Non-Binding Arbitration initiated March 21, 2013

pursuant to

Decree of May 19, 2003, 538 U.S. 720
Kansas v. Nebraska & Colorado,
No. 126 Orig., U.S. Supreme Court

Report on the

Colorado's Compact Compliance Pipeline Proposal and Bonny Reservoir Accounting Proposal

Republican River Compact

Response to application and proposal by State of Colorado, dated April 5, 2013

Prepared by

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July 29, 2013

I. Qualifications.

From late 1992 until becoming Chief Engineer in 2007, a principal part of my professional work was dedicated to the study and assessment of the hydrology and water infrastructure of the Republican River Basin ("Basin") and administration of the Republican River Compact ("Compact"). This work engaged the many technical challenges of administering the Compact before, during, and after the litigation that produced the Final Settlement Stipulation of 2003 ("FSS"). As part of these duties, I was involved in all of the technical discussions related to the negotiation of the FSS, its Accounting Procedures, the RRCA Groundwater Model ("Model"), and all joint sessions of the various negotiation teams. After the adoption of the FSS, my work focused on implementing that agreement.

Since 2007, I have served as the Chief Engineer of the Division of Water Resources, Kansas Department of Agriculture. In that capacity, I have two principal duties. My first duty is that of a professional engineer specializing in water resources. This duty includes the analysis of water supplies, water resources management, surface water and groundwater hydrology, groundwater modeling, and the assessment of water structures. My second duty is that of the Chief Engineer. As Chief Engineer, I have the duty to administer and enforce the laws relating to water supply for the State of Kansas. These consist principally of the Kansas Water Appropriation Act, the four interstate compacts to which Kansas is a party, and numerous other laws and implementing regulations related to special water districts in Kansas, dams and dams safety, floodplain activities, and more. It is my duty to ensure that my administration of these laws and regulations accords with the realities of the State of Kansas – most importantly, the realities of its water supplies and of its water needs. As the Kansas commissioner to the Republican River Compact Administration ("RRCA"), I am responsible for all Compact-related matters. As a technical expert for Kansas leading up to and during the 1998-2003 litigation and settlement, and now as Chief Engineer, I have served in the administration of the Compact for nearly twenty years.

II. Introduction.

This report summarizes my technical and administrative review of the Colorado's Compact Compliance Pipeline Proposal ("CCP Proposal") and Colorado's Bonny Reservoir Accounting Proposal ("Bonny Proposal") as was submitted to the RRCA in April 2013, and are now the subject of this arbitration. This report rests upon my three areas of expertise. First, it rests upon my role as Compact Commissioner for Kansas. Second, it rests upon my expertise in administering the Compact, the FSS, and its Accounting Procedures. I necessarily follow the rules, tests, and procedures set forth by these documents, and apply facts to them, using my own expertise. Finally, it rests upon my expertise in evaluating the hydrology and water resources of the Basin.

This report includes, for reference, my previous expert report on Colorado's previous CCP Proposal. Sections II through V of my previous report remain as important background for both the CCP issue and the Bonny issue, but will not be repeated here due to the Arbitrator's familiarity with this content from the 2010 arbitration.

Section III of this report includes an update to the procedural history on the CCP Proposal, with a focus on the current revised proposal. This section discusses the narrowing of the issues from the first arbitration by Colorado's revised proposal and through subsequent discussions between Colorado and Kansas since its submittal. Sections IV-VI discuss the remaining CCP issues, focusing on the remaining inadequacies of Colorado's proposal. Section VII provides background on Colorado's Bonny Proposal. Section VIII discusses the inadequacies of Colorado's Bonny proposal, focusing on its management implications.

My opinions are as follows:

1. The FSS requires RRCA approval of augmentation plans so that the States may fully review them to ensure that such plans are fully and appropriately integrated into the Accounting Procedures and the Model, and that such plans have sufficient terms and conditions to protect the interests of all the States consistent with the Compact and FSS. See section V of my previous report.

