

**Engineering Committee Report Republican  
River Compact Administration  
August 25, 2021**

**EXECUTIVE SUMMARY**

The Engineering Committee (EC) met six times since the August 21, 2020, Republican River Compact Administration (RRCA) Annual Meeting. Over the past year, the EC completed these assignments: 1) hold quarterly meetings; 2) exchange information listed in Section V of the RRCA Accounting Procedures and Reporting Requirements, including all required data and documentation; 3) finalize 2020 accounting; 4) continue to work on developing a recommendation for the Flood Flows provisions of the RRCA Accounting Procedures to bring them into conformance with the intent of the Final Settlement Stipulation (FSS); 5) continue work on documenting historical changes to the RRCA Accounting Procedures; 6) provide updates on the progress of new and ongoing management strategies for maintaining compact compliance; 7) continue development and maintenance of the RRCA administrative website that serves as an informational page for the public and provide regular updates to the EC; 8) continue work and provide updates on improving accounting tools developed by the Engineering Committee; 9) prepare the 2020 RRCA annual meeting report; and 10) make a recommendation on a course of action for dealing with the 2019 PRISM data correction.

Ongoing assignments include: 1) hold quarterly meetings; 2) continue work on documenting historical changes to the RRCA Accounting Procedures; 3) provide updates on the progress of new and ongoing management strategies for maintaining compact compliance; 4) work on maintaining and enhancing the RRCA public website; 5) continue work and provide future updates on improving accounting tools developed by the Engineering Committee.

The EC recommends discussion by the RRCA on the exchange of data, modeling results, and proposed accounting for 2020 incorporating the EC's proposed course of action for dealing with the 2019 PRISM data correction; retention of Principia Mathematica; modeling and data tasks to be assigned to Principia Mathematica for 2021; the status of the document summarizing historical changes to the RRCA Accounting Procedures; the ongoing maintenance and updating of the RRCA website; and recommended EC assignments and other potential assignments for the next year.

Details of the various EC tasks are described further in the remainder of this report, including:

- Attachment 1: Minutes of the quarterly meetings of the EC
- Attachment 2: Accounting Inputs and Accounting Tables from the RRCA Accounting for 2020 recommended by the EC for approval by the RRCA (Task 3)
- Attachment 3: Compilation of documents exchanged and meeting summaries regarding the Flood Flows provision of the RRCA Accounting Procedures (Task 4)
- Attachment 4: *Summary of Historical Changes to the RRCA's Accounting Procedures and Reporting Requirements* (Task 5)

## COMMITTEE ASSIGNMENTS AND RELATED WORK ACTIVITIES

1. Meet quarterly to review the tasks assigned to the committee.
  - a. The EC met October 7, 2020; January 7, 2021; April 20, 2021; and July 21, 2021. See Attachment 1 for the approved notes of these meetings.
  - b. The EC recommends that this task continue.
2. Exchange by April 15, 2021, the information listed in Section V of the RRCA Accounting Procedures and Reporting Requirements, and other data required by that document, including all necessary documentation. By July 15, 2021, the states will exchange any updates to these data.
  - a. Nebraska posted its data on April 15, 2021, and provided an update on May 18, 2021.
  - b. Kansas posted its data on April 14, 2021, and provided an update to the data on July 8, 2021.
  - c. Colorado posted its data on April 8, 2021, and added Crop Irrigation Requirement (CIR) data on June 7, 2021.
3. Finalize the 2020 accounting and recommend it for approval by the RRCA.
  - a. Colorado, Kansas, and Nebraska accounting data for 2020 are final and the EC hereby recommends approval of the accounting by the RRCA.
  - b. The applicable summary accounting tables are presented in Attachment 2.
4. Continue to work on developing a recommendation for modifying the Flood Flows provisions of the RRCA Accounting Procedures to bring them into conformance with the intent of the FSS.
  - a. Nebraska proposed revised Accounting Procedures to correct the Attachment 6 calculation of Virgin Water Supply Guide Rock to Hardy to Computed Water Supply Guide Rock to Hardy with a placeholder for the reach's Flood Flow adjustment. Willem Schreuder provided comment on the draft which was incorporated by Nebraska. Kansas recommended that the draft not be brought to the Commissioners without full resolution of the issue. The draft edit to the Accounting Procedures is included in Attachment 3.
  - b. Kansas provided a revised proposal to the Engineering Committee to cap Nebraska's Allocation Guide Rock to Hardy in Table 5C at 33,485 acre-feet when the Flood Flows adjustment is being applied. The EC reviewed and discussed this proposal. The documents associated with Kansas' revised proposal are provided in Attachment 3.
  - c. In addition to discussions at the quarterly committee meetings, the EC met on May 18, 2021, and June 22, 2021, to continue work on developing a recommendation. Summaries of these meetings are provided in Attachment 3.
  - d. The EC, with Nebraska and Kansas proposals having maintained enough discrepancy through this year's work and given the apparent infrequency in which flood flow adjustments may impact compliance tests, does not recommend continuation of this assignment next year.

5. Continue work on creating a document memorializing when RRCA Accounting Procedures have changed over the years and incorporate it into the Accounting Procedures.
  - a. The EC has completed a working version of the “AP tracking” document for review by the RRCA, titled *Summary of Historical Changes to the RRCA’s Accounting Procedures and Reporting Requirements*. The document is provided as Attachment 4.
  - b. The EC requests that the RRCA consider a standing assignment to the EC to maintain the AP tracking document and publish it on the RRCA public website.
6. Provide updates on the progress of new and ongoing management strategies for maintaining compact compliance.
  - a. Nebraska provided updates on projects in-progress by the Nebraska Bostwick Irrigation District (NBID) and Kansas Bostwick Irrigation District (KBID) (automation of Superior/Courtland headgates); NBID (work on the Superior Canal); and updates to Integrated Management Plans for the Upper, Middle, and Lower Republican Natural Resources Districts (NRD). In addition, Nebraska described NBID and Lower Republican Natural Resource NRD’s submittal for a WaterSMART grant to fund alternate locations and sources of water for the Superior Canal. Nebraska provided updates on contracts in development with Frenchman Valley Irrigation District (FVID) and Middle Republican NRD (a remote metering contract).
  - b. Kansas provided updates on KBID’s project to automate the Courtland Canal and Kansas’s second round of cost-share grant awards in the south fork of the Upper Republican River Basin for irrigation efficiency projects.
  - c. Kansas provided updates on their climate-based analyses for evaluating water savings programs. The EC heard presentations by Kansas staff on methods to use climate data to estimate groundwater pumping. The EC discussed possible use of these methods to predict groundwater pumping to improve prospective compact accounting estimates for planning purposes. The EC recommends the RRCA discuss these analyses and their potential uses.
  - d. Colorado provided updates on deliveries by the Colorado Compliance Pipeline.
  - e. The EC recommends this task as a recurring assignment.
7. Continue efforts to develop and publish an administrative website that would be an informational page for the public.
  - a. State staff have maintained and updated the website, which is accessible to the public, and reported back to the EC.
  - b. The EC recommends this task as a recurring assignment.

8. Continue work and provide future updates on improving accounting tools developed by the Engineering Committee.
  - a. The EC continues to use the website accounting tool to validate the accounting spreadsheet results.
  - b. The EC discussed the overlap in the Courtland above Lovewell and Attachment 7 inputs and calculations that when combined with varying data sources were causing inconsistencies in the accounting spreadsheet. The EC will continue to pursue this issue to improve the accounting spreadsheet.
  - c. The EC recommends this task as a recurring assignment.
9. Prepare the 2020 RRCA annual meeting report for approval by the RRCA at the 2021 annual meeting.
  - a. The report has been finalized and approved by the EC and is hereby recommended for approval by the RRCA.
10. Make a recommendation on a course of action for dealing with the 2019 PRISM data correction.
  - a. After the 2019 accounting was approved at the 2020 annual meeting, PRISM precipitation data for 2019 were revised for nine stations used in generating ground water model inputs. The EC discussed how this would impact the 2019 accounting and how to calculate the accounting for 2020.
  - b. The EC recommends that the accounting for 2019 be left as it is since the states' compliance for 2019 is not impacted by the updated PRISM precipitation data which result in small differences in ground water model results.
  - c. The EC recommends that the 2020 accounting use ground water model runs with starting heads for 2020 that incorporate the correction for 2019, and documentation explaining the difference is included with the 2020 accounting.

## **ITEMS FOR RRCA DISCUSSION & ACTION**

1. Data exchange and modeling results for 2020 incorporating the EC's proposed course of action for dealing with the 2019 PRISM data correction. The EC recommends the proposed 2020 accounting presented in Attachment 2 and in the spreadsheet titled "RRCA Accounting 2020 Final.xlsx" for approval by the RRCA. Upon approval of the accounting, the above-mentioned spreadsheet file will be placed on the public website.
2. Retention of Principia Mathematica.
3. Modeling and data tasks to be assigned to Principia Mathematica for 2021. The EC recommends that Principia Mathematica continue to maintain the web-based accounting tool and perform periodic model and accounting updates at the same level of service as in 2020.

4. The status of the document summarizing historical changes to the RRCA Accounting Procedures (Attachment 4).
5. The EC has continued to maintain and update the RRCA website. The website's purpose is to provide public information, including history of the compact and the RRCA, links to compact-related data and reports, state information, etc. The EC requests any additional comments and direction from the commissioners on the content that the RRCA wants published to the website.
6. Discussion of the recommended EC assignments and other potential assignments for the next year and agreement on a final set of assignments. The EC presents the following list of recommended assignments to report on at the 2021 annual meeting of the RRCA.

## **RECOMMENDED ASSIGNMENTS FOR THE COMING YEAR**

The Engineering Committee recommends that the Republican River Compact Administration assign the following tasks:

1. Meet quarterly to review the tasks assigned to the committee.
2. Exchange by April 15, 2022, the information listed in Section V of the RRCA Accounting Procedures and Reporting Requirements, and other data required by that document, including all necessary documentation. By July 15, 2022, the states will exchange any updates to these data.
3. Finalize the 2021 accounting and recommend it for approval by the RRCA.
4. Maintain and publish updates to *Summary of Historical Changes to the RRCA's Accounting Procedures and Reporting Requirements* as necessary.
5. Provide updates on the progress of new and ongoing management strategies for maintaining compact compliance.
6. Continue development and maintenance of the RRCA administrative website that serves as an informational page for the public and provide regular updates to the EC.
7. Continue work and provide future updates on improving accounting tools developed by the Engineering Committee.
8. Prepare the 2021 RRCA annual meeting report for approval by the RRCA at the 2022 annual meeting.
9. Retain a contract with Principia Mathematica for the period and scope outlined by the Commissioners.

The Engineering Committee Report and the exchanged data will be posted on the web at <http://republicanriver.org/>

SUBMITTED TO THE RRCA BY



Ivan Franco, Engineering Committee Member for Colorado



Christopher Beightel, Engineering Committee Member for Kansas



Kari Burgert, Chair and Engineering Committee Member for Nebraska

Meeting minutes for the  
**QUARTERLY MEETING of the  
ENGINEERING COMMITTEE of the  
REPUBLICAN RIVER COMPACT ADMINISTRATION**  
October 07, 2020 1:30 PM Central Time

Meeting was held via Zoom meeting.

**Attendees:**

Chris Beightel KS

Kari Burgert, NE

Hongsheng Cao, KS

Margeaux Carter, NE

Alexa Davis, NE

Chelsea Erickson, KS

Elizabeth Esseks, NE

Carol Myers Flaute, NE

Ivan Franco, CO

Hua Guo, NE

Lizzie Hickman, KS

Philip Paitz, NE

Sam Perkins, KS

Willem Schreüder, CO

Shea Winkler, NE

1. Introductions

1.1. The meeting started at approximately 1:35 PM.

2. Review/Modify Agenda

2.1. The EC representatives agreed to move Sam Perkins' presentation to first on the agenda.

3. Kansas' Precipitation and Irrigation Analysis

- Sam Perkins shared an analysis that he has been working on using climate-based regression estimators to evaluate water savings programs.

o Summary:

To assess the effectiveness of Local Enhanced Management Areas (LEMAs), initiated by Groundwater Management Districts (GMDs) in Kansas, and Water Conservation Areas (WCAs), initiated by individual or groups of water right holders in Kansas, on preserving groundwater resources requires distinguishing climatic impacts from change in water use behavior. A climate-based regression estimator of water use can help do this. For years when a water-savings program is in effect, the difference between reported use and estimated use represents the climate-adjusted water use savings, accounting for the uncertainty of the regression estimate. Estimators are based on monthly PRISM data for precipitation and temperature, with ET given by the Hargreaves-Samani approximation.

Two LEMAs operate in GMD4 within the RRCA GW model domain in KS. Sheridan-6 (SD-6), a 99-sq mi area mostly in Sheridan County, was established in 2012, and has shown significant reductions in water use and water level declines. In 2017, a district-wide LEMA was established, excluding minor areas without water level declines. In the analysis, simple regressions of water use versus precipitation are used to distinguish climatic variability from water use reductions for these, accounting for uncertainty of the estimates. For the GMD4 LEMA, a two-variable regression model is also shown, based on both precipitation and ET.

GMD4 accounts for about 91 percent of pumping and irrigated area reported by Kansas for RRCA GW model domain 2000-2019. For each state, reported pumping was plotted against annual precipitation for 2000-2017 for CO, KS, and NE. Data were summarized using rppKS, a version of the Republican River preprocessor. The period 2000-2017 was selected to look for the effect of the GMD4 LEMA on KS water use for 2018-2019, and any such effects in CO and NE. Average pumping reductions in 2018-2019 compared with 2000-2017 are adjusted for climatic differences.

- **Action item: Sam will share his presentation with the group.**

4. Review and Update Progress on Engineering Committee Task List - Addition of assignment 10 on the PRISM data correction

- 4.1. Meet quarterly to review the tasks assigned to the committee.
  - No comments
- 4.2. Exchange by April 15, 2021, the information listed in Section V of the RRCA Accounting Procedures and Reporting Requirements, and other data required by that document, including all necessary documentation. By July 15, 2021, the states will exchange any updates to these data.
  - No comments
- 4.3. Finalize the 2020 accounting and recommend it for approval by the RRCA.
  - No comments
- 4.4. Continue to work on developing a recommendation for modifying the Flood Flows provisions of the RRCA Accounting Procedures to bring them into conformance with the intent of the Final Settlement Stipulation (FSS).
  - Chris said that he believes that the last proposal was from Kansas. He suggested that everyone look at that proposal and either discuss it at the next quarterly meeting or hold an extra meeting to discuss the Kansas proposal before the January quarterly meeting.
  - Kari suggested an additional incremental approach in which the EC would get the wording in the Accounting Procedures fixed with regard to above and below Guide Rock Virgin Water Supply (VWS) versus Computed Water Supply (CWS). If a Flood Flows term is added to change to Computed Water Supply from Guide Rock to Hardy, then the EC can work on how to calculate the flood flow at a later time. Kari suggested all would agree that the flood flow from Guide Rock to Hardy is zero if there is no flood flow.
    - Chris agreed to Kari's proposal.
    - Ivan asked to be copied on correspondence related to this assignment.
  - **Action item: Nebraska will send out draft language for the Accounting Procedures that corrects the formulation for CWS from Guide Rock to Hardy.**
  - **Action item: Everyone will review Kansas' most recent proposal for flood flow adjustment change.**
  - **Action item: Everyone will copy Colorado on correspondence related to flood flows assignment.**
- 4.5. Continue work on creating a document memorializing when RRCA Accounting Procedures have changed over the years and incorporate it into the Accounting Procedures.
  - Chelsea sent a draft document before the annual meeting.
  - Kari volunteered to incorporate the most recent changes to Accounting Procedures into the tracking document.
  - Chris reminded the group that the original intent of the tracking document was to leave "breadcrumbs" about what people were thinking when the APs were changed (describe where we'd been and then how we got here).
  - **Action item: Nebraska (Kari) will add Accounting Procedures revisions from the 2020 RRCA annual meeting to the draft tracking document and distribute the draft to Kansas and Colorado for review (the goal is to distribute the draft document before the next quarterly meeting).**
- 4.6. Provide updates on the progress of new and ongoing management strategies for maintaining compact compliance.
  - Chris reported that there were no updates from Kansas.
  - Kari reported on ongoing Nebraska projects.
    - Nebraska Bostwick Irrigation District (NBID) and Lower Republican NRD submitted a WaterSMART application for alternate locations and sources of water for the Superior Canal.

- NBID and Kansas Bostwick Irrigation District (KBID) are working on automation of Superior/Courtland head gates automation project.
  - Willem gave an update on the Colorado Compliance Pipeline (CCP). The last information he heard was that Colorado was in good enough shape with compact compliance that it wouldn't be necessary to run the pipeline the rest of the year. However, the district is planning to start the CCP in December and then ramp it up. This would serve two purposes: Colorado would be over-delivering this year to dampen out positive and negative swings (there are predictions for drop-off the next two years); and the action could help mitigate winter flooding caused by ice jams. The plan is to run about 6,000 acre-feet early in 2021.
  - Willem said that another strategy is to get people to sign up for CREP to retire land; progress has been slow.
  - Chris asked about CREP re-enrollments in Nebraska. Carol said that she understood that most producers re-enrolled at the last minute.
  - **Action item: Kansas (Chris) will follow up about the KBID WaterSMART application for gate automation and report back at the next meeting.**
- 4.7. Continue development and maintenance of the RRCA administrative website that serves as an informational page for the public and provide regular updates to the EC.
- Chelsea reported that all documents from the annual meeting were loaded onto the website; she also updated the website with staffing changes and fixed broken links. Please contact Chelsea if you need help or want changes made. The 58<sup>th</sup> Annual Report is on the website.
  - Carol mentioned that the documents that were signed electronically for this year's meeting include the electronic tracking page for each document. She said that if anyone feels strongly that we should have copies of electronically signed documents without the electronic tracking page, let her know and she can generate a copy without the tracking page to be uploaded onto the website.
    - Chris said he has no preference on including the electronic tracking page.
  - Carol suggested adding the annual meeting date to the name of the report on the RRCA website because the report date is confusing. Chris suggested adding the meeting date and location that the report is about to the website.
    - Willem reminded the group that the early reports were labeled differently, so the process changed at some point (perhaps around 2002). Chris mentioned that reviewing the meeting transcript slows down the approval of the report. Willem suggested looking at the same description on his website.
  - **Action item: Nebraska (Carol) will send out the Nebraska spreadsheet for tracking meeting year/report numbers.**
  - **Action item: Kansas (Chelsea) will work on language to clarify how reports are described.**
  - **Action item: Anyone who has an opinion about the electronic tracking page being included or excluded from electronically signed documents from the 2020 Annual Meeting will share that at the next meeting.**
- 4.8. Continue work and provide future updates on improving accounting tools developed by the Engineering Committee
- There was nothing to add other than fixing the flood flows issue.
- 4.9. Prepare the 2020 RRCA annual meeting report for approval by the RRCA at the 2021 annual meeting
- There was an update on the status of the transcript and meeting summary for the August 21, 2020, Annual Meeting.
  - **Action item: Ivan will return the annual meeting transcript to Elizabeth when he is finished reviewing it.**

- **Action item: Elizabeth will send the meeting summary and draft report out for external review when she has completed it.**

4.10. Make a recommendation on a course of action for dealing with the 2019 PRISM data correction.

- Willem described the issue. Nine stations have changes in total precipitation of about an inch. It's hard to tell that there are any differences even though there are. The differences in model results are about 55 acre-feet for Colorado; 10 acre-feet for Kansas; and 466.50 acre-feet for Nebraska. If you carry it forward with accounting for 2020 and 2021 and compare original and corrected, the difference for 2019 for Colorado is 40 acre-feet; Kansas is 5 acre-feet, and Nebraska is 197 acre-feet.
- Willem said that the differences in 2019 don't impact compact compliance, but it would be best to fix the problem. Willem posted all the runs in the write-up he provided. Willem suggested three possible ways to deal with the changes.
  - One option is to treat the data as if the changes never happened and carry the mistake forward through 2020 and 2021.
  - The second option is to correct the 2019 run, which the EC hasn't done before (the practice has not been to correct after the accounting has been approved) and use PRISM data moving forward.
  - The third option is to recognize that there is an error in 2019: don't change 2019 data but take a run of the 2019 correction and have that be the starting condition for 2020. There would be a discontinuity between 2019 and 2020 the same way there was a discontinuity between 2006 and 2007 when the five-run procedure was adopted. This option is Willem's recommendation (fix the problem with the initial heads but leave the 2019 modeling and accounting as it is).
- Chris said that the third option sounds reasonable and sensible. He wants to have internal discussion with Kansas staff.
- Kari indicated that Nebraska is leaning toward option 3, with the distinction of preferring to archive the 2019 run and have the continuous run have the revised 2019 data but that might be something that Nebraska will just need to do for internal modeling.
  - Willem said that making the correction as described in option 3 would only affect the groundwater model. The 2020 starting heads would be different than the 2019 ending heads. The 2019 special run would be provided as a separate zip file, with an explanation of what was done.
- Chris asked how the EC should document the correction. Willem referenced the situation in 2007. On the main page of the description (for modeling and accounting) there is a reference indicating that the starting heads are special (they are different than the ending heads for 2006). The runs are included in the data folder.
- Sam asked how the multi-year simulation using current precipitation data will be affected by this. Willem indicated that is always a problem, but there is already the issue of the difference between 2006 and 2007. For future projections this may not make those runs more or less reliable because the changes are so small. However, if we were trying to do a continuous run from 1980 to 2020, that can't be done anymore. Continuous runs also can't be done because of multiple changes in models.
- **Action item – Kansas and Nebraska will report back at the next meeting on review made internally about the PRISM data correction.**

5. Summary of Meeting Actions/Assignments (in bold)

6. Future Meetings

Q2 – January 6, 2021, 2:00 pm Central

Q3 – April 20, 2021, 1:30 pm Central

Q4 – July 21, 2021, 1:30 pm Central

7. Adjourn

The meeting adjourned at approximately 3:10 PM.

