period varies from about 70 to about 75.

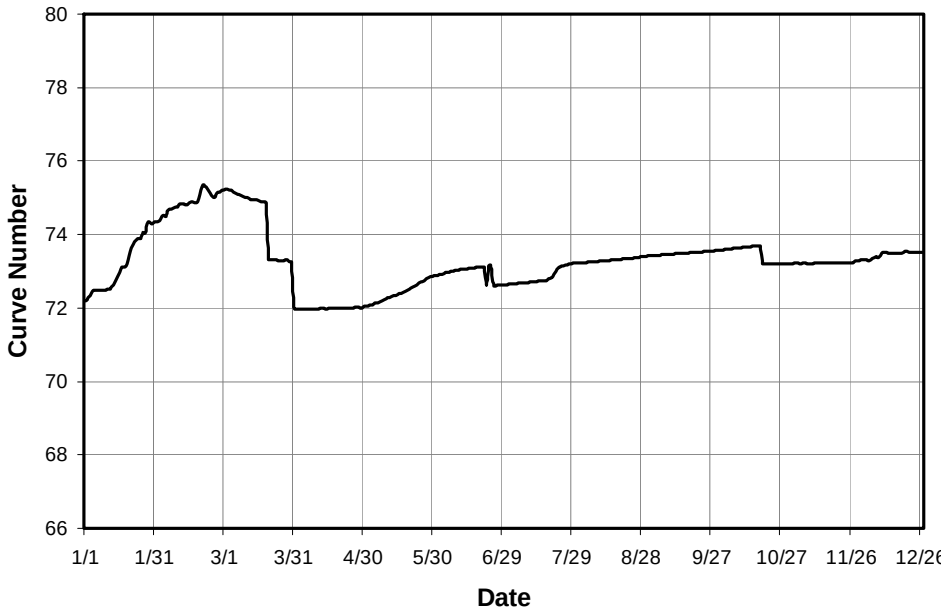


Figure 5. Simulated change in curve number due to tillage and erosion effects.

These results show the nature of the variability in the curve number for one of the cropping systems that is common in the Republican Basin. We will continue to apply these mechanistic models to improve the input parameters for the POTYLDR model.

A more detailed discussion on data collection to help define the water balance at the terraced sites and using that data to develop input to the POTYLDR water balance model is included in Appendix G.

Stream Transmission Loss

The other aspect of the model development that is under study is transmission losses of streamflow during runoff events. Transmission loss is the quantity of water that enters a stream reach, but that does not flow out of the stream reach as surface flow. Transmission loss is usually associated with evaporation and percolation. The effects have important implications on loss of streamflow and recharge distribution within the basin. So, accounting for them will have effects on where and how terracing and small reservoirs affect both recharge and streamflow within the basin.

A small runoff event occurred from the area above the Ludell, KS stream gauge on Beaver Creek on April 24-26, 2007 that totaled 523 acre-feet of flow. This same event appears to have produced a small flow at the Cedar Bluffs, KS stream gauge on April 24, 2007 a few hours later that totaled 23 acre-feet of flow. Subsequently, the main flow that occurred above Ludell made its way past the Cedar Bluff gauge. The resulting hydrograph at Cedar Bluffs from the inflow from above Ludell passed the Cedar Bluffs gauge on April 25 -28, 2007 and totaled 400 acre-feet. This distance between these two gauges is 40.4 river miles. The volume of flow decrease between the two stations was 523-400 = 123 acre-feet. This amounts to a loss of volume of about 24%.

Jordan (1977) looked at flood flows extensively in Kansas and several of the streams are in the Republican Basin that concluded that the transmission loss in one mile for medium- to large-sized streams in western Kansas averages 2% of the flow volume at the beginning of each mile. Using the same technique as Jordon, the April 24-26 runoff event showed an average of only 0.67% of the hydrograph volume was lost per river mile. Considering the small size of the event and that flow was all within the channel, the lower loss observed here is reasonable. It also leads to the conclusion that transmission losses for in-channel flows are likely to be lower than for floods that have a larger area and greater hydraulic pressures that lead to the greater percentage losses that Jordon's work showed. More data is needed, however.

4. Application of the water balance and GIS models**:**

The model has been tested for different terrace type, cross-section dimensions, functioning conditions, and cropping pattern. A summary of preliminary work is described in more detail in the Third Annual Status Report. Those results and the results discussed below should be considered preliminary because they do not include enough field data to properly calibrate the model. Based upon previous work, however, the results appear to be reasonable.

To further evaluate the overall approach to the model simulation, the USGS 06847900 PRAIRIE DOG C AB KEITH SEBELIUS LAKE, KS was chosen as a representative sub-basin on the south side of the main stem of the Republican River. It is an unregulated stream that has a total drainage area of 590 square miles all of which is described as contributing. The watershed begins in west central Thomas County west of Colby and extends generally northeastward to the streamgaging station about 10 miles west of Norton. The sub-basin includes parts of Sheridan, Decatur, and Norton Counties. Total stream length is nearly 100 miles.

The previously-developed version of POTYLDR was used to simulate the operation of important land use conditions as representative HRUs. Terraced cropland systems, 141,272 acres, were represented by conventional level, closed-end terraces in good conditions with a 3-year crop rotation of wheat-rowcrop-fallow with good residue management. Unterraced cropland, 82,591 acres, was represented by the same cropping system but with no terraces. The remainder of the watershed, 153,737 acres, was represented by range/pasture with good management practices. For analysis purposes, the average for a simulation with 60 years of continuous daily precipitation and minimum and maximum temperature were made to get the average values for use in the overall sub-basin water balance.

The weighted average runoff from the HRUs at the edge of the field averaged 0.44 inches/year. After adjustment for transmission losses, the estimate of the contribution of runoff to streamflow at the streamgage was 6,400 acre-feet. This value is quite close to the average for the past 15 years of the record.

The effect of terracing on recharge is estimated using the percolation from the three HRU's. The weighted average percolation from the HRUs is 0.41 inches/year or 12,900 acre-ft/year. The effectiveness of this percolation to actually become usable groundwater is uncertain. Some of it may return as springs or get close enough to the surface to be drawn up by deep-rooted vegetation. The estimated effectiveness used here is 80%. The net recharge from the land is then estimated to be 10,300 acre-ft/year. Adding the land recharge to the alluvial groundwater recharge then produces an estimated total annual average recharge of 15,300 acre-feet or about 0.5 inches over the sub-basin.

The effects of the terraced lands can be estimated by considering the extent of the land terraced in the sub-basin and the difference between the average depth of runoff and the depth of percolation between the terraced land and the same land assuming it were unterraced. This assumes that the terraced land, if it were unterraced, has the same runoff and percolation characteristics as the unterraced land in the sub-basin.
The estimated net effects of the terraces are that streamflow from the sub-basin is reduced by 3,200 acre-ft/year and net groundwater recharge is increased by 200 acre-ft/year. There is not a direct method to determine if these values are, indeed, correct. Field measurements that are a part of this larger study are showing that terraces of the type in this sub-basin are preventing nearly all runoff from above them from being lost. Also, substantial amounts of percolation below the terrace channel are being measured.

This analysis represents to overall approach for estimating the effects of terraced lands on streamflow and groundwater recharge. Indirectly, it also includes estimated effects of small dams in the sub-basin; however, those effects are still being worked on in another part of this project. This analysis needs to be applied to a sub-basin in the Nebraska portion of the basin to provide more confidence that is will produce results that are judged to be reasonable before it is applied to sub-basins throughout the basin.

A more detailed discussion on the application of the water balance model, evaluation, and discussion of results is included in Appendix F.

EXPENDITURES

The Final Settlement Stipulation specifies that the States and the United States will undertake this study at a cost not to exceed one million dollars of which the United States will be responsible for 75 percent of the cost and each State will be responsible for one third of the remaining 25% ($83,333 per State). The States' portion may be provided entirely through in-kind contributions. If the cost of the study exceeds one million dollars, the United States will be responsible for the entire additional amount.

The Study Plan Proposal of April 28, 2004, specified that the in-kind contributions of the States reported in the status reports would cover the period from April 1 of the previous fiscal year through March 31 of the current fiscal year. However, this status report includes costs for May 1 through April 30 as these costs provide a more up-to-date status. Table 3 shows the expenditures by each entity for each of the study years.

Table 3. -- Summary of Study Expenditures

	Study Proposal Development	***Study Expenditure Year[1]***					
		2005 **Study Yr 1**	**2006** **Study Yr 2**	**2007** **Study Yr 3**	**2008** **Study Yr 4**	**2009** **Study Yr 5**	**Total**
Colorado	$23,820	$5,625	$3,744	Not reported	Not reported		9,369
Kansas[3]	40,009	22,307	8,193	21,644	22,129		74,273
Nebraska	12,938	23,219	28,023	34,846	32,453		118,541
KSU		0	45,400	77,121	65,920	3,561	192,002
UNL		0	189,400	142,406	74,120	11,894	417,820
Reclamation[4]		64,876	25,350	85,969	13,685		189,880
NRCS		0	7,125	0			
Total		$116,027	$307,235	$361,986	$208,307		$1,001,885

[1] The Study was approved on July 27, 2004. The Study Expenditure Year for this table is defined as the period from July 27, 2004 through April 30, 2005 for Study Year 1, and May 1 through April 30 for the other study years, unless otherwise noted.

[2] Expenditures for May 1, 2007 thru June 18, 2007.

[3] Expenditures are July 1 through June 30 for 2005 and 2006, July 1 through April 30, 2007, and May 1, 2007 through April 30, 2008.

[4] Expenditures separate from funds provided to KSU and UNL under agreements.

Study expenditures totaled $986,430 through April 30, 2008, with an additional amount of $15,455 during May 1 through early June, 2008, for a total expenditure of $1,001,885.

Colorado – Colorado has provided in-kind contributions toward the study by selecting one reservoir site, assisting with the installation of equipment for monitoring the operation of the reservoir, and by assisting with other work related to the study. Colorado has contributed $9,369 of in-kind services towards the study from the date of approval of the study on July 27, 2004 through April 30, 2006.

Kansas - Kansas Division of Water Resources, Department of Agriculture, has provided staff time, plus expenses in the form of per diem cost for travel, training, installation of instruments and monitoring and maintenance on the instruments on a sample of 11 reservoirs and by assisting with other work related to the study. During 2006, Kansas produced area-capacity tables for each of the 11 dams monitored as part of this study. During 2007, Kansas purchased and supplied a survey grade GPS system to the University of Nebraska staff to use for conducting the terrace condition assessments and an equipment lease cost of $8,000 has been included in contributions by Kansas. Kansas has contributed $74,273 of in-kind services towards the study from the date of approval of the study on July 27, 2004 through April 30, 2008.

Nebraska – Nebraska has provided in-kind contributions toward the study by selecting sites, assisting with the installation of equipment for monitoring the operation of 20 reservoirs, and by assisting with other work related to the study. Nebraska conducts site visits to the 20 reservoir sites at least twice per year to download water level recorder data and to collect water surface perimeter data using GPS. Nebraska has surveyed these (and other non-federal) reservoirs to produce area-capacity tables. Nebraska has contributed $118,541 of in-kind services towards the study from the date of approval of the study on July 27, 2004 through April 30, 2008.

United States

Reclamation – Reclamation committed staff time and funding for purchase and installation of equipment related to the larger sample of 32 reservoirs. In addition, Reclamation committed staff time for preparation and administration of the funding and for mapping of terraced fields (terrace inventory) in Colorado and Kansas. Total expenditures by Reclamation for the above work from the time the MOU was signed through April 30, 2008 were about $189,880.

Reclamation entered into a 5-year agreement with the UNL in early October of 2004 to fund the majority of UNL's role in the study effort. Funding to UNL became available in February of 2005. In March, 2005 Reclamation entered into a 5-year agreement with KSU to fund the majority of their role in the study. According to the agreements, Reclamation has agreed to provide $648,789 to KSU and UNL for the study effort. Reclamation modified the funding agreement with UNL in July 2007 to include an additional $98,000 to accomplish the terrace condition assessment.

Kansas State University – Through April 30, 2008, KSU's Cooperative Agreement expenditures have been about $188,441 and an additional amount of $3,561 from May 1 through early June, 2008, for a total expenditure of $192,002. Reclamation has obligated a total of $269,126 to KSU leaving $77,124 of unexpended funds.

University of Nebraska - Through April 30, 2008, UNL's Cooperative Agreement expenditures have totaled about $405,926 and an additional amount of $11,894 from May 1 through early June, 2008, for a total expenditure of $417,820. Reclamation has obligated a total of $477,266 to UNL leaving $71,754 of unexpended funds. Obligated funds that are unused in fiscal year 2008 will be available for work in future years.

NRCS – The NRCS committed staff time and travel expenses for the pilot study to identify as-built condition of the terraces and determine present condition. The expenditure for this work was $7,125 during 2006.

STUDY TIMELINE

For the first year, July 27, 2004 thru May 30, 2005, progress on the study was on schedule for installation and monitoring of the larger sample of 32 reservoirs but behind schedule on most other aspects of the study by 4-5 months. It was anticipated that only 2-3 months of potential data collection would be lost from the delay in installation of monitoring equipment for the detailed field research. Good progress was made in assembling geographic information needed for the study.

During the second year, June 1, 2005 thru May 30, 2006, the study has fallen further behind schedule, primarily caused by delays on installation of equipment to collect data at the field research sites on detailed information regarding the water balance for the small reservoir and land terrace sites. The Conservation Committee generally believes that good results can be obtained by the planned completion date of the study. Two and one-half to three years of detailed data collection at the reservoir and terrace sites should still provide good information regarding the water balance at the sites.

During the third year, June 1 2006 thru May 30, 2007, the research team expected to apply the model to conditions in the selected test sub-basins, Prairie Dog Creek above Sebelius Lake and Medicine Creek above Harry Strunk Lake by the end of 2006. This activity was not completed because of delays is obtaining an assessment of terraced land conditions in those basins, which has been shown to be an important factor in the water balance of terraces. The original study timeline allowed for calibration of the water balance model until July 1, 2008

During the fourth year, June 1, 2007 thru May 30, 2008, the terrace condition assessment got underway with two of the counties in Nebraska containing the most terraces nearly completed by mide-June 2008. Field data collection at terrace sites has been completed for two of the three years that are typical of ecofallow, common in the Republican River Basin. Preliminary water balance partitioning was completed for example terrace sites. The field data was used along with various simulation models to develop information for adapting the POTYLDR model to represent conditions in the Republican River Basin. The field data collection and adaptation of the POTLYDR model is necessary to improve the partitioning of water into runoff, deep percolation, and evapotranspiration. The POTYLDR model was used to simulate the operation of important land use conditions as representative HRUs in the Prairie Dog Creek basin above Keith Sebelius Lake in Kansas. This evaluation included making estimates of the effects of terracing on streamflow and groundwater recharge for the sub-basin. Model calibration was not completed within the expected timeframe, which will mean less time to develop final model results.

PLANS FOR FIFTH AND FINAL YEAR

Data collection for the reservoir and land terrace sites will continue until May 2009. The assessment of terrace condition will continue and the Conservation Committee will need to gauge the progress of the assessment survey by about mid-October and determine how many more terraced sites can be surveyed in order to complete the study within the expected time. The research team will continue to use the process-based models with field data to develop input data for the water balance model. As additional water balance model data is developed, the model will be refined and use to update the Prairie Dog Creek subbasin and applied to the Medicine Creek subbasin. The water balance model will than be applied to the remaining subbasins. It is expected that a draft summary report of the study will be available for presentation to the Compact Administration during the late summer of 2009.

APPENDICES A—E NOT INCLUDED

(LITTLE OR NO CHANGE FROM PRIOR YEARS)

Progress Report for the Period: May 1, 2007-June 1, 2008

Electronic file: Progress Report June 2008.doc (Word document)

Cooperative Agreement Between The Bureau of Reclamation and Kansas State University: Modeling and Field Experimentation to Determine the Effects of Land Terracing and Non-Federal Reservoirs on Water Supplies in the Republican River Basin Above Hardy, Nebraska

Prepared by: James Koelliker, Principal Investigator
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Kansas State University Responsibilities:

a. Lead the effort to evaluate existing water balance modeling methods and improvement of those models. At least three models will be studied to determine the most reliable methods. The following sections describe the additional work done during the past year.

Water Budget Model Evaluations:

In cooperation with the University of Nebraska-Lincoln, three water budget models were evaluated and the **POTYLDR** (**POT**ential **Y**ie**LD** Model **R**evised) developed by Kansas State University (Koelliker 1994) will serve as the basic framework for the water budget simulation model.

The Overall Modeling Approach for this Project

The KSU and UNL teams met two times to work on details of this project. Also, we have shared information and data as needed via e-mail and ftp procedures. The development of the computer simulation model has been a continuing topic that has received considerable attention.

The total model will consist of four parts:

1) A GIS pre-processor framework to define geographical areas, extract characteristics of the areas from GIS coverages such as soils, land use, extent of terracing, applicable meteorological stations, and other information that can be put in GIS format. This pre-processor will generate input data for the water budget simulation model hydrologic response units (HRUs).

2) A unit area water budget simulation model capable of receiving input data for individual land-use, soil, conservation practices, and location combinations throughout the basin that will operate on a daily basis for at least 25 years to produce output of daily, monthly and annual water budgets for each applicable HRU. The operation of a terraced field will be done as an HRU as described later in detail.

3) A water budget simulation model of a small reservoir using daily outputs from the applicable HRUs for that represent its watershed conditions and reservoir stage-storage-area-discharge relationships as well as estimated seepage loss rate under the surface area of the reservoir

4) A GIS post-processor to combine results from the HRU and reservoir simulation models on an areal basis to produce monthly and annual recharge and runoff amounts from the sub-basin. Finally, a simple percent-per-mile transmission loss factor based upon the flowpath-length within the sub-basin will be used to redistribute runoff into infiltration losses to add to recharge and reduce surface runoff from the sub-basin.

The GIS pre-processor and post-processor aspects of the project are being led by the Nebraska cooperators of this project. Interactions and interfacing for data handling are in process.

Revisions to the POTYLDR Model for this Project

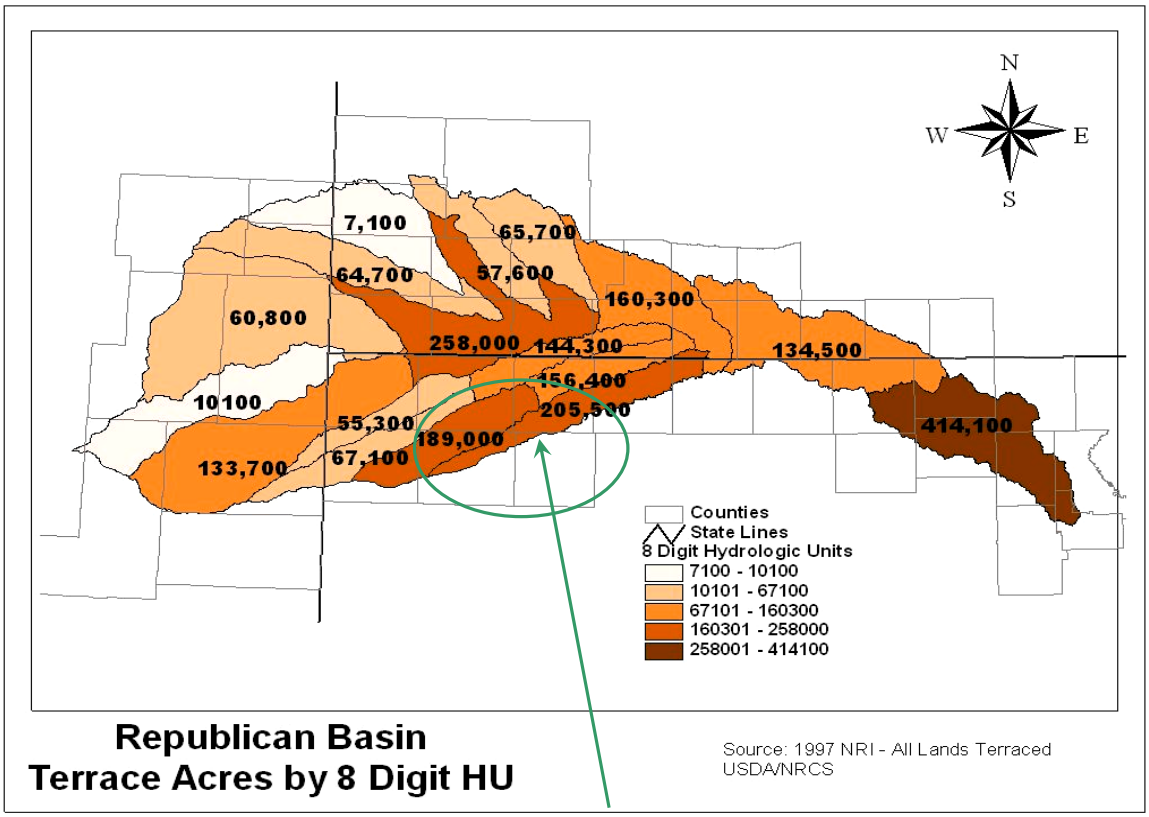
The overall POTYLDR model will serve as the basic operational framework for the water budget simulation model to operations the HRUs. It runs on a daily water budget of the inputs of precipitation and outputs of evaporation, transpiration, surface runoff and recharge and the resulting daily change in water amounts in the interception account, soil water volume, and snow storage accounts for each combination of conditions at the various locations within the basin.

Simulating the Water Budget for Prairie Dog Creek above Keith Sebelius Lake as a Representative Sub-basin

To evaluate the overall approach to the model simulation, the USGS 06847900 PRAIRIE DOG C AB KEITH SEBELIUS LAKE, KS was chosen as a representative sub-basin on the south side of main stem of the Republican River. It is an unregulated stream that has a total drainage area of 590 square miles all of which is describing as contributing. The watershed begins in west central Thomas County west of Colby and extends generally northeastward to the streamgaging station about 10 miles west of Norton. The sub-basin includes parts of Sheridan, Decatur, and Norton Counties. Total stream length is nearly 100 miles. See Figure 1.

Soils in the watershed are dominated by deep, fine-grained silt loams with moderate runoff potential, and good water-holding capacity. Most areas have low to moderate

slopes. Soils are susceptible to water erosion and wind erosion if not protected by residue or cover crops. Where slopes are not great, the soils are well suited to crop production. The sub-humid climate makes good water management important to successful dryland farming.



Prairie Dog Creek Above Sebelius Lake, KS
Prairie Dog Creek Near Woodruff, KS
205,500 acres terraced in 1997 out of a total area of 644,500 acres
Area in Prairie Dog Creek Above Sebelius Lake, KS is 377,500 acres
Estimated terraced acres is 120,000 in 1997

Figure 1. Location of Prairie Dog Creek above Sebelius Lake, KS and estimate of terraces in the sub-basin in 1997, USDA NRCS 1997 Natural Resources Inventory.

The climate of watershed is a dry, continental. With the exception of a severe deficiency in some years it is generally favorable for the successful growth of many crops. Annual precipitation increases from an annual average of 18 inches in the west to about 22 inches at the streamgaging station. Average annual evaporation is near 60 inches.

Land use in the watershed is dominated by cropland (59%) as reported by the USDA National Agricultural Statistics Service 2002 Census for the four counties and shown in Table 1.

Table 1. Land in cropland and cropland that is terraced in the Prairie Dog Creek above Sebelius Lake Sub-basin.

Land in cropland taken from
USDA National Agricultural Statistics Service, 2002 Census
http://www.nass.usda.gov/Census/Pull_Data_Census

County	Area, ac	2002 Cropland Area, ac	Cropland Percent	Part of Watershed Area, %	Cropland in County in Prairie Dog Watershed, acres	Total Land in County in Prairie Dog Watershed, acres	Prairie* Dog Creek Area Terraced Lands	Percent of Cropland** in Terraced Fields
Thomas	688,000	566,418	82	28%	87,044	105,728	30,364	35%
Sheridan	574,080	360,344	63	5%	11,851	18,880	4,756	40%
Decatur	572,160	282,306	49	65%	121,101	245,440	104,069	86%
Norton	563,840	288,731	51	2%	3,867	7,552	2,083	54%
Values for the Watershed				100%	223,863	377,600	141,272	63%
					0.59			

*Values from terracing mapping portion of this project as reported in the Third Annual Status Report
Area in Norton County above the streamgaging station is estimated.
**Assumes all terraced land is used for crops

Terraced lands for this analysis were assumed to be in cropland. As shown in Table 1, an average of 63% of the cropland in the sub-basin is terraced. Terraced land includes all of the field area with terraces on it. Generally, about ten to fifteen percent of a terraced field is below the lowest terrace and as such the runoff from that area is not retained. Therefore, runoff from the terraced land was increased to reflect this situation and percolation was reduced to account for the area for which no additional infiltration would occur.

The streamgaging station began operation in 1963 to provide estimates of inflow to Keith Sebelius Lake. Long-term average streamflow has been 8.16 cfs, 5,900 acre-feet/year, or 0.19 inches/year over the drainage area. The greatest year of streamflow, 1965, totaled 38,600 acre-feet and the lowest was 200 acre-feet in 1981. Average annual streamflow for the past 15 years, 1992-2006 has been about 6,400 acre-feet, slightly above the long-term average.

The previously-developed version of POTYLDR was used to simulate the operation of important land use conditions as representative HRUs. Terraced cropland systems were represented by conventional level, closed-end terraces in good conditions with a 3-year crop rotation of wheat-rowcrop-fallow with good residue management. Unterraced cropland was represented by the same cropping system but with no terraces. The remainder of the watershed was represented by range/pasture with good management practices. For analysis purposes, the average for a simulation with 60 years of continuous daily precipitation and minimum and maximum temperature were made to get the average values for use in the overall sub-basin water balance. Table 2 shows an overall long-term water balance for the sub-basin using the weighted amounts of land represented by the three HRUs. The weighted average runoff from the HRUs at the edge of the field averaged 0.44 inches/year.

In previous annual reports we reported that transmission losses in this area were estimated to be about two percent per mile of travel in the stream system. In Table 3, the area of the sub-basin was divided into five equal portions and the distance of travel from

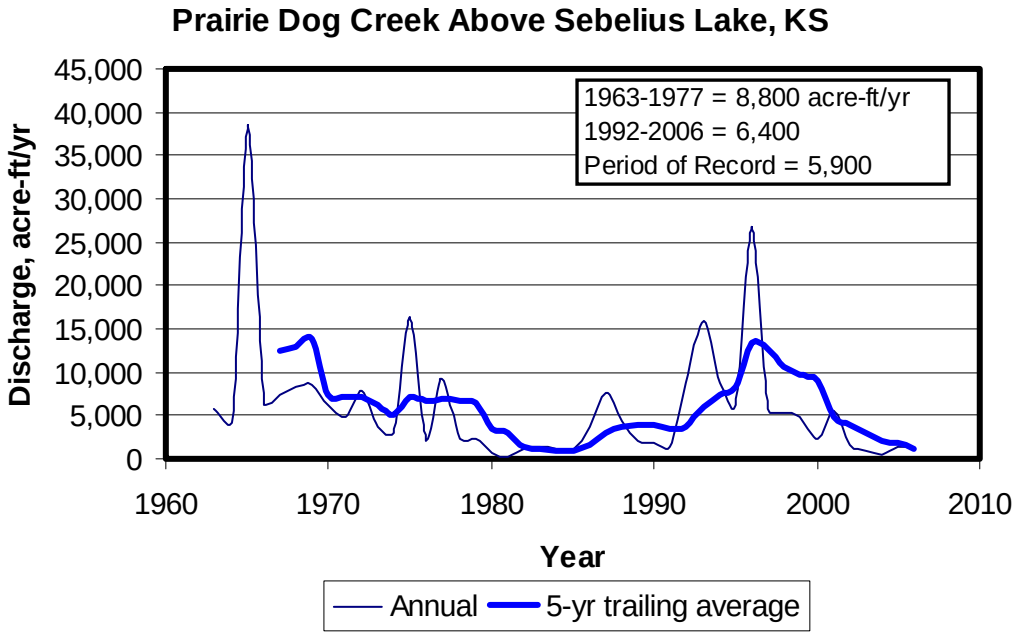


Figure 2. Annual measured streamflow from the sub-basin.

Table 2. Average annual water budget for the Prairie Dog Creek above Sebelius Lake sub-basin for current conditions.

	Total Watershed Values	Cropland With Terraces	Cropland Without Terraces	Other Land Simulated as Pasture/Range
Area, acres	377,600	141,272	82,591	153,737
Effects on the Surface Water System				
Runoff at the edge of field, inches	0.44	0.25	0.85	0.40
Acre-ft	13,900			
Transmission losses of runoff in stream system to first measurement point, %	60			
Net streamflow at measurement point, acre-ft	5,600			
Effects on the Alluvial Groundwater System				
Net efficiency of transmission losses to enter the groundwater system, %	60			
Net contribution to alluvial groundwater system, acre-ft	5,000			
Transmission losses that do not become usable groundwater, acre-ft	3,300			
Portion of unusable transmission losses that return as baseflow, %	25			
Net baseflow contribution to streamflow from transmission losses, acre-ft	800			
Transmission losses that are lost by evapotranspiration, acre-ft	2,500			
Effects on the General Groundwater System				
Percolation from the field, inches	0.41	0.7	0.4	0.15
Gross percolation from the field, acre-ft	12,900			
Effectiveness of percolation contribution to groundwater system, %	80			
Net increase in recharge to groundwater system from the field, acre-ft	10,300			
Field percolation lost as evapotranspiration, acre-ft	2,600			
General groundwater system contribution to streamflow, % of additional recharge	0			
Net contribution of groundwater system contribution to baseflow, acre-ft	0			
Net streamflow, acre-ft	6,400	0.20 inches		
Net recharge to groundwater system, acre-ft	15,300	0.49 inches		

Note: All volumes are rounded to the nearest 100 acre-ft

the center of each section was estimated. Then, the proportion of edge of the field runoff that would be estimated to reach the streamgage was calculated for each section and averaged. This approach shows that about 40% of the field runoff would be expected to reach the streamgage. Or, the transmission loss of runoff in the stream system is estimated to be 60%. Also, the percent of the total streamflow at the streamgage was calculated for each of the fractions of the sub-basin. This analysis shows that nearly 70% of the total streamflow at the streamgage would be expected from the 40% of the sub-basin nearest the streamgage.