2. As set forth more fully in Section IV below, the CCP Proposal requires the following elements, which it presently lacks.

    a. The CCP Proposal requires determination of the augmentation credit through the appropriate use of the Model to account for losses. Colorado's current proposal is an inappropriate use of the Model for this purpose.

    b. The CCP Proposal continues to lack adequate operational limits which do not protect Kansas entitlements on the South Fork Republican River.

    c. The CCP Proposal continues to include a CCP delivery method that relies on a disputed interpretation of Colorado's water-short year requirements, and the calculation method must be resolved.

3. Colorado's Bonny Reservoir Accounting Proposal is inappropriate for the following reasons:

    a. It fails to accurately represent the effects of Colorado's pumping on the basin's water supply.

b. It fails to sufficiently address evaporation from Bonny Reservoir's area in its new operational mode.

c. Separate from the reduction in CBCUs caused by reductions to evaporation, the substantial reduction in Colorado's CBCUg affected by a simple change to the Groundwater Model is an inequitable departure from the agreement that was negotiated at the time the FSS was developed and adopted by the States and Court.

4. A revised Bonny Reservoir Accounting Proposal should be developed which:

a. Avoids a substantial increase in residuals (unallocated depletions) resulting from modeling of Bonny Reservoir; and

b. Includes methods to accurately assess the surface water losses from the Bonny Reservoir area.

III. Background on Colorado's revised CCP Proposal, its consideration by the RRCA, and subsequent discussions with Colorado.

In 2009, Colorado brought its CCP Proposal to the RRCA for approval. Kansas was not able to approval the Proposal and the issue was arbitrated. In my report for that arbitration, I listed seven issues of concern leading to Kansas rejection of the proposal as follows:

1. The Colorado Proposal does not follow the Model and the Accounting Procedures of the FSS.
2. North Fork accounting credits must be limited to protect Kansas' subbasin allocations on the South Fork.
3. The operational limitations of Colorado's Proposal are ineffective.
4. The Colorado Proposal lacks any temporal limits.
5. Colorado's proposed changes to the Accounting Procedures require full review by the States.
6. Colorado's "catch-up" provisions are inadequate.
7. Colorado must explain the reasons for its increase in augmentation water to 25,000 acre-feet per year.

The Arbitrator ruled that Kansas had legitimate concerns that were not adequately addressed in Colorado's proposal and that Kansas was justified in withholding its approval of the CCP.

Following this, Kansas and Colorado resumed settlement discussions. In late 2011, Colorado ordered the draining of Bonny Reservoir to address Colorado's South Fork Republican River overuse. This introduced a significant new issue; the appropriate way to deal with the accounting and modeling of Bonny Reservoir in light of its revised condition and anticipated operations.

Colorado presented a revised CCP Proposal to the RRCA on April 5, 2013. In submitting the matter to the RRCA, Colorado included a schedule that required RRCA action within 30 days and designated the issue as a "fast-track" issue, if the states did not adopt their proposal.

At the May 2, 2013 RRCA special meeting, Kansas voted not to adopt Colorado's proposal. At the meeting, I encouraged the State of Colorado to continue its dialogue with the State of Kansas to resolve our concerns, many of which appear to be close to resolution but are not yet fully resolved, in their revised proposal. Kansas devoted significant resources in working to resolve the issues between the States.

As of July 12, 2013, Colorado and Kansas reached an oral, conceptual agreement on the following issues:

Issue 4. Specific elements for regular, periodic review of the project.

Issue 5. Colorado would submit and Kansas would support additional clarifications to the accounting procedures that would include clear reporting requirements and attach the terms and conditions related to the project to the RRCA's accounting procedures

Issue 6. Kansas concerns related to "catch-up" provisions will be sufficiently addressed in Colorado's projection methodology for determining operations and Colorado's stated intent not to replace overuse prior to this existing account period.

Issue 7. The terms of the revised CCP are sufficient to address Colorado's desire to add up to 1500 acre-feet of additional capacity to the project in the future.

While our mutual agreement on these matters has not been finalized in written form, we are sufficiently confident in our agreement that Kansas has not addressed the foregoing Issues 4, 5, 6, and 7 in its reports and does not believe these issues need to be subjects of the arbitration trial. In the unlikely event that the states have misunderstood our mutual agreement, Kansas reserves its right to file supplemental report to address any unresolved issues.