Meeting minutes for the  
**QUARTERLY MEETING of the  
ENGINEERING COMMITTEE of the  
REPUBLICAN RIVER COMPACT ADMINISTRATION**  
January 7, 2021; 10 – 11 AM CT

Meeting was held via Zoom meeting.

**Attendees:**

Chris Beightel KS

Carol Myers Flaute, NE

Kari Burgert, NE

Ivan Franco, CO

Alexa Davis, NE

Sam Perkins, KS

Chelsea Erickson, KS

Willem Schreüder, CO

Elizabeth Esseks, NE

1. Introductions
  - 1.1. The meeting started at approximately 10:05 AM.
2. Review/Modify Agenda
  - 2.1. Meeting times for April and July were corrected to 2 PM CT.
3. Review and Update Progress on Engineering Committee Task List
  - 3.1. Meet quarterly to review the tasks assigned to the committee.
    - No comments
  - 3.2. Exchange by April 15, 2021, the information listed in Section V of the RRCA Accounting Procedures and Reporting Requirements, and other data required by that document, including all necessary documentation. By July 15, 2021, the states will exchange any updates to these data.
    - No comments
  - 3.3. Finalize the 2020 accounting and recommend it for approval by the RRCA.
    - Willem sent out an updated accounting draft which still includes estimates earlier this week. Let him know if there are issues.
  - 3.4. Continue to work on developing a recommendation for modifying the Flood Flows provisions of the RRCA Accounting Procedures to bring them into conformance with the intent of the Final Settlement Stipulation (FSS).
    - Kari sent out a draft revision to the Accounting Procedures that has a placeholder for what the Flood Flows adjustment would be in the calculation of the computed water supply from Guide Rock to Hardy. The group reviewed the proposed edits in section H and Attachment 6. The proposed edits indicate that the computed water supply should include subtraction of the Flood Flow adjustment, calculation of which has not yet been determined.
    - Willem made a comment about the proposed language for the Flood-Flows term being vague in lines 558 and 559 of Kari's draft. Willem said the draft language is not clear if the term is subtracted from both gages, one gage, or the total. He proposed to revise the language and typed his suggestion into the chat: "A Flood Flow adjustment term will also be subtracted in the Computed Water Supply calculation between Guide Rock and Hardy." Kari will re-word Willem's suggestion and send the revised language to the group for review.
    - Kari reviewed the edits to Attachment 6. Some proposed changes were to fix existing mistakes, and some were specific to the Flood Flows edit.
    - Chris asked if Kari had reviewed the last interactions between Kansas and Nebraska on modifying the

Flood Flows provision. Kari responded that the Nebraska team reviewed the emails and were reminded of the different approaches the states were taking in calculating the Flood Flow adjustment applicable to the Table 5C test. She said that it would be helpful to know what criteria Kansas was using to evaluate the proposed Flood Flow adjustments and that working together to identify what would make a good Flood Flow adjustment conceptually might be an alternative path forward. Chris suggested that Kansas and Nebraska have a focused meeting to discuss just the Flood Flows adjustment.

- **Action item: NE (Kari) will re-word Willem’s suggestion for revised language describing the Flood Flow adjustment term and send it back to the group for input**
- **Action item: NE will propose times to meet to discuss the Flood Flows issue**

3.5. Continue work on creating a document memorializing when RRCA Accounting Procedures have changed over the years and incorporate it into the Accounting Procedures.

- Nebraska sent out a revision. Chris said that the Kansas team discussed the revisions and they look good. The level of detail in the notes made Chris wonder if the group is taking this document in the right direction. Chelsea said the original intent of the document was to explain why the Accounting Procedures were changed and refer to the specific annual meeting documents for additional information. A simple document could be used as a tool by public and federal partners (e.g. a list of what happened and where more information can be found).
- Kansas will finish the review and return comments to the group. Chris suggested that the document memorializing Accounting Procedures changes be patterned after the website, which would be very neutral and point to a specific resource for more information.
- Ivan said that the draft document seems more complete, and he looks forward to hearing the Kansas comments. Ivan reported that he had no substantive comments yet on the revision.
- **Action item: KS will provide revisions to NE and CO for review.**

3.6. Provide updates on the progress of new and ongoing management strategies for maintaining compact compliance.

- Chris gave an update on Kansas Bostwick Irrigation District’s (KBID) WaterSmart project. The manager, Pete Gile, is waiting to hear if the district’s grant application for automation of the Courtland Canal was approved. KBID is busy right now burying a couple of half mile lengths of pipe; that project is funded with Nebraska settlement money.
- Willem reported that the Colorado Compliance Pipeline (CCP) is up and running. It started on December 14, 2020, and ramped up gradually, delivering 400 acre-ft in December for an annual total of 6166 acre-feet. That total puts Colorado in the black for approximately 1000 acre-feet for 2020, subject to revision. The expectation is to pump 9000 acre-feet during 2021 (approximately 5000 - 6000 acre-feet in the spring, and the rest later in the year). The exact break-even number would be 9000 acre-feet.
- Kari reported that Nebraska Bostwick Irrigation District (NBID) is waiting to hear about their WaterSmart application. Regular updates on the Platte-Republican Diversion project are being posted on the NeDNR surface water permitting webpage.

3.7. Continue development and maintenance of the RRCA administrative website that serves as an informational page for the public and provide regular updates to the EC.

- Chelsea reported that she updated the annual report page. Language that had been reviewed by Ivan, Andy Pedley, and Chelsea was inserted at the beginning of that page. There is a log of water reports from Nebraska that Chelsea turned into a PDF and added a title. She sent the draft document to Ivan and Andy for review. Chelsea will post the log of water reports after she gets feedback from Ivan and Andy. Otherwise Chelsea reported that there were no other changes. She has been doing regular maintenance and updates. Chelsea copied all text from the website into a Word file in case the website failed (she can also call GoDaddy and ask them to re-set to a previous version of the website).
- Willem mentioned that the complete 1985 annual report has been uploaded to his website (after being re-scanned). Chelsea will copy the document from Willem’s website to the RRCA website.

3.8. Continue work and provide future updates on improving accounting tools developed by the Engineering Committee

- No update

3.9. Prepare the 2020 RRCA annual meeting report for approval by the RRCA at the 2021 annual meeting

- Kari said that Nebraska had received edits back from the transcriptionist, and the revised transcript will be included in the meeting summary when it is sent out for review. Kari proposed that everyone think about how much editing we should do of the transcript since it is an independent record of the meeting; there is also a meeting summary. Elizabeth reported that she is still working on the meeting summary.
- Chelsea made a comment about using court reporters or generating a record of the annual meeting in-house. The transcript is the official record of the meeting, so it should be the best record it can be. Maybe with technology available now we can start doing some of that work ourselves.
- Willem mentioned that for his class, the university gets a transcript as part of the lecture recording. The transcript is very accurate, but it doesn't capture who said what (since it just uses the Zoom recording). A transcript like that could be a good starting place for a complete meeting transcript.
- Kari said she believes that the Rules and Regs require that there be a recording of the meeting and the host state must make the recording available upon request. Previously it had been more difficult to make a recording available compared to making a transcript available. Chris said that in the past the transcript was needed because of the litigious nature of the meetings.
- Chris recommended asking the commissioners to give the EC an assignment to re-evaluate how the annual meetings should be documented and recorded. For example, Zoom meetings can be recorded and people can see who said what.
- Carol asked if the transcript needs to be part of the annual report. Chris reminded the group that in the future the people involved with the RRCA may not get along, and there could be potential issues that would require documentation with a transcript.
- Willem typed a link in the chat about Zoom audio transcription: <https://support.zoom.us/hc/en-us/articles/115004794983-Using-audio-transcription-for-cloud-recordings->
- **Action item: the EC will ask commissioners to assign the EC a task to determine how annual meetings should be documented or recorded moving forward (e.g. transcript versus recording).**

3.10. Make a recommendation on a course of action for dealing with the 2019 PRISM data correction.

- Willem reminded the group that the present data was refreshed after 2019 had been finalized. He ran the 2019 groundwater model simulations with the new data. The difference is approximately 100 acre-feet. Willem's recommendation is to update the starting heads for 2020 to new data but leave 2019 alone.
- Chris said that at the last meeting he indicated that Kansas agreed with Willem's suggestion about using the 2019 PRISM data.
- Chris wanted to know how the correction would be documented. Willem said that the EC could do the same thing that was done in 2017. On the main page of the posted runs for 2020, there would be a short description of what it is, included the revised 2019 runs documenting how data for the new 2020 starting heads was generated. Chris asked if there is an official RRCA document for this. Willem responded that there is a write-up on the website, which could be the basis of an appendix for the EC report. Chris proposed to include the documentation in the EC report, to explain that this is what happened, and this is what the EC did. Ivan and Kari agreed. Willem proposed that someone revise what he wrote into an appendix for the EC report.
- Kari said that Nebraska is still looking at a few more details and will decide about the 2019 PRISM data before the next EC meeting. Nebraska will bring a recommendation about how to document the correction to the next EC meeting.
- **Action item: NE will decide about PRISM data correction and will bring a proposal for**

**documenting the correction to the next EC meeting.**

4. Summary of Meeting Actions/Assignments (in bold)
5. Future Meetings

Q3 – April 20, 2021, 2:00 pm Central

Q4 – July 21, 2021, 2:00 pm Central

6. Adjourn

The meeting adjourned at approximately 10:51 am.

MINUTES for the  
**QUARTERLY MEETING of the  
ENGINEERING COMMITTEE of the  
REPUBLICAN RIVER COMPACT ADMINISTRATION**  
April 20, 2021 2:00 PM Central Time

Meeting was held via Zoom meeting.

**Attendees:**

Chris Beightel KS

Jesse Bradley, NE

Kari Burgert, NE

Hongsheng Cao, KS

Alexa Davis, NE

David Engelhaupt, KS

Chelsea Erickson, KS

Elizabeth Esseks, NE

Carol Myers Flaute, NE

Ivan Franco, CO

Lizzie Hickman, KS

Sam Perkins, KS

Willem Schreüder, CO

1. Introductions

1.1. The meeting started at 2:05 pm.

2. Review/Modify Agenda

2.1. No changes were made.

3. Review and Update Progress on Engineering Committee Task List (Below agenda items)

3.1. Meet quarterly to review the tasks assigned to the committee.

- Today is the third quarterly meeting, and the EC is scheduled to meet again July 21, 2021.

3.2. Exchange by April 15, 2021, the information listed in Section V of the RRCA Accounting Procedures and Reporting Requirements, and other data required by that document, including all necessary documentation. By July 15, 2021, the states will exchange any updates to these data.

- Nebraska submitted data on April 15. Nebraska expects to make an update to groundwater pumping and acres due to missing data in Dundy County. Nebraska agrees that Willem's total for Haigler/Pioneer diversions in Nebraska is the correct value and should be updated. Nebraska was using US Bureau of Reclamation (Bureau) data for the Courtland Canal flow at the state line, which differed from the flow recorded by the USGS. Kari contacted the Bureau, and they recommended using US Geological Service (USGS) data at that location. Willem suggested changing the source for the surface water input tab for the Courtland Canal at the state line to the USGS gage and Kari agreed as long as that is what the Bureau recommends.
- Colorado submitted data on April 8. Willem said that the Annual Crop Irrigation Requirement (CIR) update is still outstanding, but they will get it before July.
- Kansas submitted data on April 14. Willem asked about the 12-mile discrepancies between pumping and recharge. David explained that producers overlap in the same place of use but it's unlikely that they irrigate the places where they overlap in all cases. Chris added that overlaps are reported by water right and by seniority for administration purposes. Willem asked how we can detect when it's a mistake and when it's legitimate. David suggested checking the overlaps individually when there are very large distances. Willem suggested automating the process since there are more than 1,000 overlaps. David recommended checking the largest overlaps to be sure they're right. Chris said that Kansas would check into this and report back if they come up with a plan to resolve this issue. Kari asked if pumping and recharge would change based on resolution of overlap issue. Sam said he would expect to see small to negligible change in recharge associated with location changes of irrigation tracts. Kansas will provide a data update in June.
- **Action item: Kansas will work on a solution to resolve the overlap issue.**

- Willem said that 2020 pumping, mostly for the west side of the basin, was very high. He based the 2021 pumping projection on 2019 instead of 2020. Sometime, he would like to discuss whether the group thinks that was the right thing to do. For example, Colorado pumping last year was up 30% from 2019. Other than 2002 and 2012, 2020 was the highest year in the last 20 years. Willem is hopeful that 2021 will be closer to average. The change in Colorado depletions for 2021 based on 2021 projections for pumping is small; Willem isn't sure about the change in depletions for Kansas and Nebraska. Kari said that Nebraska will get the rest of the pumping data into 2020 files and then will let Willem know what Nebraska proposes for the prospective run for 2021.
  - **Action item: the states will provide data exchange updates to each other by July 15, 2021.**
- 3.3. Finalize the 2020 accounting and recommend it for approval by the RRCA.
- The outstanding data exchange items were noted above. Willem and Nebraska had a few differences which are being resolved (Courtland Canal at state line and Haigler gaged flows).
  - Willem commented that USGS has finalized surface water inputs gage data.
- 3.4. Continue to work on developing a recommendation for modifying the Flood Flows provisions of the RRCA Accounting Procedures to bring them into conformance with the intent of the FSS.
- Nebraska sent out an email March 1 with the recommended language edit to the Accounting Procedures suggested by Willem at the January meeting. Willem approved of the language. There were no other comments from Kansas and Colorado.
  - Kari asked if the group wants to discuss this topic more at the July meeting or if the group is ready to take a draft to the commissioners at the annual meeting. Chris suggested more discussion, including the reason for adopting the proposed interim language when no procedure for calculating the Flood Flows adjustment for the basin above or below Guide Rock has been defined. He said that the existing language is fine, but it seems appropriate to take a draft to the commissioners when we reach an agreement about the procedure for calculating the Flood Flows adjustment for the basin above or below Guide Rock. There is a conceptual framework, but he's not sure what the path forward is.
  - **Action item: Nebraska (Kari) will send a doodle poll proposing dates to have a focused meeting on calculation of the Flood Flows provisions.**
- 3.5. Continue work on creating a document memorializing when RRCA Accounting Procedures have changed over the years and incorporate it into the Accounting Procedures.
- Chelsea provided an update. Kansas has been reviewing the last draft from Nebraska that included comments and suggestions. We are probably at a point where we need to decide what to do with this document. It is an open-ended work assignment and there will probably be future updates to the APs. Chris said we need to discuss this topic when we meet to see if we can continue or finish the document. The original intent was for this to be a common reference point for all states. Chris asked if this is something we want to continue doing. Kari said that since this is an assignment from the commissioners, she would want to check with the Nebraska commissioner for his preference on that. Kari asked if Kansas is working on revisions. Chelsea said that they are trying to determine how much detail to include in the document. Ivan said that he is waiting to see what the edits are from Kansas. Ivan agrees that the EC is doing what was assigned by commissioners; there is value in this document for future EC members; and there are concerns about what if any implications the document might have.
  - **Action item: Kansas will continue to work on the draft and will send it for review soon.**
- 3.6. Provide updates on the progress of new and ongoing management strategies for maintaining compact compliance.
- Willem reported that the Colorado Compliance Pipeline (CCP) was shut off last Friday (April 16); it has pumped 6,393 acre-feet so far this year. The estimate is that the pipeline will pump an additional 3,000 acre-feet at the end of the year, depending on the summer. There is no flow yet at the Arikaree and Benkelman gages. The South Fork state line gage started slowly at 3 cubic feet per second (cfs) and now is at 8 cfs.
  - Carol reported that Nebraska Bostwick Irrigation District (NBID) was awarded a WaterSMART grant to fund work on the Superior Canal. NeDNR and Kansas Bostwick Irrigation District (KBID) have committed funds to that project, also. Nebraska is working on updates for Upper Republican, Middle Republican, and Lower Republican Natural Resources District (NRD) Integrated Management Plans (IMP). Stakeholder meetings took place in March; NeDNR expects the NRD boards to vote next

month to advance the proposed plans to public hearings in June, with the plans taking effect at the end of September. There are editorial and formatting changes to the plans, but there are no significant changes to the plan goals, objectives, and controls.

- Chris reported that in the same round of WaterSMART grants that Carol mentioned, KBID was funded just less than \$800,000 for a \$1,600,000 project to automate the Courtland Canal. The project will automate the canal from the Guide Rock diversion dam to Lovewell Reservoir. Kansas has almost finished the second round of cost-share grant awards in the south fork in the Upper Republican River Basin for irrigation efficiency projects. The funding is from recent settlement money.

3.7. Continue development and maintenance of the RRCA administrative website that serves as an informational page for the public and provide regular updates to the EC.

- Chelsea reported that nothing has happened since the last meeting. The only outstanding task is putting together a PDF document with annual report descriptions, including the year, meeting year, and report year.
- Chelsea confirmed that the new commissioners are listed on the website.

3.8. Continue work and provide future updates on improving accounting tools developed by the Engineering Committee.

- There were no updates.

