

ARKANSAS RIVER COMPACT ADMINISTRATION

Lamar, Colorado 81052

For Colorado

Chairman and Federal Representative

For Kansas

Dan McAuliffe (Acting), Denver
Colin Thompson, Holly
Matt Heimerich, Olney Springs

Robin Jennison
Healy, Kansas

David Barfield, Topeka
Randy Hayzlett, Lakin
David A. Brenn, Garden City

December 1, 2007

Mr. Colin Thompson, Chairman
Mr. David Brenn, Member
Mr. Robin Jennison, Ex-officio Member
Operations Committee
Arkansas River Compact Administration

Re: Compact Year 2007 Summary
Assistant Operations Secretary Report

Gentlemen,

The Assistant Operations Secretary position was established in March 1997. The position has provided a different perspective on John Martin Reservoir (JMR) operations and other issues related to the Arkansas River. This is the tenth year of this position and the first year I have served in it. I appreciate the opportunity to serve in this capacity.

In this report, I will provide the Kansas perspective on operations that have occurred over the past Compact Year (CY 2007), including the Pueblo Winter Water Storage Program, Deliveries to Kansas, Deliveries to the John Martin Reservoir Permanent Pool, Pass-thru & Status Accounting and Communications, as well as a table summary of the Water Issues Matrix.

Pueblo Winter Water Storage Program

I appreciate the Operations Secretary providing more detailed information concerning the operations related to the Pueblo Winter Water Storage Program (PWWSP). As a result, Kansas staff has a better understanding of how these operations are conducted. Some of the operations in CY 2007 have raised concerns that Kansas has communicated to both the Operations Secretary and the Colorado Division 2 staff. Those concerns are highlighted below.

Figure 1 is provided to show the Compact conservation operations through the Arkansas River at Las Animas gage during the PWWSP period. Note that beyond the initial transition period, the Compact Conservation storage share was stable for the majority of this period.

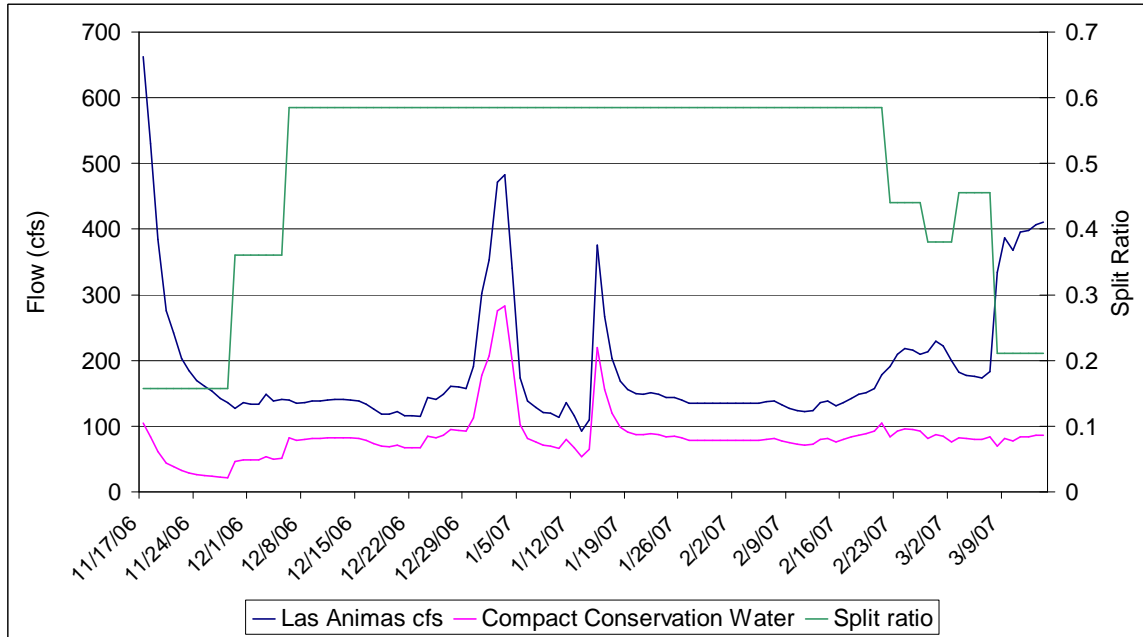


Figure 1. Information on Compact Conservation Storage during Period of Pueblo Winter Water Storage Program.