In addition to issues 1-3 listed above which have not been resolved, Kansas has raised as a related issue to this proceeding the meaning of Colorado's Water-Short Year Administration compliance test.

IV. CCP Modeling and its accounting impacts

Kansas continues to hold that both augmentation pumping and augmentation flows must be properly treated in the Compact's accounting procedures. The States agree on the representation of pumping from augmentation wells in the model.

The States do not agree on the proper way to treat augmentation water that is placed into the river system. In demanding 100% credit for CCP deliveries, Colorado effectively refuses to account for and be held responsible for any losses that will befall the augmentation water. To fail to account for the losses that occur in the physical world would be to not only inflate the credit available to the augmenting state but would also result in errors in the RRCA's accounting.

In the previous arbitration, Kansas noted Colorado's failure to propose a method for determining augmentation credit that included using the Model to evaluate the impacts of Colorado's augmentation outflows. Kansas continues to hold that the Model must be used in this way to be consistent with the FSS and with the practical requirement to consider downstream losses.

In its commentary on its revised proposal, Colorado states the following:

> "*Based on further discussion with Kansas, Colorado proposes that Colorado be given 100% credit for CCP deliveries as an offset to stream depletions to the North Fork of the Republican River, provided the deliveries are in compliance with the other terms and conditions of the resolution, and that the CCP deliveries be included in all runs of the RRCA Groundwater Model (including the "Colorado Pumping" and the "No Colorado Pumping" runs used to determine stream depletions), as shown in the proposed revisions to the RRCA Accounting Procedures."*

For reasons cited in Mr. Larson's report, Kansas does not believe Colorado's proposal for use of the Model is appropriate as it does not use the model to determine the "augmentation credit" as required by the FSS. Instead it increases each state's groundwater CBCU in the Swanson reach based on the additional flows. This also increases CBCU to Nebraska and Kansas.

The Colorado method of including augmentation outflows in the "No Colorado Pumping" run of the Model creates an artificial condition, one that has never occurred, and one that appears to contradict itself, since the outflows cannot occur without the pumping that produces them.

The Colorado method underestimates the downstream losses of augmentation flows. Augmentation water that is pumped from groundwater and offsets groundwater depletions is a direct substitute for baseflow, and so whatever the fate of such baseflow, the same fate should attach to the augmentation water.

Colorado's explanation of its modeling proposal indicates it is responsive to Kansas' suggestions in our settlement discussion. Kansas did not advocate or suggest the modeling approach proposed by Colorado.

The use of the model to determine the augmentation credit as explained in Mr. Larson's expert report instead adjusts the augmentation credit to reflect the losses estimated by the Model. That is a more appropriate treatment of the basin's water supplies and allocations. As is shown in

Mr. Larson's expert report, the calculation of Colorado's augmentation credit estimated using Kansas' modeling method and Colorado's projected hydrologic future would result in a credit of approximately 88.5% on average of Colorado's deliveries, rather than the 100% credit that Colorado proposes.

V. Operational Limits and Protecting Kansas South Fork allocation

Kansas continues to hold that defined, transparent, and enforceable operational limits are necessary to ensure that Colorado's augmentation operations are reasonably tied to its compliance requirements and that North Fork augmentation does not replace Colorado's overuse of the South Fork. As is discussed in Mr. Book's report, Colorado's revised proposal continues to have insufficient operational limits.

VI. Colorado's Water-short year test

Under the FSS (Section V.B and its related accounting procedures), during periods when the basin is in a water-short condition, each state must keep its use to a more restrictive limit than that set by the normal 5-year average compliance test. Each state's test is specific to that state, and was crafted as a product of the FSS negotiations. These state-specific tests were intended to provide each State as much flexibility as possible in the use of its allocation, while remaining consistent with the needs and rights of the other States. Both Kansas and Nebraska have two-year compliance tests in water-short years. Nebraska must keep its use above Guide Rock within its allocation above Guide Rock over the two years; importantly, the accounting treats the year that is determined to be water-short as the second year, or Year 2, of the two-year average. Kansas must restrict its northwest Kansas use for the same two years. Colorado negotiated a five-year average test under water-short years rather than a two-year test. However, Colorado cannot include its share of the Beaver Creek allocation in this five-year test. See Attachment 1.