3.9. Prepare the 2020 RRCA annual meeting report for approval by the RRCA at the 2021 annual meeting

- The draft meeting summary and attendee list were sent out for review on April 15, 2021, and comments were requested by May 15. Kansas is reviewing the draft and will send comments soon. Colorado hasn't started to review the draft yet.
- **Action item: Colorado and Kansas will review the draft 2020 annual meeting summary and attendee list and return comments to Nebraska by May 15, if possible.**

3.10. Make a recommendation on a course of action for dealing with the 2019 PRISM data correction.

- Willem reminded the group that at the last meeting the recommendation was to start the 2021 run off corrected starting heads. That is what he used for the last update that he sent on April 15. Nebraska agreed to recommend to the commissioners to use the updated 2019 run for starting 2020 heads. Kari wrote a paragraph describing the update. She proposed that the group discuss where to include the summary at the next EC meeting. Willem added a short explanation of the problem in the zip file that includes the data for 2020, but he will replace what he wrote with the summary Kari wrote. Willem asked if the detailed write-up should be included on the publicly accessible page.
- **Action item: Kari will send out the draft language describing the update for review.**

4. Summary of Meeting Actions/Assignments (in bold)

5. Future Meetings

5.1. Q4 – July 21, 2021, 2:00 pm Central

- The goal is to have a draft of the EC report ready for distribution at the July meeting.
- Possible topic for discussion at the next meeting: Is Willem's contract up after 2021 and what needs to be included in EC report to extend?

6. Adjourn

6.1. The meeting adjourned at approximately 2:48 pm.

MINUTES for the  
**QUARTERLY MEETING of the  
ENGINEERING COMMITTEE of the  
REPUBLICAN RIVER COMPACT ADMINISTRATION**  
July 21, 2021 2:00 PM Central Time

Meeting was held via Zoom meeting.

**Attendees:**

Chris Beightel KS

Kari Burgert, NE

Hongsheng Cao, KS

Sam Capps, NE

Alexa Davis, NE

David Engelhaupt, KS

Chelsea Erickson, KS

Elizabeth Esseks, NE

Ivan Franco, CO

Lizzie Hickman, KS

Sam Perkins, KS

Willem Schreüder, CO

1. Introductions
  - 1.1. The meeting started at approximately 2:04 p.m.
2. Review/Modify Agenda
  - 2.1. Sam Perkins has updated the climate-based pumping estimator; if there's time he will give an update today.
3. Review and Update Progress on Engineering Committee Task List
  - 3.1. Meet quarterly to review the tasks assigned to the committee.
    - This is the Engineering Committee's (EC) last scheduled meeting before the annual meeting.
    - The EC members agreed that the April 2021 meeting minutes are final.
    - The Republican River Compact Administration (RRCA) Annual Meeting will be held at McCook Community College on August 25, 2021. Proposed times are 8:30 a.m. for the working session and 10:30 a.m. for the annual meeting. The meeting will be a hybrid in-person and virtual meeting (via Zoom).
      - **Action item: Nebraska will send draft agendas for the working session and annual meeting to Colorado and Kansas for review.**
      - **Action item: Nebraska will notify U.S. Bureau of Reclamation, U.S. Geological Survey, and U.S. Army Corp of Engineers about the annual meeting.**
  - 3.2. Exchange by April 15, 2021, the information listed in Section V of the RRCA Accounting Procedures and Reporting Requirements, and other data required by that document, including all necessary documentation. By July 15, 2021, the states will exchange any updates to these data.
    - Nebraska sent updated data on May 18, 2021.
    - Kansas sent final data on July 8, 2021.
    - Colorado sent final Crop Irrigation Requirement (CIR) data on June 7, 2021.
    - There were no comments or questions on the data exchanged.
  - 3.3. Finalize the 2020 accounting and recommend it for approval by the RRCA.
    - Willem, Sam Perkins, and Kari have been sending updates to accounting spreadsheets and the accounting website. Kari asked if there are remaining questions on the accounting updates.
      - Willem talked about inconsistencies in the Courtland worksheet and monthly water distribution reports, which include the same data. Willem asked how the EC can prevent the U.S. Bureau of Reclamation (Bureau) from sending two different reports for the same data that are different.
        - Kari talked about this issue recently with Miles Morgan of the Bureau. The Courtland worksheet and monthly water distribution reports contain data reported from the irrigation

districts. The Courtland worksheet is updated monthly, and the monthly water distribution reports are completed at the end of the year. Miles called Nebraska Bostwick Irrigation District (NBID) and found out that NBID had been pulling different summaries for each of the spreadsheets, and they discussed the appropriate data for each. The EC now has updated, corrected Courtland worksheets and monthly water distribution worksheets.

- Kari said that the EC doesn't need to include the same data in two different parts of the spreadsheet, so the EC could simplify the spreadsheet. She suggested that simplifying the spreadsheet and eliminating repetition of data could be an assignment under #8 of the EC task list ("Continue work and provide future updates on improving accounting tools developed by the Engineering Committee"). Chris and Ivan agreed with the suggestion.
  - Willem mentioned that part of the problem is there are two different, independent entries that are not tied together; KBID above Lovewell diversions are different in part because of rounding in different places.
  - Willem confirmed that the two spreadsheets are now consistent for 2020 data.
  - Kari reported that data for the Haigler canal at the state line from the new Colorado Division of Water Resources (DWR) streamgaging website are different depending on which query is used. Willem recommended using daily average discharge values; he believes the summary report has an odd conversion from cubic feet per second (cfs) to acre-feet (AF). Ivan agreed with the recommendation. Willem said that additional discrepancies may have to do with one record being provisional and one being final based on water year.
  - Kari indicated that the EC still has a couple of weeks if anyone wants to make a final review before the annual draft EC report is sent out.
  - **Action Item: Willem will check the input data sites (including PRISM and USGS gaging sites) to see if any of the inputs have changed one last time before the annual meeting.**
- 3.4. Continue to work on developing a recommendation for modifying the Flood Flows provisions of the RRCA Accounting Procedures to bring them into conformance with the intent of the Final Settlement Stipulation (FSS).
- Since the last quarterly meeting, the EC met twice on this assignment, and Kansas submitted an email proposal on June 21, 2021, with an additional email from Kansas with a spreadsheet on July 2, 2021.
  - Kari indicated that Nebraska is not ready to move forward with Kansas' current proposal. She recommended that, given the differences between Nebraska's proposal and Kansas's proposal and given the infrequency of the events associated with this accounting issue, the EC consider wrapping up the assignment for the year, documenting the discussions and progress, and to not recommend this as an assignment for next year.
  - Chris and Ivan agreed to bring Kari's recommendation to the Commissioners in the EC report.
  - It was noted that the Accounting Procedures already describes that the issue needs to be addressed prior to impacting Nebraska's Table 5C compliance.
  - Willem wondered if there could be a year that is water-short and then change to flood flow conditions and concluded that it could happen. Chris commented that going from flood flow conditions to a water-short year is where we get into trouble.
- 3.5. Continue work on creating a document memorializing when RRCA Accounting Procedures have changed over the years and incorporate it into the Accounting Procedures.
- Chelsea reported that there is a new draft document ready for distribution, so she will send the draft to EC members today or tomorrow. She took out the extra documentation and replaced it with references to the relevant annual report and/or the RRCA website. She suggested that when bringing the document to the Commissioners, they could also provide guidance for where the document should live. Chris added that the document is more streamlined. He hopes the disclaimer language can be softened. Chelsea said that the document will be added to in the future since it is an evolving document.

- Kari asked if this document will go to the commissioners for approval, or if it will be an internal EC document. Chris indicated that he thought it was impractical to get approval from the commissioners for future changes to the document. He proposed that decisions about the document can be made by the EC the same way the EC decides about website changes.
- 3.6. Provide updates on the progress of new and ongoing management strategies for maintaining compact compliance.
- Colorado had nothing new to report.
  - Nebraska reported that updates on NBID and other projects were given at the 3-States meeting. NBID signed a contract with The Flatwater Group. The Department is working on contracts with Frenchman Valley Irrigation District and the Middle Republican Natural Resources District (a remote meter contract).
  - Kansas – Sam Perkins provided an update on the climate-based pumping estimates. Chris commented that people had been behaving the same way for years in western Kansas and Colorado, until 2018, when there was a change in behavior. The same relationship was not observed with Nebraska data.
  - Willem said that when you look at the graph of pumping over time, the data suggest that 2019 pumping was down a lot. However, the county summaries didn't look like low outliers (2020 is a high outlier). Willem wondered if carrying pumping forward from 2019 to 2021 might not be appropriate. Willem asked if it would make sense to come up with an average year and use that as a surrogate during the year before the end-of-year data is available. If there is an estimate by August of what the current year's annual pumping might be, that would be helpful for planning (e.g., Colorado Compliance Pipeline). Sam said that current-year pumping could be estimated using precipitation data from a portion of the year instead of having to wait until the year is over to use the annual precipitation data.
  - Willem said that at the beginning of August, he will start setting up predictive runs for 2022. For the predictive runs, it may be useful to take an average of last five years instead of repeating the last year. Willem commented that when the EC starts estimating 2021, if we can use precipitation as an estimator of what the pumping is, it will help us come up with better estimates for 2021 six months earlier than we would otherwise have it. Sam explained that to measure precipitation, he is using PRISM data from the PRISM grid for each state, averaged over grid cells in each state's active model. Willem asked if Sam could share the estimate for 2021 pumping.
  - The EC discussed recommending work on improving pumping estimates for the prospective accounting runs when there is a need for these.
    - **Action item: Kansas (Sam Perkins) will share the estimate for 2021 pumping with the EC.**
- 3.7. Continue development and maintenance of the RRCA administrative website that serves as an informational page for the public and provide regular updates to the EC.
- Chelsea reported that there have been no significant changes to the website. She posted the annual report description document, and she posted a notice for the annual meeting and will update it and add documents once she gets more information.
- 3.8. Continue work and provide future updates on improving accounting tools developed by the Engineering Committee.
- Kari referred to working on eliminating the Courtland/Attachment 7 data overlaps next year.
- 3.9. Prepare the 2020 RRCA annual meeting report for approval by the RRCA at the 2021 annual meeting
- Status of transcript and meeting summary for August 21, 2020, Annual Meeting (NE) – The draft report is being revised and will be sent out soon for review.
    - **Action item: Nebraska will send out the draft annual report to Colorado and Kansas for review soon.**
- 3.10. Make a recommendation on a course of action for dealing with the 2019 PRISM data correction.

- Kari confirmed that everyone agreed to using the correction. She sent out a draft description and will include the language again in the draft EC report for people to review and edit.
  - Kari proposed to include the description of the correction, the revised 2019 groundwater model run, and 2020 starting heads in the following places: the EC report (under the section describing completion of this task), the recommended approved accounting appendix, the accounting spreadsheet on the website, and the groundwater model files. Willem added that it will be on the website.
4. Review of EC report Recommended Discussion and Recommended Assignments sections
- The EC reviewed a draft list of completed and ongoing assignments for the year and reviewed a draft list of assignments for the next year to be included in the EC annual report.
  - Chris asked if the EC wanted to include more details in the task descriptions. Ivan commented that the specifics are incorporated into the tasks, and the same group of people will be discussing the assignments next year. Chris asked if additional documentation would be helpful beyond meeting minutes and suggested adding sub-bullets. Kari suggested that we start with the basic tasks for recommending as assignment then updating the task list with subtasks at the first EC meeting in October.
  - Recommended Discussion items
    - Kari noted that the PRISM data correction is part of the discussion of the recommended motion to approve the 2020 accounting.
    - Kari added an item for the commissioners to discuss the retention of Principia Mathematica (PM) and how long the contract with PM should be. The states' current 5-year contracts end in 2021. Chris and Ivan agreed.
    - Willem and Chris suggested adding the climate-based pumping estimator to the recommended discussion items. Willem reiterated that using the projected precipitation would be useful for estimating preliminary pumping and would have no official standing.
  - Recommended Assignments
    - In the recommended assignments list, Kari suggested modifying the wording of the assignment to create the document memorializing changes to the Accounting Procedures to remove “and incorporate it into the Accounting Procedures.” Chris and Ivan agreed that the language should be changed as Kari proposed.
    - Chelsea suggested keeping the document with the Accounting Procedures on the website or the annual EC report.
    - If a draft of the document is available, that can be presented to the commissioners and reviewed as a discussion item.
5. Summary of Meeting Actions/Assignments (in bold)
6. Future Meetings
- 6.1. Action item: Kari will email Colorado and Kansas about scheduling an EC meeting before the RRCA annual meeting, in case the group needs to meet.**
7. Adjourn
- 7.1. The meeting adjourned at approximately 3:13 p.m.

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# Accounting Inputs

Calendar Year		2020
<b>Groundwater Data*</b>		
North Fork Subbasin	GW CBCU Colorado	17,390
	GW CBCU Kansas	0
	GW CBCU Nebraska	1,246
Arikaree Subbasin	GW CBCU Colorado	1,646
	GW CBCU Kansas	81
	GW CBCU Nebraska	73
Buffalo Subbasin	GW CBCU Colorado	482
	GW CBCU Kansas	0
	GW CBCU Nebraska	3,603
Rock Subbasin	GW CBCU Colorado	94
	GW CBCU Kansas	0
	GW CBCU Nebraska	5,190
South Fork Subbasin	GW CBCU Colorado	11,037
	GW CBCU Kansas	3,490
	GW CBCU Nebraska	717
Frenchman Subbasin	GW CBCU Colorado	1,137
	GW CBCU Kansas	0
	GW CBCU Nebraska	78,767
Driftwood Subbasin	GW CBCU Colorado	0
	GW CBCU Kansas	0
	GW CBCU Nebraska	811
Red Willow Subbasin	GW CBCU Colorado	0
	GW CBCU Kansas	0
	GW CBCU Nebraska	8,756
Medicine Creek Subbasin	GW CBCU Colorado	0
	GW CBCU Kansas	0
	GW CBCU Nebraska	19,867
Beaver Subbasin	GW CBCU Colorado	0
	GW CBCU Kansas	6,025
	GW CBCU Nebraska	3,875
Sappa Subbasin	GW CBCU Colorado	0
	GW CBCU Kansas	2,075
	GW CBCU Nebraska	1,654
Prairie Dog Subbasin	GW CBCU Colorado	0
	GW CBCU Kansas	3,668
	GW CBCU Nebraska	0
Mainstem Subbasin	GW CBCU Colorado	(5,115)
	GW CBCU Kansas Above Guide Rock	(769)
	GW CBCU Kansas Below Guide Rock	51
	GW CBCU Nebraska Above Guide Rock	52,721
	GW CBCU Nebraska Below Guide Rock	1,769

<b>Import Water Data*</b>		
North Fork Subbasin	Imported Water Nebraska	0
Arikaree Subbasin	Imported Water Nebraska	0
Buffalo Subbasin	Imported Water Nebraska	0
Rock Subbasin	Imported Water Nebraska	0
South Fork Subbasin	Imported Water Nebraska	0
Frenchman Subbasin	Imported Water Nebraska	0
Driftwood Subbasin	Imported Water Nebraska	0
Red Willow Subbasin	Imported Water Nebraska	49
Medicine Creek Subbasin	Imported Water Nebraska	10,592
Beaver Subbasin	Imported Water Nebraska	0
Sappa Subbasin	Imported Water Nebraska	27
Prairie Dog Subbasin	Imported Water Nebraska	0
Mainstem Subbasin	Imported Water Nebraska Above Guide Rock	8,314
	Imported Water Nebraska Below Guide Rock	(20)
Total		18,962

\* The initial heads for the RRCA Groundwater Model 2020 Update are the ending heads from a groundwater model generated using corrected precipitation data rather than the RRCA Groundwater Model 2019 Update used for approved 2019 accounting. After the 2019 Update was approved, PRISM corrections for precipitation values for May-September 2019 were obtained. PRISM corrected their daily and monthly grids on August 3, 2020, after finding that some stations, including those affecting the RRCA model domain, were mis-located. The precipitation corrected 2019 groundwater model run used to generate the 2020 initial heads included 71,452 acre-feet or 2.3% additional recharge from precipitation. The updated 2020 initial heads will serve as the basis for future RRCA Groundwater Model updates.

Calendar Year		2020
<b>SW Pumping Data</b>		
North Fork Subbasin	SW Diversions - Irrigation -Non-Federal Canals- Colorado	301
	SW Diversions - Irrigation - Small Pumps - Colorado	24
	SW Diversions - M&I - Colorado	0
Arikaree Subbasin	SW Diversions - Irrigation -Non-Federal Canals- Colorado	0
	SW Diversions - Irrigation - Small Pumps - Colorado	0
	SW Diversions - M&I - Colorado	0
	SW Diversions - Irrigation - Non-Federal Canals- Kansas	0
	SW Diversions - Irrigation - Small Pumps - Kansas	0
	SW Diversions - M&I - Kansas	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska	0
	SW Diversions - Irrigation - Small Pumps - Nebraska	0
SW Diversions - M&I - Nebraska	0	
Buffalo Subbasin	SW Diversions - Irrigation -Non-Federal Canals- Colorado	0
	SW Diversions - Irrigation - Small Pumps - Colorado	0
	SW Diversions - M&I - Colorado	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska	92
	SW Diversions - Irrigation - Small Pumps - Nebraska	4
	SW Diversions - M&I - Nebraska	0
Rock Subbasin	SW Diversions - Irrigation - Non-Federal Canals - Nebraska	0
	SW Diversions - Irrigation - Small Pumps - Nebraska	0
	SW Diversions - M&I - Nebraska	0
South Fork Subbasin	SW Diversions - Irrigation -Non-Federal Canals- Colorado	0
	SW Diversions - Irrigation - Small Pumps - Colorado	0
	SW Diversions - M&I - Colorado	0
	SW Diversions - Irrigation - Non-Federal Canals- Kansas	0
	SW Diversions - Irrigation - Small Pumps - Kansas	0
	SW Diversions - M&I - Kansas	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska	0
	SW Diversions - Irrigation - Small Pumps - Nebraska	0
	SW Diversions - M&I - Nebraska	0
Frenchman Subbasin	SW Diversions - Irrigation - Non-Federal Canals - Nebraska	0
	SW Diversions - Irrigation - Small Pumps - Nebraska	0
	SW Diversions - M&I - Nebraska	0
Driftwood Subbasin	SW Diversions - Irrigation - Non-Federal Canals- Kansas	0
	SW Diversions - Irrigation - Small Pumps - Kansas	0
	SW Diversions - M&I - Kansas	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska	0
	SW Diversions - Irrigation - Small Pumps - Nebraska	0
	SW Diversions - M&I - Nebraska	0
Red Willow Subbasin	SW Diversions - Irrigation - Non-Federal Canals - Nebraska	0
	SW Diversions - Irrigation - Small Pumps - Nebraska	0
	SW Diversions - M&I - Nebraska	0
Medicine Creek Subbasin	SW Diversions - Irrigation - Non-Federal Canals - Nebraska - Above Gage	0
	SW Diversions - Irrigation - Small Pumps - Nebraska - Above Gage	57
	SW Diversions - M&I - Nebraska - Above Gage	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska -Below Gage	0
	SW Diversions - Irrigation - Small Pumps -Nebraska - Below Gage	229
	SW Diversions - M&I - Nebraska - Below Gage	0