A winter storm at the end of 2006 resulted in a moisture laden snowpack over much of Southeast Colorado. See Figures 2 and 3. As the snowpack melted during the month of February, flows in the Arkansas River below Rocky Ford increased. As a result these improved hydrologic conditions, the split ratio was adjusted by Colorado which increased the percentage going to the PWWSP. At that time, I expressed my concern that the Compact conservation storage was not benefiting from those improved conditions, which was evident at both Arkansas River at La Junta and Arkansas River at Las Animas. See Table 1. Further, due to the snowpack, it is unlikely that Colorado ditches would have been able to divert under these same conditions during the pre-PWWSP period for direct irrigation. Much of the area served by the Amity, Fort Lyon and Amity was covered with a significant amount of snow.

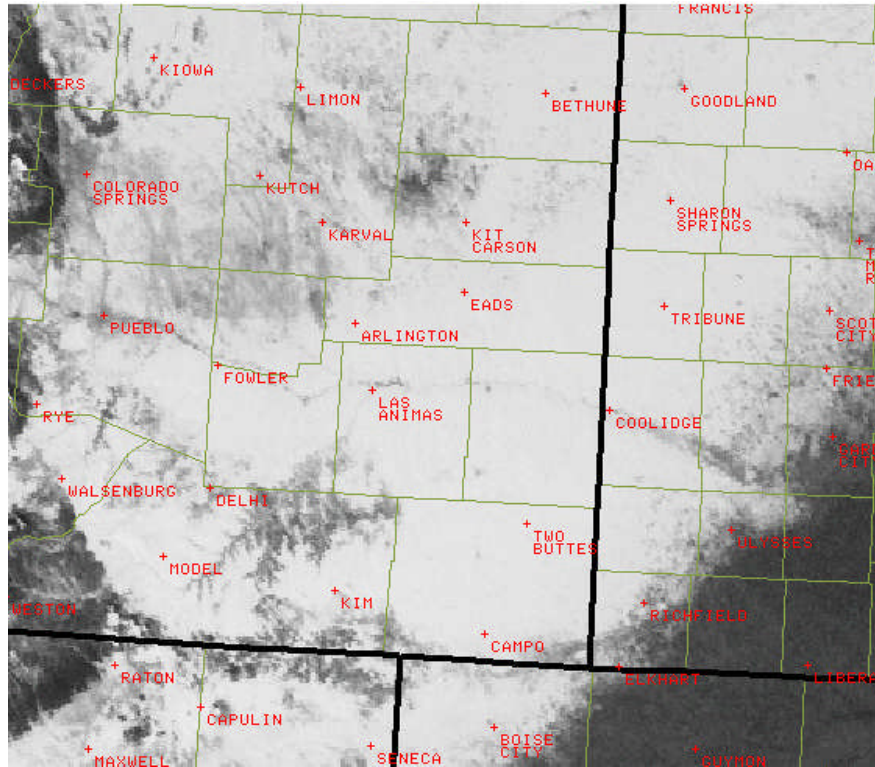


Figure 2. Visible Satellite Image – 16 January 2007 (forward of Jeff Hutton's email, 16 January 2007).