Kansas believes that the FSS and the accounting procedures require Colorado to exclude its share of the Beaver Creek allocation from all five years of this water-short year test. On the contrary, Colorado believes that only the water-short years are adjusted in the water-short test.

This issue has important ramifications for the CCP Proposal, because how it is resolved will significantly affect the amounts of projected deliveries estimated under that proposal. The difference between the States' positions is most pronounced in the first year of a water-short period. In Kansas' approach, all five years of Beaver Creek allocation would not be used in the accounting; in Colorado's approach, only that first year would not be used. See Attachment 2.

VII. Background on Colorado's Bonny Proposal

To address its overuse of the South Fork Republican River, Colorado drained Bonny Reservoir in late 2011. Colorado seeks to leverage the draining of Bonny Reservoir to reduce its CBCU on the South Fork in two ways. First, Colorado will be charged less evaporation from the drained reservoir. Second, Colorado proposes a change to the Model which will effectively

move the point in the river system at which Colorado's groundwater pumping impacts are evaluated from Bonny Reservoir to 40 miles downstream at Benkelman, Nebraska. Though there are no anticipated reductions to Colorado's groundwater pumping in the South Fork basin, this proposed Model change would have the effect of significantly reducing Colorado's groundwater CBCU. Attachment 3 displays the estimates of the groundwater pumping by the states of Colorado and Kansas from the work of the RRCA Groundwater Modeling Committee through the year 2000 and as reported to the RRCA by the states since the year 2000. Attachment 4 displays the determinations of the groundwater computed beneficial consumptive use (CBCU) from the RRCA Groundwater Model from the work of the RRCA Groundwater Modeling Committee through the year 2000 and based on data submitted to the RRCA since the year 2000.

As a result of the very significant impacts to the RRCA accounting in Colorado's modeling proposal, Kansas was not able to approve the proposed modeling change. Once again, Kansas invited additional negotiations with the State of Colorado to seek resolution of the issue. We have been unable to reach agreement on this issue.

This issue has not been arbitrated before.

VIII. Water Management Implications of Colorado's Bonny Proposal and the need for revisions to the Colorado Proposal

Mr. Larson's expert report discusses Colorado's proposal for modeling Bonny Reservoir and summarizes its dramatic reduction to Colorado's groundwater CBCU and increase in residuals (unallocated impacts). Thus, Colorado's Proposal appears to be an inaccurate representation of the impacts of Colorado's groundwater pumping.

In addition, Colorado's Proposal, if adopted, would affect the future management of this part of the Basin. Specifically:

- By producing a "paper water" reduction of Colorado's pumping impacts on the South Fork, the proposal allow Colorado to avoid making necessary reductions in South Fork consumption.
- By reducing Kansas' South Fork allocation, the proposals make Kansas' future compliance on the South Fork test more difficult.
- By reducing Kansas' allocation on the South Fork, the proposals also make Kansas' compliance on the Northwest Kansas test more difficult during water-short years. Kansas has relied upon its unused South Fork allocation to help meet its Water-Short Year Administration compliance test.

Mr. Book's report provides the specifics on these accounting impacts.

Regarding the accounting for Bonny Reservoir under Colorado's current operations, Kansas believes the following:

Bonny Modeling – Kansas believes that it is necessary to deal with these residuals when considering a change to Bonny Modeling.

Surface water evaporation – Colorado's Proposal would assess reservoir evaporation from Bonny Reservoir in the same way as other federal reservoirs. Kansas believes this assumption will need to be closely examined. The reservoir area is undergoing significant changes, with the growth of substantial growth of certain phreatophytes, which are likely resulting in significant water use. This evolution will likely to continue over time. Kansas suggests the states assess the use of alternative methods to represent the evaporative losses from areas that are not water surface but are beyond the normal band of riparian vegetation of a stream corridor. This evaporation should be charged to Colorado.