Calendar Year		2020
<b>SW Pumping Data</b>		
Beaver Subbasin	SW Diversions - Irrigation -Non-Federal Canals- Colorado	0
	SW Diversions - Irrigation - Small Pumps - Colorado	0
	SW Diversions - M&I - Colorado	0
	SW Diversions - Irrigation - Non-Federal Canals- Kansas	0
	SW Diversions - Irrigation - Small Pumps - Kansas	23
	SW Diversions - M&I - Kansas	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska - Above Gage	0
	SW Diversions - Irrigation - Small Pumps - Nebraska - Above Gage	0
	SW Diversions - M&I - Nebraska - Above Gage	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska -Below Gage	0
	SW Diversions - Irrigation - Small Pumps -Nebraska - Below Gage	0
SW Diversions - M&I - Nebraska - Below Gage	0	
Sappa Subbasin	SW Diversions - Irrigation - Non-Federal Canals- Kansas	0
	SW Diversions - Irrigation - Small Pumps - Kansas	0
	SW Diversions - M&I - Kansas	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska - Above Gage	0
	SW Diversions - Irrigation - Small Pumps - Nebraska - Above Gage	0
	SW Diversions - M&I - Nebraska - Above Gage	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska -Below Gage	0
	SW Diversions - Irrigation - Small Pumps -Nebraska - Below Gage	0
SW Diversions - M&I - Nebraska - Below Gage	0	
Prairie Dog Subbasin	SW Diversions - Irrigation - Non-Federal Canals- Kansas	0
	SW Diversions - Irrigation - Small Pumps - Kansas	1,392
	SW Diversions - M&I - Kansas	361
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska -Below Gage	0
	SW Diversions - Irrigation - Small Pumps -Nebraska - Below Gage	172
SW Diversions - M&I - Nebraska - Below Gage	0	
Mainstem Subbasin	SW Diversions - Irrigation - Non-Federal Canals- Kansas	0
	SW Diversions - Irrigation - Small Pumps - Kansas	753
	SW Diversions - M&I - Kansas	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska	1,752
	SW Diversions - Irrigation - Small Pumps - Nebraska	1,453
	SW Diversions - M&I - Nebraska	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska Below Guide Rock	0
	SW Diversions - Irrigation - Small Pumps - Nebraska Below Guide Rock	552
SW Diversions - M&I - Nebraska - Below Guide Rock	0	
<b>Non-Federal SW Consumptive Use</b>		
	% Non-Federal Canal Diversion Consumed	60%
	% Small Surface Water Pumps Consumed	75%
	% Municipal And Industrial SW Consumed	50%

Calendar Year		2020
<b>Non-Federal Reservoir Evaporation Data</b>		
North Fork Subbasin	Non-Federal Reservoir Evaporation - Colorado	40
Arikaree Subbasin	Non-Federal Reservoir Evaporation - Colorado	0
	Non-Federal Reservoir Evaporation - Kansas	19
	Non-Federal Reservoir Evaporation - Nebraska	0
Buffalo Subbasin	Non-Federal Reservoir Evaporation - Colorado	0
	Non-Federal Reservoir Evaporation - Nebraska	13
Rock Subbasin	Non-Federal Reservoir Evaporation - Nebraska	152
South Fork Subbasin	Non-Federal Reservoir Evaporation - Colorado	0
	Non-Federal Reservoir Evaporation - Kansas	165
	Non-Federal Reservoir Evaporation - Nebraska	0
Frenchman Subbasin	Non-Federal Reservoir Evaporation - Nebraska	124
Driftwood Subbasin	Non-Federal Reservoir Evaporation - Kansas	17
	Non-Federal Reservoir Evaporation - Nebraska	0
Red Willow Subbasin	Non-Federal Reservoir Evaporation - Nebraska	258
Medicine Creek Subbasin	Non-Federal Reservoir Evaporation - Nebraska - Above Gage	304
	Non-Federal Reservoir Evaporation - Nebraska - Below Gage	3
Beaver Subbasin	Non-Federal Reservoir Evaporation - Colorado	0
	Non-Federal Reservoir Evaporation - Kansas	391
	Non-Federal Reservoir Evaporation - Nebraska - Above Gage	169
	Non-Federal Reservoir Evaporation - Nebraska - Below Gage	0
Sappa Subbasin	Non-Federal Reservoir Evaporation - Kansas	420
	Non-Federal Reservoir Evaporation - Nebraska - Above Gage	79
	Non-Federal Reservoir Evaporation - Nebraska - Below Gage	5
Prairie Dog Subbasin	Non-Federal Reservoir Evaporation - Kansas	333
	Non-Federal Reservoir Evaporation - Nebraska	26
Mainstem Subbasin	Non-Federal Reservoir Evaporation - Kansas	119
	Non-Federal Reservoir Evaporation - Nebraska - Above Guide Rock Gage - Whole Basin Value:	1,478
	Non-Federal Reservoir Evaporation - Nebraska - Below Guide Rock Gage - Whole Basin Value:	84

<b>Stream Gage Data</b>		
North Fork Subbasin	North Fork Republican River At Colorado-Nebraska State Line	22,984
Arikaree Subbasin	Arikaree River At Haigler	1,657
Buffalo Subbasin	Buffalo Creek Near Haigler	2,143
Rock Subbasin	Rock Creek At Parks	4,049
South Fork Subbasin	South Fork Republican River Near Benkelman	7,229
Frenchman Subbasin	Frenchman Creek At Culbertson	19,122
Driftwood Subbasin	Driftwood Creek Near McCook	2,492
Red Willow Subbasin	Red Willow Creek Near Red Willow	4,284
Medicine Creek Subbasin	Medicine Creek Below Harry Strunk	39,930
Beaver Subbasin	Beaver Creek Near Beaver City	788
Sappa Subbasin	Sappa Creek Near Stamford	16,223
Prairie Dog Subbasin	Prairie Dog Creek Near Woodruff	8,282
Mainstem Subbasin	Republican River At Guide Rock	202,416
	Republican River Near Hardy	251,239

<b>Hardy Gage Data</b>		
USGS Gage 06853500 Republican River Near Hardy, NE		
Mainstem Subbasin	January	55,339
	February	33,332
	March	33,775
	April	23,421
	May	31,732
	June	10,810
	July	30,811
	August	8,337
	September	3,488
	October	4,298
	November	7,632
	December	8,265
		ANNUAL



# Accounting Tables

**Table 1: Annual Virgin and Computed Water Supply, Allocations, and Computed Beneficial Consumptive Uses by State, Main Stem, and Sub-Basin**

2020 Basin	Virgin Water Supply	Computed Water Supply	Allocations				Computed Beneficial Consumptive Use		
			Colorado	Kansas	Nebraska	Unallocated	Colorado	Kansas	Nebraska
North Fork	40,930	40,930	9,170	0	10,070	21,690	17,630	0	4,420
Arikaree	3,480	3,480	2,730	180	580	(10)	1,650	100	70
Buffalo	6,290	6,290	0	0	2,080	4,210	480	0	3,670
Rock	9,480	9,480	0	0	3,790	5,690	90	0	5,340
South Fork	22,640	22,640	10,050	9,100	320	3,170	11,040	3,650	720
Frenchman	102,180	103,330	0	0	55,380	47,950	1,140	0	82,130
Driftwood	450	450	0	30	70	350	0	20	810
Red Willow	16,970	21,160	0	0	4,060	17,100	0	0	9,490
Medicine	42,950	52,480	0	0	4,780	47,700	0	0	20,390
Beaver	11,260	11,260	2,250	4,370	4,570	70	0	6,430	4,040
Sappa	19,630	19,630	0	8,070	8,070	3,490	0	2,490	1,740
Prairie Dog	14,660	19,290	0	8,820	1,470	9,000	0	11,010	160
Main Stem	213,600	264,600	0	135,210	129,390	0	(5,120)	30,110	119,420
Total All Basins	504,520	575,020	24,200	165,780	224,630	160,410	26,910	53,810	252,400
Main Stem Including Unallocated		425,010	0	217,180	207,830				
Total	504,520	575,020	24,200	247,750	303,070	0	26,910	53,810	252,400

**Table 2: Original Compact Virgin Water Supply and Allocations**

Basin	Virgin Water Supply	Colorado Allocation	% of Basin Supply	Kansas Allocation	% of Basin Supply	Nebraska Allocation	% of Basin Supply	Unallocated	% of Basin Supply
North Fork	44,700	10,000	22.4%			11,000	24.6%	23,700	53.0%
Arikaree	19,610	15,400	78.5%	1,000	5.1%	3,300	16.8%	(90)	-0.4%
Buffalo	7,890					2,600	33.0%	5,290	67.0%
Rock	11,000					4,400	40.0%	6,600	60.0%
South Fork	57,200	25,400	44.4%	23,000	40.2%	800	1.4%	8,000	14.0%
Frenchman	98,500					52,800	53.6%	45,700	46.4%
Driftwood	7,300			500	6.9%	1,200	16.4%	5,600	76.7%
Red Willow	21,900					4,200	19.2%	17,700	80.8%
Medicine	50,800					4,600	9.1%	46,200	90.9%
Beaver	16,500	3,300	20.0%	6,400	38.8%	6,700	40.6%	100	0.6%
Sappa	21,400			8,800	41.1%	8,800	41.1%	3,800	17.8%
Prairie Dog	27,600			12,600	45.7%	2,100	7.6%	12,900	46.7%
Tributaries Sub-Total	384,000							175,500	
Main Stem	94,500								
Main Stem + Unallocated	270,000			138,000	51.1%	132,000	48.9%		
Total	478,900	54,100		190,300		234,500			

**Table 3A: Table to Be Used to Calculate Colorado's Five-Year Running Average Allocation and Computed Beneficial**

	Col. 1	Col. 2	Col. 3	Col. 4
Year	Allocation	Computed Beneficial Consumptive	Imported Water Supply Credit and CORWS	Difference between Allocation and the Computed Beneficial Consumptive Use offset by Imported Water Supply Credit and CORWS Credit Col 1 – (Col 2- Col 3)
2016	25,190	33,930	10,130	1,390
2017	22,960	31,810	11,330	2,480
2018	25,630	35,130	13,578	4,078
2019	22,710	32,740	8,905	(1,125)
2020	24,200	26,910	6,218	3,508
Avg 2016-2020	24,140	32,100	10,030	2,070

**Table 3B: Table to Be Used to Calculate Kansas's Five-Year Running Average Allocation and Computed Beneficial**

	Col. 1	Col. 2	Col. 3	Col. 4
Year	Allocation	Computed Beneficial Consumptive	Imported Water Supply Credit	Difference between Allocation and the Computed Beneficial Consumptive Use offset by Imported Water Supply Credit Col 1 – (Col 2- Col 3)
2016	156,760	51,320	NA	105,440
2017	177,230	62,040	NA	115,190
2018	179,780	51,450	NA	128,330
2019	333,300	47,910	NA	285,390
2020	247,750	53,810	NA	193,940
Avg 2016-2020	218,960	53,310	NA	165,660

**Table 3C: Table to Be Used to Calculate Nebraska's Five-Year Running Average Allocation and Computed Beneficial**

	Col. 1	Col. 2	Col. 3	Col. 4
Year	Allocation	Computed Beneficial Consumptive	Imported Water Supply Credit and NERWS	Difference between Allocation and the Computed Beneficial Consumptive Use offset by Imported Water Supply Credit and NERWS Credit Col 1 – (Col 2- Col 3)
2016	217,880	256,120	61,816	23,576
2017	238,540	242,140	39,439	35,839
2018	241,680	266,080	25,943	1,543
2019	389,300	262,870	26,541	152,971
2020	303,070	252,400	18,995	69,665
Avg 2016-2020	278,090	255,920	34,550	56,720

**Table 4A: Colorado Compliance with the Sub-basin Non-impairment Requirement**

Table 4A is left unpopulated pursuant to the August 24, 2016 “RESOLUTION BY THE REPUBLICAN RIVER COMPACT ADMINISTRATION APPROVING OPERATION AND ACCOUNTING FOR THE COLORADO COMPACT COMPLIANCE PIPELINE AND COLORADO’S COMPLIANCE EFFORTS IN THE SOUTH FORK REPUBLICAN RIVER BASIN”, paragraph E.

**2020**

	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6
Sub-basin	Colorado Sub-basin Allocation (Five-year Running Average)	Unallocated Supply (Five-year Running Average)	Credits from Imported Water Supply and CORWS Credit (Five-year Running Average)	Total Available Supply (Five-year Running Average)	Colorado Computed Beneficial Consumptive Use (Five-year Running Average)	Difference Between Available Supply and Computed Beneficial Consumptive Use (Five-year Running Average)
North Fork						
Arikaree						
South Fork						
Beaver						

**Table 4B: Kansas's Sub-Basin Non-impairment Compliance****2020**

	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7
Sub-basin	Kansas Sub-basin Allocation (Five-year Running Average)	Unallocated Supply (Five-year Running Average)	Unused Allocation from Colorado (Five Year Running Average)	Credits from Imported Water Supply (Five-year Running Average)	Total Available Supply Col 1 + Col 2 + Col 3 + Col 4 (Five-year Running Average)	Kansas Computed Beneficial Consumptive Use (Five-year Running Average)	Difference Between Available Supply and Computed Beneficial Consumptive Use Col 5 - Col 6 (Five-year Running Average)
Arikaree	172	(10)	446	N/A	608	156	452
South Fork	9,130	3,180	0	N/A	12,310	4,886	7,424
Driftwood	90	1,002	0	N/A	1,092	12	1,080
Beaver	4,682	70	2,414	N/A	7,166	6,658	508
Sappa	7,164	3,094	0	N/A	10,258	2,598	7,660
Prairie Dog	7,960	8,130	0	N/A	16,090	10,772	5,318

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

	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7
Year	Is the year Water Short Pursuant to III.J?* (Yes or No)	Statewide Allocation	Beaver Creek Reduction Pursuant to Table 5F	Allocation - Beaver Creek Reduction (Col. 2 - Col.3)	Computed Beneficial Consumptive (excluding the Beaver Creek Sub-basin)	Imported Water Supply Credit - IWS Beaver Creek + CORWS Credit	Difference between Allocation and the Computed Beneficial Consumptive Use offset by Imported Water Supply Credit and CORWS Credit (Col. 4 - Col. 5 + Col. 6)
2016	Yes	25,190	1,650	23,540	33,930	10,130	(260)
2017	Yes	22,960	0	22,960	31,810	11,330	2,480
2018	No	25,630	1,852	23,778	35,130	13,578	2,226
2019	Yes	22,710	0	22,710	32,740	8,905	(1,125)
2020	No	24,200	0	24,200	26,910	6,218	3,508
Avg 2016-2020	Yes	24,140	700	23,440	32,100	10,030	1,370

**Table 5F: Colorado's Beaver Creek Reduction During Water-Short Years**

Water Short Year (WSY) Pursuant to III.J	Beaver Creek Allocation	Reduction = Average of last five WSY Beaver Creek Allocations
	Col. 1	Col. 2
2002	770	N/A
2003	260	N/A
2004	360	N/A
2005	910	N/A
2006	1,420	N/A
2007	2,320	744
2013	1,130	1,054
2014	1,250	1,228
2015	2,130	1,406
2016	2,430	1,650
2018	2,430	1,852

**Table 5B: Kansas's Compliance During Water-Short Year Administration  
Kansas**

Year	Allocation				Computed Beneficial Consumptive Use	Imported Water Supply Credit	Difference Between Allocation and the Computed Beneficial Consumptive Use offset by Imported Water Supply Credit
Column	1	2	3	4	5	6	7
	Sum Sub-basins	Kansas' Share of Unallocated Supply	Kansas' Share of the Unused Colorado Allocation	Total Col 1 + Col 2 + Col 3			Col 4 - (Col 5 - Col 6)
2019	38,550	11,615	1,579	51,744	26,350	N/A	25,394
2020	30,570	8,212	1,702	40,483	23,700	N/A	16,783
Avg 2019-2020	34,560	9,913	1,640	46,114	25,025	N/A	21,089

**Table 5E: Nebraska's Tributary Compliance During Water-Short Year Administration**

Year	Allocation			Computed Beneficial Consumptive Use	Imported Water Supply Credit and AWS	Allocation - (CBCU - IWS-AWS)
	Sub-Basin Total	Share of Unallocated Supply	Total			
2018	97,670	71,863	169,533	137,900	11,446	43,079
2019	107,230	86,685	193,915	137,820	11,441	67,536
2020	95,240	78,440	173,680	132,980	10,716	51,416
Avg 2019-2020	101,235	82,563	183,798	135,400	11,079	59,476

**Table 5C: Nebraska's Compliance During Water-Short Year Administration**

Year	Allocation				Computed Beneficial Consumptive Use			Imported Water Supply Credit and NERWS Credit	Difference Between Allocation and Computed Beneficial Consumptive Use offset by Imported Water Supply Credit Above Guide Rock and NERWS Credit
Column	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9
	State-Wide Allocation	Allocation Below Guide Rock	Allocation Above Guide Rock	Nebraska's Share of Unused Colorado Allocation	State-Wide CBCU	CBCU Below Guide Rock	CBCU Above Guide Rock	Credits Above Guide Rock	Col 3 + Col 4 - (Col 7 - Col 8)
2019	389,300	56,294	333,006	1,511	262,870	1,780	261,090	26,541	99,968
2020	303,070	17,777	285,293	1,628	252,400	2,266	250,134	18,995	55,783
Avg 2019-2020	346,190	37,040	309,150	1,570	257,640	2,020	255,610	22,770	77,880

**Table 5D: Nebraska's Compliance Under a Alternative Water-Short Year Administration Plan**

Year	Allocation				Computed Beneficial Consumptive Use			Imported Water	Difference Between
Column	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9
	State-Wide Allocation	Allocation Below Guide Rock	Allocation Above Guide Rock	Share of Unused Colorado	State-Wide CBCU	CBCU Below Guide Rock	CBCU Above Guide Rock	Credits Above Guide Rock	Col 3 + Col 4 - (Col 7 - Col 8)
2018	241,680	19,786	221,894	1,340	266,080	3,314	262,766	25,943	(13,590)
2019	389,300	56,294	333,006	1,511	262,870	1,780	261,090	26,541	99,968
2020	303,070	17,777	285,293	1,628	252,400	2,266	250,134	18,995	55,783
Avg 2018-2020	311,350	31,290	280,060	1,490	260,450	2,450	258,000	23,830	47,390

# Attachments

## Attachment 1: Sub-basin Flood Flow Thresholds

Sub-basin	Sub-basin Flood Flow Threshold Acre-feet per Year <sup>3</sup>
Arikaree River	16,400
North Fork of Republican River	33,900
Buffalo Creek	9,800
Rock Creek	9,800
South Fork of Republican River	30,400
Frenchman Creek	51,900
Driftwood Creek	9,400
Red Willow Creek	15,100
Medicine Creek	55,100
Beaver Creek	13,900
Sappa Creek	26,900
Prairie Dog	15,700

<sup>3</sup> Flows considered to be Flood Flows are flows in excess of the 94% flow based on a flood frequency analysis for the years 1971-2000. The Gaged Flows are measured after depletions by Beneficial Consumptive Use and change in reservoir storage.

Attachment 6: Computing Water Supplies and Consumptive Use Above Guide Rock

Note: At its Annual Meeting on August 21, 2020, the RRCA agreed that the Accounting Procedures (Rev. May 25, 2017) do not properly implement the Flood Flows provisions at the Hardy gage with respect to the calculation of Computed Water Supply above and below Guide Rock. The current implementation could impact Nebraska's Table 5C compliance test, specifically the Allocation above Guide Rock. Nebraska and Kansas each offered proposals to resolve the issue but could not reach agreement on a solution. Due to the infrequent occurrence of Flood Flows, the RRCA deferred resolution of the matter to a future date necessitated by and preceding impact to Nebraska's Table 5C compliance. The states wish to acknowledge and memorialize the issue to encourage work towards its resolution. As it stands, Attachment 6 calculates Virgin Water Supply Guide Rock to Hardy rather than Computed Water Supply Guide Rock to Hardy which would reduce Virgin Water Supply by the relevant Flood Flows as described in Section II. Definitions and Section III. Basic Formulas.