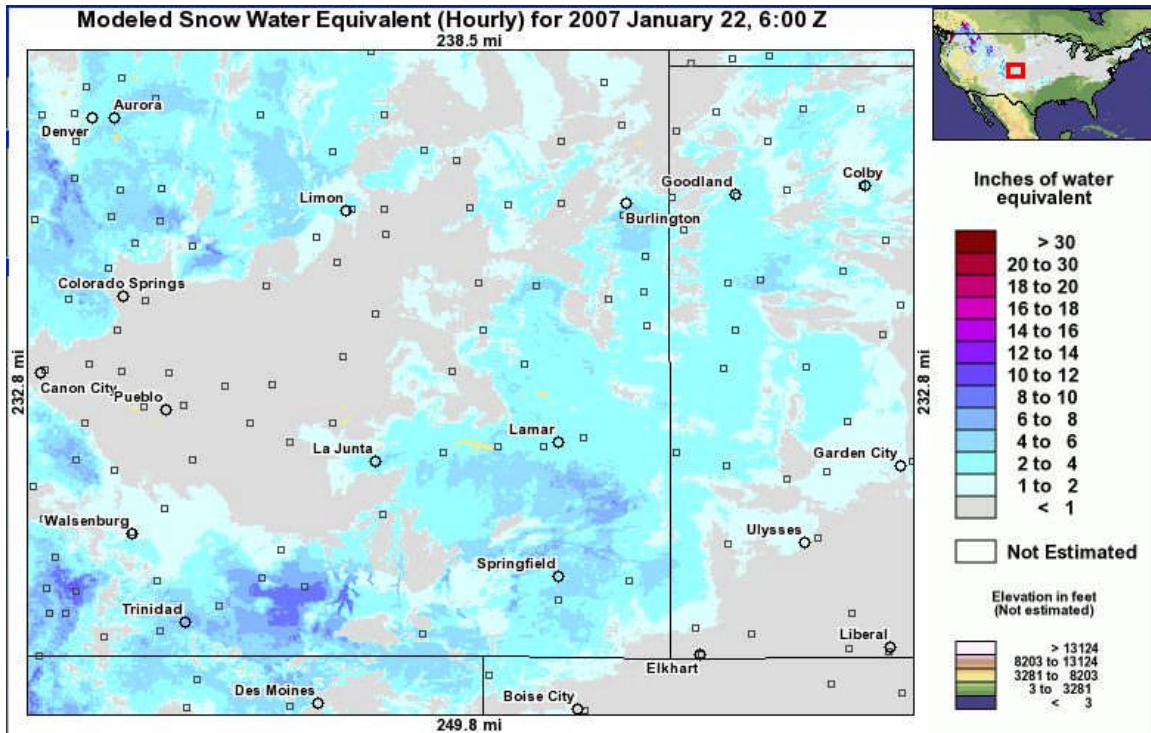


Figure 3. Modeled Snow Water Equivalent for 22 January 2007 from NOHRSC web site (www.nohrsc.noaa.gov).

Table 1. Flow at various locations and split between PWWSP / Compact Conservation Storage. Ark at Rocky Ford data from CDWR website. Ark at La Junta and Ark at Las Animas data from spreadsheet provided by Steve Witte (email, March 21, 2007). Split ratios from “wintrwatsht_2007.xls” provided by Monique Moray (email, March 19, 2007)

Date	Ark at Rocky Ford (cfs)	Ark at La Junta (cfs)	Ark at Las Animas (cfs)	PWWSP split ratio	Compact split ratio
1 Feb	35	80	135	0.4146	0.5854
2 Feb	140	50	135	0.4146	0.5854
3 Feb	404	80	135	0.4146	0.5854
4 Feb	75	70	135	0.4146	0.5854
5 Feb	51	70	135	0.4146	0.5854
6 Feb	37	90	138	0.4146	0.5854
7 Feb	36	70	141	0.4146	0.5854
8 Feb	37	70	132	0.4146	0.5854
9 Feb	36	100	127	0.4146	0.5854
10 Feb	37	90	124	0.4146	0.5854
11 Feb	46	90	122	0.4146	0.5854
12 Feb	80	100	123	0.4146	0.5854
13 Feb	86	80	138	0.4146	0.5854
14 Feb	199	70	143	0.4146	0.5854
15 Feb	116	60	133	0.4146	0.5854
16 Feb	117	115	136	0.4146	0.5854
17 Feb	65	130	142	0.4146	0.5854
18 Feb	69	115	148	0.4146	0.5854
19 Feb	73	160	151	0.4146	0.5854
20 Feb	80	140	158	0.4146	0.5854
21 Feb	83	150	178	0.5594	0.4406
22 Feb	44	130	191	0.5594	0.4406
23 Feb	42	193	220	0.6191	0.3809
24 Feb	87	189	218	0.6191	0.3809
25 Feb	-21	159	216	0.6191	0.3809
26 Feb	85	145	220	0.6191	0.3809
27 Feb	65	135	213	0.6191	0.3809
28 Feb	75	123	230	0.6191	0.3809
1 Mar	75	109	222	0.6191	0.3809
2 Mar	na	97	200	0.6191	0.3809
3 Mar	na	93	182	0.5443	0.4557
4 Mar	na	92	177	0.5443	0.4557
5 Mar	66	85	176	0.5443	0.4557
6 Mar	121	81	175	0.5443	0.4557
7 Mar	338	404	185	0.5443	0.4557
8 Mar	345	581	334	0.7893	0.2107
9 Mar	291	514	387	0.7893	0.2107
10 Mar	311	543	368	0.7893	0.2107
11 Mar	316	553	396	0.7893	0.2107
12 Mar	324	559	397	0.7893	0.2107
13 Mar	324	550	406	0.7893	0.2107
14 Mar	201	455	411	0.7893	0.2107

The information from Table 1 is displayed as a graph in Figure 4. From this graph, it is apparent that the Arkansas River flow at Rocky Ford is less than the flow at La Junta which is less than the flow at Las Animas.