List of attachments:

1. Attachment 1, "RRCA Accounting Procedures, Table 5a."
2. Attachment 2, Colorado Beaver Creek Accounting Values
3. Attachment 3, *Annual Groundwater Pumping by Colorado and Kansas in South Fork Basin 1940-2012*
4. Attachment 4, South Fork Groundwater CBCU by Colorado and Kansas 1940-2011

References:

- Colorado's Compact Compliance Pipeline Proposal, April 5, 2013
- Bonny Reservoir Accounting Proposal, April 5, 2013
- Dale E. Book, Report on Colorado Compliance Pipeline, July 29, 2013
- Steven P. Larson and Samuel P. Perkins PhD., Report on the Colorado Compact Compliance Pipeline Proposal, July 29, 2013
- Steven P. Larson and Samuel P. Perkins PhD., Report on the Colorado Bonny Reservoir Accounting Proposal, July 29, 2013
- David W. Barfield, Report on the Colorado Compliance Pipeline, June 22, 2010
- Dale E. Book, Report on the Colorado Compliance Pipeline, June 22, 2010
- Steven P. Larson, Kansas Expert Response to Colorado's Expert Report, June 22, 2010.
- Republican River Compact
- Final Settlement Stipulation
- RRCA accounting procedures, August 12, 2010
- *Kansas v. Nebraska & Colorado,* No. 126 Orig., FIRST REPORT OF THE SPECIAL MASTER (SUBJECT: NEBRASKA MOTION TO DISMISS); 530 U.S. 1272 (2000)
- *Kansas v. Nebraska & Colorado,* No. 126 Orig., SECOND REPORT OF THE SPECIAL MASTER, April 15, 2003
- *Kansas v. Nebraska & Colorado,* No. 126 Orig., FINAL REPORT OF THE SPECIAL MASTER WITH CERTIFICATE OF ADOPTION OF RRCA GROUNDWATER MODEL, September 17, 2003.
- Steve's expert report in KS v CO on the inadequacies of the 5-Run

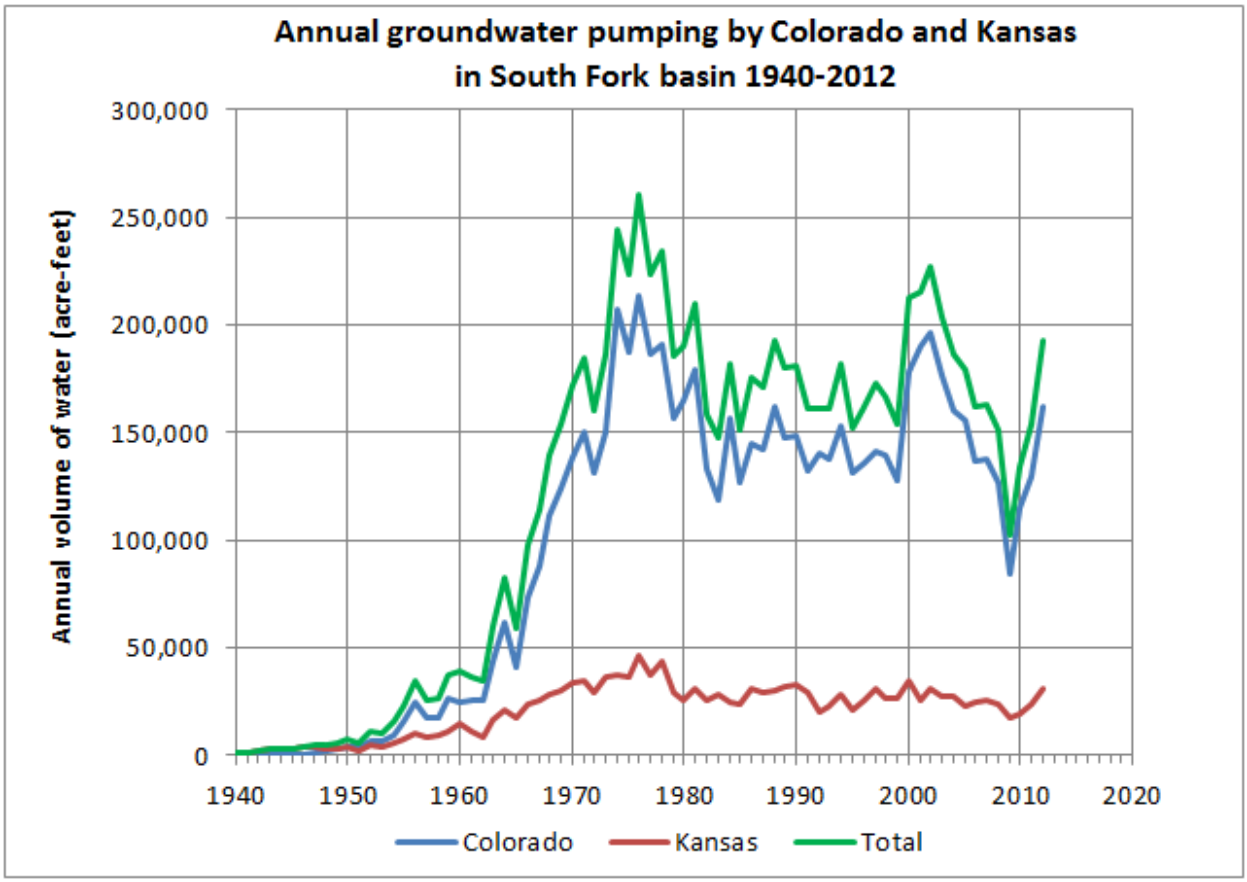
Table 5A: Colorado Compliance During Water-Short Year Administration