Table 3. Estimated effects of transmission loss and distance from the streamgage on amount of flow from fractions of the sub-basin.

Fractions From Upper to Lower End of Watershed	Estimated Runoff Upstream inches/yr	Proportion to gauge	Transmission Losses Percent reduction/mile	Upstream Runoff Travel, miles	Estimated Net Streamflow From Upstream, inches/yr	Depth From Fractions of Watershed, inches/yr	Percent of Total Streamflow at Gauge
Upper 20%	0.30	0.20	2.0%	80	0.06	0.01	6%
20%	0.35	0.30	2.0%	60	0.10	0.02	10%
Middle 20%	0.40	0.36	2.0%	50	0.15	0.03	15%
20%	0.50	0.49	2.0%	35	0.25	0.05	25%
Lower 20%	0.65	0.67	2.0%	20	0.43	0.09	44%
100%	0.44	0.40	Average values			0.20	100%

Applying the transmission loss factor of 60% produces the estimate of the contribution of runoff to streamflow at the streamgage of 5,600 acre-ft. In addition, an estimated 10% of transmission losses subsequently are expected to return to the stream to produce base flow following major runoff events. This increases average total streamflow to 6,400 acre-ft. This value is quite close to the average for the past 15 years of the record.

Since the effect of terracing on recharge is also an expected result from this study, the percolation from the three HRUs is used to estimate that value, too. There is less certainty about this long-term value for calibration purposes. The percolation from the Pasture/Range HRU was increased by 0.05 inches to account for the effects of the small impoundments that are mostly in them. About 20% of the sub-basin is estimated to be above a small dam. These dams trap most of the runoff from above them and it subsequently escapes as seepage or evaporation. With average runoff of 0.5 inches per year and half of the runoff becoming percolation from seepage, this produces a weighted average additional percolation of 0.05 inches over the area in range/pasture and decreases the average runoff from that same area by 0.1 inches.

The weighted average percolation from the HRUs is 0.41 inches/year or 12,900 acre-ft/year. The effectiveness of this percolation to actually become usable groundwater is uncertain. Some of it may return as springs or get close enough to the surface to be drawn up by deep-rooted vegetation. The estimated effectiveness used here is 80%. The net recharge from the land is then estimated to be 10,300 acre-ft/year. Adding the land recharge to the alluvial groundwater recharge then produces an estimated total annual average recharge of 15,300 acre-ft or about 0.5 inches over the sub-basin.

Simplifications for this initial analysis are several. Irrigated land was not separated. All soils were assumed to be similar, deep silt loams with good water-holding capacity. Operations of small dams were not directly simulated. Actual terrace conditions as far as water storage capacity were represented by an average in between good and fair condition. The sub-basin was not sub-divided into smaller sections. Conservation Reserve Program land was not specifically identified nor were any lands that were terraced that were not in cropland. Nonetheless, the water balance for the sub-basin is judged to be of a usable starting basis to examine the impact of the terraced lands on changes in streamflow and groundwater recharge.

The effects of the terraced lands can be estimated by considering the extent of the land terraced in the sub-basin and the difference between the average depth of runoff and the depth of percolation between the terraced land and the same land assuming it were unterraced. This assumes that the terraced land, if it were unterraced, has the same runoff and percolation characteristics as the unterraced land in the sub-basin.

Table 4 presents this analysis for the sub-basin. Here, the same assumptions about transmission losses, dispensation of water lost as transmission losses, and groundwater dispensation used for the entire sub-basin water budget are made. Also, the estimate of additional evapotranspiration on the terraced land because of the additional water stored in the soil of the terraces is presented to account for where that water moves in the sub-basin.

Edge-of-field runoff is reduced by 7,100 acre-ft by the terraces which results in a decrease of direct streamflow at the streamgage of 2,800 acre-ft. Because less runoff enters the stream valley, transmission losses are reduced by an estimated 4,300 acre-ft resulting in an estimated 2,600 acre-ft less groundwater recharge to the alluvial groundwater system. Also, the reduction in base flow from transmission losses amount to an estimated 400 acre-ft streamflow.

The increase in percolation from terraced lands is 3,500 acre-ft of which 80% is estimated to become usable groundwater while the other 20% is estimated to be lost by evapotranspiration within the sub-basin. The estimated increase in groundwater recharge is 2,800 acre-ft.

Useful evapotranspiration on the terraced lands is estimated to be about 2,800 acre-ft or 80% of the additional infiltration in the terrace channel that remains in the soil for subsequent plant use. The remaining 20% is estimated to be wasted by direct evaporation or by damaging the crop in the channel in wetter seasons.

The estimated net effects of the terraces are that streamflow from the sub-basin is reduced by 3,200 acre-ft/year and net groundwater recharge is increased by 200 acre-ft/year. There is not a direct method to determine if these values are, indeed, correct. Field measurements that are a part of this larger study a showing that terraces of the type in this sub-basin are preventing nearly all runoff from above them from being lost. Also, substantial amounts of percolation below the terrace channel are being measured.

Table 4. Estimated effects of terraced land in the Prairie Dog Creek above Sebelius Lake sub-basin on the average annual water budget for current conditions.

	Cropland With Terraces	Cropland Without Terraces
Area, acres	141,272	82,591
Effects on the Surface Water System		
Runoff at the edge of field, inches	0.25	0.85
Difference in runoff at edge of field for areas with terraces, inches	(0.6)	
Difference in runoff at edge of field produced by terraces, acre-ft	(7,100)	
Transmission losses of runoff in stream system to streamgage, %	60	
Net change in surface runoff portion of streamflow at streamgage, acre-ft	(2,800)	
Effects on the Alluvial Groundwater System		
Reduction in transmission losses because of less runoff, acre-ft	(4,300)	
Net efficiency of transmission losses to enter the groundwater system, %	60	
Net change in stream system contribution to alluvial groundwater system, acre-ft	(2,600)	
Transmission losses that do not become usable groundwater, acre-ft	(1,700)	
Portion of unusable transmission losses that return as baseflow, %	25	
Net change in baseflow contribution to streamflow, acre-ft	(400)	
Transmission losses that are lost by evapotranspiration, acre-ft	(1,300)	
Effects on the General Groundwater System		
Percolation from the field, inches	0.7	0.4
Increase in percolation from the field, inches	0.3	
Gross increase in percolation from the field, acre-ft	3,500	
Effectiveness of percolation contribution to groundwater system, %	80	
Net increase in recharge to groundwater system from the field, acre-ft	2,800	
Field percolation lost as evapotranspiration, acre-ft	700	
General groundwater system contribution to streamflow, % of additional recharge	0	
Net increase in general groundwater system contribution to baseflow, acre-ft	0	
Effects of Terraces on Dryland Cropping System		
Net increase in potentially useful dryland evapotranspiration, inches	0.3	
Net increase in potentially useful dryland evapotranspiration, acre-ft	3,500	
Effectiveness of additional evapotranspiration for crop production, %	80	
Net increase in useful dryland evapotranspiration, acre-ft	2,800	
Net change in streamflow, acre-ft	(3,200)	
Net change into the groundwater recharge system, acre-ft	200	

Note: All volumes are rounded to the nearest 100 acre-ft

There is not a good source of the adoption of terracing in this sub-basin over time. The first use of terraces in the sub-basin probably started in the 1940s. Earlier work by Koelliker et al. (1981) for the South Fork of the Solomon River did gather data from the USDA Agricultural Conservation and Stabilization Service for the miles of terraces for which cost-share payments were made for terrace construction by county up to 1980. Using those data and projecting a similar rate of terrace adoption indicate that by 1963 terraces would have been in place on nearly 40% of the amount of land with terraces currently.

This analysis represents to overall approach for estimating the effects of terraced lands on streamflow. Indirectly, it also includes estimated effects of small dams in the sub-basin; however, those effects are still being worked on in another part of this project.
This analysis needs to be applied to a sub-basin in the Nebraska portion of the basin to provide more confidence that is will produce results that are judged to be reasonable before it is applied to sub-basins throughout the basin.

Finally, the system to automate the simulation of a larger suite of HRUs has to be built so that more complete combinations of soils, land uses, terraces types and terrace conditions can be simulated and then aggregated for each of the sub-basins to be evaluated in the entire basin.

Evaluation of the Water Balance of Small Federal Reservoirs to Estimate Seepage Losses and Improved Modeling Techniques

The third annual report on this project showed our work on small, federal reservoirs have been constructed in the Republican River Basin to estimate the seepage rate from them. We have continued to work with data for the DPL-Hogan reservoir because it is the one for which there is usually water in it. Details about **DPL-Hogan:**

Location:

County: Philips, KS.
Longitude: 99.533^0W
Latitude: 39.931^0 N
Nearest rainfall station: Long Island, Kansas (1424807) is about three miles away.
Evaporation: From nearest station, weighted average for Colby and Scandia.

Reservoir details:

Surface area at minimum water level (0.63 ft) = 0.08 acre
Surface area at maximum water level (9.29 ft) = 1.08 acres
Drainage area = 80 acres

We reported a relationship between daily seepage rate and depth of water in it. Additional analysis of data through March 2008 shows that it follows this same relationship.

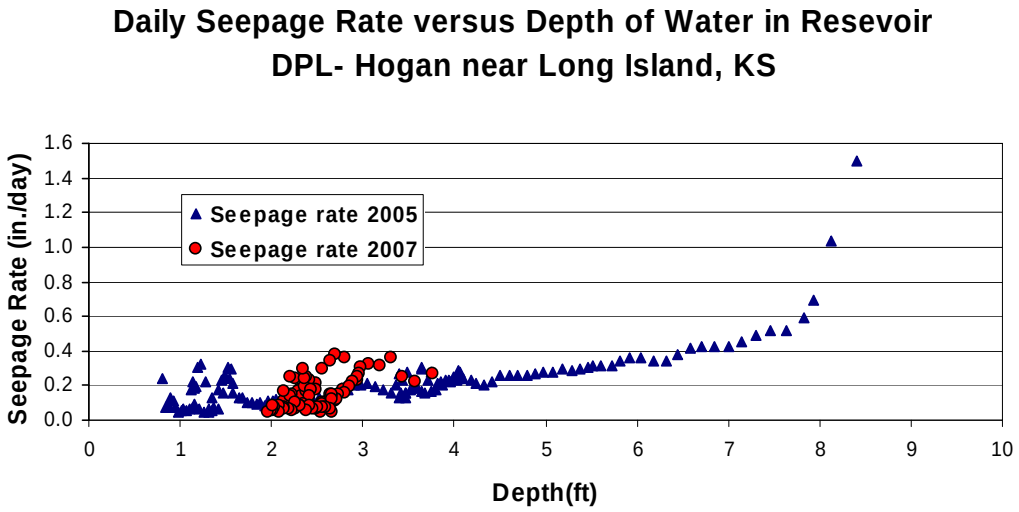


Figure 3. Average daily seepage rate versus depth for a small reservoir near Long Island, Phillips County, Kansas in 2005 and 2007.

b. Lead the effort to modify and apply a version of the selected water balance model to the land terraces and non-Federal reservoirs in the basin.

Most of the progress on this task is described above.

c. Select and administer postdoctoral research assistant(s), graduate assistant(s), and/or undergraduate student assistant(s) to complete Research Project effort.

Personnel working on this project at this time are Koelliker 10% time for the past year, and Ravikumar, a 50% time doctoral graduate student. Koelliker served as interim head of civil engineering at KSU for the past year. His duties will end June 30, 2008 and he will have more time to work on this project. Dr. Phil Barnes, a research-extension engineer in our department, is working with us on the field work aspects of this project. He has worked closely with our Nebraska colleagues in securing and setting up and instrumenting our terraced fields. His total time commitment is about 5%.

Dr. David Chandler, assistant professor, in the civil engineering department at Kansas State University began in August 2006. Dr. Chandler has considerable experience and reputation watershed modeling of natural systems. He worked 30% time on this project until December 2007 until he accepted a permanent position in civil engineering at KSU.

d. Collaborate with UNL on modeling efforts and field work involved with monitoring a small sample of land terraces and non-Federal reservoirs.

The two terrace sites in Kansas, one near Norton and the other one at the Kansas State University Experiment Field at Colby continue to be monitored. Data reporting is being done by UNL and a non-technical presentation and summary has been prepared by Dean Eisenhauer.

As described earlier in this report, we have worked with the Kansas DWR personnel on the small federal reservoirs that have been instrumented in Kansas. We have continued to correspond with them about the data and characteristics of these reservoirs and drainage areas.

e. Provide an update on the Research Project activities to Reclamation and the Conservation Committee by May 1st and December 1st of each year. The update due by May 1 will allow the Conservation Committee time to review the update and brief the RRCA at their annual meeting normally scheduled in June of each year.

This report is the May 2008 update on our work.

f. Lead in the preparation of a final report on or before June 1, 2009 that summarizes the results of the Research Project and addresses items a, b, c, and d included under B.6. Deliverable Products.

Report will be delivered when the project is nearing completion.

Assessment of Progress on This Agreement:

Work on the project is proceeding more slowly than desired. Koelliker has been interim head of Civil Engineering at K-State which has limited his time on the project. Those interim duties will end by July 1, 2008 and he will be spending more time on this work. The doctoral student on the project is concentrating on modeling small reservoirs to determine the net amount of percolation from them.

We got to get the HRU model operational for terraces in fall 2006. We have yet to begin applying it to conditions in the test sub-basins, Medicine Creek above Harry Strunk Lake. We are progressing with more model development, but we are still awaiting data about terrace conditions.

Resources for completing this major watershed simulation effort are limited. We will try to make the most of them, but if this work should become a basis for decisions affecting the Republican River Compact agreements, then the level of detail at which we are forced to work because of limited financial resources are likely not sufficient.

f. Lead in the preparation of a final report on or before June 1, 2009 that summarizes the results of the Research Project and addresses items a, b, c, and d included under B.6. Deliverable Products.

Report will be delivered when the project is nearing completion at this time. Additional time will be needed to get the overall modeling package into a usable form to give to the agency.

References Cited:

Koelliker, J.K. 1994. User's manual for POTential YieLD Model Revised. Biological and Agricultural Engineering Department, Kansas State University, Manhattan, KS.

Koelliker, J.K., J.J. Zovne, J.M. Steichen, and M.W. Berry. 1981. Study to assess water yield changes in the Solomon Basin, KS: Part I --Final Report. Kansas Water Resources Research Institute, Manhattan, KS.

PROGRESS REPORT

Modeling and Field Experimentation to Determine the Effects of Land Terracing and Non-Federal Reservoirs on Water Supplies in the Republican River Basin Above Hardy, Nebraska

Cooperative Agreement No. 05EC601962

Reporting Period: May, 2007 – May 2008

Principal Investigator: Derrel Martin
Department of Biological Systems Engineering
University of Nebraska-Lincoln, Lincoln, NE
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PROJECT OBJECTIVES

This joint project between the University of Nebraska-Lincoln, Kansas State University and the Bureau of Reclamation involves the following responsibilities:

1. Field experimentation to quantify the water balance for representative terraced land sites and small non-federal reservoirs. Subprojects include:
   a. Installation, calibration and maintenance of monitoring equipment.
   b. Identification of suitable monitoring sites.
   c. Collection of water balance data from representative sites.
   d. Processing and summarizing research results.
   e. Limited studies to estimate transmission losses in ephemeral streams and channels.

2. Modification, calibration and verification of simulation models used to predict the effects of reservoirs and terraces on subwatersheds that provide water to the riparian area adjacent to the Republican River.

3. Development of databases required to simulate the water balance of subwatersheds.

4. Development of a Geographic Information System to process input data for simulation models and simulation results to enhance understanding of depletive effects of terraces and reservoirs.

5. Conduct simulations to develop comparisons between conditions with and without terraces and small reservoirs.

6. Integration of model results, supporting data and programs into a project report.

TERRACE RESEARCH

Field Water Balance

Five field sites were selected to research the impact of terraces. The sites include two conservation bench terrace systems located near Culbertson, Nebraska and Colby, Kansas; two level terrace systems with closed ends located near Curtis, Nebraska and Norton, Kansas; and one level terrace system with open end(s) located near Stamford, Nebraska (Figure 1).

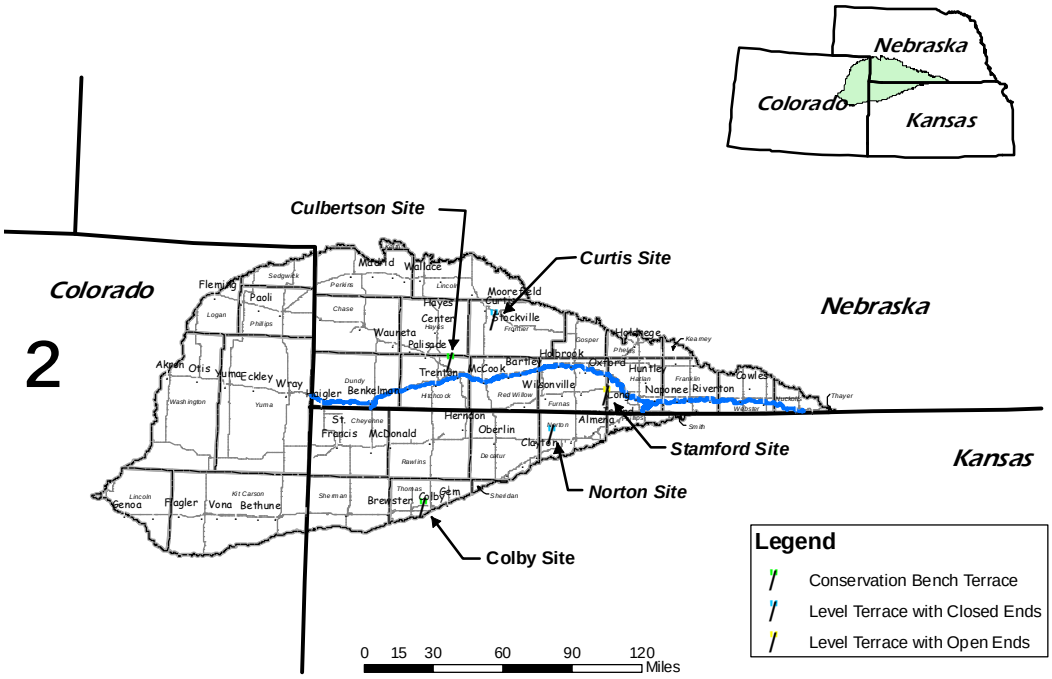


Figure 1. Location of terraced field research sites.

The water cycle components that we are monitoring are illustrated in Figure 2. Terrace systems capture runoff water from the upland contributing area and temporarily store the water in the terrace channel. Terrace systems with closed ends retain the water in the channel until it infiltrates or is used as evapotranspiration (ET). Other types of terraces are open on the ends to allow water to slowly flow from the terrace. Runoff from the contributing area may exceed the storage capacity of the channel for large storms and some water may overtop the terrace end or ridge. A significant portion of the water that overtops terraces, or that flows from the ends of open-ended terraces, will likely end up in streams; however, some of the water also seeps into dry channels between the field and the stream. Water that stays in the terrace channel can be

used by crops or percolate below the root zone of crops grown in the channel. Deep percolation ultimately reaches the local groundwater where it may (1) return to the stream as baseflow, (2) be pumped for irrigation or (3) be stored in the ground water system. Our goal for this portion of the project is to determine the amount of water that runs into terrace channels and to partition the captured water into either deep percolation or evapotranspiration. We are also estimating the amount of deep percolation, evapotranspiration and runoff for the contributing areas.

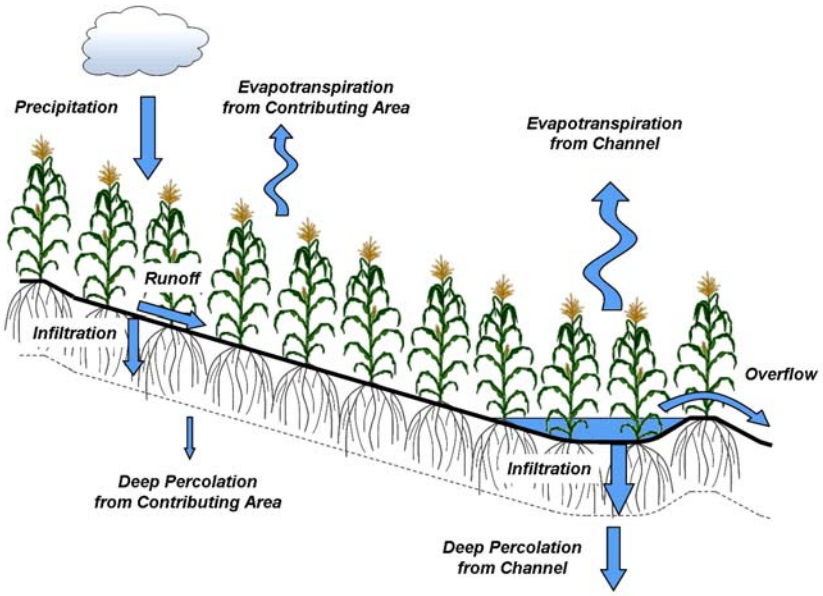


Figure 2. Water balance components of terraced land.

The following instrumentation has been installed at the sites to measure:

- Rainfall rate and amount using 8-inch diameter tipping bucket rain gauges,
- Alfalfa reference evapotranspiration (ET) using a Model E atmometer,
- Inflow into terrace channels using leveloggers,
- Outflow from terraces with open ends is measured with a velocity-area meter, and
- Soil water in and below the crop root zone is monitored with the various instruments.

Data from the field sensors are continuously gathered and stored in data loggers. The data from the loggers are downloaded to a computer during monthly field visits. Equipment was installed by the spring of 2006 and the fields have been monitored for two growing seasons.

Producers often use an ecofallow management system for dryland cropping in the region. Typical practices are to plant a row crop (usually corn or grain sorghum) in the spring of the first year. The row crop is harvested in the fall of the first season and the field is left as fallow until the fall of the second year when winter wheat is planted. Winter wheat is harvested in the summer of the third year. Row crops are planted the spring following wheat harvest. Thus, two crops are harvested in a three year period. We have completed research for two of the three years

that are typical of ecofallow. We have presented summaries of the data in previous reports and have not included more examples in this report.

A Geoprobe direct push sampler was used in April of 2006 to gather deep soil samples near each instrument cluster. Two samples were taken in the contributing area and two in the terrace channel. The soil samples were taken to a depth of 25 feet and stored in sealed plastic tubing. The water content profile was determined from the intact cores for the 25-ft profile. The undisturbed samples were analyzed in lab to determine the saturated hydraulic conductivity throughout the profile. These data are being used in combination with modeling experiments described below to simulate the performance of terraces and to estimate deep percolation travel times.

Terrace Condition

Together with the Bureau of Reclamation we have digitized the location of terraced fields across the Republican Basin. When combined with the results of field experiments we will be able to provide estimates on the distribution of water retained by terraces. However, the design capacity and general condition of the terraces play a significant role in determining the ultimate amount of retention and the apportionment of the retained water. Thus, we have initiated a study to determine the storage conditions of a sampling of terraces across the basin. Our initial plan was to randomly select approximately 1% of the fields across the basin to survey to determine the distribution of storage capacity of various types of terraces. We also will identify the types of terraces installed across the basin. The data will be included into simulation models to predict ET, deep percolation and runoff from terraced fields.

The survey is being conducted through the use of a survey-grade GPS system that was loaned to the project by the Kansas Department of Water Resources. The GPS system was installed on an all terrain vehicle (Figure 3) to allow for rapid surveying of terraces and field boundaries. The survey-grade GPS provides accurate spatial and vertical resolution of the field topography. The GPS system logs the horizontal location and the elevation within the field. We are using the system to define field boundaries and to develop estimates of the storage capacity of two terraces within each field that is surveyed.

An application to one the fields owned by a producer cooperating in the field experiments will be used to illustrate the process. The aerial photograph for the field is given in Figure 4. As the figure illustrates there are seven terraces in the field. For this field the ATV was driven around the boundary of the field as indicated by the open diamonds in the figure. The ridge of each terrace was also driven to determine the location and layout of individual terraces. The resulting relative topographic map for the field is shown in Figure 5. While the topographic map is helpful in characterizing the field it is not helpful to determine the storage capacity of the terraces in the field.

To determine the storage capacity we are driving seven paths parallel to two terraces in each field as illustrated in Figure 6. The first path is on the back slope of the terrace, the second path is along the terrace ridge, the third path is along the front slope of the terrace, the fourth path is in the bottom of the channel of the terrace, the fifth path is along the cut slope of the terrace, the sixth path is along the toe of the contributing area and the final path is along the contributing area that was not affected by terrace construction. The paths for the survey of the third terrace in the field are illustrated in Figure 7.

Figure 3. Picture of the all terrain vehicle and survey-grade GPS system used to survey terrace conditions.

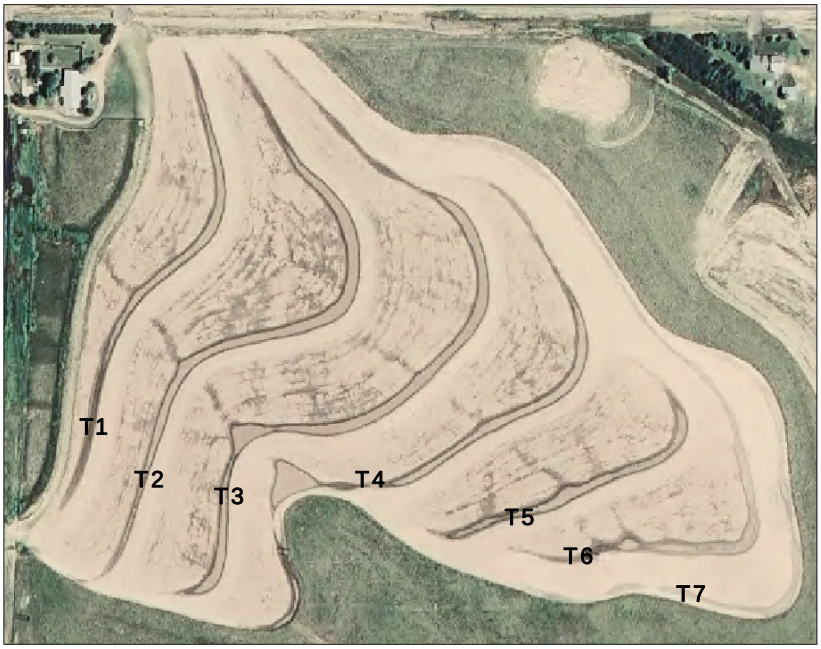


Figure 4. FSA digital photograph of a terraced field used to illustrate the use of a field-grade GPS system to characterize field conditions and terrace storage.

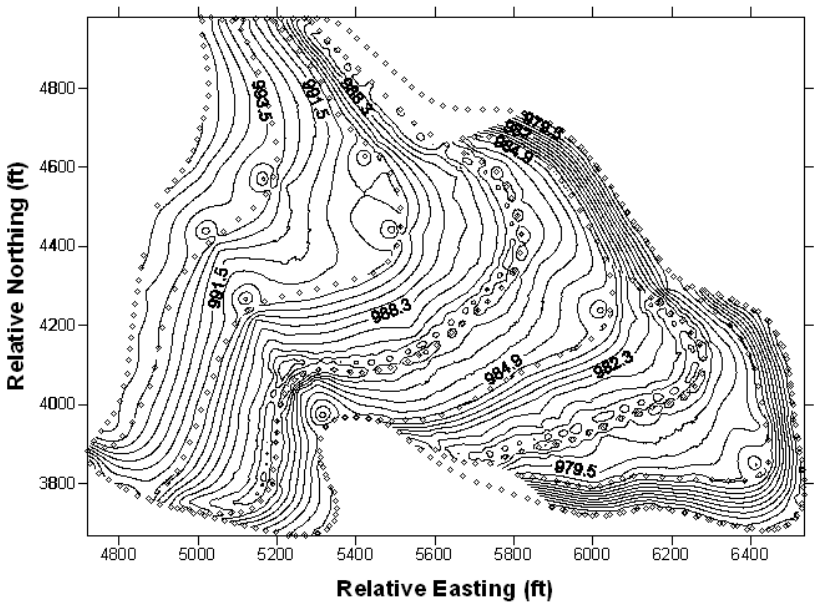


Figure 5. Relative topographic map of the producer's field as developed from driving the paths in the field depicted by the open diamonds.

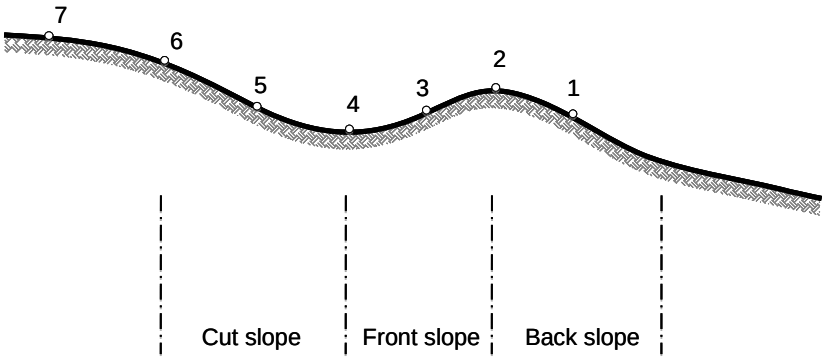


Figure 6. Location of survey lines relative to the cross-sectional profile of a terraced field.