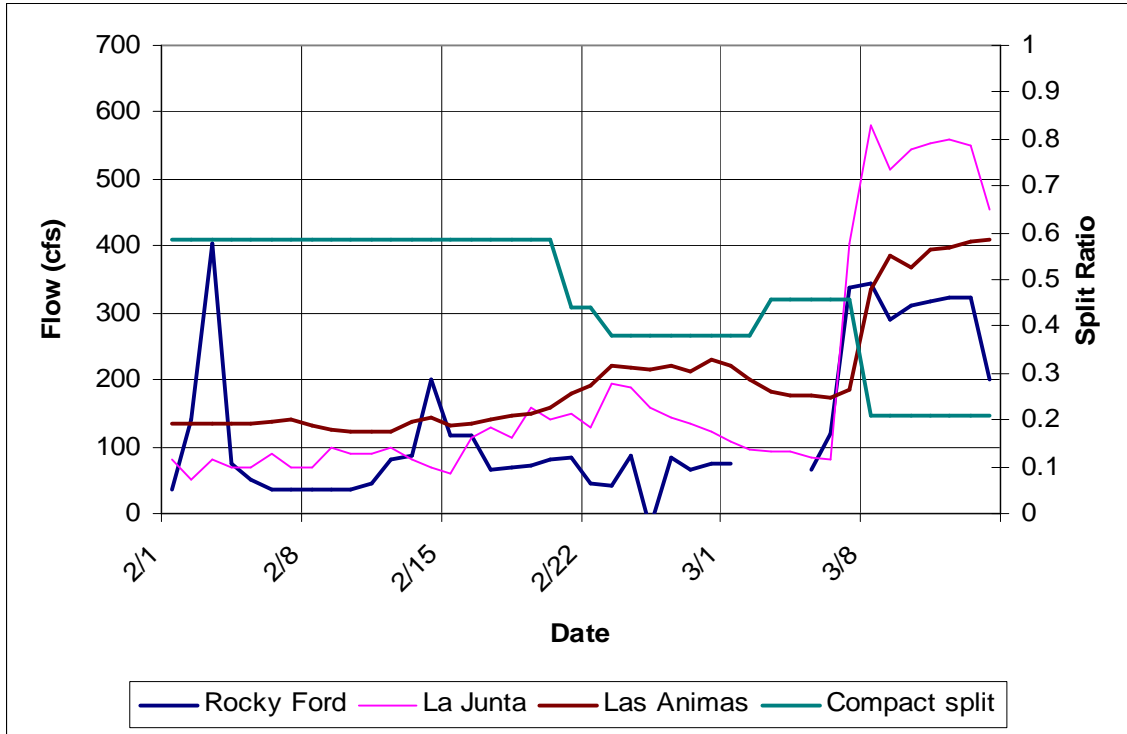


Figure 4. Flows in Arkansas River and Compact Conservation Split Ratio

The 1980 Operating Plan is clear that: “The Amity may store such water as it could otherwise divert from the Arkansas River for storage in the Great Plains Reservoir system ...” (Section III.A.) and the Fort Lyon and Las Animas Consolidated may deliver water under the PWWSP but “the delivery cannot include water that otherwise would have accumulated in conservation storage” (Sections III.B. and C.). Some of the additional river flows at Las Animas which were in excess of the flows at La Junta, would not have been available to the Fort Lyon Canal or Amity Canal, and would have been in excess of what the Las Animas Consolidated could have diverted.

Another operation was also occurring during this same period, a delivery from Pueblo Reservoir to John Martin Reservoir permanent pool, which will be discussed below.

Kansas has concluded that the quantity of water credited to Compact conservation storage passing through the Arkansas River at Las Animas has been underestimated and should be increased.

Deliveries to Kansas

Kansas called for water to be released from its Section II Account, beginning on June 27th at a rate of 610 cfs. The Operations Secretary utilized the Transit Loss Account according to our new Section II Agreement (December 2006). The Kansas Section II Account release rate was maintained until the Kansas Section II Account was exhausted on July 19th.