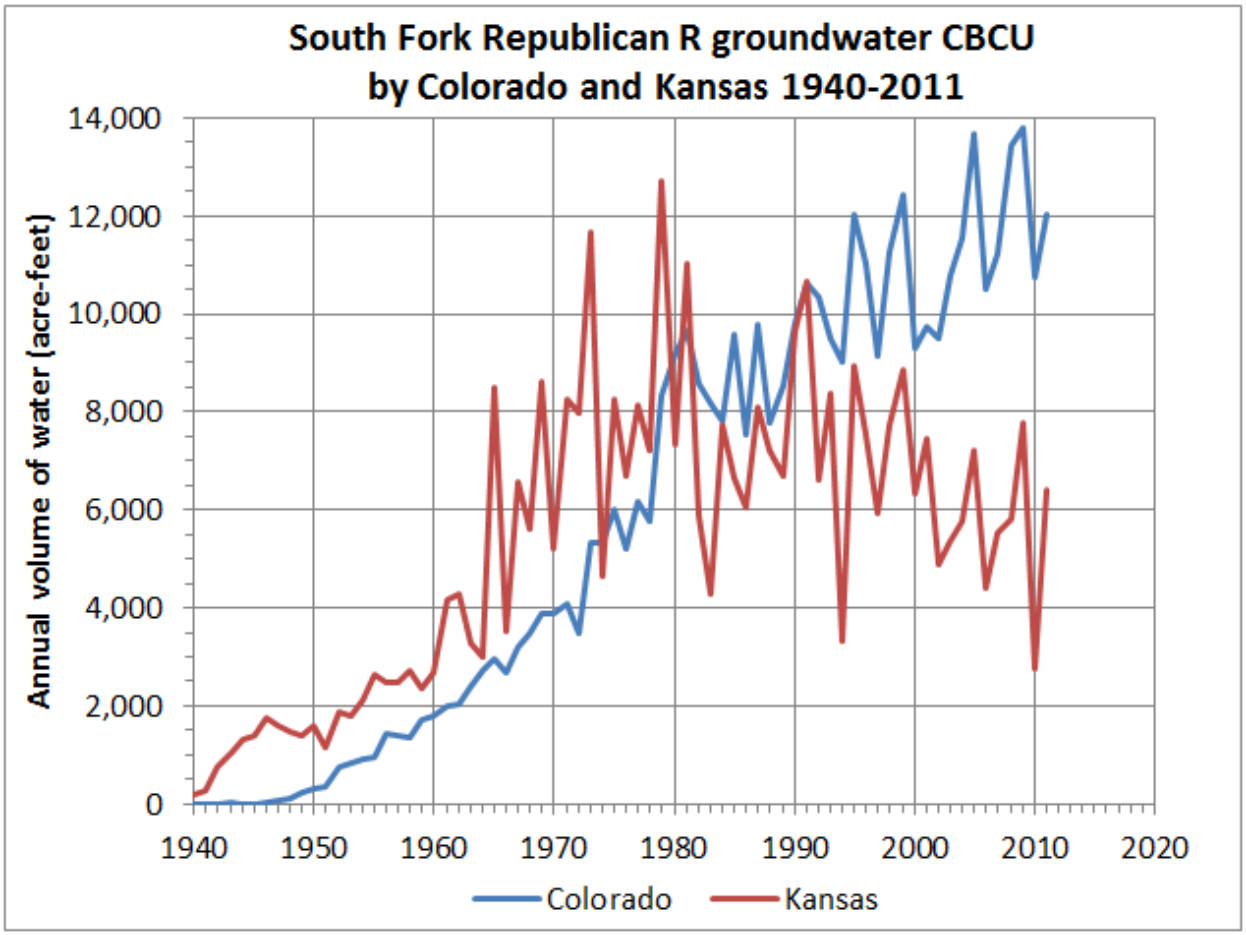
Colorado				
	Col. 1	Col. 2	Col. 3	Col 4
Year	Allocation minus Allocation for Beaver Creek	Computed Beneficial Consumptive minus Computed Beneficial Consumptive Use for Beaver Creek	Credits from Imported Water Supply excluding Beaver Creek	Difference between Allocation and Computed Beneficial Consumptive Use Minus Imported Water Supply for All Basins Except Beaver Creek Col 1 – (Col 2 – Col 3)
Year T= -4				
Year T= -3				
Year T= -2				
Year T= -1				
Current Year T= 0				
Average				

