Kansas' Review of Nebraska's Request for Change in Accounting Procedure
September 18, 2007

This memo is intended to summarize Kansas' understanding of the Nebraska's proposal for changing the agreed upon method of computing pumping impacts using results from the Republican River Compact Administration Groundwater Model (Model) and to summarize our initial response to the proposal.

Nebraska believes that the calculation of pumping impacts using results from the groundwater model improperly includes the consumption of imported water. Nebraska argues that because some of the water pumped by wells is or could be water that originated from imported water, the consumption of that water should not be counted in determining the virgin water supply in the accounting process. This argument is difficult to understand since no one has ever determined the specific origin of groundwater that is pumped and consumed. In other words, whether the origin of the pumped water is from natural recharge within the Republican River basin, natural recharge outside the Republican River basin, stored groundwater, or imported water has never been determined and probably cannot be determined with any degree of reliability.

In terms of the use of the Model to determine compliance with the Compact, however, the specific origin of the water that is pumped and consumed is not the determining factor. The only question with respect to the Model's result s that affect compact compliance is the extent to which activities in a state, either pumping or importation of water, affect base flow in the Republican River. To the extent these activities affect base flows in the river, they must be counted. In other words, it is not the source of water that counts, but the depletion or accretion to base flow that is associated with the activity that determines the amount of impact that must be considered in the compact accounting process. This concept is precisely what is included in the Accounting Procedures adopted by the Settlement and what the special master based his rulings on in determining that those effects to stream flows in the Republican River are regulated by the compact. As it is stated in the Final Report of the Special Master's With Certification of Adoption of Republican River Compact Administration Groundwater Model, September 2003: "*... the RRCA Groundwater Model which would, for use in the accounting formulas for administering the Republican River Compact, determine both stream flow depletions caused by groundwater pumping and streamflow accretions resulting from recharge by imported water*" (Page 1). It is clear that only quantification that is relevant to the compact accounting is the depletion or accretion to Republican River stream flow.

The quantification of depletion or accretion to Republican River base flow is not limited to activities that are solely within the boundaries of the Republican River Basin. Recharge from imported water can cause accretion to Republican River base flow even if the recharge occurs outside the boundary of the basin. To the extent that such recharge provides accretions to Republican River base flow, it is counted in the accounting process. Similarly, pumping from locations outside the basin can cause depletions to Republican River base flow. To the extent that such pumping causes depletions to base flow, it is counted in the accounting process. Thus both positive effects (accretions) and negative effects (depletions) on Republican River base flows caused by activities outside the physical boundaries of the basin are treated equally.

Exhibit
Neb 36
Patterson Reporting & Video

In order to provide this quantification using the groundwater model, it was agreed in the settlement that the impact of each state's pumping or water importation would be determined by comparing the model-computed historical base flow condition to the model-computed base flow condition without that activity. The states recognized that the sum of the impacts of these individual activities would not necessarily exactly equal the model-computed impact of all of the activities considered simultaneously. If the groundwater model were mathematically linear, it would, in fact, be the case that the sum of the individual affects would equal the affect determined by considering all of the activities simultaneously. However, because the groundwater model is mildly non-linear, this mathematical equality does not occur.

It should be noted that if the impact of all activities considered simultaneously were used, it would be necessary to have a method for apportioning the impact among the various activities. Such a process was considered unnecessary and it was agreed that the impacts from each state's activity would be computed separately in spite of the fact that the sum of those impacts may not exactly equal the impact of all activities considered simultaneously.

Nebraska has proposed an alternative method of computing the impacts associated with each state's activity. This alternative has been proposed to correct what they see as an inappropriate accounting of consumed water. While the connection between Nebraska's proposed alternative accounting method and their concept of what water is actually consumed is far from apparent, we have evaluated the merits of this alternative method regardless of its basis.