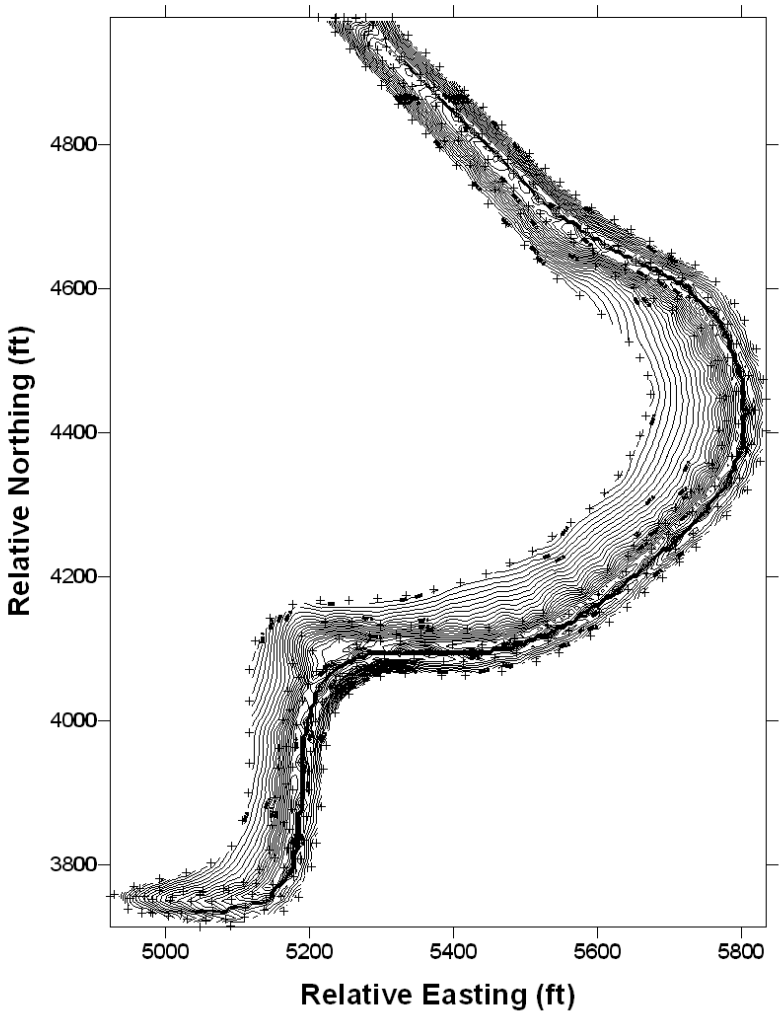


Figure 7. Topography for the third terrace in a cooperator's field.

The survey data from the GPS system is entered into the Surfer® program to process the elevation data into topographic data. The topographic data are analyzed to determine the amount of water that can be stored in the terrace channel. The storage capacity is determined for two representative terraces in each sampled field. If the terrace ridge or the ends of the terrace have been breached the elevations of the eroded zone is measured to use in determining the maximum water elevation in the terrace channel.

Two methods to determine the amount of storage per terrace were evaluated. The first method is based on summation of the storage across cross sections of the terrace channel at selected intervals. The second method computes the fill for the terrace channel based on the seven paths described above. Analysis of the survey results for the cooperator's in Table 1 shows that the methods are very similar. Using the GPS system mounted on the ATV proves to be more efficient that measuring specific cross sections at intervals along the terrace. Therefore, we are using the fill method to estimate terrace storage.

Table 1. Analysis of terrace conditions for one of the cooperator's fields.

Terrace Number	Terrace Length, ft	Drainage Area, ft^2	Mean Terrace Spacing, ft	Drainage Area, acres	Percent of Field Area
T1	1,258	139,620	NA	3.21	9.2
T2	1,659	278,210	191	6.39	18.4
T3	2,064	340,220	183	7.81	22.5
T4	1,840	244,750	142	5.62	16.2
T5	1,001	150,610	167	3.46	10.0
T6	1,789	189,960	118	4.36	12.6
T7	1,336	99,620	79	2.29	6.6
Below T7				1.58	4.5
Total	10,947			34.72	100

Storage analysis

Terrace	Maximum Storage Using Fill Method, ft^3	Runoff Needed to Fill Terrace, inches	Maximum Storage Using Cross Section Method, ft^3	Difference, percent
T3	25173	0.89	24233	3.9
T5	13126	1.05	13539	-3.0

The digitized locations of terraced fields in each county are used to draw a random sample of fields for investigation. A second sample was also drawn as an alternate to provide backup if a selected field cannot be surveyed. We are contacting land owners and producers to gain permission for the survey. Gaining permission to conduct the survey required significant time to establish and we were only able to begin surveying this spring. We are nearly done with two counties in Nebraska. These are two of the counties with the most terraced land; however, we still have many fields to survey and process. We are very appreciative of the cooperation of the landowners/operators at the field experimental sites and for the terrace condition survey.

Simulating Terrace Performance

The field measurements provide data on the characteristics of the water balance for the terrace channel and the contributing area. However, it is very difficult to directly measure either ET or deep percolation on small areas. We are using a process-based model to simulate crop growth and the water balance for each area. The Root Zone Water Quality Model (RZWQM) developed by the USDA-ARS simulates water movement within the soil profile using a finite difference solution of the Richards Equation. Evapotranspiration is simulated using a version of the Shuttleworth-Wallace model that includes the impact of crop residue on evaporation. The model provides estimates of all aspects of the water balance including ET and deep percolation. Infiltration is modeled using the Green-Ampt method.

We calibrated the model using measurements from the field sites. Input parameters determined from field measurements included: bulk density, saturated hydraulic conductivity, and the textural percentage of sand, silt and clay. Data from the Geoprobe profiles were used for the initial soil water content. Weather data from a nearby automated weather data network station were used for climatic input. Run-on to the terrace channel was simulated as an irrigation event. The satiated (*i.e.,* field saturated) volumetric water content and the bubbling pressure of the soil were adjusted to calibrate the model to the measured volumetric water content from the field. We have made initial calibrations and simulated some initial results for a limited number of conditions. The following results are an example of the types of relationships we are developing to use in adapting the POTYLD model. Our goal is to improve the partitioning of water into runoff, deep percolation, and ET.

The simulated deep percolation from the terrace channel is about ten times the amount for the contributing area for the two-year period from 2005 through 2007 at the Norton site (Figure 9). The evapotranspiration from the terrace channel over the two-year period was about 30 cm more than for the contributing area (Figure 10). The graphs illustrate that deep percolation is very significant during the fallow period and during times when plants are small for the ecofallow production system. The water balance for the two-year period is summarized in Table 2.

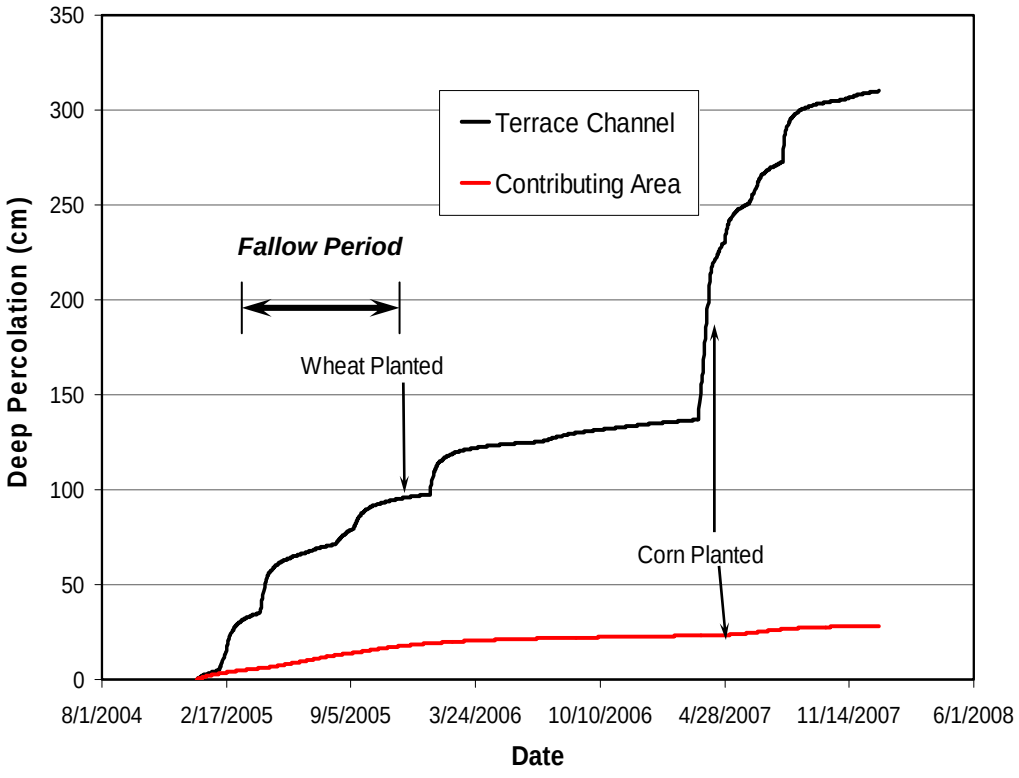


Figure 9. Simulated deep percolation for the cropping practices for the cooperator field near Norton, Kansas for 2005 through 2007.

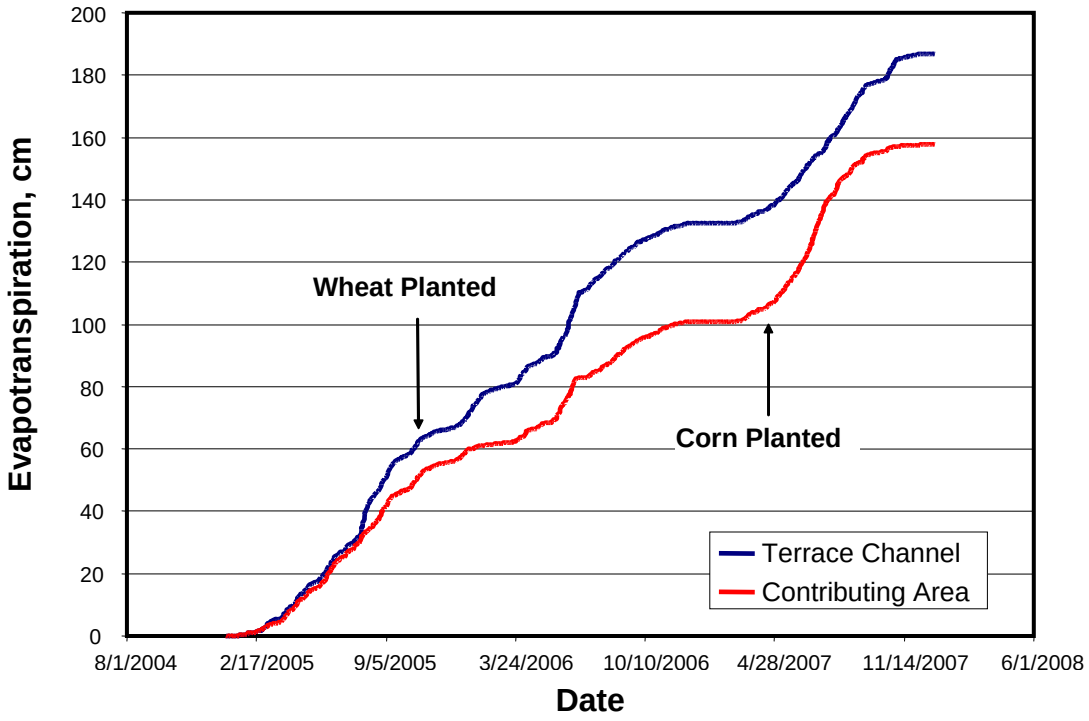


Figure 10. Simulated evapotranspiration using the RZWQM model for Norton, Kansas 2005-2007.

Table 2. Simulated water balance for the cooperator's field near Norton, Kansas for the period from January 1, 2005 through December 31, 2007.

	Contributing Slope	Terrace Channel
Precipitation (cm)	165	165
Runoff (cm)	3.88	0.00
Run-on (cm)	0	325
ET (cm)	157.7	186.8
Deep Percolation (cm)	28.2	310.0
Change in Storage (cm)	-24.8	-6.7

The accuracy of partitioning precipitation into runoff, deep percolation or evapotranspiration from the contributing area and partitioning in the terrace channel depend on estimating the rate of infiltration. The infiltration rate depends on the hydraulic conductivity of the soil which in turn depends on the tillage practices employed. The POTYLD model used to simulate the water balance of cropping practices depends on the curve number method to estimate infiltration. The

WEPP model includes routines to adjust the hydraulic conductivity of the soil based on tillage practices. Using the WEPP model we are able to develop routines to adjust the curve number for the POTYLD model to improve simulation of the water balance for the terraced fields.

The routine used in the WEPP program to adjust the hydraulic conductivity is given by:

$$K_{fs} = K_b \left\{ \frac{K_f}{K_b} + \left(1 - \frac{K_f}{K_b} \right) \exp \left[C\, E_a \left(1 - \frac{rr}{4} \right) \right] \right\}$$

where:

K_{fs} = Field saturated hydraulic conductivity,
K_b = Baseline hydraulic conductivity,
K_f = Long term hydraulic conductivity,
C = Soil stability factor,
E_a = Cumulative rainfall energy since last tillage, and
rr = Random roughness following tillage.

Runoff in the WEPP model is based on the Green-Ampt infiltration equation with a given hydraulic conductivity. We simulated the variability in hydraulic conductivity based on the equation shown above. A function was developed to relate hydraulic conductivity to runoff curve number for the following conditions:

- A 3-hour, 100-year return period storm for Colby, KS
- A rainfall depth of 10.6 cm
- Surface storage of 0.1 cm
- Wetting front suction of 17 cm
- An increase of volumetric water content following infiltration equal to 0.27

The resulting hydraulic conductivity-curve number relationship in shown in Figure 12. As illustrated the curve number could range from a low of 60 to a maximum value of 85.

We used the simulations to determine the variability of hydraulic conductivity from eco-fallow cropping systems. The hydraulic conductivity at the Curtis site varies from a low value of 1.4 cm/hr to a maximum value of 4 cm/hr for a two-year period (Figure 11). The pattern for the average curve number for a three-year period for an eco-fallow system is shown in Figure 13. The average curve number for the three-year period varies from about 70 to about 75.

These results show the nature of the variability in the curve number for one of the cropping systems that is common in the Republican Basin. We will continue to apply these mechanistic models to improve the input parameters for the POTYLD model.

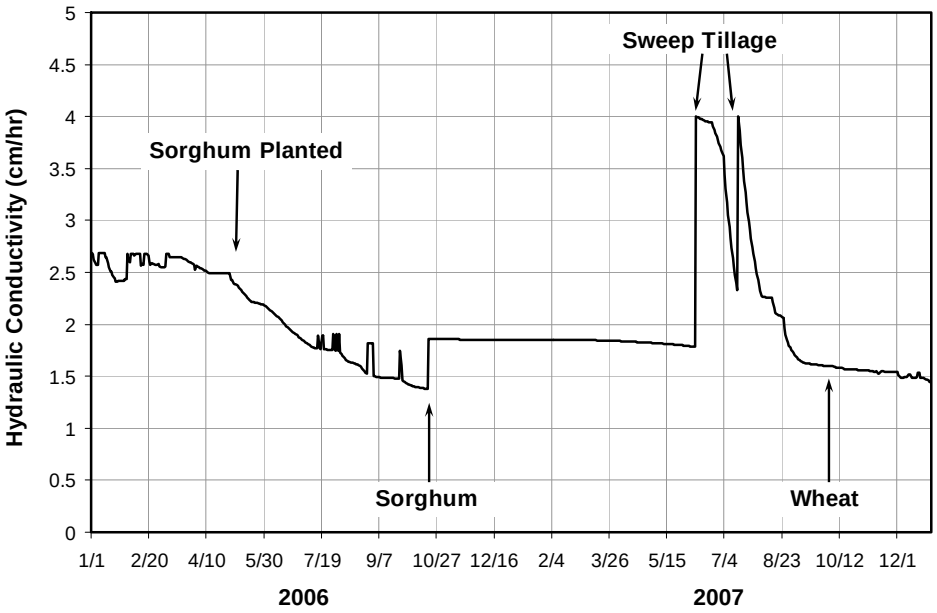


Figure 11. Simulated hydraulic conductivity for a two-year period at the Curtis site.

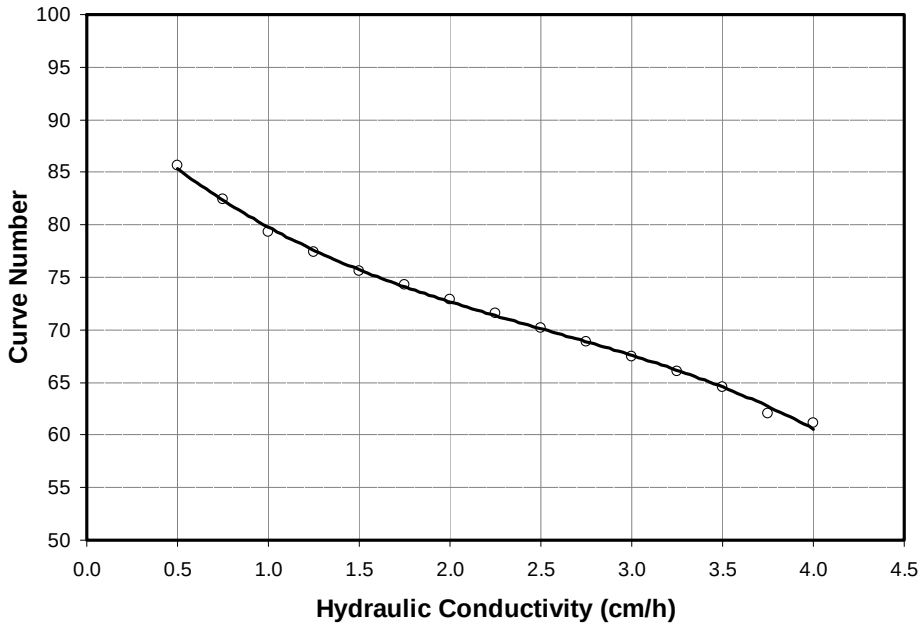


Figure 12. Effect of change in hydraulic conductivity on the curve number.

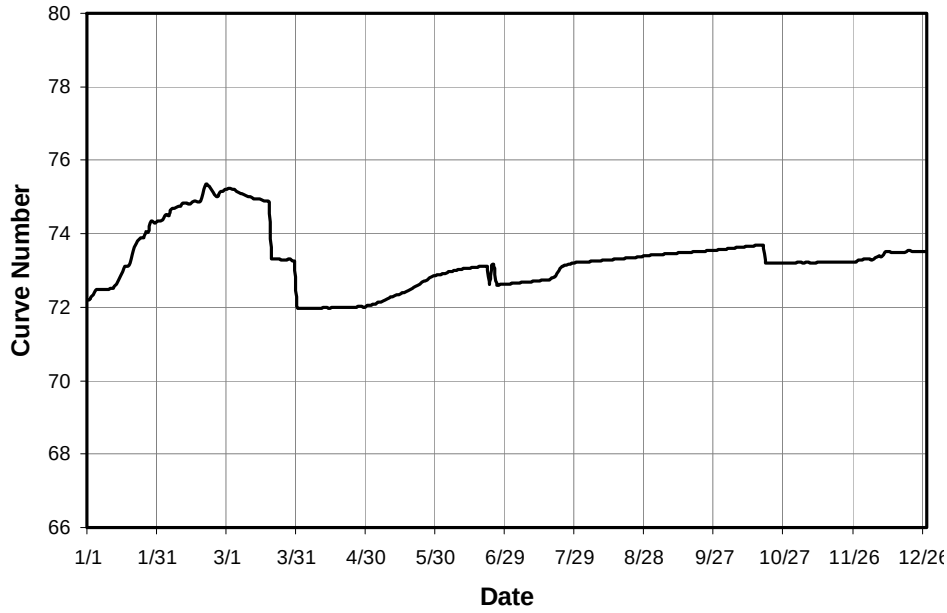


Figure 13. Simulated change in curve number due to tillage and erosion effects.

DATABASE DEVELOPMENT

Databases have been developed for use in simulating the hydrologic impact of small reservoirs and terraces. The databases include the SSURGO dataset, a digital soil survey prepared for each county, which involves spatial and tabular data. The spatial data component is available as an ESRI ArcGIS shape file. The soil types are defined in the attribute tables by a numerical code called the map unit key. The attribute tables include soil property values which are associated with each soil series in the shape file. For the POTYLDR model, the required soil properties are located in the mapunit, component, and chorizon tables. We reclassified the soil data because each polygon in the SSURGO shapefile or coverage represents a different soil type, which may appear more than once throughout the dataset. In addition, a single record in the shapefile or coverage may fall into an association of multiple horizons. Reclassifying soil data provides delineation of representative hydrologic response units in the watershed.

Two types of weather data have been assembled. Data from the automated weather data network (AWDN) operated by the High Plains Regional Climate Center are being used to compute reference crop evapotranspiration using the hourly Penman-Monteith method. The AWDN data were used to calibrate the Hargreaves equation for the Great Plains. The Hargreaves method only requires the daily maximum and minimum air temperature to estimate reference crop ET. The calibrated Hargreaves method was then used with data from the Cooperative program operated by NOAA and the National Weather Service (NWS). These data are referred to as the NWS data. These records only include the daily maximum and minimum air

temperature and the amount of precipitation received for the day. The Hargreaves method is used with these data to develop estimates of reference crop ET. Several other databases have been developed for the project:

The location of terraced land in Nebraska and the Sappa Creek watershed in Kansas were originally digitized by Nebraska based on 1994 DOQQ images. We are updating these data to current conditions to more nearly match the time frame for the areas of the watershed digitized by the Bureau of Reclamation. The FSA data and field boundaries from CLU (common land unit) data were used in creating the updated terrace shape files. Updating has been done on a county-by-county basis in NE. With the new procedure each shape has a unique ID within each county. The updated is based on the FSA dataset which contains photographic information obtained for the National Agricultural Imagery Program (NAIP) for 2006 and is comprised of scanned photographs that were acquired with a precision aerial mapping camera.

ATTACHMENT N

U.S. GEOLOGICAL SURVEY
WATER DATA REPORT 2007

06821500 Arikaree River at Haigler, Nebr.

Republican Basin
Arikaree Subbasin

LOCATION.--Lat 40°01′45″, long 101°58′03″ referenced to North American Datum of 1983, in NE ¼ NE ¼ sec.29, T.1 N., R.41 W., Dundy County, NE, Hydrologic Unit 10250001, on right bank at downstream side of bridge on U.S. Highway 34, 1.3 mi upstream from Burlington Northern Inc. bridge, 1.9 mi upstream from confluence with North Fork Republican River, 2 mi northwest of Haigler, and 3.2 mi downstream from Kansas-Nebraska state line.

DRAINAGE AREA.--1,700 mi^2 of which 680 mi^2 probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--October 1931 to current year. Monthly discharge only for some periods, published in WSP 1310.

REVISED RECORDS.--WSP 1919: 1951, 1954, 1956, 1960. WDR NE-94-1: Drainage area.

GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is 3,250.98 ft above sea level. See WSP 1919 for history of changes prior to Sept. 29, 1964. Sept. 29, 1964 to Apr. 25, 1982 on left bank 57 ft downstream from bridge at present datum. Data collection platform at station.

REMARKS.--Records fair except for estimated daily discharges, which are poor. Natural flow affected by ground-water withdrawals and diversions for irrigation of about 1,500 acres in Colorado and by return flow from Haigler Canal.

06821500 Arikaree River at Haigler, Nebr.—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2006 TO SEPTEMBER 2007
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	2.4	0.00	0.00	0.00	0.00	1.0	0.34	8.0	2.4	5.2	0.06	0.54
2	3.5	0.00	0.00	0.00	0.00	0.94	0.35	9.8	4.5	5.5	0.00	0.29
3	2.5	0.00	0.00	0.00	0.00	0.70	0.25	13	3.3	5.1	0.00	0.29
4	1.6	0.00	0.00	0.00	0.00	0.72	0.24	16	4.5	2.6	0.00	0.00
5	0.07	0.00	0.00	0.00	0.00	0.80	0.28	15	7.3	3.1	0.00	0.21
6	0.05	0.00	0.00	0.00	0.00	0.89	0.27	18	7.0	2.3	0.06	0.18
7	0.07	0.00	0.00	0.00	0.00	0.91	0.32	19	2.6	0.83	1.3	0.17
8	0.00	0.00	0.00	0.00	0.00	0.94	0.35	16	3.4	1.5	0.12	0.30
9	0.00	0.00	0.00	0.00	0.00	0.82	0.37	18	0.68	3.2	0.00	0.54
10	0.00	0.00	0.00	0.00	0.00	0.74	0.40	18	1.9	4.2	0.00	1.00
11	0.00	0.00	0.00	0.00	0.00	0.66	0.32	13	1.1	3.8	0.01	1.2
12	0.00	0.00	0.00	0.00	0.00	0.61	0.30	11	3.6	2.2	0.06	0.49
13	0.00	0.00	0.00	0.00	0.00	0.58	0.46	10	e9.0	0.79	0.10	0.35
14	0.00	0.00	0.00	0.00	0.00	0.52	0.59	9.1	e5.0	0.94	0.10	0.06
15	0.00	0.00	0.00	0.00	0.00	0.42	0.49	8.4	e1.0	1.1	0.00	0.14
16	0.00	0.00	0.00	0.00	0.00	0.41	0.45	8.1	0.21	0.00	0.44	0.16
17	0.00	0.00	0.00	0.00	0.00	0.44	0.41	8.9	0.11	0.00	1.3	0.49
18	0.00	0.00	0.00	0.00	0.00	0.44	0.40	8.3	0.06	0.00	0.81	0.68
19	0.00	0.00	0.00	0.00	0.21	0.36	0.39	7.0	0.66	0.00	1.9	1.0
20	0.00	0.00	0.00	0.00	e0.78	0.37	0.36	7.4	5.2	0.00	1.8	1.2
21	0.00	0.00	0.00	0.00	e0.85	0.37	0.37	7.2	3.4	0.00	1.2	0.97
22	0.00	0.00	0.00	0.00	e0.61	0.32	0.43	5.1	5.0	0.00	0.05	1.3
23	0.00	0.00	0.00	0.00	0.71	0.33	3.9	3.0	7.5	0.00	0.06	1.3
24	0.00	0.00	0.00	0.00	0.29	0.34	99	2.2	5.5	0.00	0.27	0.06
25	0.00	0.00	0.00	0.00	0.00	0.33	16	4.6	5.1	0.00	0.03	0.32
26	0.00	0.00	0.00	0.00	0.50	0.30	e8.0	2.9	5.8	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	1.0	0.32	e6.5	2.2	5.6	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	1.3	0.35	e5.0	2.7	4.2	0.18	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.48	e4.0	3.5	2.8	0.00	0.03	0.00
30	0.00	0.00	0.00	0.00	---	0.38	5.3	5.7	2.7	0.04	0.19	0.00
31	0.00	---	0.00	0.00	---	0.38	---	2.6	---	0.07	0.13	---
Total	10.19	0.00	0.00	0.00	6.25	17.17	155.84	283.7	111.12	42.65	10.02	13.24
Mean	0.33	0.00	0.00	0.00	0.22	0.55	5.19	9.15	3.70	1.38	0.32	0.44
Max	3.5	0.00	0.00	0.00	1.3	1.0	99	19	9.0	5.5	1.9	1.3
Min	0.00	0.00	0.00	0.00	0.00	0.30	0.24	2.2	0.06	0.00	0.00	0.00
Ac-ft	20	0.00	0.00	0.00	12	34	309	563	220	85	20	26

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1932 - 2007, BY WATER YEAR (WY)

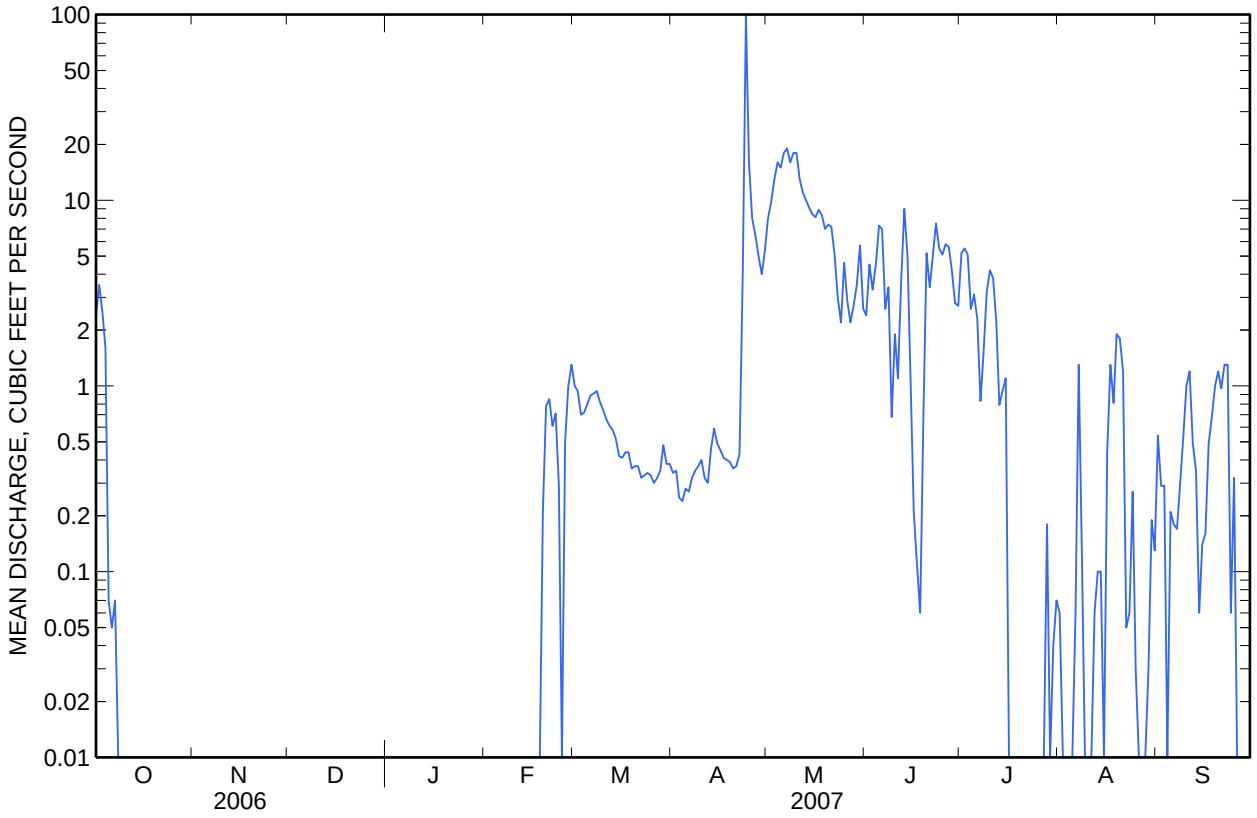
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	9.04	7.42	5.87	6.96	14.2	25.4	21.1	37.2	36.4	18.0	16.9	13.8
Max	39.8	31.8	28.3	24.0	67.0	400	78.0	709	599	193	111	140
(WY)	(1943)	(1947)	(1939)	(1934)	(1937)	(1960)	(1944)	(1935)	(1935)	(1962)	(1938)	(1938)
Min	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.83	0.07	0.00	0.00	0.00
(WY)	(2005)	(2002)	(2002)	(2003)	(2003)	(2004)	(2004)	(2004)	(2002)	(2002)	(1952)	(2002)

06821500 Arikaree River at Haigler, Nebr.—Continued

SUMMARY STATISTICS

	Calendar Year 2006		Water Year 2007		Water Years 1932 - 2007	
Annual total	203.96		650.18			
Annual mean	0.56		1.78		17.7	
Highest annual mean					127	1935
Lowest annual mean					0.28	2002
Highest daily mean	11	May 11	99	Apr 24	17,000	May 31, 1935
Lowest daily mean	0.00	Jan 4	0.00	Oct 8	0.00	Jul 21, 1932
Annual seven-day minimum	0.00	Jun 9	0.00	Oct 8	0.00	Jul 30, 1934
Maximum peak flow			172	Apr 24	50,000a	May 31, 1935
Maximum peak stage			7.56	Apr 24	11.20b	May 31, 1935
Annual runoff (ac-ft)	405		1,290		12,790	
10 percent exceeds	2.1		5.2		29	
50 percent exceeds	0.00		0.11		7.3	
90 percent exceeds	0.00		0.00		0.20	

a From rating curve extended above 3,800 ft3/s on basis of slope area measurement
b Site and datum then in use



06823000 North Fork Republican River at Colorado-Nebraska State Line

Republican Basin
North Fork Republican Subbasin

LOCATION.--Lat 40°04′10″, long 102°03′03″ referenced to North American Datum of 1927, in NW ¼ SW ¼ sec.10, T.1 N., R.42 W., Dundy County, NE, Hydrologic Unit 10250002, on right bank 100 ft east of Colorado-Nebraska State line, 9.5 mi upstream from confluence with Arikaree River, and at mile 448.