Colorado's Beaver Creek Allocations

	Colorado Computed Water Supply	Colorado Beaver Creek allocation	Colorado Beaver Creek CBCU	Colorado Beaver Creek Compliance	5-year Sum of Colorado Beaver Creek Allocation	Sum of Colorado Beaver Creek Allocations in Water-Short Years	Criteria met for Water-Short Year Declaration
1995	15,410	3,080	0	3,080			No
1996	27,430	5,490	0	5,490			No
1997	19,880	3,980	0	3,980			No
1998	12,880	2,580	0	2,580			No
1999	13,080	2,620	0	2,620	17,750		No
2000	9,690	1,940	0	1,940	16,610		No
2001	7,480	1,500	0	1,500	12,620		No
2002	3,870	**770**	0	770	**9,410**	**770**	Yes
2003	1,290	**260**	0	260	**7,090**	**1,030**	Yes
2004	1,820	**360**	0	360	**4,830**	**1,390**	Yes
2005	4,560	**910**	0	910	**3,800**	**2,300**	Yes
2006	7,110	**1,420**	0	1,420	**3,720**	**3,720**	Yes
2007	11,600	**2,320**	0	2,320	**5,270**	**5,270**	Yes
2008	15,480	3,100	0	3,100	8,110		No
2009	14,780	2,960	0	2,960	10,710		No
2010	13,630	2,730	0	2,730	12,530		No
2011	12,810	2,560	0	2,560	13,670		No
2012	9,310	1,860	0	1,860	13,210		No
2013*		800	0	800	**10,910**	10,910	Yes

* 2013 values are estimated for illustration purposes only


Annual groundwater pumping by Colorado and Kansas in South Fork basin 1940-2012
Annual volume of water (acre-feet)
300,000
250,000
200,000
150,000
100,000
50,000
0
1940
1950
1960
1970
1980
1990
2000
2010
2020
Colorado
Kansas
Total


South Fork Republican R groundwater CBCU
by Colorado and Kansas 1940-2011
Annual volume of water (acre-feet)
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
1940
1950
1960
1970
1980
1990
2000
2010
2020
Colorado
Kansas