Once the Kansas Section II Account was exhausted, Kansas then called for water to be released from the Offset Account. The Offset Account release was at a rate of 510 cfs, which was maintained until the Offset Account was effectively exhausted on July 28th.

As a result of the Kansas Section II Account and Offset Account Crediting Agreements, the States are essentially in agreement on final delivery quantities of both the Kansas Section II Account and the Offset Account release. See Table 2. This is in stark contrast with previous years where the States disagreed with the amounts delivered to the Stateline.

Table 2. Summary of Kansas Section II and Offset Accounts during June and July 2007, from "CombinedJune27-July28.xls" spreadsheet provided by Bill Tyner (email, August 7, 2007)

Offset Delivery Efficiency =	83.6%
Offset Net Delivery =	7,700 AF
Offset Consumable Delivery =	6,650 AF
ESF Delivery Efficiency =	104%
Section II Delivery =	26,464 AF
Section II Delivery Transit Loss =	0 AF
Evaporation Delivery Credit =	0 AF
Total Offset =	9,208 AF
Transit Loss on Consumable =	1,303 AF
Granada Transit Loss Credit Percentage =	21.5%
Transit Loss Model Input JMR to Lamar =	21 AF
Transit Loss Model Input Lamar to Granada =	120 AF
Transit Loss Model Input Granada to Stateline =	322 AF
Total Transit Loss Model Input =	463 AF

Deliveries to John Martin Reservoir Permanent Pool

Three deliveries were made to the permanent pool in CY 2007: February, June, and October. Briefly, there are two concerns identified with these deliveries at this time: (1) the release is accounted for as a “block” at John Martin Reservoir, rather than how it was delivered and (2) the transit loss charged was only a portion of the loss computed with the Livingston transit loss method, to represent an estimate of only stream channel

evaporation. The October delivery will be discussed in some detail below, but similar concerns would exist for the February and June deliveries.

In October, releases of consumable water were made from both Pueblo Reservoir and Lake Meredith. An email (4 Oct) from Scott Lorenz, Colorado Division 2 provided that 3,000 AF of water would be released from Pueblo Reservoir beginning on October 4th at 8 am (Mountain time) at a rate of 302.5 cfs, and 2,000 AF would be released from Lake Meredith, beginning on October 5th at 10 pm (Mountain time) at a rate of 201.66 cfs. These releases were coordinated so that they would arrive together at John Martin Reservoir on October 7th.

Given the past concerns with deliveries to the Permanent Pool, Garden City Field Office staff tracked these releases to John Martin Reservoir. Base flows were determined for various locations between Pueblo and John Martin Reservoirs. In reviewing the hourly flow for the Arkansas River at Las Animas, it appears that these releases started passing through this gaging station on October 7th at approximately 11:00 am. This suggests that the release traveled slower than expected, as it had been anticipated that these releases would arrive at John Martin Reservoir at 8:00 am on the October 7th. Additionally, we noted that the John Martin Reservoir Permanent Pool account was credited with 900 AF on each of five (5) days, representing an inflow of approximately 454 cfs each of those days. This was in excess of the flows which were available at Arkansas River at Las Animas. This raised a concern with us to how these releases were be accounted for.

In Table 3, we used daily average flows to quantify the delivery above the base flows at these same locations. In the far left column, we have also included how these releases were accounted for in John Martin Reservoir. As the releases progressed downstream, the hydrograph flattened and was extended. At the Arkansas River at Las Animas, the flow remained above the base flow for an extended period. Beginning on approximately October 19th, the flow at Arkansas River at Las Animas began to increase.

Concerns about how this delivery was measured into JMR were communicated to the Division Engineer / Operations Secretary. The October delivery was discussed at the November 19th meeting between the OS and AOS. Though the OS provided additional explanation regarding these deliveries, and others that occurred previously, Kansas still has some concerns as will be described below.

The Operations Secretary has generally referred to the *Transit Losses and Traveltimes of Reservoir Releases Along the Arkansas River from Pueblo Reservoir to John Martin Reservoir, Southeastern Colorado* ("Livingston 1978 Report") and specifically, to a comment in the Summary related to reservoir-to-reservoir releases as follows:

"Transit losses for releases made to an on-channel reservoir are only 10 percent of these rates if bank storage and channel storage *are not considered as true losses.*" (emphasis added) – page 29 of Livingston 1978 Report.