DRAINAGE AREA.--2,370 mi² of which 2,196 mi² probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--October 1930 to current year. Prior to October 1932, published as North Fork of Arikaree River at Colorado-Nebraska State line. Monthly discharge only for some periods, published in WSP 1310.

REVISED RECORDS.--WSP 1240: 1947(M). WSP 1390: 1934. WDR NE-94-1: Drainage area.

GAGE.--Water-stage recorder. Steel piling control since January 1965. Datum of gage is 3,336.09 ft above sea level. Prior to Oct. 17, 1934, non-recording gage at present site and datum. Data Collection platform at station.

REMARKS.--Records fair except for estimated daily discharges, which are poor. Natural flow affected by diversion in Haigler Canal for irrigation of about 2,700 acres in Colorado and Nebraska.

06823000 North Fork Republican River at Colorado-Nebraska State Line—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2006 TO SEPTEMBER 2007
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	6.9	37	e37	e33	e35	51	40	17	e32	12	16	14
2	6.6	35	e39	e32	e34	47	41	15	e26	11	12	11
3	7.2	36	e37	e41	e39	49	41	11	e20	13	e8.3	9.9
4	7.4	36	e38	e50	e40	50	40	12	e14	12	e8.7	8.8
5	e7.0	35	e40	50	e46	48	40	13	e13	11	e9.0	8.4
6	e7.0	37	41	e42	51	48	40	13	17	10	e9.5	8.4
7	e7.0	38	40	e36	55	47	39	11	13	9.1	e20	7.7
8	e7.0	38	40	e39	54	47	40	8.9	12	7.8	44	8.2
9	e8.0	39	41	e40	50	44	40	8.2	14	9.1	42	9.2
10	e9.0	e39	41	40	48	43	40	8.4	15	8.4	42	11
11	e14	e39	41	44	49	44	41	9.8	15	6.6	e30	11
12	22	e39	40	e40	51	42	43	8.4	17	6.5	e20	9.9
13	18	e39	40	e38	e48	42	46	8.0	41	6.6	e12	8.9
14	16	e39	42	e34	e44	41	45	7.8	57	7.6	9.7	11
15	16	e39	43	e28	e39	42	43	8.4	57	7.9	9.0	11
16	21	e39	43	36	e40	42	41	7.9	47	7.1	15	11
17	29	e39	42	e37	e50	42	41	8.3	41	6.7	23	9.9
18	34	e39	40	e39	51	42	37	8.7	35	5.9	15	8.3
19	e36	39	40	e37	53	42	37	7.0	22	6.4	13	8.7
20	e36	e39	43	e36	56	43	37	7.3	15	6.9	12	11
21	e36	e39	44	e37	58	43	36	6.8	12	6.1	11	12
22	e36	39	e39	e39	58	42	34	10	16	6.0	8.9	11
23	e36	e39	e34	e40	57	42	29	8.6	22	6.2	11	10
24	e36	e39	e36	e42	57	43	33	7.2	24	5.9	15	11
25	36	e39	e38	e48	54	42	37	8.4	15	6.9	27	e7.0
26	e36	e39	e37	50	51	40	41	7.8	14	8.4	28	e6.0
27	e36	e39	41	45	54	40	35	7.7	12	9.3	23	e4.9
28	e36	39	37	e41	54	41	27	8.1	11	e32	16	e5.0
29	e36	39	39	e42	---	39	24	8.7	9.0	e41	13	e6.0
30	e36	e37	41	e40	---	39	22	32	10	e29	11	e6.0
31	e36	---	e36	e36	---	39	---	41	---	20	11	---
Total	711.1	1,148	1,230	1,232	1,376	1,346	1,130	345.4	668.0	342.4	545.1	276.2
Mean	22.9	38.3	39.7	39.7	49.1	43.4	37.7	11.1	22.3	11.0	17.6	9.21
Max	36	39	44	50	58	51	46	41	57	41	44	14
Min	6.6	35	34	28	34	39	22	6.8	9.0	5.9	8.3	4.9
Ac-ft	1,410	2,280	2,440	2,440	2,730	2,670	2,240	685	1,320	679	1,080	548

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1935 - 2007, BY WATER YEAR (WY)

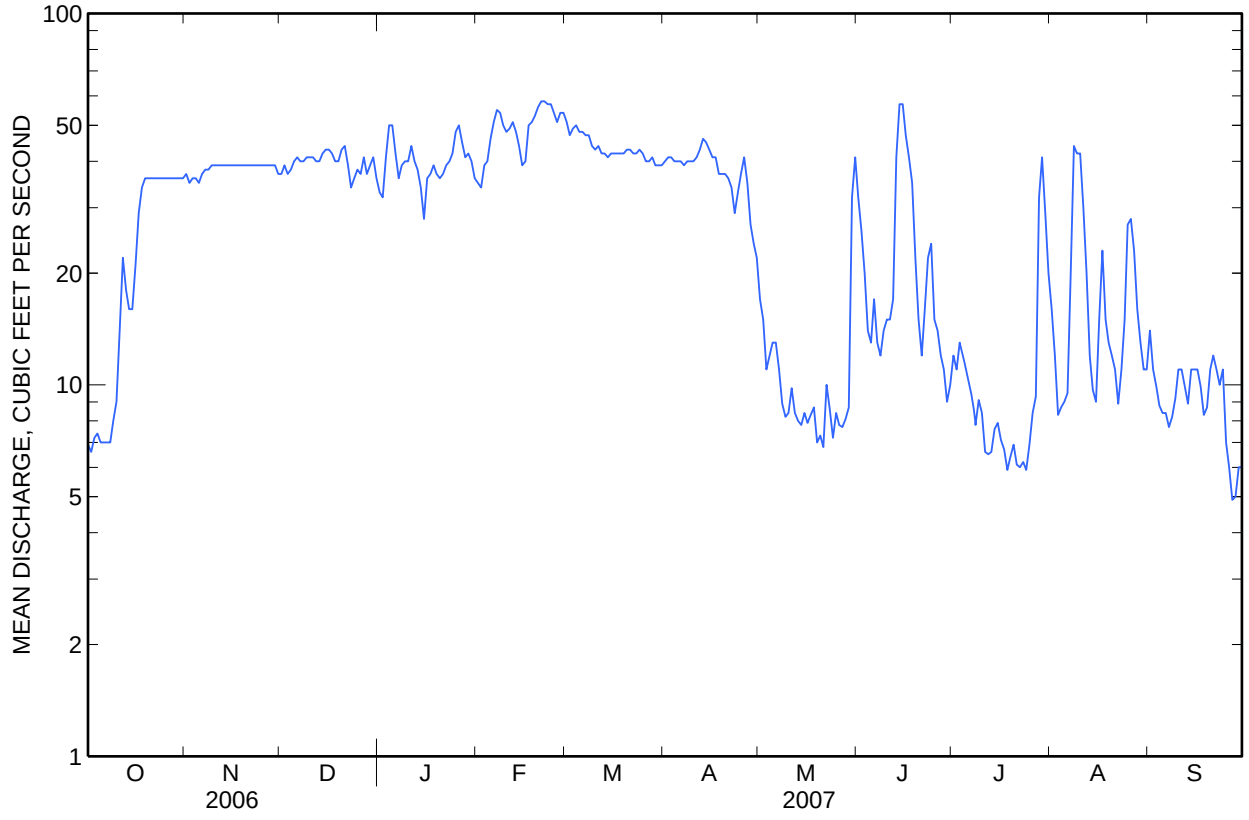
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	35.3	54.4	58.3	58.5	59.9	62.3	54.6	38.2	32.4	17.4	17.5	24.2
Max	67.1	83.5	74.7	73.4	76.8	85.8	85.7	104	113	93.8	72.4	128
(WY)	(1963)	(1957)	(1954)	(1953)	(1960)	(1960)	(1980)	(1951)	(1962)	(1962)	(1950)	(1951)
Min	11.1	26.3	34.5	39.4	35.2	41.5	21.3	7.24	5.80	3.76	4.12	5.78
(WY)	(1979)	(2004)	(2002)	(1979)	(2002)	(2006)	(1999)	(2000)	(2002)	(2002)	(1940)	(1978)

06823000 North Fork Republican River at Colorado-Nebraska State Line—Continued

SUMMARY STATISTICS

	Calendar Year 2006		Water Year 2007		Water Years 1935 - 2007	
Annual total	8,712.0		10,350.2			
Annual mean	23.9		28.4		42.8	
Highest annual mean					65.3	1951
Lowest annual mean					24.0	2006
Highest daily mean	48	Jan 2	58	Feb 21	761	May 15, 1951
Lowest daily mean	2.9	Aug 12	4.9	Sep 27	1.5	Sep 12, 1999
Annual seven-day minimum	4.7	Jul 11	6.2	Jul 18	2.3	Aug 5, 1940
Maximum peak flow			63a	Jun 14	2,110b	Apr 28, 1947
Maximum peak stage			1.32c	Dec 23	5.92	Apr 28, 1947
Annual runoff (ac-ft)	17,280		20,530		31,010	
10 percent exceeds	41		46		71	
50 percent exceeds	25		36		45	
90 percent exceeds	5.4		7.8		8.3	

a Stage 1.06 ft
b From rating curve extended above 800 ft^3/s on basis of slope-area measurement of peak flow
c Backwater from ice



06823500 Buffalo Creek near Haigler, Nebr.

Republican Basin
North Fork Republican Subbasin

LOCATION.--Lat 40°02′22″, long 101°52′00″ referenced to North American Datum of 1983, in SE ¼ NW ¼ sec.20, T.1 N., R.40 W., Dundy County, NE, Hydrologic Unit 10250002, on upstream side of bridge, 0.4 mi upstream from mouth, and 4 mi northeast of Haigler.

DRAINAGE AREA.--172.00 mi² of which 163.4 mi² probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--October 1940 to current year.

REVISED RECORDS.--WSP 2119: 1948-50(M), 1957(M). WDR NE-94-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 3,189.00 ft above sea level. Prior to Sep 19, 1980, at site 0.5 mi upstream at datum 15.57 ft higher. Sep 18, 1980 to Jun 4, 1996 on left bank 15 ft upstream from county highway bridge at datum 0.10 ft lower. Jun 4, 1996 to Nov 7, 1996 135 ft downstream from county highway bridge, at datum 0.10 ft lower. Data collection platform at station.

REMARKS.--Records fair except for estimated daily discharges, which are poor. Natural flow affected by diversion about 1 mi upstream for irrigation of 880 acres.

06823500 Buffalo Creek near Haigler, Nebr.—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2006 TO SEPTEMBER 2007
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	2.6	2.4	e2.9	e2.4	e2.7	e4.8	4.0	4.8	3.8	0.00	2.0	3.4
2	2.5	2.4	e3.0	e2.1	e2.2	e4.0	4.1	4.4	2.9	0.00	1.5	3.2
3	2.6	4.0	e2.8	e3.0	e1.9	e3.2	4.7	4.4	2.4	0.00	0.25	1.2
4	2.3	4.1	e4.9	e4.3	e2.0	e4.4	4.0	4.7	2.1	0.00	0.26	0.00
5	2.4	3.9	e4.9	e3.3	e4.0	e6.3	3.6	4.8	1.9	0.00	0.27	0.00
6	2.4	3.4	e4.5	e3.6	e3.5	e6.7	3.7	4.4	2.1	0.00	0.30	0.00
7	1.9	3.3	e3.8	e3.5	e3.4	5.4	3.8	4.3	1.4	0.00	0.93	0.00
8	1.7	3.7	5.0	e3.7	e3.9	5.0	3.9	4.1	0.00	0.00	1.1	0.00
9	4.7	3.1	4.9	e3.9	e3.5	4.6	4.0	4.1	0.00	0.00	3.6	0.00
10	6.6	2.7	4.7	e2.9	e3.4	4.5	3.8	4.0	0.22	0.00	5.5	1.8
11	7.6	2.5	4.8	e3.2	e4.7	4.3	3.9	4.0	1.6	0.00	4.8	3.4
12	6.5	2.6	3.6	e3.2	e4.2	4.0	3.9	3.9	0.91	0.00	4.6	3.5
13	4.9	3.0	5.3	e2.8	e2.7	3.7	4.9	3.8	6.5	0.00	4.8	2.9
14	4.2	3.1	4.3	e2.3	e2.2	3.4	5.2	3.6	16	0.00	4.6	2.6
15	4.2	2.0	4.0	e3.0	e2.3	3.4	4.8	3.6	11	0.00	2.1	2.5
16	4.3	2.1	3.9	e3.6	e3.4	3.0	4.4	3.7	6.2	0.00	8.3	2.6
17	3.9	2.2	3.7	e3.1	e3.8	1.7	4.2	3.5	4.1	0.00	6.5	3.1
18	3.4	2.4	e3.6	e2.3	e4.4	2.3	4.0	3.4	3.0	0.00	5.6	2.9
19	3.3	2.2	e3.7	e2.3	e5.1	2.6	4.1	3.3	2.6	0.09	5.0	2.6
20	3.0	2.4	e3.7	e2.4	e4.0	2.5	4.0	3.4	1.6	0.00	4.8	2.9
21	2.4	2.2	e2.7	e2.5	e4.2	1.9	4.5	3.2	0.06	0.00	2.0	1.1
22	3.2	2.2	e2.3	e2.5	e4.1	2.2	4.9	3.4	4.9	0.00	0.01	0.00
23	3.3	2.3	e3.3	e2.4	e4.3	2.3	5.1	3.9	4.5	0.00	0.00	0.00
24	3.8	3.4	e4.5	e2.5	e4.0	2.5	15	3.6	3.6	0.00	3.2	0.00
25	3.6	4.9	e3.6	e2.7	e3.1	2.5	12	3.2	2.5	0.00	5.5	0.00
26	3.6	3.7	e3.6	e3.8	e3.3	2.0	8.7	1.8	1.9	0.00	5.4	0.57
27	3.9	3.4	e4.1	e2.5	e4.2	1.6	6.9	2.2	1.8	0.00	2.4	1.7
28	4.2	3.4	e4.7	e2.2	e5.2	2.3	5.9	2.3	0.74	0.24	0.02	1.6
29	3.4	e2.1	e4.7	e2.9	---	4.4	5.3	2.9	0.00	1.3	0.95	2.1
30	3.1	e1.1	e3.6	e3.2	---	3.8	5.0	5.6	0.23	5.5	3.9	2.6
31	2.7	---	e2.0	e2.1	---	3.9	---	4.9	---	4.9	3.7	---
Total	112.2	86.2	121.1	90.2	99.7	109.2	156.3	117.2	90.56	12.03	93.89	48.27
Mean	3.62	2.87	3.91	2.91	3.56	3.52	5.21	3.78	3.02	0.39	3.03	1.61
Max	7.6	4.9	5.3	4.3	5.2	6.7	15	5.6	16	5.5	8.3	3.5
Min	1.7	1.1	2.0	2.1	1.9	1.6	3.6	1.8	0.00	0.00	0.00	0.00
Ac-ft	223	171	240	179	198	217	310	232	180	24	186	96

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1941 - 2007, BY WATER YEAR (WY)

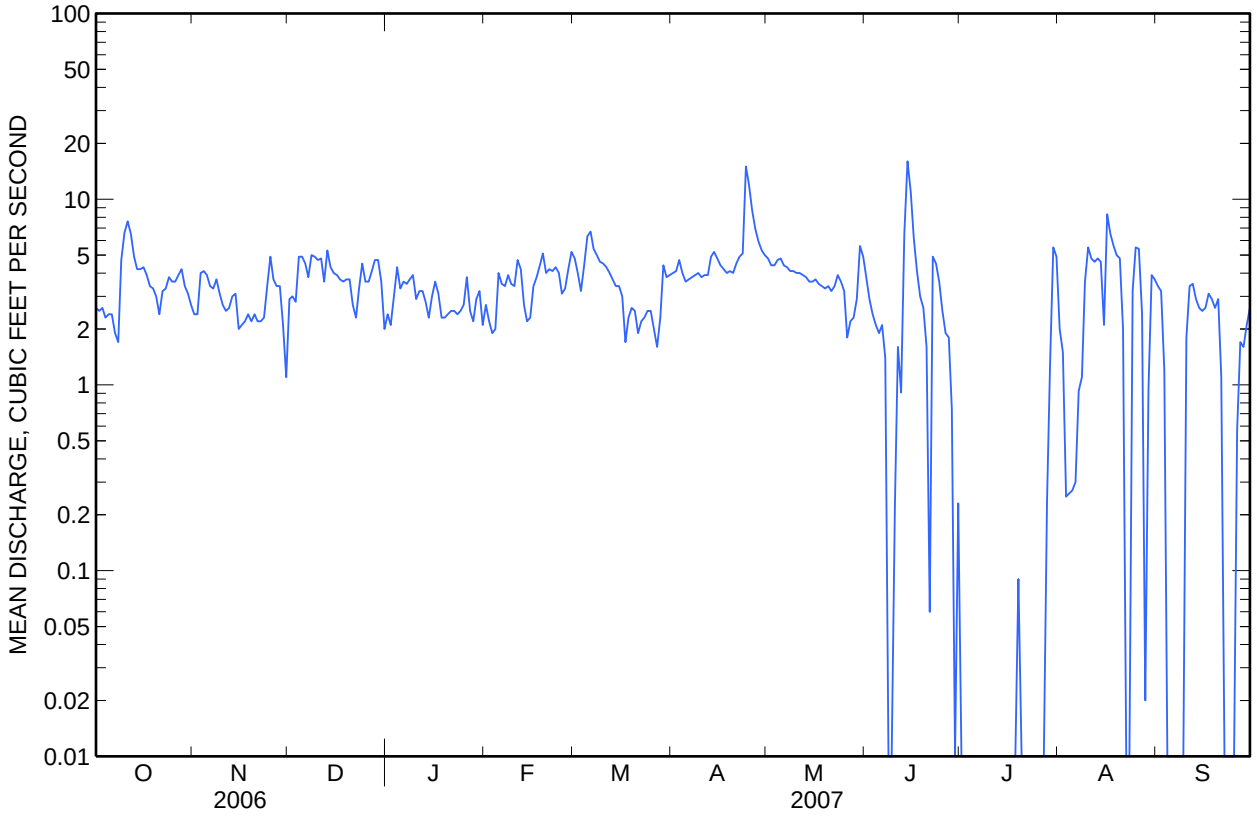
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	6.37	7.47	7.67	7.87	8.41	8.67	8.56	7.30	5.23	2.43	2.32	3.96
Max	12.6	12.1	13.7	12.7	12.9	14.3	14.2	12.5	13.2	11.0	19.7	15.2
(WY)	(1943)	(1947)	(1946)	(1942)	(1960)	(1952)	(1944)	(1944)	(1962)	(1948)	(1950)	(1951)
Min	0.32	1.59	2.53	2.60	0.89	2.72	2.56	1.23	0.00	0.00	0.00	0.23
(WY)	(2004)	(2004)	(2006)	(2006)	(1998)	(1998)	(2006)	(2006)	(1994)	(1997)	(2000)	(1998)

06823500 Buffalo Creek near Haigler, Nebr.—Continued

SUMMARY STATISTICS

	Calendar Year 2006		Water Year 2007		Water Years 1941 - 2007	
Annual total	817.05		1,136.85			
Annual mean	2.24		3.11		6.34	
Highest annual mean					10.9	1951
Lowest annual mean					2.17	2006
Highest daily mean	7.6	Oct 11	16	Jun 14	90	Aug 11, 1950
Lowest daily mean	0.00	May 25	0.00	Jun 8	0.00	Aug 3, 1955
Annual seven-day minimum	0.00	May 25	0.00	Jul 1	0.00	Aug 14, 1973
Maximum peak flow			23a	Apr 24	140b	Jun 27, 1948
Maximum peak stage			2.61c	Mar 4	5.93c	Jan 3, 1976
Annual runoff (ac-ft)	1,620		2,250		4,590	
10 percent exceeds	4.2		4.9		11	
50 percent exceeds	2.4		3.3		6.8	
90 percent exceeds	0.00		0.00		0.18	

a Stage 2.46 ft
b Stage 4.37 ft, site and datum then in use
c Backwater from ice



06824000 Rock Creek at Parks, Nebr.

Republican Basin
North Fork Republican Subbasin

LOCATION.--Lat 40°02′32″, long 101°43′41″ referenced to North American Datum of 1983, in SW ¼ NE ¼ sec.21, T.1 N., R.39 W., Dundy County, NE, Hydrologic Unit 10250002, on right bank at west edge of Parks, 100 ft downstream from county road bridge and 0.5 mi upstream from mouth.

DRAINAGE AREA.--23.60 mi² of which 3.60 mi² probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--October 1940 to current year.

REVISED RECORDS.--WSP 1630: 1951(M). WDR NE-94-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 3,093.35 ft above sea level. Data collection platform at station.

REMARKS.--Records fair except for estimated daily discharges, which are poor. One diversion about 2 mi above station for irrigation of 215 acres; flow regulated at times by reservoir at State fish hatchery 7 mi upstream.

06824000 Rock Creek at Parks, Nebr.—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2006 TO SEPTEMBER 2007
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	7.0	10	e5.8	e7.0	e5.7	9.5	6.1	5.1	12	6.3	7.1	5.9
2	7.0	11	e6.0	e7.1	e4.6	8.9	5.7	4.9	9.9	6.5	7.3	5.7
3	6.9	10	e6.5	e7.2	e5.6	8.1	5.6	4.7	8.6	6.6	7.5	5.6
4	7.0	9.6	e7.0	e7.4	e6.1	8.2	5.5	4.9	7.5	6.4	6.7	5.4
5	7.1	9.8	e5.3	e7.3	e7.2	8.2	5.1	5.3	7.1	5.8	6.4	5.3
6	7.1	e9.8	5.8	e6.6	e7.7	8.5	5.3	5.0	6.7	5.1	6.2	5.4
7	6.7	e9.8	5.7	e7.0	e7.2	8.7	5.3	4.9	5.7	4.8	8.7	5.5
8	5.6	e9.8	5.8	e7.1	e7.0	8.4	5.3	4.7	5.5	4.4	8.9	5.4
9	7.7	e9.8	5.9	e7.0	e6.5	8.7	5.3	4.6	4.9	e4.7	8.9	5.6
10	9.8	e9.6	5.9	e7.4	e6.5	8.4	5.3	4.5	4.9	e4.8	7.8	6.1
11	9.9	e9.4	5.9	e7.5	e7.0	8.2	5.6	4.4	4.9	5.9	6.7	6.8
12	8.6	e9.6	6.0	e7.2	e6.9	8.2	5.6	4.0	7.4	5.8	6.0	6.5
13	7.9	11	6.0	e6.8	e5.7	8.4	7.5	3.5	14	7.5	6.0	6.1
14	7.5	13	5.9	e6.3	e4.9	8.3	8.4	3.3	19	7.7	5.9	5.9
15	7.3	14	6.0	e5.9	e4.7	7.9	7.4	3.8	16	6.8	6.3	5.8
16	7.9	14	6.1	e6.2	e5.5	7.4	6.4	4.0	12	5.8	22	5.7
17	14	9.2	6.0	e6.3	e5.9	7.2	6.0	4.0	9.6	5.2	12	6.3
18	9.9	7.5	6.0	e5.9	e6.5	7.1	5.5	4.1	7.9	4.7	7.7	6.3
19	8.6	7.5	e6.5	e6.0	e6.7	7.1	4.9	4.2	7.4	4.6	6.4	6.0
20	8.4	7.4	e6.7	e6.2	e7.0	6.7	4.6	4.2	7.1	4.6	5.8	6.0
21	7.9	7.5	e7.5	e6.3	e7.8	6.2	4.4	4.3	7.4	6.3	5.5	5.8
22	7.9	7.7	e7.2	e6.6	e8.1	6.2	5.9	5.0	16	5.6	5.7	5.8
23	8.0	7.6	e7.5	e6.7	e8.5	6.0	6.3	5.6	12	5.0	6.6	5.6
24	8.3	7.4	e7.7	e6.5	e7.8	6.4	7.3	5.5	9.3	4.8	6.7	5.8
25	8.5	6.9	e7.2	e6.4	e8.2	6.3	11	5.3	7.3	4.6	6.7	5.9
26	9.4	6.8	e7.9	e6.3	e8.5	5.9	11	5.2	6.6	4.5	6.4	5.7
27	9.7	6.8	e8.0	e6.1	e9.0	5.7	8.6	5.4	7.0	5.8	6.1	5.7
28	9.2	6.6	e8.1	e5.9	9.7	5.9	7.1	5.4	6.8	9.3	5.9	5.7
29	9.0	6.5	e7.9	e6.7	---	8.1	6.1	6.9	6.6	9.5	5.8	5.6
30	9.3	e6.0	e7.7	e6.3	---	7.5	5.6	16	6.3	8.5	6.1	6.5
31	11	---	e7.2	e7.4	---	6.6	---	14	---	7.6	6.3	---
Total	260.1	271.6	204.7	206.6	192.5	232.9	189.7	166.7	263.4	185.5	228.1	175.4
Mean	8.39	9.05	6.60	6.66	6.88	7.51	6.32	5.38	8.78	5.98	7.36	5.85
Max	14	14	8.1	7.5	9.7	9.5	11	16	19	9.5	22	6.8
Min	5.6	6.0	5.3	5.9	4.6	5.7	4.4	3.3	4.9	4.4	5.5	5.3
Ac-ft	516	539	406	410	382	462	376	331	522	368	452	348

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1941 - 2007, BY WATER YEAR (WY)

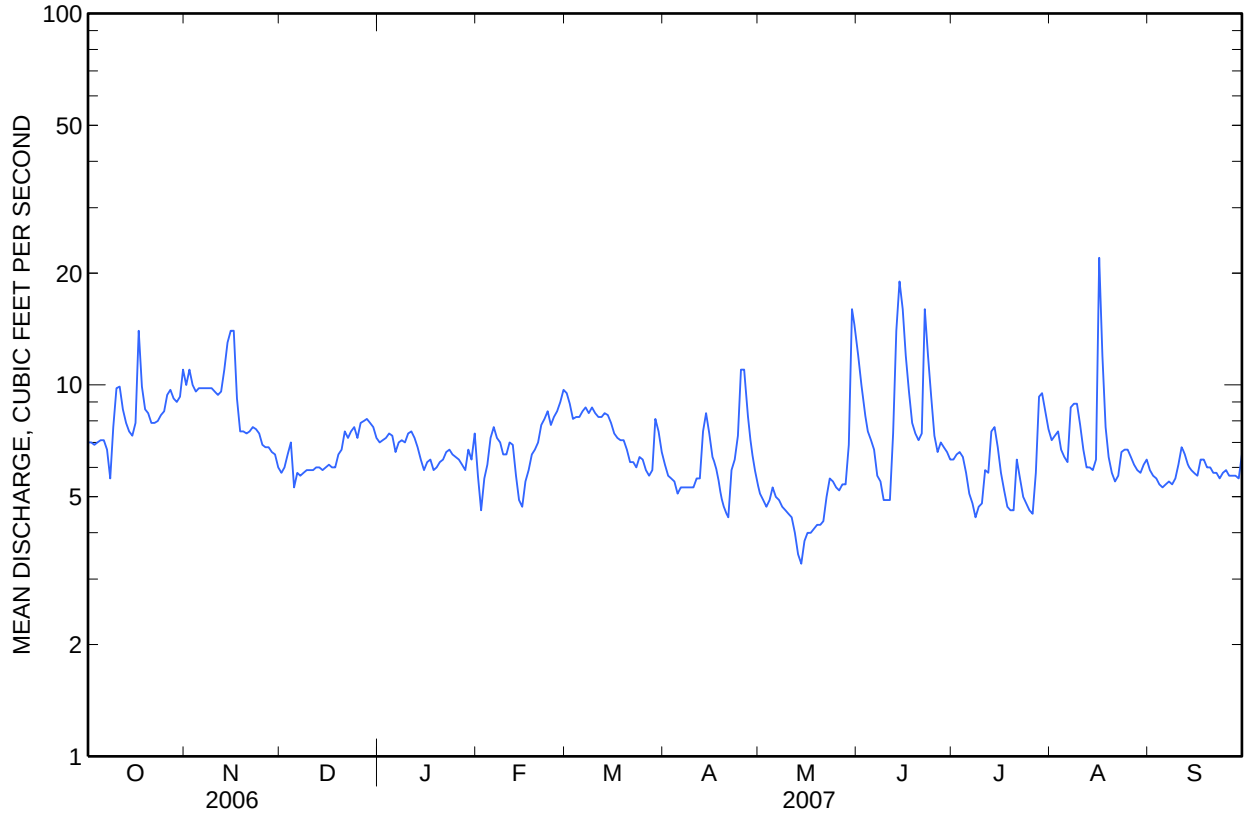
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	11.9	12.8	12.7	12.8	13.0	13.1	13.0	12.9	12.4	11.2	10.8	11.1
Max	16.2	19.7	17.1	17.9	17.5	18.1	18.1	19.0	19.0	30.3	17.7	18.8
(WY)	(1966)	(1943)	(1941)	(1942)	(1949)	(1949)	(1949)	(1969)	(1965)	(1965)	(1950)	(1951)
Min	3.05	3.15	6.60	6.66	6.15	7.36	6.32	5.38	5.44	5.18	5.05	4.56
(WY)	(2004)	(2004)	(2007)	(2007)	(2003)	(2004)	(2007)	(2007)	(2006)	(2001)	(2003)	(2003)

06824000 Rock Creek at Parks, Nebr.—Continued

SUMMARY STATISTICS

	Calendar Year 2006		Water Year 2007		Water Years 1941 - 2007	
Annual total	2,585.8		2,577.2			
Annual mean	7.08		7.06		12.3	
Highest annual mean					15.8	1949
Lowest annual mean					6.57	2004
Highest daily mean	14	Oct 17	22	Aug 16	111	Jul 6, 1965
Lowest daily mean	4.3	Jun 9	3.3	May 14	0.63	Oct 26, 2003
Annual seven-day minimum	4.8	Jun 4	3.8	May 12	0.64	Oct 23, 2003
Maximum peak flow			24a	Aug 16	493b	Jul 5, 1965
Maximum peak stage			3.25c	Feb 3	6.00	Jul 5, 1965
Annual runoff (ac-ft)	5,130		5,110		8,920	
10 percent exceeds	8.7		9.6		16	
50 percent exceeds	7.0		6.6		12	
90 percent exceeds	5.4		4.9		8.0	

a Stage 2.29 ft
b From rating curve extended above 40 ft^3/s on basis of slope conveyance
c Backwater from ice



06827500 South Fork Republican River near Benkelman, Nebr.

Republican Basin
South Fork Republican Subbasin

LOCATION.--Lat 40°00′37″, long 101°32′31″ referenced to North American Datum of 1983, in SE ¼ NW ¼ sec.31, T.1 N., R.37 W., Dundy County, NE, Hydrologic Unit 10250003, 1 mi downstream from Kansas-Nebraska State line, 2.5 mi southwest of Benkelman, and 3.4 mi upstream from mouth.