Year	Total Mainstem CWS	Hardy Gage	Superior Courtland Diversion Dam	Courtland Canal Diversions	Superior Canal Diversion	Courtland Canal Returns	Superior Canal Returns	Total Bostwick Returns Below Guide Rock	NE CBCU Below Guide Rock	KS CBCU Below Ruide Rock	Total CBCU Below Guide Rock	Gain Guide Rock to Hardy	VWS Guide Rock to Hardy	Mainstem VWS Above Guide Rock	NE MS Allocation Above Guide Rock	KS MS Allocation Above Guide Rock	Nebraska Guide Rock to Hardy Allocation	Kansas Guide Rock to Hardy Allocation
2020	264,600	251,239	202,416	55,120	10,070	7,327	8,024	15,352	2,266	616	2,882	33,471	36,353	228,247	111,613	116,634	17,777	18,577

COURTLAND CANAL	
	2020
Return Flow From Courtland Canal To Republican River Above Lovewell From Kansas	536
Return Flow From Courtland Canal To Republican River Above Hardy From Nebraska	6,791
Courtland Canal Diversions At Headgate	44,380
Courtland Canal At Kansas-Nebraska State Line	35,756
NE Courtland Canal CBCU (includes transportation loss)	342
Superior Canal CBCU	2,046

NEBRASKA	
	2020
SW Diversions - Irrigation - Small Pumps - Nebraska Below Guide Rock	552
SW Diversions - M&I - Nebraska - Below Guide Rock	0
SW Non-Federal Reservoir Evaporation - Below Guide Rock	84
SW Return - Irrigation	138
SW Return - M&I	0
GW CBCU Nebraska Below Guide Rock	1,769

KANSAS	
	2020
SW CBCU - Irrigation - Small Pumps	565
SW CBCU - M&I	0
GW CBCU Kansas Below Guide Rock	51

2020

**Attachment 7: Calculations of Return Flows from Bureau of Reclamation Canals**

Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	Col 10	Col 11	Col 12
Canal	Canal Diversion	Spill to Waste-Way	Net Diversion	Field Deliveries	Canal Loss	Average Field Loss Factor	Field Loss	Total Loss from District	Percent Field and Canal Loss That Returns to the Stream	Total return to Stream from Canal and Field Loss	Return as Percent of Canal Diversion
Name Canal	Headgate Diversion	Sum of measured spills to river	Col 2 - Col 3	Sum of Deliveries to the field	Col 4 - Col 5	1 -Weighted Average Efficiency of Application System for the District*	Col 5 x Col 7	Col 6 + Col 8	Estimated Percent Loss*	Col 9 x Col 10 + Col 3	Col 11/Col 2
Σ Irrigation Season											
Σ Non- Irrigation Season											
Culbertson	5,380	89	5,291	257	5,034	30%	77	5,111	82%	4,280	80%
	1,342	0	1,342	0	1,342	30%	0	1,342	92%	1,235	92.0%
Culbertson Extension	0	0	0	0	0	30%	0	0	82%	0	100%
	0	0	0	0	0	30%	0	0	92%	0	100.0%
Meeker - Driftwood	19,398	1,817	17,581	7,463	10,118	30%	2,239	12,357	82%	11,950	61.6%
	0	0	0	0	0	30%	0	0	92%	0	100.0%
Red Willow	5,226	0	5,226	1,423	3,803	30%	427	4,230	82%	3,469	66.4%
	0	0	0	0	0	30%	0	0	92%	0	100.0%
Bartley	7,388	1,397	5,991	2,487	3,504	30%	746	4,250	82%	4,882	66.1%
	0	0	0	0	0	30%	0	0	92%	0	100.0%
Cambridge	26,599	1,175	25,424	11,107	14,317	30%	3,332	17,649	82%	15,647	58.8%
	115	18	97	0	97	30%	0	97	92%	107	93.3%
Naponee	1,593	342	1,251	356	895	35%	125	1,020	82%	1,178	74.0%
	0	0	0	0	0	35%	0	0	92%	0	100.0%
Franklin	22,053	3,211	18,842	5,770	13,072	35%	2,020	15,092	82%	15,586	70.7%
	0	0	0	0	0	35%	0	0	92%	0	100.0%
Franklin Pump	1,190	111	1,079	452	627	35%	158	785	82%	755	63.4%
	0	0	0	0	0	35%	0	0	92%	0	100.0%
Almena	3,076	0	3,076	1,109	1,967	30%	333	2,300	82%	1,886	61.3%
Superior	10,070	3,691	6,379	1,586	4,793	31%	492	5,285	82%	8,024	79.7%
	0	0	0	0	0	31%	0	0	92%	0	100.0%
Nebraska Courtland	499	0	499	400	99	23%	92	191	82%	157	31.4%
Courtland Canal Above Lovewell (KS)	18,181	1,532	16,649	6,568	10,081	23%	1,511	11,592	82%	11,037	60.7%
Courtland Canal Below Lovewell	24,486	2,899	21,587	12,764	8,823	23%	2,936	11,759	82%	12,541	51.2%

\* 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.

Attachment 8: Calculation of the Computed Water Supply Adjustment and Remaining Compact Compliance Volume for Implementation of 2016 RRCA Resolution

CCV and RCCV Tracking <sup>a</sup>												
	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12
Year	Start of Year RCCV	RCCV Adjustment	CCV	CCV Inflow Into HCL	RCCV Inflow Into HCL	Total CCV and RCCV Inflow Into HCL	Total CCV and RCCV Available for Release	CCV Released from HCL as Flow	CCV Released from HCL as Evaporation	CCV Retained in HCL (at End of Year)	CWSA	End of Year RCCV
	=Col 12 of previous year	b	c			= Col. 4 + Col. 5	=Col. 6 + Col. 10 of previous year			= Col. 7 – (Col. 8 + Col. 9)	=Col. 10 – Col. 10 of previous year	= Col. 1 – Col. 2 + Col. 3 - Col. 6 <sup>d</sup>
2007	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	0	8,332	0	8,332	8,332	0	0	8,332	8,332	0
2016	0	0	41,935	24,752	0	24,752	33,084	5,084	4,321	23,679	15,347	9,300
2017	9,300	0	20,000	20,000	0	20,000	43,679	20,000	2,241	21,438	-2,241	9,300
2018	9,300	0	0	0	0	0	21,438	0	1,339	20,099	-1,339	9,300
2019	9,300	0	0	0	0	0	20,099	0	2,340	17,759	-2,340	9,300
2020	9,300	1,860	0	0	0	0	17,759	0	3,889	13,870	-3,889	7,440

APV and RWS					RCCV Calc
Colorado		Nebraska			
Aug. Pumping Volume (APV)	Resolution Water Supply Credit (CORWS)	Aug. Pumping Volume (APV) Rock Creek That Passed Sub-basin Gage in the Current Year	Aug. Pumping Volume (APV) N-CORPE That Passed Sub-basin Gage in the Current Year	Resolution Water Supply Credit (NERWS)	Extra CCV Efforts Above CCV (Use with RCCV Calc)
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	15,766	0	15,766	0
7,448	7,448	19,397	42,758	62,155	0
10,760	10,760	1,098	25,932	18,698	8332
10,130	10,130	499	22,803	41,935	449
11,330	11,330	4,563	11,106	20,000	0
13,578	13,578	0	0	0	0
8,905	8,905	0	0	0	0
6,218	6,218	0	0	0	0

- a. Calculations for RCCV, CWSA, & RWS don't start until Oct. 1, 2015
- b. See Provision 10 of the RRCA Resolution signed August 24, 2016, titled "Resolution Approving Long-Term Agreement Related to the Operation of Harlan County Lake for Compact Call Years" for the terms of assigning RCCV Adjustment. The RCCV Adjustment for each year is equal to 20% of the unadjusted portion of the RCCV, if it is a non-Compact Call Year, plus any remaining volumetric reductions from the previous four years.
- c. In years when the contributions from Nebraska's water management activities, consistent with the 2016 CCY HCL Operations Resolution, are greater than CCV and the NERWS is equal to the greater contribution volume, CCV in Column 3 should also be set equal to the contribution.
- d. The formula for calculation of RCCV is based on calendar year operations and will vary when operations occur in a different calendar year than NERWS Credit is applied.

Flood Flow Calculations Based on Accounting Procedures III.B.1 and Attachment 1.

Hardy Gage Monthly Data (acre-feet)					
	2016	2017	2018	2019	2020
January	5,429	11,315	4,619	13,289	55,339
February	6,532	6,369	5,521	6,875	33,332
March	6,415	6,420	7,386	61,131	33,775
April	6,625	6,933	3,658	21,669	23,421
May	13,501	33,286	2,309	66,000	31,732
June	5,901	11,956	7,601	69,761	10,810
July	4,844	24,712	3,805	118,015	30,811
August	6,153	5,874	5,065	82,834	8,337
September	9,868	3,532	23,848	30,188	3,488
October	5,278	8,752	17,603	21,527	4,298
November	5,286	2,399	9,231	59,330	7,632
December	4,685	5,575	20,216	75,757	8,265
ANNUAL	80,515	127,122	110,862	626,376	251,239
Over 400K	0	0	0	226,376	0

Sub-basin Flows Above Attachment 1 Flood Flow Thresholds					
	2016	2017	2018	2019	2020
North Fork	0	0	0	0	0
Arikaree	0	0	0	0	0
Buffalo	0	0	0	0	0
Rock	0	0	0	0	0
South Fork	0	0	0	0	0
Frenchman	0	0	0	0	0
Driftwood	0	0	0	0	0
Red Willow	0	0	0	0	0
Medicine Creek	0	0	0	0	0
Beaver	0	0	0	0	0
Sappa	0	0	0	15,988	0
Prairie Dog	0	0	0	25,260	0
Sub-basin Sum	0	0	0	41,248	0

5-month Consecutive Period Flows (acre-feet)					
	2016	2017	2018	2019	2020
Jan-May	38,501	64,322	23,494	168,964	177,598
Feb-Jun	38,973	64,964	26,475	225,436	133,069
Mar-Jul	37,285	83,307	24,760	336,576	130,548
Apr-Aug	37,023	82,760	22,438	358,279	105,110
May-Sep	40,266	79,359	42,628	366,798	85,177
Jun-Oct	32,043	54,825	57,922	322,325	57,743
Jul-Nov	31,428	45,268	59,552	311,894	54,566
Aug-Dec	31,269	26,132	75,962	269,636	32,020

5-month Consecutive Period Test					
	2016	2017	2018	2019	2020
Jan-May	0	0	0	0	0
Feb-Jun	0	0	0	0	0
Mar-Jul	0	0	0	1	0
Apr-Aug	0	0	0	1	0
May-Sep	0	0	0	1	0
Jun-Oct	0	0	0	0	0
Jul-Nov	0	0	0	0	0
Aug-Dec	0	0	0	0	0
TOTAL	0	0	0	3	0

2-month Consecutive Period Flows (acre-feet)					
	2016	2017	2018	2019	2020
Jan-Feb	11,960	17,683	10,140	20,164	88,671
Feb-Mar	12,946	12,789	12,907	68,006	67,107
Mar-Apr	13,039	13,353	11,045	82,800	57,195
Apr-May	20,126	40,219	5,967	87,669	55,152
May-Jun	19,402	45,242	9,910	135,761	42,541
Jun-Jul	10,744	36,668	11,406	187,776	41,621
Jul-Aug	10,996	30,586	8,870	200,849	39,148
Aug-Sep	16,020	9,406	28,912	113,022	11,825
Sep-Oct	15,146	12,283	41,451	51,715	7,786
Oct-Nov	10,564	11,151	26,834	80,857	11,930
Nov-Dec	9,971	7,974	29,447	135,087	15,898

2-month Consecutive Period Test					
	2016	2017	2018	2019	2020
Jan-Feb	0	0	0	0	0
Feb-Mar	0	0	0	0	0
Mar-Apr	0	0	0	0	0
Apr-May	0	0	0	0	0
May-Jun	0	0	0	0	0
Jun-Jul	0	0	0	0	0
Jul-Aug	0	0	0	1	0
Aug-Sep	0	0	0	0	0
Sep-Oct	0	0	0	0	0
Oct-Nov	0	0	0	0	0
Nov-Dec	0	0	0	0	0
TOTAL	0	0	0	1	0

Final Sub-basin Flood Flows					
	2016	2017	2018	2019	2020
North Fork Flood Flow	0	0	0	0	0
Arikaree Flood Flow	0	0	0	0	0
Buffalo Flood Flow	0	0	0	0	0
Rock Flood Flow	0	0	0	0	0
Southfork Flood Flow	0	0	0	0	0
Frenchman Flood Flow	0	0	0	0	0
Driftwood Flood Flow	0	0	0	0	0
Red Willow Flood Flow	0	0	0	0	0
Medicine Creek Flood Flow	0	0	0	0	0
Beaver Flood Flow	0	0	0	0	0
Sappa Flood Flow	0	0	0	15,988	0
Prairie Dog Flood Flow	0	0	0	25,260	0
Mainstem Flood Flow	0	0	0	185,128	0

Combined Test					
	2016	2017	2018	2019	2020
FINAL TOTAL	0	0	0	4	0

**Draft Edit to Accounting Procedures  
Proposed by Nebraska on 03/01/2021**

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# Republican River Compact Administration

## ACCOUNTING PROCEDURES AND REPORTING REQUIREMENTS

Revised August 21, 2020

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154 **I. Introduction**

155  
156 This document describes the definitions, procedures, basic formulas, specific formulas, and data  
157 requirements and reporting formats to be used by the RRCA to compute the Virgin Water Supply,  
158 Computed Water Supply, Allocations, Imported Water Supply Credit, Resolution Water Supply  
159 Credits, and Computed Beneficial Consumptive Use. These computations shall be used to  
160 determine supply, allocations, use and compliance with the Compact according to the Stipulation  
161 and the attached RRCA Resolutions. These definitions, procedures, basic and specific formulas,  
162 data requirements and attachments may be changed by consent of the RRCA consistent with  
163 Subsection I.F of the Stipulation. This document will be referred to as the RRCA Accounting  
164 Procedures. Attached to these RRCA Accounting Procedures as Figure 1 is the map attached to  
165 the Compact that shows the Basin, its streams and the Basin boundaries.  
166

167  
168 **II. Definitions**

169  
170 The following words and phrases as used in these RRCA Accounting Procedures are defined as  
171 follows:  
172

173 **2016 Colorado CCP/SF Resolution:** “Resolution Approving Operation and Accounting for the  
174 Colorado Compact Compliance Pipeline and Colorado’s Compliance Efforts in the South Fork  
175 Republican River Basin”, adopted by the RRCA on August 24, 2016;  
176

177 **2016 CCY HCL Operations Resolution:** “Resolution Approving Long-Term Agreements  
178 Related to the Operation of Harlan County Lake for Compact Call Years”, adopted by the RRCA  
179 on August 24, 2016;  
180

181 **Additional Water Administration Year:** a year when the projected or actual irrigation water  
182 supply is less than 130,000 Acre-feet of storage available for use from Harlan County Lake as  
183 determined by the Bureau of Reclamation using the methodology described in the Harlan County  
184 Lake Operation Consensus Plan attached as Appendix K to the Stipulation;  
185

186 **Allocation(s):** the water supply allocated to each State from the Computed Water Supply;  
187

188 **Annual:** yearly from January 1 through December 31;  
189

190 **Augmentation Pumping Volume:** The measured outflow from an augmentation project;  
191

192 **Basin:** the Republican River Basin as defined in Article II of the Compact;  
193

194 **Beaver Creek Reduction:** the Water Short Year reduction to Colorado’s statewide allocation. The  
195 procedure to determine the Beaver Creek Reduction is set forth in III.E;  
196

197

198 **Beneficial Consumptive Use:** that use by which the Water Supply of the Basin is consumed  
199 through the activities of man, and shall include water consumed by evaporation from any  
200 reservoir, canal, ditch, or irrigated area;

201  
202 **Change in Federal Reservoir Storage:** the difference between the amount of water in storage in  
203 the reservoir on December 31 of each year and the amount of water in storage on December 31 of  
204 the previous year. The current area capacity table supplied by the appropriate federal operating  
205 agency shall be used to determine the contents of the reservoir on each date;

206  
207 **Colorado Resolution Water Supply Credit (CORWS Credit):** The credit provided for  
208 Colorado's Compact compliance activities through augmentation pumping in conformance with the  
209 2016 Colorado CCP/SF Resolution;

210  
211 **Compact:** the Republican River Compact, Act of February 22, 1943, 1943 Kan. Sess. Laws 612,  
212 codified at Kan. Stat. Ann. § 82a-518 (1997); Act of February 24, 1943, 1943 Neb. Laws 377,  
213 codified at 2A Neb. Rev. Stat. App. § 1-106 (1995), Act of March 15, 1943, 1943 Colo. Sess.  
214 Laws 362, codified at Colo. Rev. Stat. §§ 37-67-101 and 37-67-102 (2001); Republican River  
215 Compact, Act of May 26, 1943, ch. 104, 57 Stat. 86;

216  
217 **Compact Compliance Volume (CCV):** a volume of water, as defined under the 2016 CCY HCL  
218 Operations Resolution;

219  
220 **Computed Beneficial Consumptive Use:** for purposes of Compact accounting, the stream flow  
221 depletion resulting from the following activities of man:

- 222  
223       Irrigation of lands in excess of two acres;  
224       Any non-irrigation diversion of more than 50 Acre-feet per year;  
225       Multiple diversions of 50 Acre-feet or less that are connected or otherwise combined to  
226       serve a single project will be considered as a single diversion for accounting purposes if  
227       they total more than 50 Acre-feet;  
228       Net evaporation from Federal Reservoirs;  
229       Net evaporation from Non-federal Reservoirs within the surface boundaries of the Basin;  
230       Any other activities that may be included by amendment of these formulas by the RRCA;

231  
232 **Computed Water Supply:** the Virgin Water Supply less the Change in Federal Reservoir Storage  
233 in any Designated Drainage Basin, plus the Computed Water Supply Adjustment (for the  
234 Main Stem only), and less the Flood Flows;

235  
236 **Computed Water Supply Adjustment:** an adjustment made to the Computed Water Supply of  
237 the Main Stem reflecting water contributed to the Kansas Account that is not beneficially  
238 consumed in the year it is provided, consistent with the terms of the 2016 CCY HCL Operations  
239 Resolution;

240  
241

242 **Designated Drainage Basins:** the drainage basins of the specific tributaries and the Main Stem of  
243 the Republican River as described in Article III of the Compact. Attached hereto as Figure 3 is a  
244 map of the Sub-basins and Main Stem;

245  
246 **Dewatering Well:** a Well constructed solely for the purpose of lowering the groundwater  
247 elevation;

248

249 **Federal Reservoirs:**

250

251 Bonny Reservoir

252 Swanson Lake

253 Enders Reservoir

254 Hugh Butler Lake

255 Harry Strunk Lake

256 Keith Sebelius Lake

257 Harlan County Lake

258 Lovewell Reservoir

259

260 **Flood Flows:** the amount of water deducted from the Virgin Water Supply as part of the  
261 computation of the Computed Water Supply due to a flood event as determined by the  
262 methodology described in Subsection III.B.1.;

263

264 **Gaged Flow:** the measured flow at the designated stream gage;

265

266 **Guide Rock:** a point at the Superior-Courtland Diversion Dam on the Republican River near  
267 Guide Rock, Nebraska; the Superior-Courtland Diversion Dam gage plus any flows through the  
268 sluice gates of the dam, specifically excluding any diversions to the Superior and Courtland  
269 Canals, shall be the measure of flows at Guide Rock;

270

271 **Historic Consumptive Use:** that amount of water that has been consumed under appropriate and  
272 reasonably efficient practices to accomplish without waste the purposes for which the  
273 appropriation or other legally permitted use was lawfully made;

274

275 **Imported Water Supply:** the water supply imported by a State from outside the Basin resulting  
276 from the activities of man;

277

278 **Imported Water Supply Credit:** the accretions to stream flow due to water imports from outside  
279 of the Basin as computed by the RRCA Groundwater Model. The Imported Water Supply Credit  
280 of a State shall not be included in the Virgin Water Supply and shall be counted as a credit/offset  
281 against the Computed Beneficial Consumptive Use of water allocated to that State, except as  
282 provided in Subsection V.B.2. of the Stipulation and Subsections III.I. – J. of these RRCA  
283 Accounting Procedures;