Table 3. October Permanent Pool Release(s) at Various Locations and JMAS Permanent Pool Accounting

	Ark River at Pueblo below Pueblo Dam	Ark River at Moffat Street / Pueblo	Ark River at Avondale	Ark River at Nepesta	Ark River at Catlin Dam near Fowler	Lake Meredith	Ark River at Rocky Ford	Ark River at La Junta	Ark River at Las Animas	JMAS Perm Pool Delivery
	(AF)	(AF)	(AF)	(AF)	(AF)	(AF)	(AF)	(AF)	(AF)	(AF)
Baseflow	384.14	374.22	739.85	601.00	116.37	11.24	136.20	123.64	124.96	na
10/1/2007										
10/2/2007										
10/3/2007										
10/4/2007	413.23	290.25	109.09							
10/5/2007	641.33	563.98	727.94	238.02		72.07				
10/6/2007	603.65	542.16	716.04	424.47	577.86	397.36	357.69	106.45		
10/7/2007	583.81	528.27	672.41	418.52	623.48	395.38	774.23	741.17	136.86	
10/8/2007	601.66	528.27	696.21	384.80	661.17	399.34	811.91	820.51	606.95	
10/9/2007	224.80	282.32	646.62	345.13	686.95	395.38	922.99	830.43	676.37	900
10/10/2007			103.14	124.96	623.48	333.89	968.61	860.18	694.23	900
10/11/2007					155.37		345.79	620.17	725.96	900
10/12/2007					16.53		99.84	181.82	394.72	900
10/13/2007									218.19	900
10/14/2007									119.01	
10/15/2007									61.49	
10/16/2007									55.54	
10/17/2007									53.55	
10/18/2007									37.69	
	3,068.47	2,735.25	3,671.46	1,935.90	3,344.84	1,993.42	4,281.05	4,160.72	3,780.55	4,500

The Livingston 1978 Report notes that the transit loss model simulates response during steady-state conditions and that during un-steady state condition the transit losses are approximations. Tributary inflows, canal diversions, or water table conditions are listed as factors that would affect transit losses (page 21 of Livingston 1978 Report). The report also notes that conditions that are significantly different from the conditions that existed at the time of the calibration release (Sept 1975) would also affect the accuracy of the transit loss estimation.

In addition, Livingston 1978 Report noted an administrative decision was made by the Colorado State Engineer and the Southeastern Colorado Water Conservancy District for reservoir to headgate transit loss determinations. It was noted that some of the bank storage would return for an extended period, particularly for water that is temporarily stored in the river banks. This decision appears to reflect the difficulty in distinguishing water that was part of a release from natural flow soon after the end of the release. I would note that similar considerations would apply to releases for the benefit of the permanent pool especially given the increase in flow seen in the Arkansas River at Las Animas beginning on October 19th. See Figure 5.