DRAINAGE AREA.--2,740 mi² of which 550 mi² probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--October 1894 to September 1895, October 1902 to November 1906, October 1930 to September 1932, August 1937 to current year. Published as South Fork of Republican River at Benkelman prior to 1906 and as Republican River at Benkelman 1931-32. Monthly discharge only for some periods, published in WSP 1310.

REVISED RECORDS.--WSP 1310: 1904-6, 1931. WSP 1390: 1940, 1945, 1947. WSP 1919: 1951-52, 1954-56. WSP 2119: Drainage area. WDR NE-97: 1995 (M).

GAGE.--Water-stage recorder. Datum of gage is 2,989.91 ft above sea level. Prior to Dec. 10, 1947, non-recording gages at several sites within 3.5 mi of present site at various datums. Dec.10, 1947 to Sept. 28, 1966 water-stage recorder 170 ft upstream at datum 3.00 ft higher and Sept. 29, 1966 to Mar. 7, 1968 at site 300 ft upstream at datum 3.00 ft higher. Mar. 8, 1968 to May 29, 1991 at site 300 ft upstream at datum 1.0 ft higher. May 30, 1991 to Sept. 30, 1998 at present site at datum 1.0 ft higher. Data collection platform at station.

REMARKS.--Records fair. Natural flow affected by irrigation development above station and, since July 6, 1950, by storage in Bonny Reservoir.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage known since at least 1923, 10.1 ft, May 31, 1935, from floodmark at site 0.26 mi downstream, at datum 2.00 ft higher, discharge 150,000 ft³/s, by slope-area measurement.

06827500 South Fork Republican River near Benkelman, Nebr.—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2006 TO SEPTEMBER 2007
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.0	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.7	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.1	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.7	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.1	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.5	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.4	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.9	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.7	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.2	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.26	2.9	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	1.4	2.7	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	2.5	2.6	4.5	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	3.7	2.3	20	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	4.6	1.9	28	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	4.2	1.6	20	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	3.6	1.4	15	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	3.1	0.97	12	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	2.8	0.07	9.8	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	2.1	0.00	8.3	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	2.0	0.00	7.1	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	2.3	0.00	7.1	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	2.1	0.00	4.6	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	4.9	0.00	3.2	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	e11	0.00	2.1	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	e19	0.00	1.2	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	e16	0.00	0.47	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	e13	0.00	0.02	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	12	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	11	0.00	0.00	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.00	0.00	---
Total	0.00	0.00	0.00	0.00	0.00	0.00	121.56	74.74	143.39	0.00	0.00	0.00
Mean	0.00	0.00	0.00	0.00	0.00	0.00	4.05	2.41	4.78	0.00	0.00	0.00
Max	0.00	0.00	0.00	0.00	0.00	0.00	19	9.0	28	0.00	0.00	0.00
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ac-ft	0.00	0.00	0.00	0.00	0.00	0.00	241	148	284	0.00	0.00	0.00

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1938 - 2007, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	14.8	19.5	18.6	21.0	35.7	47.0	51.8	64.7	65.4	51.7	30.9	21.8
Max	160	113	77.0	77.5	121	227	158	396	455	616	383	335
(WY)	(1966)	(1970)	(1943)	(1943)	(1949)	(1942)	(1958)	(1957)	(1948)	(1946)	(1958)	(1951)
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(WY)	(1940)	(1953)	(1953)	(1977)	(2003)	(2004)	(2004)	(2004)	(2002)	(1943)	(1940)	(1939)

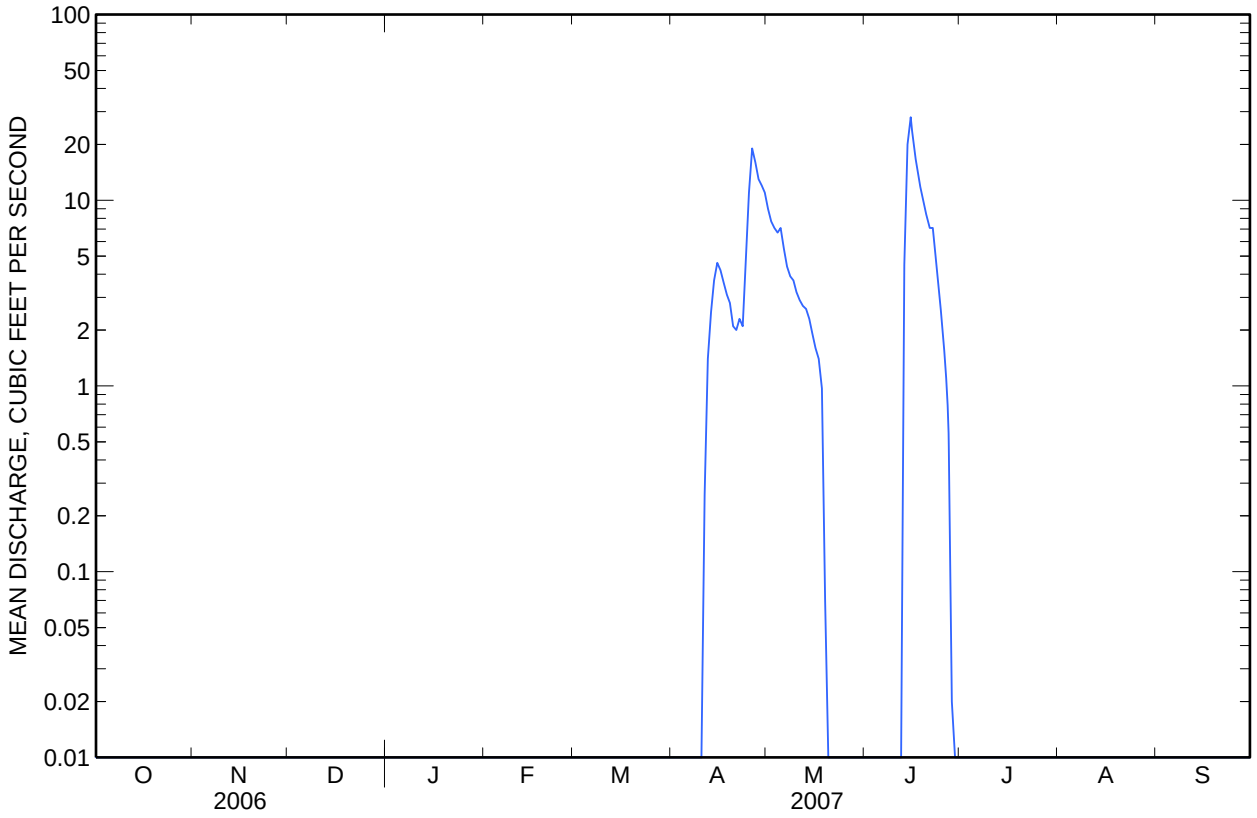
06827500 South Fork Republican River near Benkelman, Nebr.—Continued

SUMMARY STATISTICS

	Calendar Year 2006		Water Year 2007		Water Years 1938 - 2007	
Annual total	0.00		339.69			
Annual mean	0.00		0.93		36.9	
Highest annual mean					121	1951
Lowest annual mean					0.00	2004
Highest daily mean	0.00	Jan 1	28	Jun 15	6,220	Aug 16, 1958
Lowest daily mean	0.00	Jan 1	0.00	Oct 1	0.00	Jul 3, 1938
Annual seven-day minimum	0.00	Jan 1	0.00	Oct 1	0.00	Aug 1, 1938
Maximum peak flow			31a	Jun 15	19,600	Aug 16, 1958
Maximum peak stage			2.21	Apr 26	8.70b	Aug 16, 1958
Annual runoff (ac-ft)	0.00		674		26,720	
10 percent exceeds	0.00		2.7		80	
50 percent exceeds	0.00		0.00		16	
90 percent exceeds	0.00		0.00		0.00	

a Stage 2.05 ft

b May have been higher during flood of June 24, 1945, site and datum then in use



06828500 Republican River at Stratton, Nebr.

Republican Basin
Upper Republican Subbasin

LOCATION.--Lat 40°08′26″, long 101°13′47″ referenced to North American Datum of 1983, in NW ¼ SW ¼ sec.13, T.2 N., R.35 W., Hitchcock County, NE, Hydrologic Unit 10250004, on right bank at downstream side of county bridge, 0.5 mi south of Stratton, 0.2 mi downstream from Muddy Creek, 10 mi upstream from Trenton Dam, 19 mi downstream from South Fork Republican River, and at river mile 387.

DRAINAGE AREA.--8,200 mi^2 of which 4,510 mi^2 probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--July 1950 to current year.

REVISED RECORDS.--WDR NE-73: 1968-71(M), 1972. WDR NE-94-1: Drainage area.

GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is 2,775.49 ft above NGVD of 1929. Prior to Aug. 1, 1967, at site 0.3 mi downstream at present datum. Data collection platform at station.

REMARKS.--Records fair except for estimated daily discharges, which are poor. Natural flow affected by irrigation development above station and by storage in Bonny Reservoir (06826000).

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum flood since at least 1826 occurred May 31, 1935, discharge, about 200,000 ft^3/s, based on slope-area measurement at Max.

06828500 Republican River at Stratton, Nebr.—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2006 TO SEPTEMBER 2007
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0.00	0.00	0.00	e31	e17	e140	90	84	56	3.4	0.00	0.00
2	0.00	0.00	0.00	e29	e19	e115	84	73	34	2.4	0.00	0.00
3	0.00	0.00	0.00	e30	e20	e108	80	66	23	1.5	0.00	0.00
4	0.00	0.00	0.00	e31	e22	103	76	62	22	0.87	0.00	0.00
5	0.00	0.00	0.18	e29	e22	101	73	55	22	0.38	0.00	0.00
6	0.00	0.00	19	e27	e22	95	71	47	22	0.12	0.00	0.00
7	0.00	0.00	28	e25	e23	90	67	41	19	0.03	0.00	0.00
8	0.00	0.00	31	e23	e23	91	65	37	16	0.01	0.00	0.00
9	0.00	0.00	37	e22	e22	90	67	34	13	0.04	0.00	0.00
10	0.00	0.00	40	e18	e20	86	68	32	10	0.02	0.00	0.00
11	0.00	0.00	42	e19	e20	83	64	29	8.1	0.02	0.00	0.00
12	0.00	0.00	44	e18	e22	81	61	27	8.1	0.00	0.00	0.00
13	0.00	0.00	49	e16	e17	80	71	24	15	0.02	0.00	0.00
14	0.00	0.00	51	e13	e19	77	76	20	67	0.00	0.00	0.00
15	0.00	0.00	49	e12	e19	73	76	19	84	0.00	0.00	0.00
16	0.00	0.00	52	e13	e23	68	75	17	61	0.00	0.00	0.00
17	0.00	0.00	52	e14	e27	68	72	18	55	0.00	0.00	0.00
18	0.00	0.00	57	e14	e30	66	64	16	49	0.00	0.00	0.00
19	0.00	0.00	e54	e14	e34	63	52	14	41	0.00	0.00	0.00
20	0.00	0.00	e49	e15	e38	60	49	12	32	0.00	0.00	0.00
21	0.00	0.00	e42	e15	e46	59	52	11	24	0.00	0.00	0.00
22	0.00	0.00	e40	e17	e62	57	74	13	20	0.00	0.00	0.00
23	0.00	0.00	e39	e18	e69	56	76	13	19	0.00	0.00	0.00
24	0.00	0.00	e38	e19	e84	61	159	15	16	0.00	0.00	0.00
25	0.00	0.00	e39	e19	e121	63	201	13	12	0.00	0.00	0.00
26	0.00	0.00	e39	e20	e183	59	165	12	9.9	0.00	0.00	0.00
27	0.00	0.00	e38	e20	e162	57	189	11	9.4	0.00	0.00	0.00
28	0.00	0.00	e40	e18	e154	57	128	9.8	7.6	0.00	0.00	0.00
29	0.00	0.00	e38	e19	---	176	108	16	5.8	0.00	0.00	0.00
30	0.00	0.00	e35	e18	---	168	97	29	4.6	0.00	0.00	0.00
31	0.00	---	e33	e17	---	114	---	23	---	0.00	0.00	---
Total	0.00	0.00	1,075.18	613	1,340	2,665	2,650	892.8	785.5	8.81	0.00	0.00
Mean	0.00	0.00	34.7	19.8	47.9	86.0	88.3	28.8	26.2	0.28	0.00	0.00
Max	0.00	0.00	57	31	183	176	201	84	84	3.4	0.00	0.00
Min	0.00	0.00	0.00	12	17	56	49	9.8	4.6	0.00	0.00	0.00
Ac-ft	0.00	0.00	2,130	1,220	2,660	5,290	5,260	1,770	1,560	17	0.00	0.00

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1950 - 2007, BY WATER YEAR (WY)

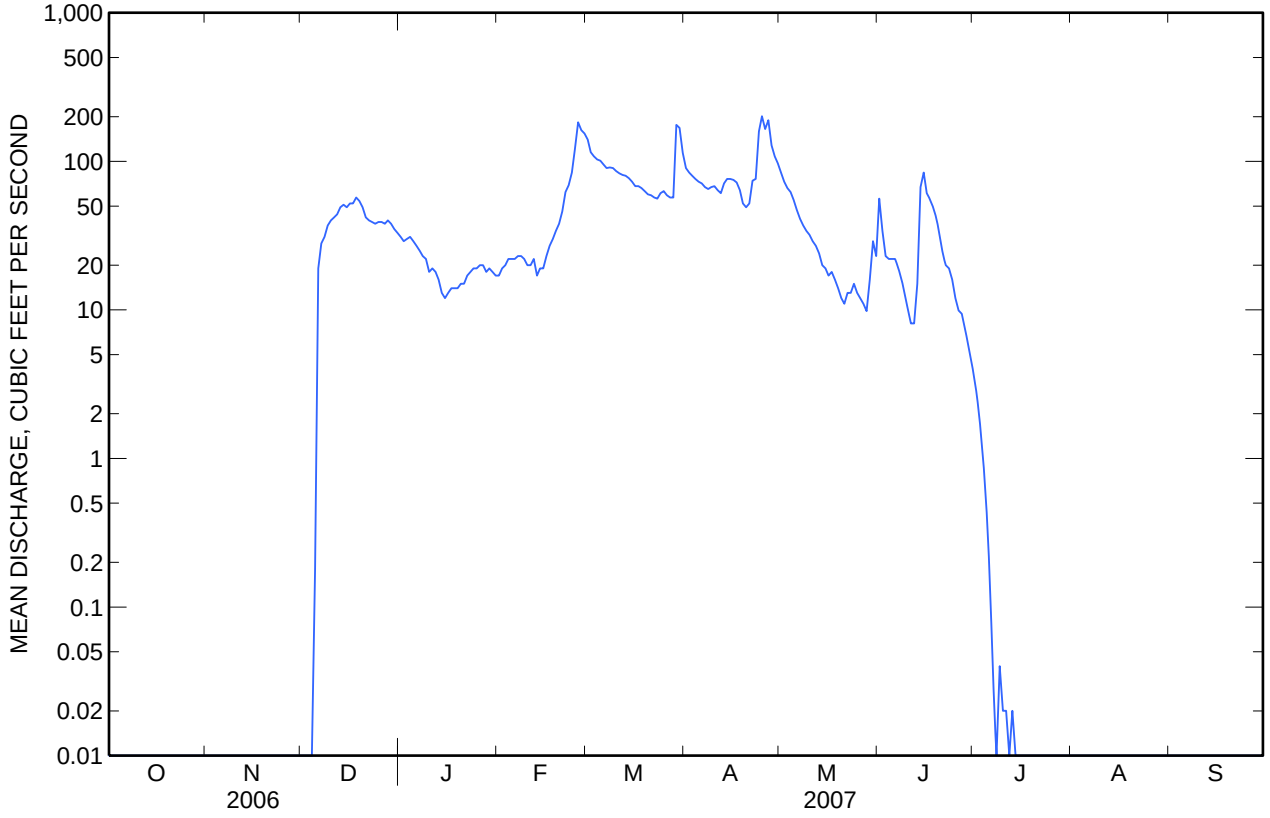
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	42.6	79.3	81.2	92.0	131	164	155	155	127	76.9	57.8	46.0
Max	285	218	157	159	225	788	388	766	572	759	479	1,005
(WY)	(1966)	(1970)	(1966)	(1974)	(1963)	(1960)	(1980)	(1957)	(1951)	(1962)	(1950)	(1951)
Min	0.00	0.00	0.00	11.5	22.3	42.0	36.7	5.12	0.00	0.00	0.00	0.00
(WY)	(1977)	(2003)	(2004)	(2005)	(2003)	(2005)	(2004)	(2006)	(2000)	(1954)	(1952)	(1952)

06828500 Republican River at Stratton, Nebr.—Continued

SUMMARY STATISTICS

	Calendar Year 2006		Water Year 2007		Water Years 1950 - 2007	
Annual total	6,320.44		10,030.29			
Annual mean	17.3		27.5		99.7	
Highest annual mean					304	1951
Lowest annual mean					12.1	2004
Highest daily mean	71	Jan 1	201	Apr 25	8,180	Aug 1, 1962
Lowest daily mean	0.00	May 26	0.00	Oct 1	0.00	Jun 18, 1952
Annual seven-day minimum	0.00	May 26	0.00	Oct 1	0.00	Jun 18, 1952
Maximum peak flow			233	Apr 26	26,800	Jul 31, 1962
Maximum peak stage			8.28a	Feb 19	9.34	Jul 31, 1962
Annual runoff (ac-ft)	12,540		19,900		72,220	
10 percent exceeds	47		76		205	
50 percent exceeds	0.00		14		71	
90 percent exceeds	0.00		0.00		0.00	

a Backwater from ice



06834000 Frenchman Creek at Palisade, Nebr.

Republican Basin
Frenchman Subbasin

LOCATION.--Lat 40°21′06″, long 101°07′25″ referenced to North American Datum of 1983, in SW ¼ SE ¼ sec.36, T.5 N., R.34 W., Hayes County, NE, Hydrologic Unit 10250005, on right bank at upstream side of bridge on U.S. Highway 6, 0.7 mi west of Palisade, 1.5 mi upstream from Stinking Water Creek, and at mile 30.2.

DRAINAGE AREA.--1,300 mi² of which 190 mi² probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--October 1894 to October 1896, June 1950 to current year. Published as Frenchman River at Palisade, October 1894 to October 1896 and October 1965 to September 1972.

REVISED RECORDS.--WDR NE-94-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 2,743.49 ft above sea level. October 1894 to October 1896, non-recording gage at railroad bridge 0.4 mi downstream at different datum; June 1950 to Feb 7, 1977 recording gage at site 2,000 ft upstream at datum 4.0 ft higher.

COOPERATION.--Records provided by Nebraska Department of Natural Resources and reviewed by the U.S. Geological Survey.

REMARKS.--Records good except for estimated daily discharges, which are poor. Natural flow affected by irrigation development above station and, since Oct 23, 1950, by storage in Enders Reservoir (06832000).

06834000 Frenchman Creek at Palisade, Nebr.—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2006 TO SEPTEMBER 2007
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	13	18	e21	e15	e17	33	41	37	50	27	28	13
2	13	18	e24	e15	e23	31	33	35	43	26	25	13
3	13	18	e24	e17	e12	37	31	34	39	25	23	12
4	12	19	e22	e24	e17	31	30	34	36	24	22	12
5	12	19	e15	e33	e26	30	29	35	34	23	20	11
6	12	20	e26	e29	e39	30	28	34	33	22	20	11
7	12	20	e15	e16	e46	30	28	33	32	21	24	11
8	13	20	e17	e17	e28	30	27	31	29	20	27	11
9	14	20	e24	e23	e17	29	27	31	27	20	22	12
10	16	20	e26	e21	e17	28	27	31	27	20	21	14
11	17	20	e27	e30	e17	28	27	30	28	22	19	15
12	16	20	29	e24	e21	28	26	29	37	21	18	15
13	15	21	29	e2.6	e12	28	26	28	194	21	17	14
14	15	21	29	e1.8	e4.6	28	26	27	176	21	17	14
15	16	25	29	e8.9	e4.3	28	26	26	217	19	16	14
16	17	24	29	e11	e25	28	26	26	78	19	15	14
17	18	26	28	e11	59	28	26	26	57	18	15	15
18	17	26	e26	e9.5	90	27	26	25	52	16	15	15
19	17	26	e23	e13	116	27	25	25	49	31	14	16
20	17	26	e23	e21	103	27	25	25	43	18	14	16
21	17	27	e24	e15	87	27	25	24	38	17	13	15
22	17	28	e22	e14	57	27	26	24	37	15	15	15
23	17	28	e20	e15	48	27	26	24	36	14	15	15
24	17	29	e24	e21	43	28	43	23	34	13	15	15
25	17	29	e27	e27	41	28	56	22	31	12	16	15
26	18	29	e28	e33	38	27	56	22	30	11	16	15
27	18	29	e29	e33	35	27	46	22	29	12	15	15
28	18	30	e31	e20	34	27	42	22	28	36	14	15
29	18	e26	e27	e29	---	147	39	113	27	161	14	15
30	18	e19	e23	e24	---	82	38	221	27	50	14	15
31	18	---	e13	e14	---	52	---	86	---	32	14	---
Total	488	701	754	587.8	1,076.9	1,085	957	1,205	1,598	807	553	418
Mean	15.7	23.4	24.3	19.0	38.5	35.0	31.9	38.9	53.3	26.0	17.8	13.9
Max	18	30	31	33	116	147	56	221	217	161	28	16
Min	12	18	13	1.8	4.3	27	25	22	27	11	13	11
Ac-ft	968	1,390	1,500	1,170	2,140	2,150	1,900	2,390	3,170	1,600	1,100	829

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1950 - 2007, BY WATER YEAR (WY)

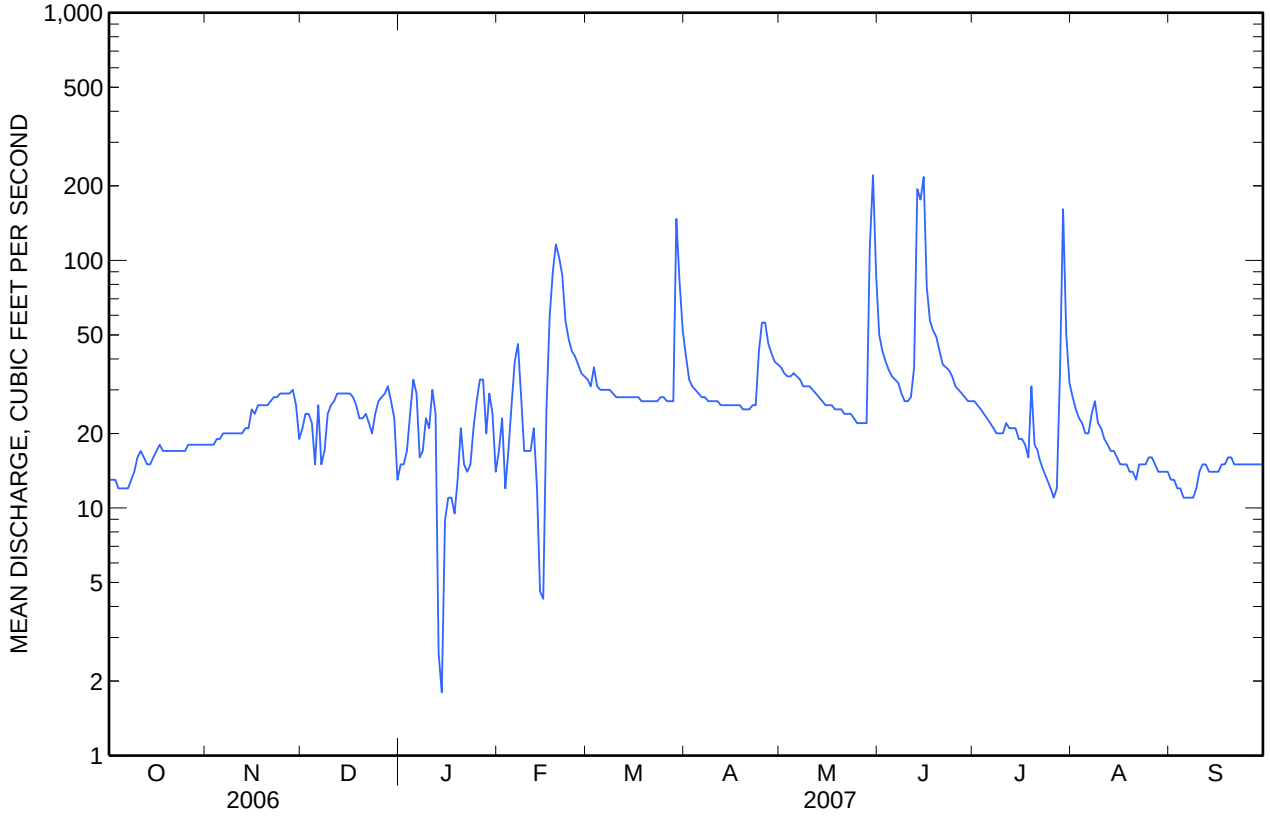
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	36.6	33.6	33.8	35.7	40.6	45.0	44.2	49.1	65.3	166	151	61.0
Max	120	88.9	97.4	102	147	247	198	151	270	340	367	232
(WY)	(1963)	(1959)	(1959)	(1953)	(1952)	(1960)	(1960)	(1957)	(1967)	(1968)	(1962)	(1962)
Min	10.2	16.9	17.1	19.0	21.8	21.5	21.2	16.2	8.61	8.26	3.41	2.25
(WY)	(2003)	(2003)	(2006)	(2007)	(2006)	(2003)	(2005)	(2006)	(2002)	(2006)	(2002)	(2002)

06834000 Frenchman Creek at Palisade, Nebr.—Continued

SUMMARY STATISTICS

	Calendar Year 2006		Water Year 2007		Water Years 1950 - 2007	
Annual total	6,147.17		10,230.7			
Annual mean	16.8		28.0		64.0	
Highest annual mean					115	1960
Lowest annual mean					15.8	2006
Highest daily mean	31	Dec 28	221	May 30	2,090	Jun 17, 1956
Lowest daily mean	0.12	Aug 5	1.8	Jan 14	0.01	Aug 24, 2003
Annual seven-day minimum	1.6	Aug 1	8.3	Jan 13	0.03	Aug 21, 2003
Maximum peak flow			600	May 30	5,560a	Jun 17, 1956
Maximum peak stage			8.62	May 30	8.79a	Jun 17, 1956
Annual runoff (ac-ft)	12,190		20,290		46,350	
10 percent exceeds	26		39		150	
50 percent exceeds	18		24		34	
90 percent exceeds	5.4		14		20	

a Site and datum then in use



06835500 Frenchman Creek at Culbertson, Nebr.

Republican Basin
Frenchman Subbasin

LOCATION.--Lat 40°14′05″, long 100°52′40″ referenced to North American Datum of 1927, in SW ¼ SE ¼ sec.12, T.3 N., R.32 W., Hitchcock County, NE, Hydrologic Unit 10250005, on right bank 8 ft upstream from bridge on U.S. Highways 6 and 34, 2 mi west of Culbertson, and 4.0 mi upstream from mouth.