284

285

286 **Kansas Account:** an account that shall store all Project Water made available for exclusive use  
287 by Kansas Bostwick Irrigation District (KBID), and water supplies previously available to KBID  
288 under Warren Act Contract(s) existing as of the date of the 2016 Colorado CCP/SF Resolution  
289 and the 2016 CCY HCL Operations Resolution;

290  
291 **Kansas Supplemental Account:** an account that shall store water supplies not in the Kansas  
292 Account and which shall be for use outside of KBID within the state of Kansas in conformance  
293 with the 2016 Colorado CCP/SF Resolution and the 2016 CCY HCL Operations Resolution;

294  
295 **Main Stem:** the Designated Drainage Basin identified in Article III of the Compact as the North  
296 Fork of the Republican River in Nebraska and the main stem of the Republican River between  
297 the junction of the North Fork and the Arikaree River and the lowest crossing of the river at the  
298 Nebraska-Kansas state line and the small tributaries thereof, and also including the drainage  
299 basin Blackwood Creek;

300  
301 **Main Stem Allocation:** the portion of the Computed Water Supply derived from the Main Stem  
302 and the Unallocated Supply derived from the Sub-basins as shared by Kansas and Nebraska;

303  
304 **Meeting(s):** a meeting of the RRCA, including any regularly scheduled annual meeting or any  
305 special meeting;

306  
307 **Modeling Committee:** the modeling committee established in Subsection IV.C. of the  
308 Stipulation;

309  
310 **Moratorium:** the prohibition and limitations on construction of new Wells in the geographic area  
311 described in Section III. of the Stipulation;

312  
313 **Nebraska Resolution Water Supply Credit (NERWS Credit):** The credit provided for  
314 Nebraska's Compact compliance activities through augmentation pumping and other water  
315 management activities in conformance with the 2016 CCY HCL Operations Resolution;

316  
317 **Non-federal Reservoirs:** reservoirs other than Federal Reservoirs that have a storage capacity of  
318 15 Acre-feet or greater at the principal spillway elevation;

319  
320 **Northwest Kansas:** those portions of the Sub-basins within Kansas;

321  
322 **Remaining Compact Compliance Volume (RCCV):** is a volume of water, as defined under the  
323 2016 CCY HCL Operations Resolution;

324  
325 **Replacement Well:** a Well that replaces an existing Well that a) will not be used after  
326 construction of the new Well and b) will be abandoned within one year after such construction or  
327 is used in a manner that is excepted from the Moratorium pursuant to Subsections III.B.1.c.-f. of  
328 the Stipulation;

329

330 **RRCA:** Republican River Compact Administration, the administrative body composed of the  
331 State officials identified in Article IX of the Compact;

332  
333 **RRCA Accounting Procedures:** this document and all attachments hereto;

334  
335 **RRCA Groundwater Model:** the groundwater model developed under the provisions of  
336 Subsection IV.C. of the Stipulation and as subsequently adopted and revised through action of the  
337 RRCA;

338  
339 **State:** any of the States of Colorado, Kansas, and Nebraska;

340  
341 **States:** the States of Colorado, Kansas and Nebraska;

342  
343 **Stipulation:** the Final Settlement Stipulation to be filed in *Kansas v. Nebraska and Colorado*, No.  
344 126, Original, including all Appendices attached thereto;

345  
346 **Sub-basin:** the Designated Drainage Basins, except for the Main Stem, identified in Article III of  
347 the Compact. For purposes of Compact accounting the following Sub-basins will be defined as  
348 described below:

349  
350 North Fork of the Republican River in Colorado drainage basin is that drainage area above  
351 USGS gaging station number 06823000, North Fork Republican River at the Colorado-  
352 Nebraska State Line,

353  
354 Arikaree River drainage basin is that drainage area above USGS gaging station number  
355 06821500, Arikaree River at Haigler, Nebraska,

356  
357 Buffalo Creek drainage basin is that drainage area above USGS gaging station number  
358 06823500, Buffalo Creek near Haigler, Nebraska,

359  
360 Rock Creek drainage basin is that drainage area above USGS gaging station number  
361 06824000, Rock Creek at Parks, Nebraska,

362  
363 South Fork of the Republican River drainage basin is that drainage area above USGS  
364 gaging station number 06827500, South Fork Republican River near Benkelman,  
365 Nebraska,

366  
367 Frenchman Creek (River) drainage basin in Nebraska is that drainage area above USGS  
368 gaging station number 06835500, Frenchman Creek in Culbertson, Nebraska,

369  
370 Driftwood Creek drainage basin is that drainage area above USGS gaging station number  
371 06836500, Driftwood Creek near McCook, Nebraska,

372  
373

374 Red Willow Creek drainage basin is that drainage area above USGS gaging station number  
375 06838000, Red Willow Creek near Red Willow, Nebraska,

376  
377 Medicine Creek drainage basin is that drainage area above the Medicine Creek below  
378 Harry Strunk Lake, State of Nebraska gaging station number 06842500; and the drainage  
379 area between the gage and the confluence with the Main Stem,

380  
381 Sappa Creek drainage basin is that drainage area above USGS gaging station number  
382 06847500, Sappa Creek near Stamford, Nebraska and the drainage area between the gage  
383 and the confluence with the Main Stem; and excluding the Beaver Creek drainage basin  
384 area downstream from the State of Nebraska gaging station number 06847000 Beaver  
385 Creek near Beaver City, Nebraska to the confluence with Sappa Creek,

386  
387 Beaver Creek drainage basin is that drainage area above State of Nebraska gaging station  
388 number 06847000, Beaver Creek near Beaver City, Nebraska, and the drainage area  
389 between the gage and the confluence with Sappa Creek,

390  
391 Prairie Dog Creek drainage basin is that drainage area above USGS gaging station number  
392 06848500, Prairie Dog Creek near Woodruff, Kansas, and the drainage area between the  
393 gage and the confluence with the Main Stem;

394  
395 Attached hereto as Figure 2 is a line diagram depicting the streams, Federal Reservoirs and gaging  
396 stations;

397  
398 **Test hole:** a hole designed solely for the purpose of obtaining information on hydrologic and/or  
399 geologic conditions;

400  
401 **Trenton Dam:** a dam located at 40 degrees, 10 minutes, 10 seconds latitude and 101 degrees, 3  
402 minutes, 35 seconds longitude, approximately two and one-half miles west of the town of Trenton,  
403 Nebraska;

404  
405 **Unallocated Supply:** the “water supplies of upstream basins otherwise unallocated” as set forth in  
406 Article IV of the Compact;

407  
408 **Upstream of Guide Rock, Nebraska:** those areas within the Basin lying west of a line  
409 proceeding north from the Nebraska-Kansas state line and following the western edge of Webster  
410 County, Township 1, Range 9, Sections 34, 27, 22, 15, 10 and 3 through Webster County,  
411 Township 2, Range 9, Sections 34, 27 and 22; then proceeding west along the southern edge of  
412 Webster County, Township 2, Range 9, Sections 16, 17 and 18; then proceeding north following  
413 the western edge of Webster County, Township 2, Range 9, Sections 18, 7 and 6, through  
414 Webster County, Township 3, Range 9, Sections 31, 30, 19, 18, 7 and 6 to its intersection with  
415 the northern boundary of Webster County. Upstream of Guide Rock, Nebraska shall not include  
416 that area in Kansas east of the 99° meridian and south of the Kansas-Nebraska state line;

417

418 **Virgin Water Supply:** the Water Supply within the Basin undepleted by the activities of man;

419  
420 **Water Short Year Administration:** administration in a year when the projected or actual  
421 irrigation water supply is less than 119,000 acre feet of storage available for use from Harlan  
422 County Lake as determined by the Bureau of Reclamation using the methodology described in the  
423 Harlan County Lake Operation Consensus Plan attached as Appendix K to the Stipulation.

424  
425 **Water Supply of the Basin or Water Supply within the Basin:** the stream flows within the  
426 Basin, excluding Imported Water Supply;

427  
428 **Well:** any structure, device or excavation for the purpose or with the effect of obtaining  
429 groundwater for beneficial use from an aquifer, including wells, water wells, or groundwater  
430 wells as further defined and used in each State’s laws, rules, and regulations.

431  
432

433 **III. Basic Formulas**

434  
435 The basic formulas for calculating Virgin Water Supply, Computed Water Supply,  
436 Imported Water Supply, Allocations and Computed Beneficial Consumptive Use are set  
437 forth below. The results of these calculations shall be shown in a table format as shown  
438 in Table 1.

439

Basic Formulas for Calculating Virgin Water Supply, Computed Water Supply, Allocations and Computed Beneficial Consumptive Use	
Sub-basin VWS	= Gage + All CBCU + $\Delta$ S – IWS – APV*
Main Stem VWS	= Hardy Gage – $\Sigma$ Sub-basin gages + All CBCU in the Main Stem + $\Delta$ S – IWS
CWS	= VWS - $\Delta$ S – FF + CWSA <sup>1</sup>
Allocation for each State in each Sub-basin And Main Stem	= CWS x %
State's Allocation	= $\Sigma$ Allocations for Each State
State's CBCU	= $\Sigma$ State's CBCUs in each Sub-basin and Main Stem

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<sup>1</sup> The Computed Water Supply Adjustment (CWSA) is only applied to the Main Stem, with respect to Harlan County Lake operations, as described in Subsection IV.B and Attachment 8.



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**3. Imported Water Supply Credit Calculation:**

The amount of Imported Water Supply Credit shall be determined by the RRCA Groundwater Model. The Imported Water Supply Credit of a State shall not be included in the Virgin Water Supply and shall be counted as a credit/offset against the Computed Beneficial Consumptive Use of water allocated to that State. Currently, the Imported Water Supply Credits shall be determined using two runs of the RRCA Groundwater Model:

- a. The “base” run shall be the run with all groundwater pumping, groundwater pumping recharge, and surface water recharge within the model study boundary for the current accounting year turned “on.”
- b. The “no NE import” run shall be the run with the same model inputs as the base run with the exception that surface water recharge associated with Nebraska’s Imported Water Supply shall be turned “off.” This will be the same “no NE import” run used to determine groundwater Computed Beneficial Consumptive Uses.

The Imported Water Supply Credit shall be the difference in stream flows between these two model runs. Differences in stream flows shall be determined at the same locations as identified in Subsection III.D.1. for the “no pumping” runs. Should another State import water into the Basin in the future, the RRCA will develop a similar procedure to determine Imported Water Supply Credits.

**4. Augmentation Pumping Volume**

The Augmentation Pumping Volume (APV) of a State shall not be included in the Virgin Water Supply of the applicable sub-basin.

**B. Calculation of Computed Water Supply**

On any Designated Drainage Basin without a Federal Reservoir, the Computed Water Supply will be equal to the Virgin Water Supply of that Designated Drainage Basin minus Flood Flows.

On any Designated Drainage Basin with a Federal Reservoir, the Computed Water Supply will be equal to the Virgin Water Supply minus the Change in Federal Reservoir Storage in that Designated Drainage Basin and minus Flood Flows. In the Main Stem only, the Computed Water Supply Adjustment will also be added to determine the Computed Water Supply for the Main Stem, as shown in Subsection IV.B and discussed below in sub-section 2 and as illustrated in Attachment 8.

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### 1. Flood Flows

If in any calendar year there are five consecutive months in which the total actual stream flow<sup>2</sup> at the Hardy gage is greater than 325,000 Acre-feet, or any two consecutive months in which the total actual stream flow is greater than 200,000 Acre-feet, the annual flow in excess of 400,000 Acre-feet at the Hardy gage will be considered to be Flood Flows that will be subtracted from the Virgin Water Supply to calculate the Computed Water Supply, and Allocations. The Flood Flow in excess of 400,000 Acre-feet at the Hardy gage will be subtracted from the Virgin Water Supply of the Main Stem to compute the Computed Water Supply unless the Annual Gaged Flows from a Sub-basin, minus the Augmentation Pumping Volume for that Sub-basin, were in excess of the flows shown for that Sub-basin in Attachment 1. These excess Sub-basin flows shall be considered to be Sub-basin Flood Flows.

If there are Sub-basin Flood Flows, the total of all Sub-basin Flood Flows shall be compared to the amount of Flood Flows at the Hardy gage. If the sum of the Sub-basin Flood Flows are in excess of the Flood Flow at the Hardy gage, the flows to be deducted from each Sub-basin shall be the product of the Flood Flows for each Sub-basin times the ratio of the Flood Flows at the Hardy gage divided by the sum of the Flood Flows of the Sub-basin gages. If the sum of the Sub-basin Flood Flows is less than the Flood Flow at the Hardy gage, the entire amount of each Sub-basin Flood Flow shall be deducted from the Virgin Water Supply to compute the Computed Water Supply of that Sub-basin for that year. The remainder of the Flood Flows will be subtracted from the flows of the Main Stem. [A Flood Flows adjustment term will also be subtracted in the Computed Water Supply calculation between Guide Rock and Hardy.](#)<sup>3</sup>

### 2. Computed Water Supply Adjustment

The Computed Water Supply Adjustment shall be applied to the Main Stem calculations for years when Nebraska's Compact compliance activities are stored in Harlan County Lake for future Kansas use subject to the terms of the 2016 CCY

<sup>2</sup> These actual stream flows reflect Gaged Flows after depletions by Beneficial Consumptive Use and change in reservoir storage above the gage.

<sup>3</sup> [A method for calculating a Flood Flows adjustment term to be subtracted in the Computed Water Supply between Guide Rock and Hardy calculation in the event of Flood Flows has not yet been agreed upon for inclusion in this document.](#) At its Annual Meeting on August 21, 2020, the RRCA agreed that the Accounting Procedures (Rev. May 25, 2017) do not properly implement the Flood Flow provisions at the Hardy gage with respect to the calculation of Computed Water Supply above and below Guide Rock.- The current implementation could impact Nebraska's Table 5C compliance test, specifically the Allocation above Guide Rock.- Nebraska and Kansas each offered proposals to resolve the issue but could not reach agreement on a solution. Due to the infrequent occurrence of Flood Flows, the RRCA deferred resolution of the matter to a future date necessitated by and preceding impact to Nebraska's Table 5C compliance. The states wish to acknowledge and memorialize the issue to encourage work toward its resolution.

566 HCL Operations Resolution. The methods used to calculate the Computed Water  
567 Supply Adjustment and RCCV are contained in Attachment 8 and will be applied  
568 for compliance activities initiated after October 1, 2015.

569 **C. Calculation of Annual Allocations**

570  
571 Article IV of the Compact allocates 54,100 Acre-feet for Beneficial Consumptive  
572 Use in Colorado, 190,300 Acre-feet for Beneficial Consumptive Use in Kansas  
573 and 234,500 Acre-feet for Beneficial Consumptive Use in Nebraska. The  
574 Compact provides that the Compact totals are to be derived from the sources and  
575 in the amounts specified in Table 2.

576  
577 The Allocations derived from each Sub-basin to each State shall be the Computed  
578 Water Supply multiplied by the percentages set forth in Table 2. In addition,  
579 Kansas shall receive 51.1% of the Main Stem Allocation and the Unallocated  
580 Supply and Nebraska shall receive 48.9% of the Main Stem Allocation and the  
581 Unallocated Supply.

582  
583 **D. Calculation of Annual Computed Beneficial Consumptive Use**

584  
585

586 **1. Groundwater**

587 Computed Beneficial Consumptive Use of groundwater shall be determined by  
588 use of the RRCA Groundwater Model. The Computed Beneficial Consumptive  
589 Use of groundwater for each State shall be determined as the difference in  
590 streamflows using two runs of the model:

591  
592 The “no NE import” run shall be the run with all groundwater pumping,  
593 groundwater pumping recharge, and surface water recharge within the model study  
594 boundary for the current accounting year “on”, with the exception that surface water  
595 recharge associated with Nebraska’s Imported Water Supply shall be turned “off.”

596  
597 The “no State pumping” run shall be the run with the same model inputs as the  
598 “no NE import” run with the exception that all groundwater pumping and  
599 pumping recharge of that State shall be turned “off.”

600  
601 An output of the model is baseflows at selected stream cells. Changes in the  
602 baseflows predicted by the model between the “no NE import” run and the “no-  
603 State- pumping” model run is assumed to be the depletions to streamflows, i.e.,  
604 groundwater computed beneficial consumptive use, due to State groundwater  
605 pumping at that location. The values for each Sub-basin will include all  
606 depletions and accretions upstream of the confluence with the Main Stem. The  
607 values for the Main Stem will include all depletions and accretions in stream  
608 reaches not otherwise accounted for in a Sub-basin. The values for the Main Stem  
609 will be computed separately for the reach above Guide Rock, and the reach below

610 Guide Rock.

611

612

613 **2. Surface Water**

614 The Computed Beneficial Consumptive Use of surface water for irrigation and  
615 non- irrigation uses shall be computed by taking the diversions from the river and  
616 subtracting the return flows to the river resulting from those diversions, as  
617 described in Subsections IV.A.2.a.-d. The Computed Beneficial Consumptive Use  
618 of surface water from Federal Reservoir and Non-Federal Reservoir evaporation  
619 shall be the net reservoir evaporation from the reservoirs, as described in  
620 Subsections IV.A.2.e.-f.

621 For Sub-basins where the gage designated in Section II. is near the confluence with  
622 the Main Stem, each State's Sub-basin Computed Beneficial Consumptive Use of  
623 surface water shall be the State's Computed Beneficial Consumptive Use of  
624 surface water above the Sub-basin gage. For Medicine Creek, Sappa Creek, Beaver  
625 Creek and Prairie Dog Creek, where the gage is not near the confluence with the  
626 Main Stem, each State's Computed Beneficial Consumptive Use of surface water  
627 shall be the sum of the State's Computed Beneficial Consumptive Use of surface  
628 water above the gage, and its Computed Beneficial Consumptive Use of surface  
629 water between the gage and the confluence with the Main Stem.

630

631 **E. Calculation to Determine Compact Compliance Using Five-Year**  
632 **Running Averages**

633

634 Each year, using the procedures described herein, the RRCA will calculate the Annual  
635 Allocations by Designated Drainage Basin and total for each State, the Computed  
636 Beneficial Consumptive Use by Designated Drainage Basin and total for each State,  
637 CORWS and NERWS (RWS Credits), and the Imported Water Supply Credit that a State  
638 may use for the preceding year. These results for the current Compact accounting year as  
639 well as the results of the previous four accounting years and the five-year average of these  
640 results will be displayed in the format shown in Table 3.

641

642 The amount of CORWS Credit shall be determined based on the Compact compliance  
643 activities through augmentation pumping in conformance with the 2016 Colorado  
644 CCP/SF Resolution. CORWS Credit shall be determined based on the measured outflow  
645 from the Colorado Compact Compliance Pipeline. The CORWS Credit shall be counted  
646 as a credit/offset against the Computed Beneficial Consumptive Use of water by  
647 Colorado.

648

649 Colorado's compliance will be measured based on the average of the accounting results  
650 from the current accounting year's annual balance and the previous four accounting year's  
651 annual balances. If none of those five years is a Water Short Year (as defined in Section  
652 III.J.), then Colorado's compliance will be calculated using Table 3A.