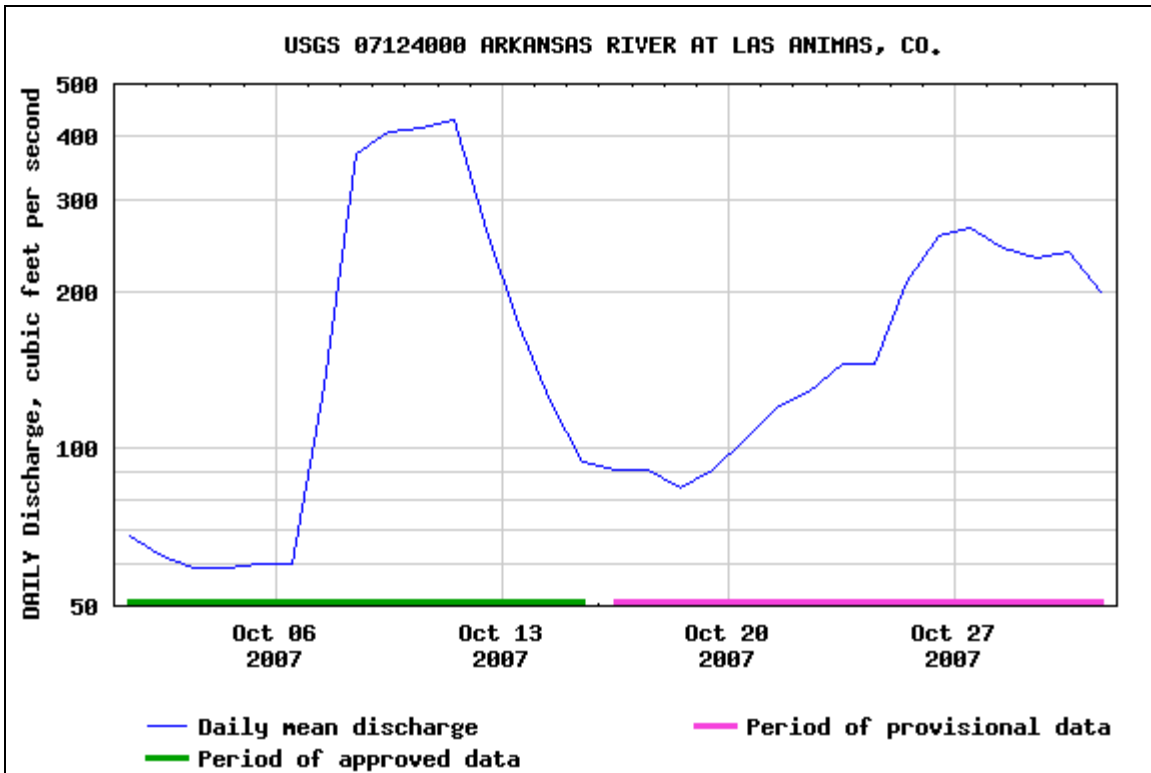


Figure 5. Hydrograph from USGS website (November 30, 2007) for Arkansas River at Las Animas.

The values in Table 3 represent flows above the base flow ahead of the permanent pool hydrograph. The flow for the Arkansas River at Las Animas is the last measured location where the release arrival of the permanent pool is distinguishable from other

operational or tributary (gaged and ungaged) inflows into John Martin Reservoir. Table 3 suggests that approximately 3,781 AF of these releases passed this gage over twelve (12) days. This compares to the 4,500 AF credited to the JMR Permanent Pool over five (5) days by Colorado. For the reasons set forth above, Kansas requests that the October delivery to the permanent pool be limited to 3,781 AF, less the transit loss which would have occurred from the Arkansas River at Las Animas gage to John Martin Reservoir.

Pass-thru and Status Accounting

The Assistant Operations Secretary provided to the Operations Secretary a spreadsheet that tracks both the amount of water being passed thru John Martin Reservoir and the difference between the content based on the staff gage reading and the John Martin Accounting System (JMAS). Kansas is aware of two pass-thru operations that occurred during this year: (1) delivery to Fort Bent for the benefit of the City of Lamar (Fry-Ark Project water) beginning on August 3rd and continuing to October 1st and (2) starting on October 7th water stored by the Fort Lyon in Adobe which was delivered to Gageby Creek (a direct tributary to John Martin Reservoir) and was passed to the Fort Bent and Amity which was to last approximately four (4) days. I don't have any specific detail on actual operations. These would be included with other waters which were passed-thru John Martin Reservoir during these times. Kansas would appreciate having enough information concerning these operations listed above to be able to separate these operations from other pass-thru water.

Communications

Operations Committee Meetings: The Operations Committee met twice, with the participation of the OS and AOS: April 10th in Pueblo, Colorado, and October 9th in Garden City, Kansas. Written summaries of these meetings were generated for the Operations Committee review.

OS-AOS Meetings: The OS and AOS meet twice: in Pueblo on April 9th and in Lamar on November 19th.

Water Issues Matrix

This is a joint work product of the States which is designed to track the various disputed issues. A summary table showing the status of the 32 issues (14 pending, 5 removed and 13 resolved) was developed and is attached.

Conclusion

In this report I have provided the Kansas perspective on operations for the CY 2007, including the Pueblo Winter Water Storage Program (PWWSP), Deliveries to Kansas, Deliveries to the John Martin Reservoir Permanent Pool account, Pass-thru & Status Accounting, and Communications. Kansas would like to see our concerns addressed about the PWWSP split during the period of February through March. We

have concluded that the quantity of water credited to Compact Conservation Storage was under-estimated and should be increased. We would also like to see our concerns addressed about the October delivery into JMR, along with previous deliveries. Kansas requests that the credit for deliveries to the permanent pool be limited to quantities that can be shown to have arrived.