DRAINAGE AREA.--2,990 mi² of which 1,400 mi² probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--June 1913 to September 1915 (gage heights and discharge measurements only), October 1930 to current year. Published as Frenchman River at Culbertson October 1965 to September 1972. Monthly discharge only for some periods, published in WSP 1310.

REVISED RECORDS.--WSP 1390: 1931, 1933, 1934(M), 1938(M). WDR NE-84-1: 1979, 1982(M). WDR NE-94-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 2,583.44 ft above sea level. See WSP 1919 for history of changes prior to Nov. 2, 1950. Data collection platform at station.

REMARKS.--Records good except for estimated daily discharges, which are poor. Natural flow affected by irrigation development above station and, since Oct. 23, 1950, by storage in Enders Reservoir (station 06832000). Principal diversion is by Culbertson Canal, 20,800 acres.

EXTREMES FOR PERIOD OF RECORD.--(BEFORE REGULATION BY ENDERS RESERVOIR) Maximum discharge, 15,000 ft³/s, estimated, May 31, 1935, stage 14.8 ft, from floodmarks, present site and datum; minimum daily discharge, 7 ft³/s Aug 13, 14, and 26, 1936.

06835500 Frenchman Creek at Culbertson, Nebr.—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2006 TO SEPTEMBER 2007
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	17	31	29	e39	e34	65	89	78	268	69	56	27
2	17	31	27	e34	e28	64	86	e75	163	66	54	26
3	16	31	27	e29	e29	63	76	e72	138	65	49	26
4	16	32	28	e30	e30	62	71	e70	110	63	46	25
5	17	33	29	e30	e30	61	69	e70	98	61	44	25
6	17	33	33	e27	e31	60	68	e68	93	60	41	24
7	17	33	34	e29	e28	60	67	e68	87	59	47	23
8	17	34	34	e34	e31	60	66	67	82	79	45	23
9	19	33	35	e37	e36	59	66	67	78	70	44	23
10	20	33	35	e35	e36	59	66	65	76	59	40	25
11	21	33	35	e34	e36	88	65	63	75	57	39	26
12	22	33	36	e29	e36	79	64	61	75	56	38	27
13	23	32	36	e28	e34	67	65	60	81	57	37	26
14	23	33	31	e25	e32	63	66	58	168	60	35	26
15	23	34	31	e22	e33	62	65	57	175	54	33	27
16	24	33	31	e23	e35	60	65	56	287	53	33	27
17	25	33	30	e25	e37	60	64	55	471	52	32	27
18	25	33	30	e26	e44	59	64	55	420	50	31	28
19	25	33	35	e30	e79	59	63	54	310	52	31	28
20	26	32	34	e28	e114	58	63	53	217	54	31	28
21	26	33	36	e29	e168	58	63	52	159	46	29	28
22	26	33	36	e26	206	58	67	52	132	44	28	27
23	27	32	38	e26	151	58	67	52	120	42	35	27
24	27	32	39	e29	109	59	97	51	107	41	31	27
25	28	32	40	e32	84	59	112	51	96	40	30	26
26	29	31	37	e36	75	59	115	50	88	39	30	27
27	29	31	42	e35	68	58	110	50	85	38	29	27
28	29	31	39	e27	65	58	96	50	79	38	28	28
29	30	31	40	e29	---	72	89	53	75	59	28	28
30	30	32	55	e27	---	145	83	1,160	72	114	27	28
31	31	---	53	e29	---	98	---	826	---	63	27	---
Total	722	971	1,095	919	1,719	2,050	2,267	3,719	4,485	1,760	1,128	790
Mean	23.3	32.4	35.3	29.6	61.4	66.1	75.6	120	150	56.8	36.4	26.3
Max	31	34	55	39	206	145	115	1,160	471	114	56	28
Min	16	31	27	22	28	58	63	50	72	38	27	23
Ac-ft	1,430	1,930	2,170	1,820	3,410	4,070	4,500	7,380	8,900	3,490	2,240	1,570

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1951 - 2007, BY WATER YEAR (WY)

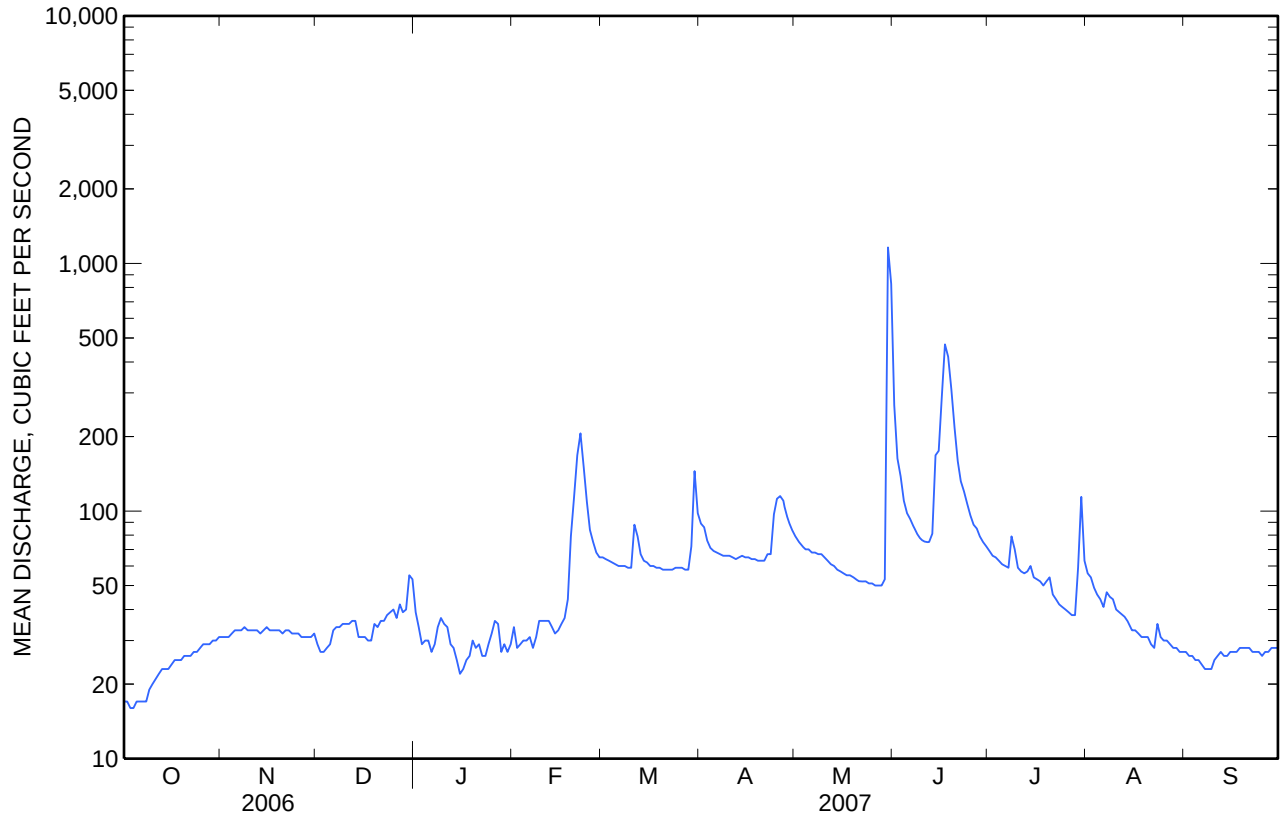
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	64.7	75.8	75.2	76.4	93.2	104	74.0	62.2	72.6	45.4	34.7	51.1
Max	172	146	162	182	210	543	290	222	351	269	258	245
(WY)	(1963)	(1963)	(1959)	(1953)	(1952)	(1960)	(1960)	(1952)	(1967)	(1962)	(1962)	(1951)
Min	0.00	5.13	16.9	21.9	40.5	31.8	16.7	12.4	4.57	0.32	0.15	0.00
(WY)	(2003)	(2003)	(2003)	(2004)	(2004)	(2003)	(2004)	(2002)	(2000)	(2002)	(2003)	(2002)

06835500 Frenchman Creek at Culbertson, Nebr.—Continued

SUMMARY STATISTICS

	Calendar Year 2006		Water Year 2007		Water Years 1951 – 2007a	
Annual total	11,278.18		21,625			
Annual mean	30.9		59.2		69.0	
Highest annual mean					165	1960
Lowest annual mean					17.4	2003
Highest daily mean	55	Dec 30	1,160	May 30	3,060	Jun 18, 1956
Lowest daily mean	0.71	Aug 7	16	Oct 3	0.00	Aug 7, 1980
Annual seven-day minimum	0.91	Aug 4	17	Oct 1	0.00	Aug 18, 2000
Maximum peak flow			1,660	May 30	5,260	Jun 17, 1951
Maximum peak stage			9.85	May 30	10.43	Jun 17, 1951
Annual runoff (ac-ft)	22,370		42,890		49,950	
10 percent exceeds	51		88		125	
50 percent exceeds	32		38		58	
90 percent exceeds	5.5		26		13	

a Since regulation by Enders Reservoir



06836500 Driftwood Creek near McCook, Nebr.

Republican Basin
Upper Republican Subbasin

LOCATION.--Lat 40°08′45″, long 100°40′22″ referenced to North American Datum of 1927, in SW ¼ SE ¼ sec.11, T.2 N., R.30 W., Red Willow County, NE, Hydrologic Unit 10250004, on right bank downstream from county road bridge, 5.8 mi upstream from mouth, and 3.5 mi southwest of McCook.

DRAINAGE AREA.--361 mi² of which 10 mi² probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--March 1946 to current year.

REVISED RECORDS.--WSP 1210: 1950. WDR NE-94-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 2,502.78 ft above NGVD of 1929. Prior to Oct. 12, 1962, at site 1.5 mi downstream in old channel at datum 9.00 ft lower, Oct. 12, 1962 to Apr. 11, 1963 at site 1.8 mi downstream at datum 12.75 ft lower, Apr. 12, 1963 to Apr. 22, 1982 at site 1.3 mi downstream at datum 9.00 ft lower, and Apr. 22, 1982 to May 29, 1992 at site 3.2 mi downstream at datum 17.55 ft lower. Data collection platform at station.

REMARKS.--Records fair. Natural flow affected by waste from Meeker-Driftwood Canal and by irrigation development above station.

06836500 Driftwood Creek near McCook, Nebr.—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2006 TO SEPTEMBER 2007
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0.12	0.51	0.54	e0.28	0.19	1.7	1.7	11	19	0.60	1.8	0.22
2	0.11	0.43	0.48	e0.27	0.18	1.2	1.6	9.2	28	0.48	1.1	0.17
3	0.08	0.35	0.33	e0.29	0.15	0.91	1.4	8.2	9.9	0.27	1.1	0.06
4	0.17	0.29	0.33	e0.30	0.15	0.95	1.4	7.9	4.3	0.55	0.99	0.03
5	0.24	0.32	0.36	e0.31	0.21	1.0	1.5	7.6	2.7	0.63	0.97	0.01
6	0.20	0.30	0.39	0.33	0.30	1.1	1.6	6.8	1.9	0.73	1.0	0.03
7	0.14	0.27	0.36	0.31	0.33	1.1	1.7	5.9	1.6	0.77	1.9	0.06
8	0.47	0.23	0.35	0.31	0.36	1.2	1.8	5.7	1.4	0.96	8.3	0.05
9	1.1	0.24	0.35	0.30	0.40	1.4	2.0	5.4	1.1	15	15	0.05
10	0.80	0.30	0.37	0.27	0.44	1.5	2.3	5.1	1.1	44	5.4	0.47
11	0.75	0.38	0.38	0.28	0.46	1.6	2.3	4.4	1.0	5.5	3.3	0.49
12	0.57	0.39	0.40	0.30	0.49	1.8	2.1	4.6	0.82	4.3	2.0	0.25
13	1.0	0.42	0.41	0.26	0.50	1.8	2.4	4.7	0.98	3.8	1.3	0.10
14	1.3	0.40	0.43	0.24	0.57	2.0	2.5	5.1	1.2	3.1	0.92	0.02
15	1.3	0.43	0.41	0.25	0.56	1.9	2.4	5.1	1.1	2.6	0.74	0.03
16	1.3	0.44	0.38	0.23	0.60	2.0	2.1	5.1	0.74	2.4	0.88	0.02
17	1.8	0.38	0.36	0.20	0.59	2.0	1.9	5.2	0.64	2.8	1.1	0.04
18	1.2	0.32	0.35	0.20	0.61	2.1	1.7	5.0	0.61	3.6	1.0	0.03
19	0.51	0.34	0.35	0.20	0.61	2.1	1.7	4.4	0.55	2.8	0.40	0.02
20	1.1	0.30	0.46	0.20	0.68	1.9	1.8	4.1	0.46	80	0.32	0.02
21	1.3	0.18	0.51	0.19	0.82	2.0	1.2	3.6	0.44	11	0.39	0.02
22	1.2	0.16	0.49	0.18	0.81	2.1	2.4	3.3	0.57	5.1	0.55	0.02
23	1.1	0.22	0.38	0.18	0.83	2.2	2.1	2.9	0.44	3.3	0.68	0.01
24	0.99	0.32	0.40	0.18	0.82	2.4	926	2.2	0.29	2.6	0.80	0.00
25	0.97	0.33	0.41	0.20	0.86	2.5	370	2.3	0.34	2.2	0.82	0.00
26	1.0	0.46	0.40	0.20	1.0	2.3	90	2.3	0.33	2.0	1.0	0.00
27	0.83	0.53	0.41	0.20	1.0	2.2	31	2.3	0.41	1.7	0.68	0.00
28	0.73	0.61	0.41	0.21	1.0	2.1	20	2.4	0.23	1.7	0.77	0.00
29	0.66	0.59	0.32	0.19	---	2.3	15	2.8	0.24	1.8	0.51	0.00
30	0.57	0.54	0.27	0.19	---	2.3	13	3.8	0.27	1.9	0.47	0.05
31	0.40	---	0.28	0.18	---	2.0	---	5.5	---	2.2	0.35	---
Total	24.01	10.98	12.07	7.43	15.52	55.66	1,508.6	153.9	82.66	210.39	56.54	2.27
Mean	0.77	0.37	0.39	0.24	0.55	1.80	50.3	4.96	2.76	6.79	1.82	0.08
Max	1.8	0.61	0.54	0.33	1.0	2.5	926	11	28	80	15	0.49
Min	0.08	0.16	0.27	0.18	0.15	0.91	1.2	2.2	0.23	0.27	0.32	0.00
Ac-ft	48	22	24	15	31	110	2,990	305	164	417	112	4.5

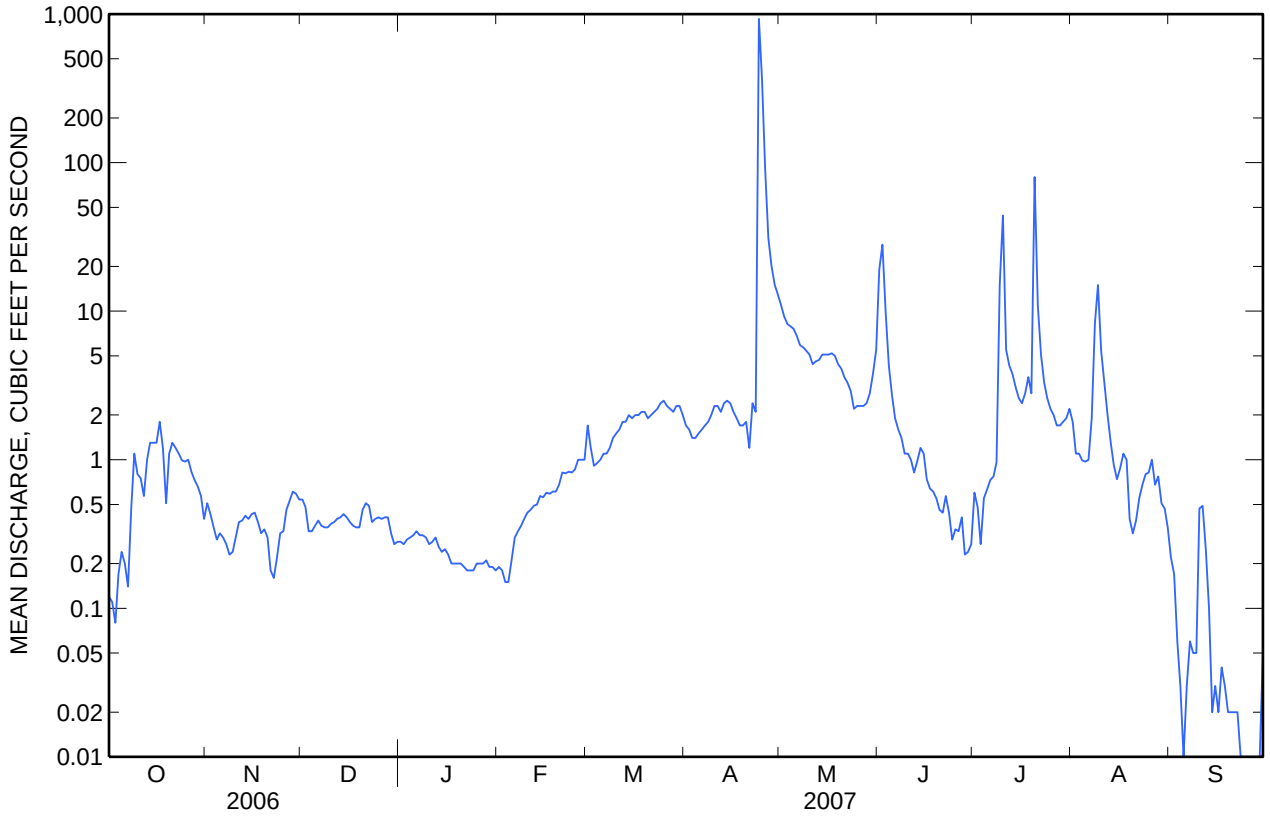
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1946 - 2007, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	6.50	3.47	3.39	3.36	5.29	7.23	4.84	8.89	16.0	18.2	15.2	12.0
Max	137	7.71	7.44	7.96	31.4	209	50.3	112	85.8	100	156	302
(WY)	(1947)	(1998)	(1974)	(1974)	(1960)	(1960)	(2007)	(1957)	(1947)	(1956)	(1950)	(1951)
Min	0.07	0.08	0.08	0.05	0.05	0.04	0.20	0.19	0.23	0.05	0.05	0.04
(WY)	(1956)	(1956)	(1955)	(1955)	(1956)	(1956)	(1948)	(1956)	(1954)	(1955)	(1946)	(1953)

06836500 Driftwood Creek near McCook, Nebr.—Continued

SUMMARY STATISTICS

	Calendar Year 2006		Water Year 2007		Water Years 1946 - 2007	
Annual total	297.87		2,140.03			
Annual mean	0.82		5.86		8.73	
Highest annual mean					35.0	1951
Lowest annual mean					0.93	2006
Highest daily mean	3.3	May 24	926	Apr 24	3,950	Aug 7, 1950
Lowest daily mean	0.03	Aug 3	0.00	Sep 24	0.00	Apr 25, 1946
Annual seven-day minimum	0.04	Jul 28	0.00	Sep 23	0.00	Jun 12, 1946
Maximum peak flow			1,760	Apr 24	4,740	Aug 7, 1950
Maximum peak stage			18.48	Apr 24	25.43	Aug 7, 1950
Annual runoff (ac-ft)	591		4,240		6,320	
10 percent exceeds	1.6		4.6		10	
50 percent exceeds	0.57		0.68		4.4	
90 percent exceeds	0.06		0.18		0.30	



06837000 Republican River at McCook, Nebr.

Republican Basin
Upper Republican Subbasin

LOCATION.--Lat 40°11′16″, long 100°37′07″ referenced to North American Datum of 1983, in SW ¼ NE ¼ sec.32, T.3 N., R.29 W., Red Willow County, NE, Hydrologic Unit 10250004, on left bank at downstream side of bridge on U.S. Highway 83 at south edge of McCook, 2.5 mi downstream from Driftwood Creek, 10.5 mi upstream from Red Willow Creek, and at mile 348.

DRAINAGE AREA.--12,240 mi^2 of which 6,020 mi^2 probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--October 1930 to June 1932, October 1954 to current year. Monthly discharge only for some periods, published in WSP 1310.

REVISED RECORDS.--WDR NE-94-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 2,456.37 ft above sea level. October 1930 to June 1932, non-recording gage on former highway bridge 300 ft upstream at different datum, and October 1954 to Mar 13, 1959 on highway bridge 25 ft upstream at present datum. Mar 13, 1959 to Mar 29, 1988 at present site and datum. Mar 29, 1988 to Oct 31, 1989 200 ft downstream at present datum. Data collection platform at station.

REMARKS.--Records fair except for the period April 24–July 10 and estimated daily discharges, which are poor. Natural flow affected by irrigation development above station and by storage in Bonny Reservoir, Enders Reservoir (06832000), and Swanson Lake (06829000).

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum flood since at least 1826 occurred May 31, 1935, discharge about 245,000 ft^3/s.

06837000 Republican River at McCook, Nebr.—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2006 TO SEPTEMBER 2007
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0.05	12	e5.0	e6.1	e22	103	111	134	962	49	60	24
2	0.05	12	e10	e16	e20	98	97	120	524	48	50	23
3	0.05	13	e8.0	e18	e22	90	95	112	333	46	45	22
4	0.06	12	e7.0	e22	e19	84	83	107	250	49	40	21
5	0.09	12	e10	e24	20	81	77	103	192	43	41	20
6	0.13	12	e13	26	e20	80	75	96	158	41	42	20
7	0.12	12	e17	27	e20	78	72	91	133	39	55	19
8	0.10	12	e13	26	20	76	70	88	115	39	56	19
9	0.28	12	e14	27	21	75	69	86	105	87	63	19
10	1.2	12	e14	e31	22	73	70	85	98	106	55	26
11	1.9	13	e21	e30	26	72	68	82	94	66	41	24
12	0.88	14	e20	e29	e22	92	65	80	93	52	39	24
13	0.45	14	e19	27	e20	96	69	79	103	46	36	23
14	0.29	15	23	e23	e16	82	72	77	123	47	33	23
15	0.21	14	26	e21	e16	74	69	74	205	46	31	23
16	0.25	e13	26	e20	27	70	67	73	225	40	35	23
17	0.33	13	e24	e19	26	69	65	73	338	38	32	23
18	1.3	12	e25	18	30	67	64	72	e525	36	30	23
19	3.7	13	e23	18	41	65	63	71	e565	36	29	23
20	4.5	e14	41	19	103	64	62	71	e442	87	27	24
21	4.9	15	48	17	227	63	61	70	e298	93	27	23
22	5.5	15	36	e16	272	62	87	72	e209	51	29	22
23	6.5	15	e32	e16	244	61	93	72	e154	44	36	22
24	7.6	15	e27	16	197	68	1,990	71	e119	40	36	21
25	8.6	15	e27	18	162	69	1,050	70	92	37	32	21
26	15	16	e23	18	137	65	467	69	75	35	30	21
27	16	16	e30	e18	121	64	292	67	67	33	28	21
28	13	17	e36	e18	109	63	219	66	62	38	26	21
29	12	e16	e36	20	---	69	178	66	56	36	26	21
30	12	e6.2	e10	e21	---	73	154	94	52	54	26	25
31	12	---	e6.6	22	---	134	---	979	---	97	25	---
Total	129.04	402.2	670.6	647.1	2,002	2,380	6,074	3,470	6,767	1,599	1,161	664
Mean	4.16	13.4	21.6	20.9	71.5	76.8	202	112	226	51.6	37.5	22.1
Max	16	17	48	31	272	134	1,990	979	962	106	63	26
Min	0.05	6.2	5.0	6.1	16	61	61	66	52	33	25	19
Ac-ft	256	798	1,330	1,280	3,970	4,720	12,050	6,880	13,420	3,170	2,300	1,320

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1955 - 2007, BY WATER YEAR (WY)

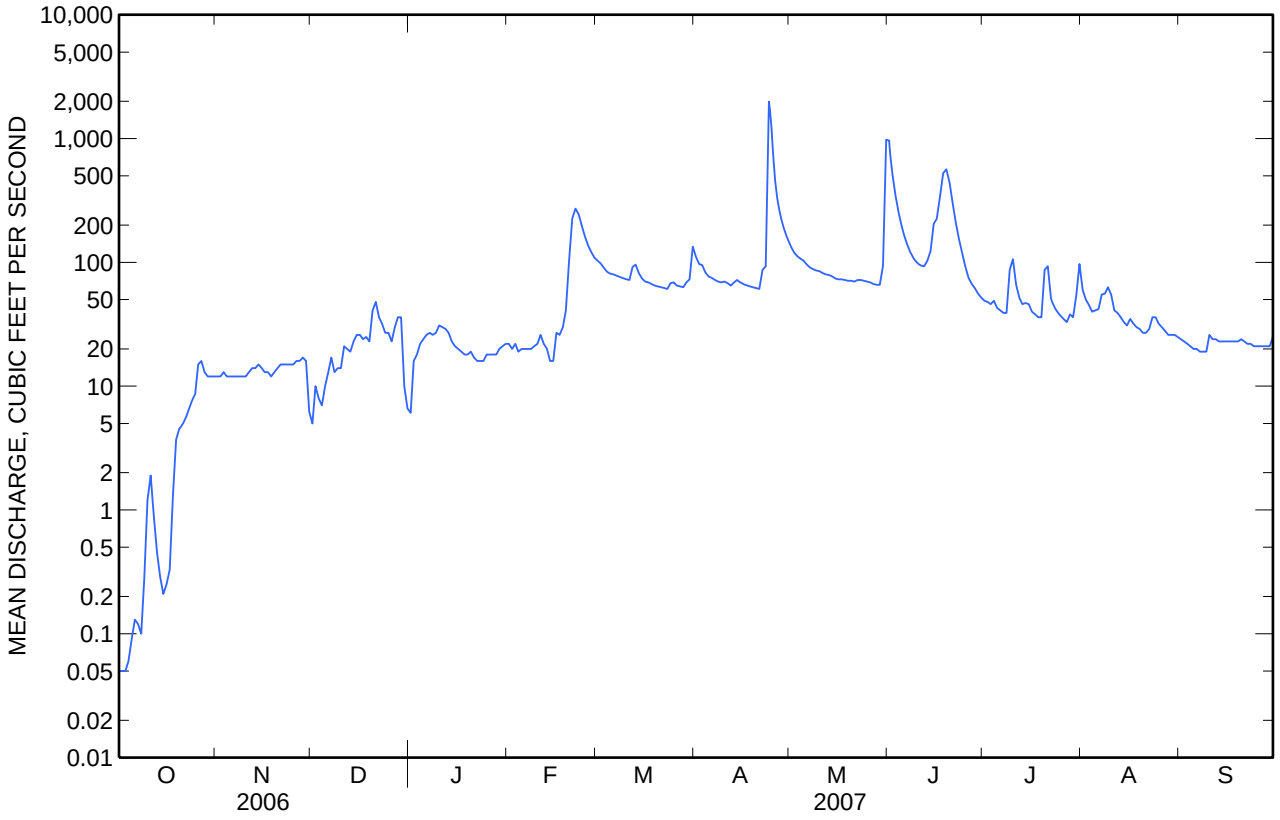
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	86.7	99.3	97.0	101	137	162	148	156	171	188	152	86.1
Max	466	341	321	269	398	901	577	1,022	1,070	1,142	970	286
(WY)	(1966)	(1966)	(1959)	(1959)	(1958)	(1960)	(1958)	(1957)	(1962)	(1962)	(1962)	(1962)
Min	0.04	0.03	0.28	9.17	36.6	33.8	21.8	14.8	6.41	1.77	0.48	0.17
(WY)	(2004)	(2004)	(2003)	(2003)	(2003)	(2003)	(2004)	(2004)	(2002)	(2002)	(2006)	(2003)

06837000 Republican River at McCook, Nebr.—Continued

SUMMARY STATISTICS

	Calendar Year 2006		Water Year 2007		Water Years 1955 - 2007	
Annual total	8,526.80		25,965.94			
Annual mean	23.4		71.1		132	
Highest annual mean					383	1962
Lowest annual mean					15.0	2003
Highest daily mean	61	Jan 1	1,990	Apr 24	5,020	Mar 21, 1960
Lowest daily mean	0.04	Sep 30	0.05	Oct 1	0.00	Sep 24, 2000
Annual seven-day minimum	0.05	Sep 26	0.08	Oct 1	0.00	Aug 29, 2001
Maximum peak flow			3,250	Apr 24	5,890a	Mar 21, 1960
Maximum peak stage			9.76	Apr 24	9.76	Apr 24, 2007
Annual runoff (ac-ft)	16,910		51,500		95,730	
10 percent exceeds	49		117		236	
50 percent exceeds	16		35		99	
90 percent exceeds	0.18		12		35	

a Stage 9.14 ft



06838000 Red Willow Creek near Red Willow, Nebr.

Republican Basin
Red Willow Subbasin

LOCATION.--Lat 40°14′05″, long 100°30′03″ referenced to North American Datum of 1983, in NE ¼ NE ¼ sec.17, T.3 N., R.28 W., Red Willow County, NE, Hydrologic Unit 10250007, on left bank near downstream side of bridge on U.S. Highways 6 and 34, 0.8 mi north of Red Willow and 2.1 mi upstream from mouth.

DRAINAGE AREA.--820.00 mi^2 of which 415 mi^2 probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--September 1939 to current year.

REVISED RECORDS.--WSP 1510: 1945(M). WDR NE-94-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 2,398.64 ft above sea level. Prior to May 26, 1945, non-recording gage at bridge 1.2 mi upstream at datum 11.16 ft higher; May 26, 1945 to Aug. 2, 1974 water-stage recorder at left downstream side of bridge, present datum; Aug. 3, 1974 to June 27, 1980 on right bank at downstream side of bridge, present datum; and June 28, 1980 to May 19, 1992 at left downstream side of bridge, present datum. Data collection platform at station.