653

654 If any one of the previous four accounting years or the current accounting year is a Water  
655 Short Year (as defined in Section III.J.a and b), then Colorado’s compliance will be  
656 calculated using Table 5A. For each accounting year that is designated as a Water Short  
657 Year pursuant to Section III.J, Colorado’s statewide allocation will be reduced by the  
658 Beaver Creek Reduction which is the average of the unused Colorado Beaver Creek Sub-  
659 basin allocation for the five most-recent Water Short Year designations prior to that  
660 accounting year as shown in Table 5F example. The Beaver Creek Reduction will be  
661 reported in Table 5F. If the accounting year was not designated as a Water Short Year  
662 then the Beaver Creek Reduction will not be applied in that year.  
663

664 The amount of NERWS Credit shall be determined based on the Compact compliance  
665 activities through augmentation pumping and other water management activities in  
666 conformance with the 2016 CCY HCL Operations Resolution. NERWS Credit for the  
667 year shall be equal to the greater of the Compact Compliance Volume and the  
668 contribution from Nebraska’s water management activities consistent with the 2016  
669 CCY HCL Operations Resolution. NERWS Credit shall be counted as a credit/offset  
670 against the Computed Beneficial Consumptive Use of water by Nebraska. NERWS  
671 Credit for Nebraska augmentation activities initiated prior to October 1, 2015, will be  
672 equal to the measured outflow from the augmentation projects.  
673

674 **F. Calculations To Determine Colorado’s and Kansas’s Compliance with the**  
675 **Sub- basin Non-Impairment Requirement**  
676

677 The data needed to determine Colorado's and Kansas's compliance with the Sub-basin non-  
678 impairment requirement in Subsection IV.B.2. of the Stipulation are shown in Tables 4.A.  
679 and B.  
680

681 **G. Calculations To Determine Projected Water Supply**  
682

683  
684 **1. Procedures to Determine Water Short Years**

685 The Bureau of Reclamation will provide each of the States with a monthly or, if  
686 requested by any one of the States, a more frequent update of the projected or actual  
687 irrigation supply from Harlan County Lake for that irrigation season using the  
688 methodology described in the Harlan County Lake Operation Consensus Plan,  
689 attached as Appendix K to the Stipulation. The steps for the calculation are as  
690 follows:  
691

692 Step 1. At the beginning of the calculation month (1) the total projected inflow  
693 for the calculation month and each succeeding month through the end of May  
694 shall be added to the previous end of month Harlan County Lake content and (2)  
695 the total projected 1993 level evaporation loss for the calculation month and each  
696 succeeding month through the end of May shall then be subtracted. The total  
697 projected inflow shall be the 1993 level average monthly inflow or the running

698 average monthly inflow for the previous five years, whichever is less.

699  
700 Step 2. Determine the maximum irrigation water available by subtracting the  
701 sediment pool storage (currently 164,111 Acre-feet) and adding the summer  
702 sediment pool evaporation (20,000 Acre-feet) to the result from Step 1.

703  
704 Step 3. For October through January calculations, take the result from Step 2 and  
705 using the Shared Shortage Adjustment Table in Attachment 2 hereto, determine the  
706 preliminary irrigation water available for release. The calculation using the end of  
707 December content (January calculation month) indicates the minimum amount of  
708 irrigation water available for release at the end of May. For February through June  
709 calculations, subtract the maximum irrigation water available for the January  
710 calculation month from the maximum irrigation water available for the calculation  
711 month. If the result is negative, the irrigation water available for release (January  
712 calculation month) stays the same. If the result is positive the preliminary irrigation  
713 water available for release (January calculation month) is increased by the positive  
714 amount.

715  
716 Step 4. Compare the result from Step 3 to 119,000 Acre-feet. If the result from  
717 Step 3 is less than 119,000 Acre-feet Water Short Year Administration is in  
718 effect.

719  
720 Step 5. The final annual Water-Short Year Administration calculation determines  
721 the total estimated irrigation supply at the end of June (calculated in July). Use  
722 the result from Step 3 for the end of May irrigation release estimate, add the June  
723 computed inflow to Harlan County Lake and subtract the June computed gross  
724 evaporation loss from Harlan County Lake.

725  
726  
727 **2. Procedures to Determine 130,000 Acre Feet Projected Water Supply**  
728 To determine the preliminary irrigation supply for the October through June  
729 calculation months, follow the procedure described in steps 1 through 4 of the  
730 "Procedures to determine Water Short Years" Subsection III. G. 1. The result from  
731 step 4 provides the forecasted water supply, which is compared to 130,000 Acre-  
732 feet. For the July through September calculation months, use the previous end of  
733 calculation month preliminary irrigation supply, add the previous month's Harlan  
734 County Lake computed inflow and subtract the previous month's computed gross  
735 evaporation loss from Harlan County Lake to determine the current preliminary  
736 irrigation supply. The result is compared to 130,000 Acre-feet.

737  
738  
739 **H. Calculation of Computed Water Supply, Allocations and Computed Beneficial**  
740 **Consumptive Use Above and Below Guide Rock During Water-Short**  
741 **Administration Years.**

742  
743 For Water-Short-Administration Years, in addition to the normal calculations, the  
744 Computed Water Supply, Allocations, Computed Beneficial Consumptive Use, NERWS  
745 Credit, and Imported Water Supply Credits shall also be calculated above Guide Rock as  
746 shown in Table 5C. These calculations shall be done in the same manner as in non-  
747 Water-Short Administration years except that water supplies originating below Guide  
748 Rock shall not be included in the calculations of water supplies originating above Guide  
749 Rock. The calculations of Computed Beneficial Consumptive Uses shall be also done in  
750 the same manner as in non-Water-Short Administration years except that Computed  
751 Beneficial Consumptive Uses from diversions below Guide Rock shall not be included.  
752 The depletions from the water diverted by the Superior and Courtland Canals at the  
753 Superior- Courtland Diversion Dam shall be included in the calculations of Computed  
754 Beneficial Consumptive Use above Guide Rock. Imported Water Supply Credits above  
755 Guide Rock, as described in Sub-section III.I., may be used as offsets against the  
756 Computed Beneficial Consumptive Use above Guide Rock by the State providing the  
757 Imported Water Supply Credits.

758  
759 The Computed Water Supply of the Main Stem reach between Guide Rock and the Hardy  
760 gage shall be determined by taking the difference in stream flow at Hardy and Guide Rock,  
761 adding Computed Beneficial Consumptive Uses in the reach (this does not include the  
762 Computed Beneficial Consumptive Use from the Superior and Courtland Canal diversions),  
763 ~~and~~ subtracting return flows from the Superior and Courtland Canals in the reach, and  
764 subtracting the Flood Flow adjustment for the Main Stem between Guide Rock and Hardy.<sup>4</sup>  
765 The Computed Water Supply above Guide Rock shall be determined by subtracting the  
766 Computed Water Supply of the Main Stem reach between Guide Rock and the Hardy gage  
767 from the total Computed Water Supply.<sup>5</sup> Nebraska's Allocation above Guide Rock shall be  
768 determined by subtracting 48.9% of the Computed Water Supply of the Main Stem reach  
769 between Guide Rock and the Hardy gage from Nebraska's total Allocation. Nebraska's  
770 Computed Beneficial Consumptive Uses above Guide Rock shall be determined by  
771 subtracting Nebraska's Computed Beneficial Consumptive Uses below Guide Rock from  
772 Nebraska's total Computed Beneficial Consumptive Use.

773  
774 **I. Calculation of Imported Water Supply Credits During Water-Short**  
775 **Year Administration Years.**

776  
777 Imported Water Supply Credit during Water-Short Year Administration years shall be  
778 calculated consistent with Subsection V.B.2.b. of the Stipulation.  
779

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<sup>4</sup> A method for calculating a Flood Flows adjustment term to be subtracted in the Computed Water Supply between Guide Rock and Hardy calculation in the event of Flood Flows has not yet been agreed upon for inclusion in this document.

<sup>5</sup> At its Annual Meeting on August 21, 2020, the RRCA agreed to revisit the calculation of the Computed Water Supply of the Main Stem reach between Guide Rock and the Hardy gage and the Computed Water Supply above Guide Rock per Section III.B.1.

780 The following methodology shall be used to determine the extent to which Imported Water  
781 Supply Credit, as calculated by the RRCA Groundwater Model, can be credited to the State  
782 importing the water during Water-Short Year Administration years.  
783  
784

785 **1. Monthly Imported Water Supply Credits**

786 The RRCA Groundwater Model will be used to determine monthly Imported  
787 Water Supply Credits by State in each Sub-basin and for the Main Stem. The  
788 values for each Sub-basin will include all depletions and accretions upstream of  
789 the confluence with the Main Stem. The values for the Main Stem will include all  
790 depletions and accretions in stream reaches not otherwise accounted for in a Sub-  
791 basin. The values for the Main Stem will be computed separately for the reach 1)  
792 above Harlan County Dam, 2) between Harlan County Dam and Guide Rock, and  
793 3) between Guide Rock and the Hardy gage. The Imported Water Supply Credit  
794 shall be the difference in stream flow for two runs of the model: a) the “base” run  
795 and b) the “no State import” run.  
796

797 During Water-Short Year Administration years, Nebraska’s credits in the Sub-  
798 basins shall be determined as described in Section III. A. 3.  
799  
800

801 **2. Imported Water Supply Credits Above Harlan County Dam**

802 Nebraska's Imported Water Supply Credits above Harlan County Dam shall be the  
803 sum of all the credits in the Sub-basins and the Main Stem above Harlan County  
804 Dam.  
805  
806

807 **3. Imported Water Supply Credits Between Harlan County Dam and**  
808 **Guide Rock During the Irrigation Season**

809  
810 a. During Water-Short Year Administration years, monthly credits in the  
811 reach between Harlan County Dam and Guide Rock shall be determined  
812 as the differences in the stream flows between the two runs at Guide  
813 Rock.  
814

815 b. The irrigation season shall be defined as starting on the first day of  
816 release of water from Harlan County Lake for irrigation use and ending on  
817 the last day of release of water from Harlan County Lake for irrigation  
818 use.  
819

820 c. Credit as an offset for a State's Computed Beneficial Consumptive Use  
821 above Guide Rock will be given to all the Imported Water Supply accruing  
822 in the reach between Harlan County Dam and Guide Rock during the  
823 irrigation season. If the period of the irrigation season does not coincide

824 with the period of modeled flows, the amount of the Imported Water  
825 Supply credited during the irrigation season for that month shall be the total  
826 monthly modeled Imported Water Supply Credit times the number of days  
827 in the month occurring during the irrigation season divided by the total  
828 number of days in the month.

829  
830  
831 **4. Imported Water Supply Credits Between Harlan County Dam and**  
832 **Guide Rock During the Non-Irrigation Season**

833  
834 a. Imported Water Supply Credit shall be given between Harlan County  
835 Dam and Guide Rock during the period that flows are diverted to fill  
836 Lovewell Reservoir to the extent that imported water was needed to  
837 meet Lovewell Reservoir target elevations.

838  
839 b. Fall and spring fill periods shall be established during which credit shall  
840 be given for the Imported Water Supply Credit accruing in the reach. The  
841 fall period shall extend from the end of the irrigation season to December 1.  
842 The spring period shall extend from March 1 to May 31. The Lovewell  
843 target elevations for these fill periods are the projected end of November  
844 reservoir level and the projected end of May reservoir level for most  
845 probable inflow conditions as indicated in Table 4 in the current Annual  
846 Operating Plan prepared by the Bureau of Reclamation.

847  
848 c. The amount of water needed to fill Lovewell Reservoir for each period  
849 shall be calculated as the storage content of the reservoir at its target  
850 elevation at the end of the fill period minus the reservoir content at the  
851 start of the fill period plus the amount of net evaporation during this  
852 period minus White Rock Creek inflows for the same period.

853  
854 d. If the fill period as defined above does not coincide with the period of  
855 modeled flows, the amount of the Imported Water Supply Credit during the  
856 fill period for that month shall be the total monthly modeled Imported  
857 Water Supply Credit times the number of days in the month occurring  
858 during the fill season divided by the total number of days in the month.

859  
860 e. The amount of non-imported water available to fill Lovewell Reservoir to  
861 the target elevation shall be the amount of water available at Guide Rock  
862 during the fill period minus the amount of the Imported Water Supply  
863 Credit accruing in the reach during the same period.

864  
865 f. The amount of the Imported Water Supply Credit that shall be credited  
866 against a State's Consumptive Use shall be the amount of water imported by  
867 that State that is available in the reach during the fill period or the amount

868 of water needed to reach Lovewell Reservoir target elevations minus the  
869 amount of non-imported water available during the fill period, whichever is  
870 less.

871  
872  
873  
874

875 **5. Other Credits**

876 Kansas and Nebraska will explore crediting Imported Water Supply that is  
877 otherwise useable by Kansas.

878  
879

880 **J. Calculations of Compact Compliance in Water-Short Year Administration Years**

881

882 During Water-Short Year Administration, using the procedures described in Subsections  
883 III.A-D, the RRCA will calculate the Annual Allocations for each State, the Computed  
884 Beneficial Consumptive Use by each State, and Imported Water Supply Credit and RWS  
885 Credits that a State may use to offset Computed Beneficial Consumptive Use in that year.  
886 The resulting annual and average values will be calculated as displayed in Tables 5 A-C  
887 and E.

888 The compliance tests outlined in Tables 5B – 5E shall not apply when on or before June  
889 30:

- 890 a. the sum of all waters available for irrigation from Harlan County Lake, including  
891 irrigation releases prior to June 30 of each year, the RCCV (as calculated in  
892 Attachment 8), and the volume in the Kansas Supplemental Account, is greater  
893 than or equal to 119,000 acre-feet; or  
894 b. the sum of the Kansas Account, Kansas Supplemental Account, and irrigation  
895 releases made from both accounts prior to June 30 of each year is greater than or  
896 equal to 68,000 acre-feet.

897

898 For the State of Colorado, if the current accounting year or any one of the previous four  
899 years is designated as a Water Short Year based on the criteria in Section III.J.a or b  
900 above, then Colorado’s compliance will be calculated using Table 5A. The methods used  
901 to implement the Table 5A calculations will be in conformance with Section III.E.

902

903 If Nebraska is implementing an Alternative Water-Short-Year Administration Plan, data  
904 to determine Compact compliance will be shown in Table 5D. Nebraska’s compliance  
905 with the Compact will be determined in the same manner as Nebraska’s Above Guide  
906 Rock compliance except that compliance will be based on a three-year running average  
907 of the current year and previous two year calculations. In addition, Table 5 D. will  
908 display the sum of the previous two-year difference in Allocations above Guide Rock and  
909 Computed Beneficial Consumptive Uses above Guide Rock minus any Imported Water  
910 Credits and compare the result with the Alternative Water-Short-Year Administration  
911 Plan’s expected decrease in Computed Beneficial Consumptive Use above Guide Rock.

912 Nebraska will be within compliance with the Compact as long as the three-year running  
913 average difference in Column 8 is positive and the sum of the previous year and current  
914 year deficits above Guide Rock are not greater than the expected decrease in Computed  
915 Beneficial Consumptive Use under the plan.  
916  
917  
918

919 **IV. Specific Formulas**

920  
921 **A. Computed Beneficial Consumptive Use**

922  
923  
924 **1. Computed Beneficial Consumptive Use of Groundwater:**

925 The Computed Beneficial Consumptive Use caused by groundwater diversion  
926 shall be determined by the RRCA Groundwater Model as described in Subsection  
927 III.D.1.  
928  
929

930 **2. Computed Beneficial Consumptive Use of Surface Water:**

931 The Computed Beneficial Consumptive Use of surface water shall be calculated as  
932 follows:

933 a) Non-Federal Canals

934 Computed Beneficial Consumptive Use from diversions by non- federal  
935 canals shall be 60 percent of the diversion; the return flow shall be 40  
936 percent of the diversion  
937  
938

939 b) Individual Surface Water Pumps

940 Computed Beneficial Consumptive Use from small individual surface  
941 water pumps shall be 75 percent of the diversion; return flows will be 25  
942 percent of the diversion unless a state provides data on the amount of  
943 different system types in a Sub-basin, in which case the following  
944 percentages will be used for each system type:  
945

946	Gravity Flow	30%
947	Center Pivot	17%
948	LEPA	10%

949  
950  
951 c) Federal Canals

952 Computed Beneficial Consumptive Use of diversions by Federal canals  
953 will be calculated as shown in Attachment 7. For each Bureau of  
954 Reclamation Canal the field deliveries shall be subtracted from the  
955 diversion from the river to determine the canal losses. The field delivery

956 shall be multiplied by one minus an average system efficiency for the  
957 district to determine the loss of water from the field. Eighty-two percent  
958 of the sum of the field loss plus the canal loss shall be considered to be  
959 the return flow from the canal diversion for diversions occurring during  
960 the irrigation season (May-September). For recharge diversions  
961 occurring during the non-irrigation season (October-April), 92 percent  
962 of the sum of the field loss plus the canal loss shall be considered to be  
963 the return flow from the canal diversion. The assumed field efficiencies  
964 and the amount of the field and canal loss that reaches the stream may be  
965 reviewed by the RRCA and adjusted as appropriate to insure their  
966 accuracy.

967

968

969

d) Non-irrigation Uses

970 Any non-irrigation uses diverting or pumping more than 50 acre-feet  
971 per year will be required to measure diversions. Non-irrigation uses  
972 diverting more than 50 Acre-feet per year will be assessed a Computed  
973 Beneficial Consumptive Use of 50% of what is pumped or diverted,  
974 unless the entity presents evidence to the RRCA demonstrating a  
975 different percentage should be used.

976

977

978

e) Evaporation from Federal Reservoirs

979 Net Evaporation from Federal Reservoirs will be calculated as follows:

980

981

982

(1) Harlan County Lake, Evaporation Calculation

983

984

April 1 through October 31:

985

986

987

988

989

990

991

992

993

Evaporation from Harlan County Lake is calculated by the Corps of Engineers on a daily basis from April 1 through October 31. Daily readings are taken from a Class A evaporation pan maintained near the project office. Any precipitation recorded at the project office is added to the pan reading to obtain the actual evaporation amount. The pan value is multiplied by a pan coefficient that varies by month. These values are:

March	.56
April	.52
May	.53
June	.60
July	.68
August	.78

September .91  
October 1.01

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1026

The pan coefficients were determined by studies the Corps of Engineers conducted a number of years ago. The result is the evaporation in inches. It is divided by 12 and multiplied by the daily lake surface area in acres to obtain the evaporation in Acre-feet. The lake surface area is determined by the 8:00 a.m. elevation reading applied to the lake's area-capacity data. The area-capacity data is updated periodically through a sediment survey. The last survey was completed in December 2000.

November 1 through March 31

During the winter season, a monthly total evaporation in inches has been determined. The amount varies with the percent of ice cover. The values used are:

HARLAN COUNTY LAKE

Estimated Evaporation in Inches  
Winter Season -- Monthly Total  
PERCENTAGE OF ICE COVER

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
JAN	0.88	0.87	0.85	0.84	0.83	0.82	0.81	0.80	0.78	0.77	0.76
FEB	0.90	0.88	0.87	0.86	0.85	0.84	0.83	0.82	0.81	0.80	0.79
MAR	1.29	1.28	1.27	1.26	1.25	1.24	1.23	1.22	1.21	1.20	1.19
OCT	4.87			NO IC							
NOV	2.81			NO IC							
DEC	1.31	1.29	1.27	1.25	1.24	1.22	1.20	1.18	1.17	1.16	1.14

The monthly total is divided by the number of days in the month to obtain a daily evaporation value in inches. It is divided by 12 and multiplied by the daily lake surface area in acres to obtain the evaporation in Acre-feet. The lake surface area is determined by the 8:00 a.m. elevation reading applied to the lake's area-capacity data. The area-capacity data is updated periodically through a sediment survey. The last survey was completed in December 2000.

To obtain the net evaporation, the monthly precipitation on the lake

1027 is subtracted from the monthly gross evaporation. The monthly  
1028 precipitation is calculated by multiplying the sum of the month's  
1029 daily precipitation in inches by the average of the end of the month  
1030 lake surface area for the previous month and the end of the month  
1031 lake surface area for the current month in acres and dividing the  
1032 result by 12 to obtain the precipitation for the month in acre feet.

1033  
1034 Kansas supplemental accounts established within Harlan County  
1035 Lake, as defined in the 2016 CCY HCL Operations Resolution, will  
1036 be charged annual net evaporation in an amount proportional to the  
1037 relative contents of the supplemental account compared to the total  
1038 irrigation supply.