Sincerely,



Kevin L. Salter, P.E.
Assistant Water Commissioner

Attachment

Water Issues Matrix Summary Table

Version Date : 12/01/2007

Issue #	Description	Pending	Removed	Resolved	ARCA Resolution	Comment
32	Totals	15	4	13		
10	Permanent Pool evaporation charges calculated by pro rata volume vs. incremental area			X	2006-01	Special Engineering Committee Recommendation A
11	Transfer of Account water to Permanent Pool during flood control operations in JMR		X			
12	Consideration of new sources for permanent pool water	X				LAWMA & CDOW made a conceptual proposal before Dec 2005 ARCA Annual Meeting. Issue is before the ARCA Engineering Committee.
13	1980 Operating Plan's Restriction on use of Section III related to Perm Pool		X			Steve Witte will review this to determine if it is still an issue.
20	Winter Water Account of convenience			X	2006-02	Special Engineering Committee Recommendation B
21	Timely distribution of Section III storage charge during Pueblo Winter Water Storage Program (PWWSP)			X	2006-02	Special Engineering Committee Recommendation B
22	Criteria for determining Section III storage under the Pueblo Winter Water Storage Program (PWWSP)	X				
23	Reporting of Winter Water vs. Winter Compact storage split calculation			X		See Joint Recommendations as transmitted by Operations Committee letter dated 19 August 2004.
24	Utilization of "Summer storage season" as defined by the 1980 Operating Plan	X				kls -- consider recharacterizing this issue under Issue 60 and remove as a separate issue per Steve's recommendation on 19 Nov 2007.
25	Criteria for Summer storage event trigger -- Section II.B 1	X				Placed on matrix in April 2007 / not currently before the Special Engineering Committee
26	Section II limitations on use made of account water to irrigation only	X				Placed on matrix in April 2007 / not currently before the Special Engineering Committee
30	Determination of transit loss under Section II(E)(4)			X		Resolved pursuant to an Agreement between State & Chief Engineers (December 2006).
31	Sections II (E)(4) and III (D) are unclear as to where transfers to make up deficits should be made	X				Subject of Special Engineering Committee Recommendation E to be considered at the 2007 ARCA Annual meeting.
32	How should transit loss account be used?	X				Subject of Special Engineering Committee Recommendation E to be considered at the 2007 ARCA Annual meeting.
40	Exchange of daily reservoir status accounting			X		See Joint Recommendations as transmitted by Operations Committee letter dated 19 August 2004.
41	Non-reporting of Section II(C)(1) determinations			X		See Joint Recommendations as transmitted by Operations Committee letter dated 19 August 2004.
42	Summer season interruption of transfers from conservation storage to accounts			X	2006-03	Special Engineering Committee Recommendation C
43	Winter storage period interruption of transfers from summer conservation storage to accounts			X	2006-03	Special Engineering Committee Recommendation C
50	Commencement of a spill event	X				
51	Spilling accounts	X				Subject of Special Engineering Committee Recommendation F to be considered at the 2007 ARCA Annual meeting.
52	Upstream storage during JMR spill events	X				
53	Adjusted JMR inflows during times of spill	X				
54	Section II spill volume during summer storage season			X	2006-04	Special Engineering Committee Recommendation D
60	Section II(C)(2) compliance (Agreement B)	X				
61	Retroactive adjustments of accounting for prior years if accounting methods are revised	X				
62	OS Report status for 1994 through 2006	X				
63	Status of Assistant Operations Secretary Reports: 1998, 1999, 2000, 2001 & 2002		X			

Water Issues Matrix Summary Table

Version Date: 12/01/2007

Issue #	Description	Pending	Removed	Resolved	ARCA Resolution	Comment
64	Assistant Operations Secretary Reports: purpose and timeliness			X		See Joint Recommendations as transmitted by Operations Committee letter dated 19 August 2004.
65	Consider Moving Date of Annual Meetings to January or February		X			
66	Need for definite process for introducing and resolving operational issues			X		See Joint Recommendations as transmitted by Operations Committee letter dated 19 August 2004.
67	When issues are resolved, is it in the form of separate resolutions and /or revisions to the 1980 Operating Plan?			X		Process has been established to address resolution of issues as they were resolved.
70	Trinidad Reservoir: Passing of inflows exceeding 1,000 cfs	X				