REMARKS.--Records fair except for estimated daily discharges, which are poor. Natural flow affected by irrigation development above station, since Sept 5, 1961 by storage in Hugh Butler Lake (06837390), and since June 1963 by Red Willow Canal, which diverts 4.5 mi above station for irrigation of about 4,150 acres.

EXTREMES FOR PERIOD OF RECORD.--(BEFORE REGULATION BY HUGH BUTLER LAKE) Maximum discharge 30,000 ft^3/s June 22, 1947, from rating curve extended above 6,800 ft^3/s on basis of slope-area measurement of peak flow, stage 18.36 ft; minimum daily, 2.0 ft^3/s July 29–31, 1954, Sept 10, 1961.

06838000 Red Willow Creek near Red Willow, Nebr.—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2006 TO SEPTEMBER 2007
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	4.3	5.3	e4.8	e4.2	e5.4	e7.8	7.9	9.2	9.2	4.8	4.9	4.6
2	4.2	5.4	e5.0	e4.4	e4.4	e7.8	7.9	8.8	8.0	4.9	5.2	4.2
3	5.4	5.5	e5.2	e5.5	e4.0	e5.9	7.6	8.8	7.5	5.1	5.4	4.2
4	4.1	5.5	e5.4	e6.0	e4.7	e6.0	7.4	8.9	7.4	5.6	5.6	4.1
5	4.6	5.5	5.4	e5.8	e5.1	e6.4	7.5	9.1	7.2	5.2	5.3	4.0
6	4.8	5.5	5.3	e4.2	e6.1	e7.1	7.7	8.8	7.1	5.4	5.2	4.0
7	4.7	5.5	e5.0	e4.9	e6.3	e7.6	7.5	8.5	7.0	4.9	60	4.4
8	4.8	5.6	e5.2	e5.8	e6.0	e9.0	7.6	8.5	6.7	4.7	11	4.5
9	5.8	5.5	e5.4	e6.0	e6.3	7.7	7.5	8.6	6.6	51	5.6	4.5
10	6.1	5.4	e5.4	e5.5	e6.6	7.4	7.7	8.5	6.7	7.5	5.0	5.8
11	5.7	5.3	e5.4	e5.3	e6.8	7.4	7.6	8.6	7.1	6.2	5.0	5.9
12	5.2	5.4	5.1	e4.6	e7.2	7.2	7.3	8.7	6.9	5.8	5.2	4.9
13	5.2	5.4	5.0	e4.1	e6.0	7.2	7.6	8.7	e7.3	5.4	5.4	4.6
14	5.3	5.4	5.3	e4.1	e5.8	7.3	7.8	8.9	e7.8	5.4	5.9	5.0
15	5.2	5.4	e5.4	e5.0	e5.7	7.2	7.5	8.8	8.1	5.3	5.8	5.0
16	5.5	e4.9	5.7	e5.1	e6.2	7.3	7.5	8.7	7.4	4.9	5.8	5.2
17	5.8	5.3	5.9	e4.4	e6.7	7.5	7.6	8.9	7.2	4.9	5.3	6.4
18	5.7	5.1	e5.8	e4.0	e6.7	7.6	7.5	8.9	7.2	4.7	4.9	5.4
19	5.2	5.0	e5.2	e4.0	e6.9	7.7	7.6	8.6	6.9	4.4	e4.8	5.0
20	5.4	e4.8	e5.3	e3.5	e6.6	7.6	7.6	8.6	6.7	4.5	4.3	4.9
21	5.5	5.0	5.4	e3.8	e7.4	7.9	7.7	8.7	6.7	5.1	4.1	4.9
22	5.4	4.9	4.7	e3.8	e7.0	7.9	9.7	8.5	6.4	4.6	4.6	4.8
23	5.6	5.0	3.9	e4.0	e7.7	8.0	9.2	8.4	6.5	4.5	4.6	4.8
24	5.6	5.0	4.3	e4.5	e7.2	8.5	588	8.1	e6.7	4.2	5.1	4.5
25	5.6	5.0	3.7	e5.2	e6.5	8.8	132	7.9	6.4	4.6	4.8	4.5
26	5.8	5.0	4.9	e5.6	e6.4	8.1	25	8.0	5.6	4.1	4.9	4.8
27	5.5	4.9	5.6	e5.6	e7.3	7.9	12	7.9	5.6	4.4	4.9	4.6
28	5.4	5.0	4.6	e4.7	e7.6	8.1	11	7.9	5.7	7.3	4.6	4.4
29	5.4	e5.0	e4.6	e5.1	---	8.6	10	8.2	6.0	7.6	4.6	4.6
30	5.4	e4.8	e6.2	e5.6	---	8.5	9.7	43	5.4	5.5	4.9	5.5
31	5.2	---	e4.4	e5.8	---	8.1	---	96	---	5.5	5.3	---
Total	163.4	156.3	158.5	150.1	176.6	237.1	966.2	387.7	207.0	208.0	218.0	144.0
Mean	5.27	5.21	5.11	4.84	6.31	7.65	32.2	12.5	6.90	6.71	7.03	4.80
Max	6.1	5.6	6.2	6.0	7.7	9.0	588	96	9.2	51	60	6.4
Min	4.1	4.8	3.7	3.5	4.0	5.9	7.3	7.9	5.4	4.1	4.1	4.0
Ac-ft	324	310	314	298	350	470	1,920	769	411	413	432	286

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1962 - 2007, BY WATER YEAR (WY)

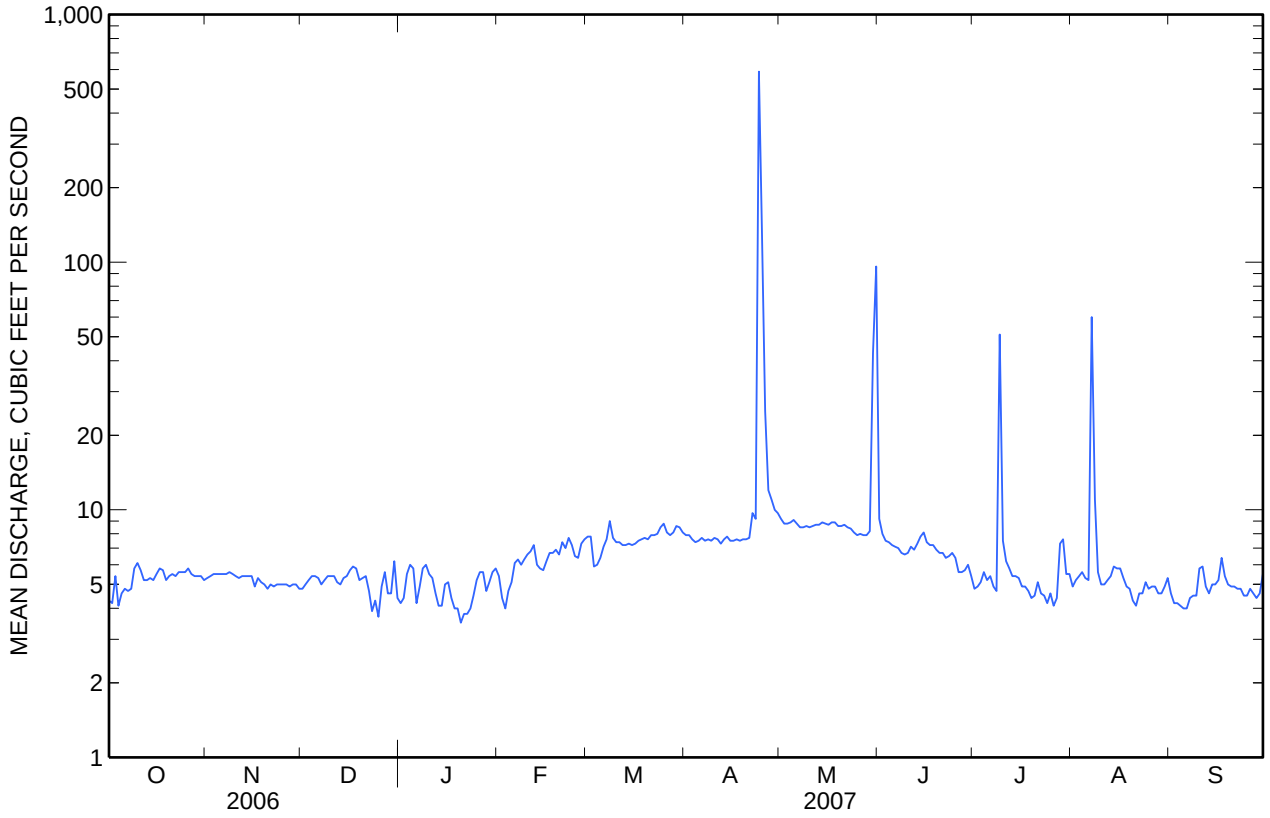
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	8.15	8.24	8.34	8.90	10.3	11.0	11.4	11.4	19.7	22.2	20.5	9.71
Max	18.8	13.6	12.1	21.1	32.9	35.5	41.5	36.6	124	72.1	92.4	29.0
(WY)	(1970)	(1997)	(1966)	(1962)	(1968)	(1994)	(1970)	(1973)	(1967)	(2006)	(1978)	(1978)
Min	3.84	4.98	4.75	3.53	4.32	6.11	4.98	2.87	4.47	3.13	1.66	2.78
(WY)	(1978)	(1978)	(2003)	(2004)	(2004)	(2002)	(1978)	(1978)	(2004)	(2003)	(2003)	(2003)

06838000 Red Willow Creek near Red Willow, Nebr.—Continued

SUMMARY STATISTICS

	Calendar Year 2006		Water Year 2007		Water Years 1962 – 2007a	
Annual total	5,092.80		3,172.9			
Annual mean	14.0		8.69		12.5	
Highest annual mean					25.5	1967
Lowest annual mean					4.75	2004
Highest daily mean	100	Jul 6	588	Apr 24	668	Jul 18, 1962
Lowest daily mean	0.95	Feb 17	3.5	Jan 20	0.00	Sep 2, 1995
Annual seven-day minimum	3.0	Feb 15	3.9	Jan 17	0.17	Jul 30, 2005
Maximum peak flow			996	Apr 24	2,210b	Jul 18, 1962
Maximum peak stage			14.62	Apr 24	14.62	Apr 24, 2007
Annual runoff (ac-ft)	10,100		6,290		9,060	
10 percent exceeds	49		8.5		20	
50 percent exceeds	5.6		5.6		8.9	
90 percent exceeds	4.0		4.5		4.9	

a Since regulation by Hugh Butler Lake
b Stage 13.86 ft



06843500 Republican River at Cambridge, Nebr.

Republican Basin
Upper Republican Subbasin

LOCATION.--Lat 40°17′04″, long 100°08′37″ referenced to North American Datum of 1983, in NW ¼ SE ¼ sec.28, T.4 N., R.25 W., Furnas County, NE, Hydrologic Unit 10250004, on left bank 400 ft south of U.S. Highways 6 and 34, 0.5 mi downstream from Medicine Creek, 1 mi east of Cambridge, 1.3 mi upstream from Cambridge diversion dam, and at mile 315.

DRAINAGE AREA.--14,460 mi^2 of which 6,680 mi^2 probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--September 1945 to current year.

REVISED RECORDS.--WDR NE-84-1: 1983(M). WDR NE-94-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 2,239.07 ft above sea level. Prior to July 13, 1948, non-recording gage at site 150 ft upstream at same datum and July 13, 1948 to Sept. 25, 1950 at present site and datum.

COOPERATION.--Records provided by Nebraska Department of Natural Resources and reviewed by the U.S. Geological Survey.

REMARKS.--Records good except for estimated daily discharges, which are poor. Natural flow affected by irrigation development above station and since 1949 by regulation from upstream reservoirs.

EXTREMES FOR PERIOD OF RECORD.--(BEFORE START OF STORAGE IN HARRY STRUNK LAKE) Maximum discharge, 160,000 ft^3/s, June 22, 1947, gage height 16.70 ft, from floodmarks; minimum daily, 6.4 ft^3/s, Aug 14, 1949.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage since at least 1826, 17.6 ft May 31 to June 1, 1935, information from local resident, discharge, about 280,000 ft^3/s.

06843500 Republican River at Cambridge, Nebr.—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2006 TO SEPTEMBER 2007
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	e0.92	e0.80	e0.57	e10	e12	148	141	295	891	307	240	e18
2	e0.95	e0.67	e0.79	e3.2	e11	136	154	266	1,460	312	238	e20
3	e1.0	e0.73	e0.86	e5.6	e12	127	154	247	1,110	307	233	e16
4	e1.2	e1.3	e0.94	e3.2	e15	122	146	239	939	308	228	e15
5	e1.3	e2.1	e0.86	e4.3	e17	120	146	234	849	299	225	e13
6	e1.3	e3.0	e1.2	e3.6	e16	119	143	222	781	273	223	e12
7	e1.4	e4.1	e1.2	e6.4	e14	117	141	216	712	202	239	e14
8	e1.4	e4.1	e1.2	e7.0	e12	117	140	210	658	193	253	e17
9	e1.5	e2.8	e1.2	e11	e11	122	139	204	601	337	244	e22
10	e2.1	e2.0	e1.2	e13	e13	157	139	199	552	358	237	e22
11	e2.7	e1.5	e1.3	e13	e15	159	141	193	511	320	234	e26
12	e1.4	e1.3	e2.0	e12	e15	163	137	186	460	306	220	26
13	e0.90	e1.6	e3.0	e9.1	e14	163	142	180	430	298	e81	24
14	e0.71	e1.5	e4.0	e8.7	e11	161	143	172	445	280	e49	23
15	e0.63	e1.8	e5.0	e9.9	e7.7	161	142	168	401	269	e36	26
16	e1.2	e2.8	e6.0	e9.5	e20	155	141	162	367	262	e34	22
17	e1.4	e2.0	e7.0	e6.1	e18	148	138	159	357	258	e32	22
18	e1.2	e2.4	e7.8	e6.7	e22	146	136	153	360	252	e29	22
19	e2.0	e1.8	e6.6	e8.1	e34	142	135	148	387	245	e26	20
20	e3.5	e2.4	e13	e6.8	e50	140	133	144	441	247	e24	20
21	e2.4	e2.9	17	e10	e79	137	132	139	420	246	e24	19
22	e0.98	e3.0	24	e8.7	e105	133	153	141	361	253	e28	18
23	e1.4	e3.1	26	e12	e136	131	158	140	320	243	e33	17
24	e2.2	e3.1	20	e12	e283	136	591	135	292	240	e37	16
25	e3.1	e2.9	20	e13	e307	139	2,560	131	293	234	e35	16
26	e5.3	e3.3	17	e13	e243	143	2,230	130	338	230	e30	16
27	e6.0	e2.9	18	e11	178	143	804	129	336	227	e29	16
28	e2.8	e3.5	20	e10	158	142	521	128	330	238	e28	16
29	e2.6	e1.0	e18	e14	---	151	398	134	322	239	e26	16
30	e1.6	e0.71	e16	e13	---	148	335	172	317	237	e23	19
31	e0.86	---	e19	e14	---	146	---	336	---	234	e21	---
Total	57.95	67.11	280.72	287.9	1,828.7	4,372	10,713	5,712	16,041	8,254	3,439	569
Mean	1.87	2.24	9.06	9.29	65.3	141	357	184	535	266	111	19.0
Max	6.0	4.1	26	14	307	163	2,560	336	1,460	358	253	26
Min	0.63	0.67	0.57	3.2	7.7	117	132	128	292	193	21	12
Ac-ft	115	133	557	571	3,630	8,670	21,250	11,330	31,820	16,370	6,820	1,130

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1950 - 2007, BY WATER YEAR (WY)

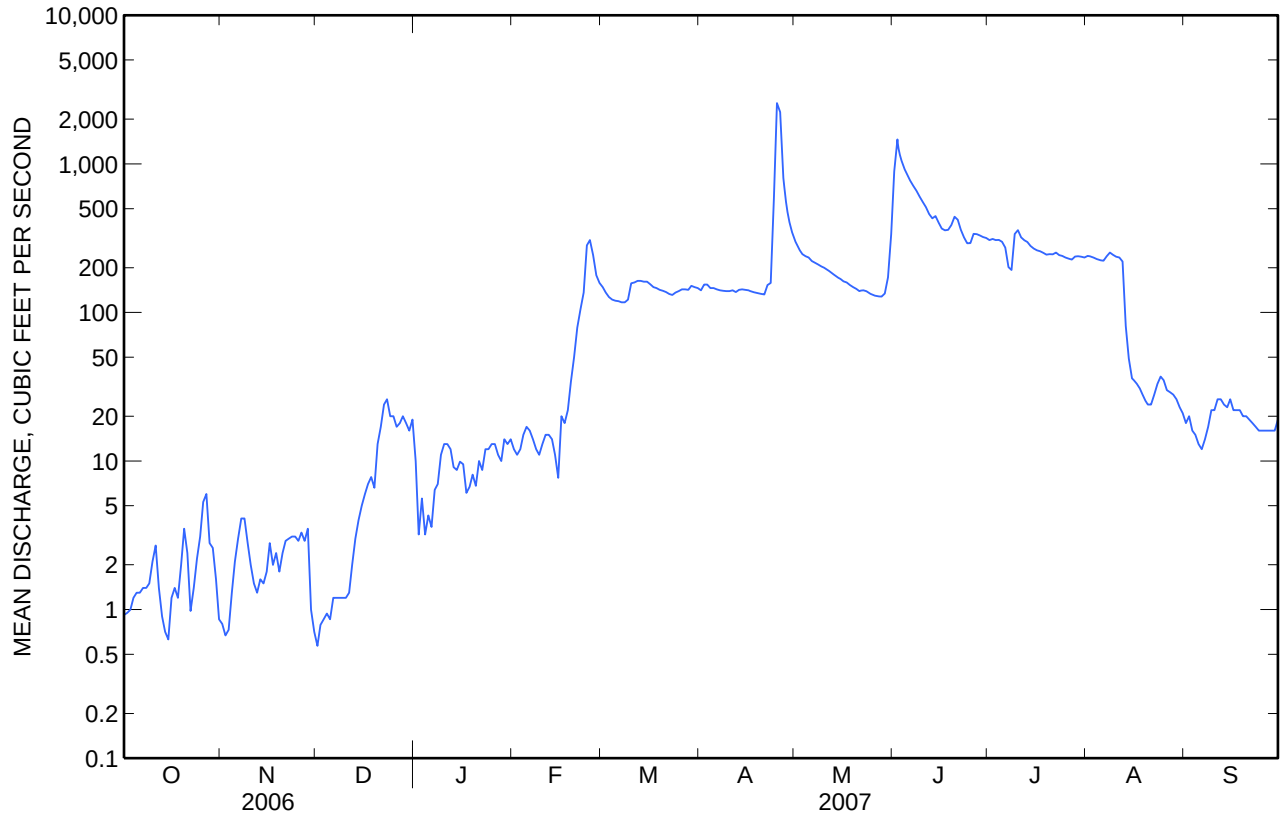
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	107	138	135	142	218	270	242	276	322	347	277	138
Max	515	425	389	384	579	1,684	756	1,624	1,743	1,613	1,202	1,935
(WY)	(1966)	(1966)	(1966)	(1959)	(1966)	(1960)	(1958)	(1957)	(1962)	(1962)	(1962)	(1951)
Min	0.00	0.06	0.09	0.11	1.98	28.2	17.7	6.98	24.8	160	96.7	0.12
(WY)	(2005)	(2004)	(2004)	(2004)	(2004)	(2004)	(2004)	(2004)	(2006)	(1952)	(2006)	(2003)

06843500 Republican River at Cambridge, Nebr.—Continued

SUMMARY STATISTICS

	Calendar Year 2006		Water Year 2007		Water Years 1950 – 2007a	
Annual total	17,649.93		51,622.38			
Annual mean	48.4		141		218	
Highest annual mean					686	1951
Lowest annual mean					41.0	2004
Highest daily mean	279	Jul 20	2,560	Apr 25	8,610	Mar 22, 1960
Lowest daily mean	0.08	Jun 10	0.57	Dec 1	0.00	Oct 13, 2002
Annual seven-day minimum	0.22	Jun 9	0.82	Nov 29	0.00	Oct 13, 2002
Maximum peak flow			3,400	Apr 25	11,000b	Sep 4, 1951
Maximum peak stage			8.88	Apr 25	9.35c	Mar 22, 1960
Annual runoff (ac-ft)	35,010		102,400		157,800	
10 percent exceeds	127		321		395	
50 percent exceeds	46		32		154	
90 percent exceeds	1.0		1.5		51	

a Since beginning of storage in Harry Strunk Lake
b Stage 7.02 ft
c Discharge 9,080 ft^3/s



06844500 Republican River near Orleans, Nebr.

Republican Basin
Harlan County Reservoir Subbasin

LOCATION.--Lat 40°07′54″, long 99°30′09″ referenced to North American Datum of 1983, in NE ¼ NE ¼ sec.19, T.2 N., R.19 W., Harlan County, NE, Hydrologic Unit 10250009, on right bank 18 ft downstream from bridge on State Highway 89, 200 ft downstream from Burlington Northern Inc. bridge, 2 mi west of Orleans, 2.8 mi upstream from Sappa Creek, 23 mi upstream from Harlan County Dam, and at mile 262.

DRAINAGE AREA.--15,580 mi^2 of which 6,700 mi^2 probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--October 1947 to current year.

REVISED RECORDS.--WDR NE-94-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,972.57 ft above sea level. Prior to June 2, 1948, non-recording gage at present site and datum. Data collection platform at station.

REMARKS.--Records fair except for estimated daily discharges, which are poor. Natural flow affected by irrigation development above station and regulation by upstream reservoirs.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximun flood since at least 1826 occurred June 1, 1935. Flood of June 23, 1947, reached a stage of 14.00 ft, from floodmark, approximate discharge 145,000 ft^3/s.

06844500 Republican River near Orleans, Nebr.—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2006 TO SEPTEMBER 2007
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	e5.9	14	9.1	25	e27	375	218	484	776	346	314	51
2	e5.8	14	9.8	20	e26	311	213	429	e710	334	286	48
3	5.8	15	9.2	25	e28	265	205	395	e1,070	332	277	45
4	5.9	15	9.7	27	e29	230	204	374	e1,040	543	265	42
5	5.9	16	12	29	32	214	210	366	e880	483	252	39
6	6.0	17	12	28	29	202	209	355	e800	388	247	37
7	6.1	18	12	30	30	193	208	344	731	356	248	39
8	6.1	18	12	31	32	185	207	330	664	293	548	45
9	7.2	18	14	33	33	180	206	318	618	799	573	44
10	7.9	16	13	33	37	173	206	304	572	572	379	42
11	8.3	16	14	39	42	168	206	292	526	796	292	44
12	6.0	16	16	24	51	183	202	280	490	507	253	47
13	3.2	16	16	25	54	186	209	269	744	436	236	46
14	3.5	17	19	23	47	184	208	263	1,030	422	194	43
15	5.6	18	18	22	50	182	209	257	792	387	136	44
16	8.3	17	20	22	45	181	208	243	650	366	111	45
17	9.8	18	19	25	40	186	206	242	564	342	99	47
18	10	17	17	26	e89	185	206	239	548	325	89	48
19	11	17	15	28	e214	185	205	227	534	306	82	46
20	14	17	23	e27	e737	182	204	214	526	293	80	46
21	14	18	29	30	e913	180	203	207	544	288	77	44
22	13	18	28	28	e1,020	176	210	204	536	278	77	42
23	14	18	24	27	e1,100	174	225	301	487	278	78	42
24	14	18	24	28	1,180	179	668	240	435	266	156	43
25	15	18	21	29	1,560	179	2,680	216	385	257	123	40
26	17	17	20	31	1,630	180	2,380	207	e340	249	90	40
27	22	17	22	e29	673	183	2,500	198	e370	241	76	40
28	18	18	25	e27	459	199	1,070	193	e370	277	67	40
29	15	14	e25	e29	---	208	709	194	362	335	62	41
30	16	9.5	e23	e29	---	209	568	304	351	375	57	42
31	14	---	e24	e29	---	224	---	443	---	376	53	---
Total	314.3	495.5	554.8	858	10,207	6,241	15,362	8,932	18,445	11,846	5,877	1,302
Mean	10.1	16.5	17.9	27.7	365	201	512	288	615	382	190	43.4
Max	22	18	29	39	1,630	375	2,680	484	1,070	799	573	51
Min	3.2	9.5	9.1	20	26	168	202	193	340	241	53	37
Ac-ft	623	983	1,100	1,700	20,250	12,380	30,470	17,720	36,590	23,500	11,660	2,580

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1948 - 2007, BY WATER YEAR (WY)

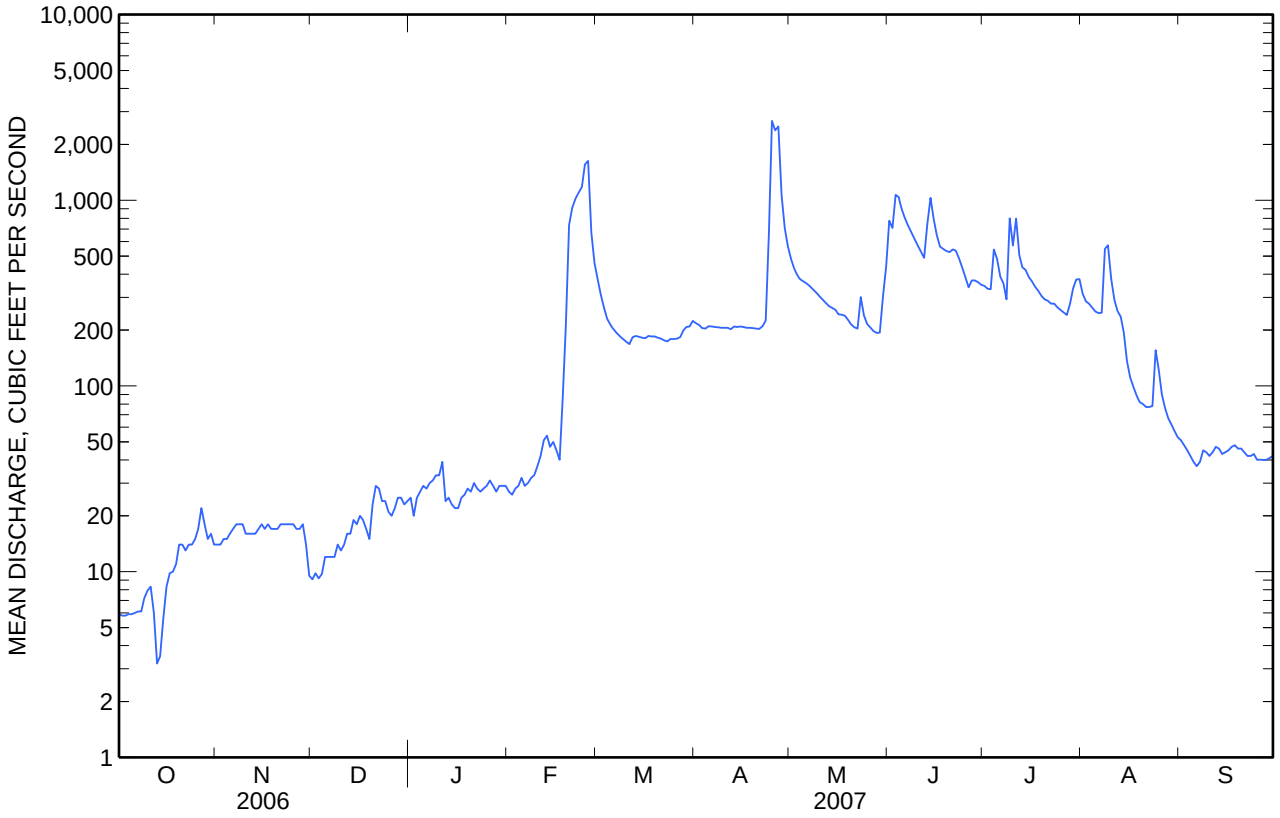
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	116	154	153	155	271	347	308	357	431	239	164	133
Max	840	519	438	392	772	1,720	915	1,528	2,732	1,602	1,396	2,026
(WY)	(1966)	(1966)	(1966)	(1953)	(1949)	(1960)	(1949)	(1951)	(1948)	(1962)	(1962)	(1951)
Min	0.00	0.00	0.00	1.09	12.8	32.4	35.6	17.5	1.84	0.06	0.00	0.00
(WY)	(1992)	(2003)	(2004)	(2004)	(2004)	(2004)	(2004)	(2004)	(2004)	(2006)	(2002)	(2002)

06844500 Republican River near Orleans, Nebr.—Continued

SUMMARY STATISTICS

	Calendar Year 2006		Water Year 2007		Water Years 1948 - 2007	
Annual total	10,466.12		80,434.6			
Annual mean	28.7		220		235	
Highest annual mean					746	1951
Lowest annual mean					9.44	2004
Highest daily mean	93	Mar 30	2,680	Apr 25	18,400	Jun 22, 1948
Lowest daily mean	0.00	Jul 2	3.2	Oct 13	0.00	Sep 15, 1952
Annual seven-day minimum	0.00	Jul 2	5.9	Oct 1	0.00	Sep 15, 1952
Maximum peak flow			3,270	Apr 25	40,600a	Jun 22, 1948
Maximum peak stage			8.69	Apr 25	12.95b	Mar 8, 1993
Annual runoff (ac-ft)	20,760		159,500		170,300	
10 percent exceeds	72		546		451	
50 percent exceeds	17		90		147	
90 percent exceeds	0.00		14		23	

a From rating curve extended above 29,000 ft^3/s, stage 11.25 ft
b Backwater from ice



06847500 Sappa Creek near Stamford, Nebr.

Republican Basin
Lower Sappa Subbasin

LOCATION.--Lat 40°07′39″, long 99°36′42″ referenced to North American Datum of 1983, in SE ¼ NE ¼ sec.19, T.2 N., R.20 W., Harlan County, NE, Hydrologic Unit 10250011, on left bank 40 ft south of Burlington Northern Inc. track, 500 ft downstream from bridge on county highway, 2 mi east of Stamford, and 6.5 mi upstream from mouth.