The ultimate goal of the RRCA Groundwater Model is to provide a measure of what base flows would have been if the States had not pumped groundwater or recharged imported water. That overall measure could be determined by comparing the model-computed historical stream flows to the model-computed stream flows with all pumping and recharge of imported water removed from the analysis (herein referred to as the "virgin water supply metric"). This measure gives us the total impact on stream flows caused by the States' pumping and the recharge of imported water. As described above, however, this result does not apportion the impact among the States. Conceptually, the condition with no pumping and no imported water represents what the stream flows would have been if none of this activity had occurred. In that sense, it represents a "virgin water supply" condition with respect to the modeled elements of the groundwater model and their impact on Republican River stream flows.

This measure does provide a metric for comparing the accounting method agreed to in the settlement with Nebraska's alternative accounting proposal. It is a relatively straightforward process to add up the impacts using the accounting method agreed to in the settlement or to add up the impacts from Nebraska's alternative accounting proposal and compare those totals to the virgin water supply metric described above. If the Nebraska alternative accounting proposal provides a better approximation of this metric, it is worthy of further consideration.

Our calculations, as summarized in the table below, show that the accounting agreed to in the settlement provides a better approximation of the virgin water supply metric than the Nebraska proposed accounting method. The table shows that the accounting agreed to in the settlement results in both positive and negative annual differences from the virgin water supply metric. The resultant average for the years 1990 – 2000, the last ten years of the calibration of the model is -

150 acre-feet. For the last six years, 2001-2006, the average difference is 2,053 acre-feet. The Nebraska alternative accounting proposal departs significantly further from the virgin water supply metric than the accounting method agreed to in the settlement, has a negative bias, and for the period studied is increasing.

It remains our view, based on our understanding of the agreement of the States at the time of the settlement and these results, that the current accounting methods are appropriate.

Table: Comparison of total impacts under adopted procedures and as proposed by Nebraska versus the virgin water supply metric.

Year	Virgin Water Supply Metric	Compact Method Total	Nebraska Proposed Alternative	Difference [Compact Method – Metric]	Difference [Nebraska Proposal – Metric]
1990	180542	176749	170646	-3793	-9896
1991	200582	200424	191432	-158	-9150
1992	206037	204478	195938	-1559	-10099
1993	213153	210926	212593	-2227	-560
1994	188954	194203	186345	5249	-2609
1995	219075	220673	213807	1598	-5268
1996	229586	228517	228167	-1069	-1419
1997	208878	212730	202992	3852	-5886
1998	210089	208778	200587	-1311	-9502
1999	230055	231109	222053	1054	-8002
2000	203222	199934	192856	-3288	-10366
2001	236771	230905	221333	-5866	-15438
2002	196546	195685	183123	-861	-13423
2003	221307	228528	210485	7221	-10822
2004	231704	237594	219651	5890	-12053
2005	237802	240969	224287	3167	-13515
2006	219356	222122	204589	2766	-14767
Averages:					
1990-2000	208198	208047	201583	-150	-6614
1990-2006	213745	214372	204758	627	-8987
2001-2006	223914	225967	210578	2053	-13336

Beaver Accounting Point – period of record is 1918 to 2006

Run	Minimum Annual Baseflow Computed at the Accounting Point Over Period of Record (ac-ft)	Maximum Annual Baseflow Computed at the Accounting Point Over Period of Record (ac-ft)
CKMN	0	10,960
CKM	727	11,637
CKN	0	10,958
CMN	272	12,380
KMN	0	10,960
Theta (All Off)	884	16,707

Frenchmen at Enders Accounting Point – period of record is 1918 to 2006

Run	Minimum Annual Baseflow Computed at the Accounting Point Over Period of Record (ac-ft)	Maximum Annual Baseflow Computed at the Accounting Point Over Period of Record (ac-ft)
CKMN	4,287	52,299
CKM	44,798	55,589
CKN	4,287	52,299
CMN	4,287	52,299
KMN	4,321	52,308
Theta (All Off)	44,798	58,352

Main Stem Republican at Accounting Point above Harlan Reservoir – period of record is 1918 to 2006

Run	Minimum Annual Baseflow Computed at the Accounting Point Over Period of Record (ac-ft)	Maximum Annual Baseflow Computed at the Accounting Point Over Period of Record (ac-ft)
CKMN	144	270,893
CKM	23,919	278,786
CKN	0	270,616
CMN	197	272,510
KMN	143	271,348
Theta (All Off)	23,808	280,587