DRAINAGE AREA.--3,840 mi^2 of which 470 mi^2 probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--October 1945 to current year. Monthly discharge only for some periods, published in WSP 1310.

REVISED RECORDS.--WSP 1919: 1960. WDR NE-71-1: Calendar year totals. WRD NE-82-1: 1979(M). WDR NE-94-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,981.31 ft above sea level. Data collection platform at station.

REMARKS.--Records fair except for estimated daily discharges, which are poor.

06847500 Sappa Creek near Stamford, Nebr.—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2006 TO SEPTEMBER 2007
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0.00	0.00	0.00	0.00	0.00	32	0.00	8.4	22	e1.6	1.9	0.00
2	0.00	0.00	0.00	0.00	0.00	14	0.00	6.2	14	e1.3	0.46	0.00
3	0.00	0.00	0.00	0.00	0.00	9.5	0.00	9.4	9.4	e1.4	10	0.00
4	0.00	0.00	0.00	0.00	0.00	4.0	0.00	8.4	11	e78	4.8	0.00
5	0.00	0.00	0.00	0.00	0.00	1.9	0.00	5.9	25	15	1.8	0.00
6	0.00	0.00	0.00	0.00	0.00	0.88	0.00	4.4	20	7.0	0.89	0.00
7	0.00	0.00	0.00	0.00	0.00	0.55	0.00	3.9	17	3.7	0.96	0.00
8	0.00	0.00	0.00	0.00	0.00	0.15	0.00	2.6	19	2.4	1.7	0.00
9	0.00	0.00	0.00	0.00	0.00	0.71	0.00	1.8	13	1.9	0.73	0.00
10	0.00	0.00	0.00	0.00	0.00	0.45	0.00	2.7	8.3	1.6	0.49	0.00
11	0.00	0.00	0.00	0.00	0.00	0.29	0.00	4.3	5.0	1.5	0.38	0.00
12	0.00	0.00	0.00	0.00	0.00	0.31	0.00	2.7	4.0	10	0.15	0.00
13	0.00	0.00	0.00	0.00	0.00	0.04	0.00	1.8	50	25	0.19	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	36	16	0.06	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.95	24	8.8	0.01	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	13	5.5	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	20	3.1	0.00	0.00
18	0.00	0.00	0.00	0.00	7.4	0.00	0.00	0.34	16	1.8	0.00	0.00
19	0.00	0.00	0.00	0.00	39	0.00	0.00	0.27	e24	14	0.00	0.00
20	0.00	0.00	0.00	0.00	92	0.00	0.00	0.12	e19	14	0.00	0.00
21	0.00	0.00	0.00	0.00	184	0.00	0.00	0.03	e12	8.9	0.00	0.00
22	0.00	0.00	0.00	0.00	192	0.00	0.00	0.00	e10	5.4	0.07	0.00
23	0.00	0.00	0.00	0.00	170	0.00	0.00	0.00	e9.0	2.4	0.41	0.00
24	0.00	0.00	0.00	0.00	154	0.00	24	0.68	e7.0	1.3	0.01	0.00
25	0.00	0.00	0.00	0.00	120	0.00	19	20	e6.0	1.1	0.00	0.00
26	0.00	0.00	0.00	0.00	e100	0.00	24	10	e4.8	0.75	0.00	0.00
27	0.00	0.00	0.00	0.00	e77	0.00	36	7.6	e3.2	0.62	0.00	0.00
28	0.00	0.00	0.00	0.00	e57	0.00	29	4.4	e2.5	0.30	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	16	3.4	e2.0	0.21	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	12	6.1	e1.8	0.11	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	19	---	0.84	0.00	---
Total	0.00	0.00	0.00	0.00	1,192.40	64.78	160.00	137.76	428.0	235.53	25.01	0.00
Mean	0.00	0.00	0.00	0.00	42.6	2.09	5.33	4.44	14.3	7.60	0.81	0.00
Max	0.00	0.00	0.00	0.00	192	32	36	20	50	78	10	0.00
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.8	0.11	0.00	0.00
Ac-ft	0.00	0.00	0.00	0.00	2,370	128	317	273	849	467	50	0.00

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1946 - 2007, BY WATER YEAR (WY)

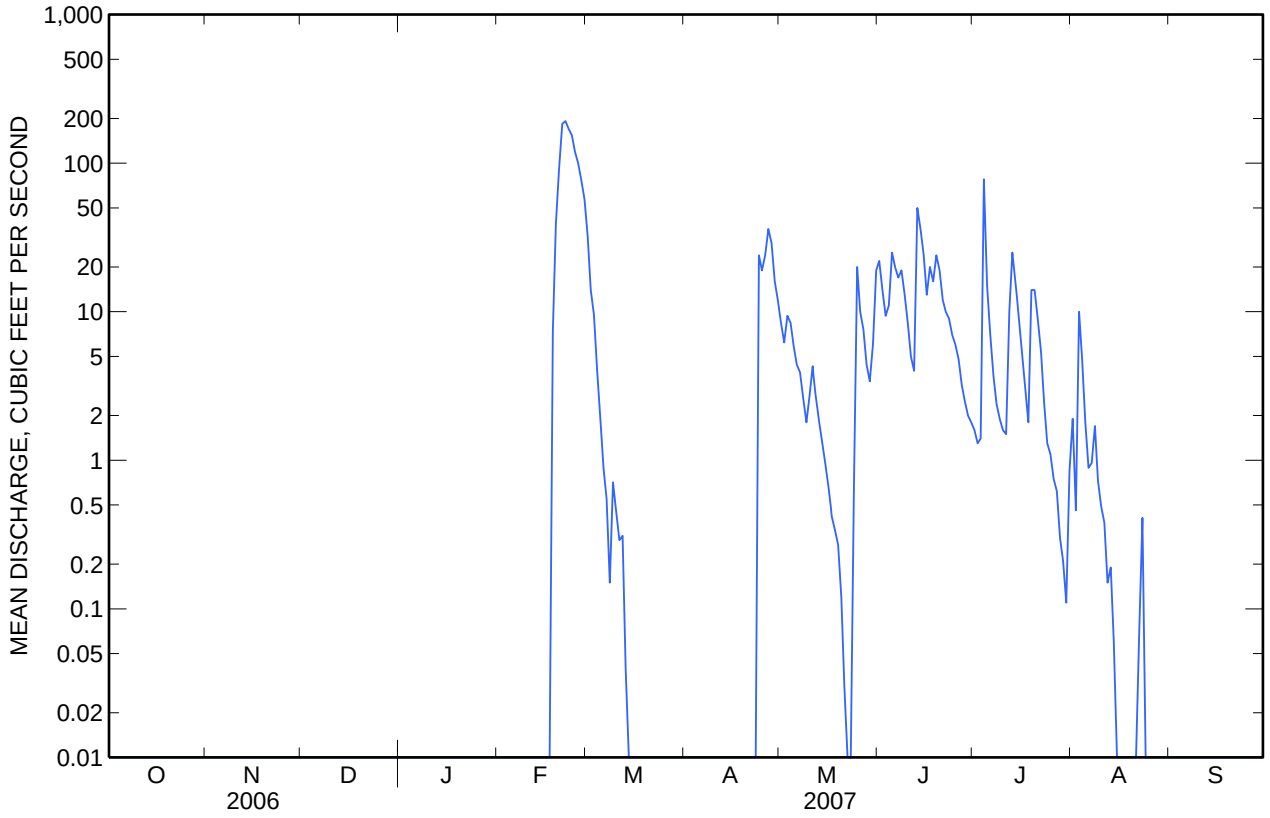
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	35.4	11.7	9.74	8.45	18.1	31.7	22.7	51.2	132	79.9	51.4	36.3
Max	965	145	96.2	71.5	182	486	164	522	878	891	544	708
(WY)	(1947)	(1947)	(1966)	(1966)	(1966)	(1960)	(1960)	(1949)	(1947)	(1951)	(1950)	(1951)
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(WY)	(1954)	(1955)	(1955)	(1955)	(1956)	(1956)	(1956)	(1956)	(1981)	(1977)	(1955)	(1959)

06847500 Sappa Creek near Stamford, Nebr.—Continued

SUMMARY STATISTICS

	Calendar Year 2006		Water Year 2007		Water Years 1946 - 2007	
Annual total	0.00		2,243.48			
Annual mean	0.00		6.15		40.8	
Highest annual mean					229	1951
Lowest annual mean					0.00	2006
Highest daily mean	0.00	Jan 1	192	Feb 22	16,600	Jun 24, 1966
Lowest daily mean	0.00	Jan 1	0.00	Oct 1	0.00	Sep 12, 1953
Annual seven-day minimum	0.00	Jan 1	0.00	Oct 1	0.00	Sep 12, 1953
Maximum peak flow			236	Feb 22	43,400a	Jun 24, 1966
Maximum peak stage			9.23	Feb 21	22.13b	Jun 24, 1966
Annual runoff (ac-ft)	0.00		4,450		29,530	
10 percent exceeds	0.00		14		73	
50 percent exceeds	0.00		0.00		4.7	
90 percent exceeds	0.00		0.00		0.00	

a From contracted-opening and flow-over-road measurement of peak flow
b From floodmark



06852500 Courtland Canal at Nebraska-Kansas Stateline

Republican Basin
Middle Republican Subbasin

LOCATION.--Lat 40°00′15″, long 98°07′55″ referenced to North American Datum of 1927, in SW ¼ SE ¼ sec.32, T.1 N., R.7 W., Nuckolls County, NE, Hydrologic Unit 10250016, on left bank 0.2 mi upstream from Nebraska-Kansas State line and 3.5 mi southwest of Superior, NE.

DRAINAGE AREA.--N.A.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--October 1954 to current year.

GAGE.--Water-stage recorder and USBR data collection platform with a concrete Parshall flume. Datum of gage is 1,612.46 ft, above sea level.

REMARKS.--Records good. Flow is completely regulated by Courtland diversion dam on the Republican River. There are numerous diversions above the station for irrigation.

06852500 Courtland Canal at Nebraska-Kansas Stateline—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2006 TO SEPTEMBER 2007
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	19	37	34	53	38	106	93	99	36	77	231	131
2	18	37	34	45	34	98	88	85	24	123	243	102
3	17	38	29	55	38	84	83	78	22	146	237	91
4	15	40	34	65	36	82	75	81	24	193	207	83
5	16	42	36	75	38	81	72	145	34	226	176	77
6	19	43	41	53	40	77	75	264	34	243	157	71
7	19	43	36	58	43	74	74	233	36	236	161	72
8	19	45	33	90	43	72	73	325	35	218	178	77
9	19	44	42	58	45	73	73	346	36	212	197	74
10	22	42	48	53	45	70	74	267	37	230	202	70
11	28	41	52	52	47	69	80	152	57	235	198	73
12	29	42	57	24	47	69	75	94	86	235	191	71
13	29	45	63	25	31	68	76	92	94	230	178	67
14	29	45	53	29	39	66	82	93	102	223	165	62
15	31	45	48	30	41	64	81	61	100	217	164	60
16	33	44	47	34	43	62	80	13	99	216	168	59
17	33	47	45	33	44	63	78	12	96	199	171	65
18	32	47	42	36	45	62	77	12	97	189	173	72
19	34	47	36	37	55	63	74	12	95	192	172	78
20	35	47	55	36	139	60	74	12	114	197	172	79
21	38	48	64	34	e280	62	74	13	150	199	174	70
22	35	48	59	35	e260	60	73	17	148	191	175	64
23	34	49	54	35	e235	60	70	56	151	185	191	60
24	35	49	49	36	e217	69	76	42	148	181	217	60
25	37	48	50	39	204	79	101	33	193	181	216	60
26	38	47	39	42	174	76	118	34	193	183	211	56
27	40	47	49	45	134	75	101	34	193	183	188	57
28	38	49	50	43	115	74	93	34	125	184	148	56
29	38	44	52	46	---	74	94	34	76	212	144	56
30	39	38	65	39	---	74	118	35	77	222	185	55
31	37	---	72	40	---	80	---	37	---	221	175	---
Total	905	1,328	1,468	1,375	2,550	2,246	2,475	2,845	2,712	6,179	5,765	2,128
Mean	29.2	44.3	47.4	44.4	91.1	72.5	82.5	91.8	90.4	199	186	70.9
Max	40	49	72	90	280	106	118	346	193	243	243	131
Min	15	37	29	24	31	60	70	12	22	77	144	55
Ac-ft	1,800	2,630	2,910	2,730	5,060	4,450	4,910	5,640	5,380	12,260	11,430	4,220

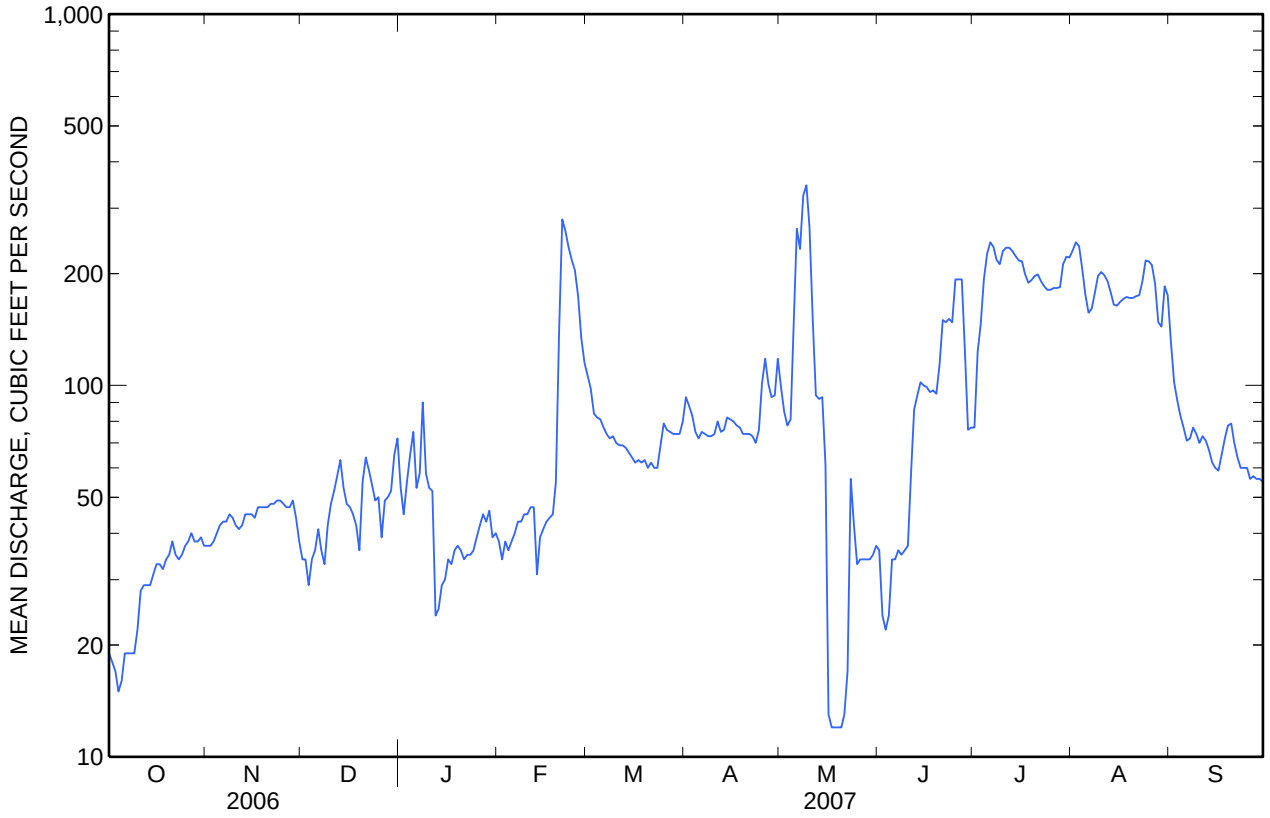
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1955 - 2007, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	30.6	14.5	8.52	9.25	9.15	13.2	20.3	53.8	111	328	260	62.9
Max	464	212	75.0	84.4	91.1	187	109	237	362	627	570	205
(WY)	(1958)	(1967)	(2001)	(1992)	(2007)	(2000)	(2000)	(1958)	(1988)	(1976)	(1976)	(1995)
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.9	12.5	0.64	0.00
(WY)	(1955)	(1955)	(1955)	(1955)	(1955)	(1955)	(1955)	(1957)	(2004)	(2005)	(2004)	(1977)

06852500 Courtland Canal at Nebraska-Kansas Stateline—Continued

SUMMARY STATISTICS

	Calendar Year 2006		Water Year 2007		Water Years 1955 - 2007	
Annual total	19,379.70		31,976			
Annual mean	53.1		87.6		77.5	
Highest annual mean					138	1976
Lowest annual mean					19.5	1955
Highest daily mean	270	Jul 12	346	May 9	731	Oct 22, 1957
Lowest daily mean	0.00	Aug 3	12	May 17	0.00	Oct 1, 1954
Annual seven-day minimum	0.00	Aug 3	13	May 16	0.00	Oct 1, 1954
Maximum peak flow			360	May 8	781	Sep 2, 1973
Maximum peak stage			3.16	May 8	5.05	Sep 2, 1973
Annual runoff (ac-ft)	38,440		63,420		56,180	
10 percent exceeds	81		197		269	
50 percent exceeds	47		63		0.00	
90 percent exceeds	14		33		0.00	



06853020 Republican River at Guide Rock, Nebr.

Republican Basin
Middle Republican Subbasin

LOCATION.--Lat 40°03′51″, long 98°19′51″ referenced to North American Datum of 1983, in NE ¼ SE ¼ sec.9, T.1 N., R.9 W., Webster County, NE, Hydrologic Unit 10250016, on left downstream bank at Nebraska State Highway 78 bridge, 0.2 mi downstream from Minnie Creek and 0.5 mi south of Guide Rock. Station is 3.1 river miles downstream from station 06853000, Republican River near Guide Rock, previous site, and at river mile 176.

DRAINAGE AREA.--22,100 mi^2 of which 7,490 mi^2 probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--August 1950 to current year. August 1950 to September 1984 published as Republican River near Guide Rock (06853000).

REVISED RECORDS.--WDR NE-97-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,616.15 ft, NGVD, levels by U.S. Corps of Engineers. Prior to Oct. 1, 1959, at datum 12.98 ft higher, and Oct. 1, 1959 to Nov. 28, 1984, at datum 7.98 ft higher, both at site 3.1 mi upstream. Data collection platform with satellite telemetry at station.

COOPERATION.--Records provided by Nebraska Department of Natural Resources and reviewed by the U.S. Geological Survey.

REMARKS.--Records good except for estimated daily discharges, which are poor. Natural flow affected by irrigation development above station, by regulation of upstream reservoirs, and since Nov. 14, 1952, by storage in Harlan County Lake (station 06849000).

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum flood since at least 1826 occurred June 1 or 2, 1935, discharge, about 250,000 ft^3/s, from slope-area measurements near Bloomington and Hardy.

06853020 Republican River at Guide Rock, Nebr.—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2006 TO SEPTEMBER 2007
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0.23	1.2	1.3	e2.9	e1.9	4.7	5.5	3.5	366	109	443	8.9
2	0.20	1.2	1.5	e2.8	e1.8	4.2	4.7	3.9	291	58	120	6.6
3	0.22	1.2	1.4	e2.7	e1.5	3.7	4.4	5.2	201	25	38	5.4
4	0.22	1.3	1.7	e2.7	e1.7	3.4	4.3	6.9	153	28	6.1	4.7
5	0.22	1.3	1.8	2.6	e1.9	3.4	4.4	1,610	116	10	3.3	3.5
6	0.24	1.3	1.9	2.4	e2.4	3.4	4.4	3,980	105	20	2.7	2.3
7	0.26	1.3	1.5	2.4	e2.3	2.9	4.2	723	89	7.0	1.9	2.4
8	0.27	1.3	1.6	2.4	e2.2	2.8	4.0	271	70	6.3	1.7	2.2
9	0.26	1.3	1.9	2.2	e2.1	2.5	4.0	64	62	5.7	1.5	2.0
10	0.43	1.2	1.9	2.3	e2.1	2.4	4.2	67	77	7.1	1.4	2.1
11	0.55	1.2	1.9	e2.1	e2.3	2.4	4.3	124	32	24	1.3	2.0
12	0.41	1.4	1.7	e1.4	e2.2	2.4	3.7	127	2.2	27	1.3	1.8
13	0.39	1.3	1.7	e1.4	e2.2	2.3	4.3	96	108	19	1.5	1.8
14	0.43	1.4	1.7	e1.3	e1.6	2.0	4.1	75	640	16	1.3	1.8
15	0.47	1.4	1.9	e1.3	e1.5	2.0	3.9	168	882	13	1.4	1.9
16	0.52	1.4	1.9	e1.1	e1.6	2.1	3.6	214	443	14	1.3	2.1
17	0.55	1.3	1.8	e1.1	e2.0	2.2	3.5	213	233	9.8	1.8	2.0
18	0.55	1.3	1.7	e1.2	e3.8	2.1	3.4	170	159	8.1	2.1	2.6
19	0.55	1.3	e1.6	e1.6	e24	2.0	3.3	141	126	7.0	1.8	1.9
20	0.58	1.3	e1.8	e1.5	e30	2.0	3.2	127	131	5.8	2.1	1.9
21	0.70	1.4	e1.8	e1.4	e32	2.3	3.1	115	99	5.1	2.2	1.9
22	0.58	1.3	e1.9	e1.2	e30	2.1	3.0	75	43	3.4	2.8	2.0
23	0.62	1.4	e2.0	e1.3	e31	2.1	2.8	76	44	2.1	27	1.9
24	0.73	1.4	2.2	e1.4	e27	3.7	4.4	145	141	1.4	145	2.1
25	0.81	1.4	2.2	e1.5	18	3.2	10	123	84	1.0	86	2.2
26	1.1	1.5	2.1	e1.7	11	2.7	8.8	144	55	0.58	14	2.1
27	1.3	1.5	2.2	e1.7	7.0	4.3	5.0	163	63	0.30	2.7	2.3
28	1.2	1.6	2.1	e1.9	5.4	3.5	4.2	106	114	0.69	3.1	2.2
29	1.2	1.5	e2.6	e2.0	---	3.8	3.8	82	165	456	882	2.3
30	1.2	1.3	e4.1	e1.8	---	3.9	3.6	120	146	436	111	2.3
31	1.2	---	e4.2	e1.9	---	5.5	---	199	---	351	15	---
Total	18.19	40.2	61.6	57.2	252.5	92.0	130.1	9,537.5	5,240.2	1,677.37	1,926.3	81.2
Mean	0.59	1.34	1.99	1.85	9.02	2.97	4.34	308	175	54.1	62.1	2.71
Max	1.3	1.6	4.2	2.9	32	5.5	10	3,980	882	456	882	8.9
Min	0.20	1.2	1.3	1.1	1.5	2.0	2.8	3.5	2.2	0.30	1.3	1.8
Ac-ft	36	80	122	113	501	182	258	18,920	10,390	3,330	3,820	161

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1950 - 2007, BY WATER YEAR (WY)

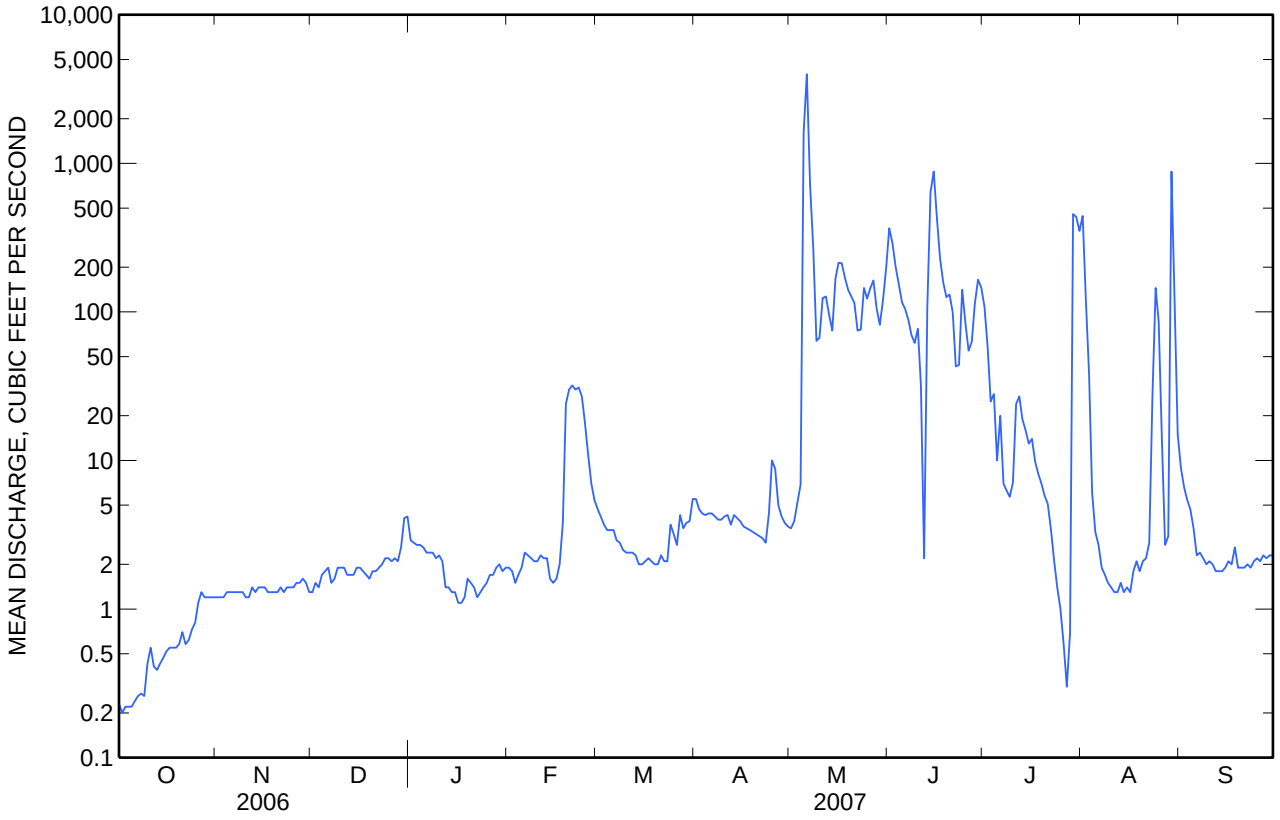
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	183	166	144	138	226	288	328	378	429	462	217	249
Max	2,073	1,245	819	588	948	1,077	2,484	2,511	3,619	4,298	1,712	3,602
(WY)	(1966)	(1994)	(1994)	(1952)	(1952)	(1952)	(1960)	(1960)	(1951)	(1951)	(1962)	(1951)
Min	0.26	0.89	1.68	1.67	2.14	2.89	2.19	2.95	1.39	1.66	0.47	0.19
(WY)	(2006)	(2006)	(2005)	(2006)	(2006)	(2006)	(2006)	(2005)	(2006)	(2005)	(2004)	(2005)

06853020 Republican River at Guide Rock, Nebr.—Continued

SUMMARY STATISTICS

	Calendar Year 2006		Water Year 2007		Water Years 1950 - 2007	
Annual total	1,364.70		19,114.36			
Annual mean	3.74		52.4		267	
Highest annual mean					1,495	1951
Lowest annual mean					2.53	2005
Highest daily mean	314	Aug 19	3,980	May 6	20,900	Jun 16, 1957
Lowest daily mean	0.03	Jul 30	0.20	Oct 2	0.03	Jul 30, 2006
Annual seven-day minimum	0.05	Jul 25	0.23	Oct 1	0.05	Jul 25, 2006
Maximum peak flow			4,940	May 6	29,200a	Jun 16, 1957
Maximum peak stage			12.44	May 6	20.73a	Jun 16, 1957
Annual runoff (ac-ft)	2,710		37,910		193,100	
10 percent exceeds	4.0		123		639	
50 percent exceeds	1.5		2.3		109	
90 percent exceeds	0.28		1.2		4.2	

a Site and datum then in use



ATTACHMENT O

RESOLUTION OF THE
REPUBLICAN RIVER COMPACT ADMINISTRATION

HONORING ANN SALOMON BLEED

RESOLUTION OF THE REPUBLICAN RIVER COMPACT ADMINISTRATION HONORING

Ann Salomon Bleed

WHEREAS, Ann Salomon Bleed, Lincoln, Nebraska, has resigned her position as Director, Nebraska Department of Natural Resources and thus Nebraska Commissioner of the Republican River Compact Administration (RRCA) after having served faithfully in that position and others for over twenty years; and

WHEREAS, as the Nebraska Commissioner to the RRCA, and the Director of the Nebraska Department of Natural Resources, Ann has diligently represented the Compact interests of the State of Nebraska and residents of the Republican River valley in Nebraska; and

WHEREAS, while diligently representing the State of Nebraska and its constituents, Ann exhibited professionalism, integrity, and provided leadership and guidance towards addressing the complexities of water administration and compact compliance issues, continually reaching out to the States of Colorado and Kansas to compile the most accurate accounting possible of the waters of the Republican River, and to reach fair and reasonable solutions to the many issues associated with the Republican River Compact; and

WHEREAS, Ann's expertise of water matters, conscientiousness, diligence, positive attitude, and cooperative temperament have been an asset to the RRCA and the State of Nebraska;

NOW THEREFORE, be it hereby resolved that the Republican River Compact Administration does hereby express its sincerest gratitude and appreciation to Ann Salomon Bleed for her dedicated service to the RRCA in her position of Nebraska Commissioner and others, and extends its best wishes to Ms. Bleed in all her future endeavors;

Be it further resolved that the RRCA honors Ms. Bleed's service by including this resolution and appropriate dedicatory remarks in the RRCA annual report for Compact year 2007 and hereby instructs the Nebraska Commissioner to send copies of this resolution to the Bleed family and the Governor of the State of Nebraska.

Entered, this 13th day of August, 2008, at the annual meeting of the RRCA held in Lincoln, Nebraska.

Brian P. Dunnigan, Acting Director
Nebraska Commissioner (Chairman)

Dick Wolfe, State Engineer,
Colorado Commissioner

David W. Barfield, Chief Engineer,
Kansas Commissioner