1039  
1040 The remaining annual net evaporation (Acre-feet) will be charged to  
1041 Kansas and Nebraska in proportion to the annual diversions made  
1042 by the Kansas Bostwick Irrigation District and the Nebraska  
1043 Bostwick Irrigation District during the time period each year when  
1044 irrigation releases are being made from Harlan County Lake. For  
1045 any year in which no irrigation releases were made from Harlan  
1046 County Lake, the annual net evaporation charged to Kansas and  
1047 Nebraska will be based on the average of the above calculation for  
1048 the most recent three years in which irrigation releases from Harlan  
1049 County Lake were made. In the event Nebraska chooses to  
1050 substitute supply for the Superior Canal from Nebraska's allocation  
1051 below Guide Rock in Water-Short Year Administration years, the  
1052 amount of the substitute supply will be included in the calculation of  
1053 the split as if it had been diverted to the Superior Canal at Guide  
1054 Rock.

1055  
1056  
1057 (2) Evaporation Computations for Bureau of Reclamation Reservoirs  
1058 The Bureau of Reclamation computes the amount of evaporation  
1059 loss on a monthly basis at Reclamation reservoirs. The following  
1060 procedure is utilized in calculating the loss in Acre-feet.

1061  
1062 An evaporation pan reading is taken each day at the dam site. This  
1063 measurement is the amount of water lost from the pan over a 24-hour  
1064 period in inches. The evaporation pan reading is adjusted for any  
1065 precipitation recorded during the 24-hour period. Instructions for  
1066 determining the daily pan evaporation are found in the "National  
1067 Weather Service Observing Handbook No. 2 – Substation  
1068 Observations." All dams located in the Kansas River Basin with the  
1069 exception of Bonny Dam are National Weather Service Cooperative  
1070 Observers. The daily evaporation pan readings are totaled at the end

1071 of each month and converted to a “free water surface” (FWS)  
1072 evaporation, also referred to as “lake” evaporation. The FWS  
1073 evaporation is determined by multiplying the observed pan  
1074 evaporation by a coefficient of .70 at each of the reservoirs. This  
1075 coefficient can be affected by several factors including water and air  
1076 temperatures. The National Oceanic and Atmospheric  
1077 Administration (NOAA) has published technical reports describing  
1078 the determination of pan coefficients. The coefficient used is taken  
1079 from the “NOAA Technical Report NWS 33, Map of coefficients to  
1080 convert class A pan evaporation to free water surface evaporation”.  
1081 This coefficient is used for the months of April through October  
1082 when evaporation pan readings are recorded at the dams. The  
1083 monthly FWS evaporation is then multiplied by the average surface  
1084 area of the reservoir during the month in acres. Dividing this value  
1085 by twelve will result in the amount of water lost to evaporation in  
1086 Acre-feet during the month.

1087  
1088 During the winter months when the evaporation pan readings are  
1089 not taken, monthly evaporation tables based on the percent of ice  
1090 cover are used. The tables used were developed by the Corps of  
1091 Engineers and were based on historical average evaporation rates. A  
1092 separate table was developed for each of the reservoirs. The  
1093 monthly evaporation rates are multiplied by the .70 coefficient for  
1094 pan to free water surface adjustment, divided by twelve to convert  
1095 inches to feet and multiplied by the average reservoir surface area  
1096 during the month in acres to obtain the total monthly evaporation  
1097 loss in Acre- feet.

1098  
1099 To obtain the net evaporation, the monthly precipitation on the lake  
1100 is subtracted from the monthly gross evaporation. The monthly  
1101 precipitation is calculated by multiplying the sum of the month's  
1102 daily precipitation in inches by the average of the end of the month  
1103 lake surface area for the previous month and the end of the month  
1104 lake surface area for the current month in acres and dividing the  
1105 result by 12 to obtain the precipitation for the month in acre feet.

1106  
1107

1108 f) Non-Federal Reservoir Evaporation:

1109

1110 For Non-Federal Reservoirs with a storage capacity less than 200 Acre-feet,  
1111 the presumptive average annual surface area is 25% of the area at the  
1112 principal spillway elevation. Net evaporation for each such Non-Federal  
1113 Reservoir will be calculated by multiplying the presumptive average annual  
1114 surface area by the net evaporation from the nearest climate and evaporation

1115 station to the Non-Federal Reservoir. A State may provide actual data in lieu  
1116 of the presumptive criteria.

1117  
1118 Net evaporation from Non-Federal Reservoirs with 200 Acre-feet of  
1119 storage or greater will be calculated by multiplying the average annual  
1120 surface area (obtained from the area-capacity survey) and the net  
1121 evaporation from the nearest evaporation and climate station to the  
1122 reservoir. If the average annual surface area is not available, the Non-  
1123 Federal Reservoirs with 200 Acre-feet of storage or greater will be  
1124 presumed to be full at the principal spillway elevation.

1125  
1126

### 1127 **B. Specific Formulas for Each Sub-basin and the Main Stem**

1128  
1129 All calculations shall be based on the calendar year and shall be rounded to the nearest 10  
1130 Acre-feet using the conventional rounding formula of rounding up for all numbers equal  
1131 to five or higher and otherwise rounding down.

1132

#### 1133 Abbreviations:

1134 APV = Augmentation Pumping Volume  
1135 CBCU = Computed Beneficial Consumptive  
1136 Use CWS = Computed Water Supply  
1137 CWSA = Computed Water Supply Adjustment  
1138 D = Non-Federal Canal Diversions for Irrigation  
1139 Ev = Evaporation from Federal Reservoirs  
1140 EvNFR = Evaporation from Non-Federal Reservoirs  
1141 FF = Flood Flow  
1142 GW = Groundwater Computed Beneficial Consumptive Use (includes  
1143 irrigation and non-irrigation uses)  
1144 IWS = Imported Water Supply Credit from Nebraska  
1145 M&I = Non-Irrigation Surface Water Diversions (Municipal and Industrial)  
1146 P = Small Individual Surface Water Pump Diversions for Irrigation  
1147 RF = Return Flow  
1148 VWS = Virgin Water Supply  
1149 c = Colorado  
1150 k = Kansas  
1151 n = Nebraska  
1152  $\Delta S$  = Change in Federal Reservoir Storage  
1153 % = Average system efficiency for individual pumps in the Sub-basin  
1154 % BRF = Percent of Diversion from Bureau Canals that returns to the stream  
1155 #### = Value expected to be zero

1156  
1157

1158	<b>1. North Fork of Republican River in Colorado<sup>6</sup></b>	
1159		
1160	CBCU Colorado	= 0.6 x Haigler Canal Diversion Colorado + 0.6 x Dc + %
1161		x Pc + 0.5 x M&Ic + EvNFRc + GWc
1162		
1163	CBCU Kansas	= GWk
1164		
1165	CBCU Nebraska	= 0.6 x Haigler Canal Diversion Nebraska + GWn
1166		
1167		Note: The diversion for Haigler Canal is split between
1168		Colorado and Nebraska based on the percentage of land
1169		irrigated in each state
1170		
1171	VWS	= North Fork of the Republican River at the State Line,
1172		Stn. No. 06823000 + CBCUc + CBCUk + CBCUn
1173		+ Nebraska Haigler Canal RF– IWS – APV
1174		
1175		Note: The Nebraska Haigler Canal RF returns to the Main Stem.
1176	CWS	= VWS - FF
1177		
1178	Allocation Colorado	= 0.224 x CWS
1179		
1180	Allocation Nebraska	= 0.246 x CWS
1181		
1182	Unallocated	= 0.53 x CWS
1183		
1184		
1185	<b>2. Arikaree River<sup>6S</sup></b>	
1186		
1187	CBCU Colorado	= 0.6 x Dc + % x Pc + 0.5 x M&Ic + EvNFRc + GWc
1188		
1189	CBCU Kansas	= 0.6 x Dk + % x Pk + 0.5 x M&Ik + EvNFRk + GWk
1190		
1191	CBCU Nebraska	= 0.6 x Dn + % x Pn + 0.5 x M&In + EvNFRn + GWn
1192		
1193	VWS	= Arikaree Gage at Haigler Stn. No. 06821500 + CBCUc
1194		+ CBCUk + CBCUn – IWS
1195		
1196	CWS	= VWS - FF
1197		
1198	Allocation Colorado	= 0.785 x CWS

<sup>6</sup> 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.

1199		
1200	Allocation Kansas	= 0.051 x CWS
1201		
1202	Allocation Nebraska	= 0.168 x CWS
1203		
1204	Unallocated	= -0.004 x CWS
1205		
1206		
1207	<b>3. Buffalo Creek</b>	
1208		
1209	CBCU Colorado	= 0.6 x Dc + % x Pc + 0.5 x M&In + EvNFRc
1210		+ GWc
1211		
1212	CBCU Kansas	= GWk
1213		
1214	CBCU Nebraska	= 0.6 x Dn + % x Pn + 0.5 x M&In + EvNFRn + GWn
1215		
1216	VWS	= Buffalo Creek near Haigler Gage Stn. No. 06823500
1217		+ CBCUc + CBCUk + CBCUn – IWS
1218		
1219	CWS	= VWS - FF
1220	Allocation Nebraska	= 0.330 x CWS
1221		
1222	Unallocated	= 0.670 x CWS
1223		
1224		
1225	<b>4. Rock Creek</b>	
1226		
1227	CBCU Colorado	= GWc
1228		
1229	CBCU Kansas	= GWk
1230		
1231	CBCU Nebraska	= 0.6 x Dn + % x Pn + 0.5 x M&In + EvNFRn + GWn
1232		
1233	VWS	= Rock Creek at Parks Gage Stn. No. 06824000 + CBCUc
1234		+ CBCUk + CBCUn – IWS – APV
1235		
1236	CWS	= VWS – FF
1237		
1238	Allocation Nebraska	= 0.400 x CWS
1239		
1240	Unallocated	= 0.600 x CWS
1241		
1242		

1243	<b>5. South Fork Republican River</b>	
1244		
1245	CBCU Colorado	= 0.6 x Hale Ditch Diversion + 0.6 x Dc + % x Pc
1246		+ 0.5 x M&Ic + EvNFRc + Bonny Reservoir Ev + GWc
1247		
1248	CBCU Kansas	= 0.6 x Dk + % x Pk + 0.5 x M&Ik + EvNFRk + GWk
1249		
1250	CBCU Nebraska	= 0.6 x Dn + % x Pn + 0.5 x M&In + EvNFRn + GWn
1251		
1252	VWS	= South Fork Republican River near Benkelman Gage
1253		Stn. No. 06827500 + CBCUc + CBCUk + CBCUn
1254		+ ΔS Bonny Reservoir – IWS
1255		
1256	CWS	= VWS - ΔS Bonny Reservoir - FF
1257		
1258	Allocation Colorado	= 0.444 x CWS
1259		
1260	Allocation Kansas	= 0.402 x CWS
1261		
1262	Allocation Nebraska	= 0.014 x CWS
1263		
1264	Unallocated	= 0.140 x CWS
1265		
1266		
1267	<b>6. Frenchman Creek in Nebraska</b>	
1268		
1269	CBCU Colorado	= GWc
1270		
1271	CBCU Kansas	= GWk
1272		
1273	CBCU Nebraska	= Culbertson Canal Diversions (IRR Season) x (1-%BRF)
1274		+ Culbertson Canal Diversions (Non-IRR Season) x (1-
1275		92%) + Culbertson Extension (IRR Season) x (1-%BRF)
1276		+ Culbertson Extension (Non-IRR Season) x (1-92%)
1277		+ 0.6 x Champion Canal Diversion + 0.6 x Riverside Canal
1278		Diversion + 0.6 x Dn + % x Pn + 0.5 x M&In + EvNFRn
1279		+ Enders Reservoir Ev + GWn
1280		
1281	VWS	= Frenchman Creek in Culbertson, Nebraska Gage Stn. No.
1282		06835500 + CBCUc + CBCUk + CBCUn
1283		+ 0.17 x Culbertson Diversion RF + Culbertson Extension RF
1284		+ 0.78 x Riverside Diversion RF + ΔS Enders Reservoir –
1285		IWS
1286		

1287		Note: 17% of the Culbertson Diversion RF and 100% of the
1288		Culbertson Extension RF return to the Main Stem
1289		
1290	CWS	= VWS - $\Delta$ S Enders Reservoir – FF
1291		
1292	Allocation Nebraska	= 0.536 x CWS
1293		
1294	Unallocated	= 0.464 x CWS
1295		<b>7. Driftwood Creek</b>
1296		
1297	CBCU Colorado	= GWc
1298		
1299	CBCU Kansas	= 0.6 x Dk + % x Pk + 0.5 x M&Ik + EvNFRk + GWk
1300		
1301	CBCU Nebraska	= 0.6 x Dn + % x Pn + 0.5 x M&In + EvNFRn + GWn
1302		
1303	VWS	= Driftwood Creek near McCook Gage Stn. No. 06836500
1304		+ CBCUc + CBCUk + CBCUn
1305		– 0.24 x Meeker Driftwood Canal RF - IWS
1306		
1307		Note: 24 % of the Meeker Driftwood Canal RF returns to
1308		Driftwood Creek
1309		
1310	CWS	= VWS – FF
1311		
1312	Allocation Kansas	= 0.069 x CWS
1313		
1314	Allocation Nebraska	= 0.164 x CWS
1315		
1316	Unallocated	= 0.767 x CWS
1317		
1318		
1319		<b>8. Red Willow Creek in Nebraska</b>
1320		
1321	CBCU Colorado	= GWc
1322		
1323	CBCU Kansas	= GWk
1324		
1325	CBCU Nebraska	= 0.1 x Red Willow Canal CBCU + 0.6 x Dn + % x Pn
1326		+ 0.5 x M&In + EvNFRn + 0.1 x Hugh Butler Lake Ev
1327		+ GWn
1328		
1329		Note:
1330		Red Willow Canal CBCU = Red Willow Canal Diversion

1331		(IRR Season) x (1- % BRF) + Red Willow Canal Diversion
1332		(Non-IRR Season) x (1-92%)
1333		
1334		90% of the Red Willow Canal CBCU and 90% of Hugh
1335		Butler Lake Ev charged to Nebraska's CBCU in the Main
1336		Stem
1337		
1338	VWS	= Red Willow Creek near Red Willow Gage Stn. No.
1339		06838000 + CBCUc + CBCUk + CBCUn + 0.9 x Red
1340		Willow Canal CBCU + 0.9 x Hugh Butler Lake Ev + 0.9 x
1341		Red Willow Canal RF+ ΔS Hugh Butler Lake – IWS
1342		
1343		Note: 90% of the Red Willow Canal RF returns to the
1344		Main Stem
1345		
1346	CWS	= VWS - ΔS Hugh Butler Lake - FF
1347		
1348	Allocation Nebraska	= 0.192 x CWS
1349		
1350	Unallocated	= 0.808 x CWS
1351		
1352		
1353		<b>9. Medicine Creek</b>
1354		
1355	CBCU Colorado	= GWc
1356		
1357	CBCU Kansas	= GWk
1358		
1359	CBCU Nebraska	= 0.6 x Dn above and below gage + % x Pn above and below
1360		gage + 0.5 x M&In above and below gage + EvNFRn above
1361		and below gage + GWn
1362		
1363		Notes: Harry Strunk Lake Ev charged to Nebraska's
1364		CBCU in the Main Stem.
1365		
1366		CU from Harry Strunk releases in the Cambridge Canal is
1367		charged to the Main stem (no adjustment to the VWS
1368		formula is needed as this water shows up in the Medicine
1369		Creek gage).
1370		
1371	VWS	= Medicine Creek below Harry Strunk Lake Gage Stn. No.
1372		06842500 + CBCUc + CBCUk + CBCUn – 0.6 x Dn below
1373		gage - % x Pn below gage – 0.5 * M&In below gage
1374		- EvNFRn below gage + Harry Strunk Lake Ev + ΔS Harry

1375		Strunk Lake – IWS – APV
1376		
1377		Note: The CBCU surface water terms for Nebraska which
1378		occur below the gage are added in the VWS for the Main
1379		Stem
1380		
1381	CWS	= VWS - ΔS Harry Strunk Lake - FF
1382		
1383	Allocation Nebraska	= 0.091 x CWS
1384		
1385	Unallocated	= 0.909 x CWS
1386		
1387		
1388		<b>10. Beaver Creek</b>
1389		
1390	CBCU Colorado	= 0.6 x Dc + % x Pc + 0.5 x M&Ic + EvNFRc + GWc
1391		
1392	CBCU Kansas	= 0.6 x Dk + % x Pk + 0.5 x M&Ik + EvNFRk + GWk
1393		
1394	CBCU Nebraska	= 0.6 x Dn above and below gage + % x Pn above and
1395		below gage + 0.5 x M&In above and below gage
1396		+ EvNFRn above and below gage + GWn
1397		
1398	VWS	= Beaver Creek near Beaver City gage Stn. No. 06847000 +
1399		BCUc + CBCUk + CBCUn – 0.6 x Dn below gage - % x Pn
1400		below gage – 0.5 * M&In below gage - EvNFRn below
1401		gage – IWS
1402		
1403		Note: The CBCU surface water terms for Nebraska which
1404		occur below the gage are added in the VWS for the Main
1405		Stem
1406		
1407	CWS	= VWS – FF
1408		
1409	Allocation Colorado	= 0.200 x CWS
1410		
1411	Allocation Kansas	= 0.388 x CWS
1412		
1413	Allocation Nebraska	= 0.406 x CWS
1414		
1415	Unallocated	= 0.006 x CWS
1416		
1417		
1418		<b>11. Sappa Creek</b>

1419		
1420	CBCU Colorado	= GWc
1421		
1422	CBCU Kansas	= 0.6 x Dk + % x Pk + 0.5 x M&Ik + EvNFRk + GWk
1423		
1424	CBCU Nebraska	= 0.6 x Dn above and below gage + % x Pn above and
1425		below gage + 0.5 x M&In above and below gage
1426		+ EvNFRn above and below gage + GWn
1427		
1428	VWS	= Sappa Creek near Stamford gage Stn. No. 06847500
1429		- Beaver Creek near Beaver City gage Stn. No. 06847000
1430		+ CBCUc + CBCUk + CBCUn - 0.6 x Dn below gage
1431		- % x Pn below gage - 0.5 * M&In below gage - EvNFRn
1432		below gage - IWS
1433		
1434		Note: The CBCU surface water terms for Nebraska which
1435		occur below the gage are added in the VWS for the Main Stem.
1436	CWS	= VWS - FF
1437		
1438	Allocation Kansas	= 0.411 x CWS
1439		
1440	Allocation Nebraska	= 0.411 x CWS
1441		
1442	Unallocated	= 0.178 x CWS
1443		
1444		
1445	<b>12. Prairie Dog Creek</b>	
1446		
1447	CBCU Colorado	= GWc
1448		
1449	CBCU Kansas	= Almena Canal Diversion x (1-%BRF) + 0.6 x Dk + % x Pk
1450		+ 0.5 x M&Ik + EvNFRk + Keith Sebelius Lake Ev + GWk
1451		
1452	CBCU Nebraska	= 0.6 x Dn below gage + % x Pn below gage + 0.5 x
1453		M&In below gage + EvNFRn + GWn below gage
1454		
1455	VWS	= Prairie Dog Creek near Woodruff, Kansas USGS Stn. No.
1456		06848500 + CBCUc + CBCUk + CBCUn - 0.6 x Dn below
1457		gage - % x Pn below gage - 0.5 x M&In below gage -
1458		EvNFRn below gage + ΔS Keith Sebelius Lake - IWS
1459		
1460		Note: The CBCU surface water terms for Nebraska which
1461		occur below the gage are added in the VWS for the Main
1462		Stem

1463		
1464	CWS	= VWS - ΔS Keith Sebelius Lake - FF
1465		
1466	Allocation Kansas	= 0.457 x CSW
1467		
1468	Allocation Nebraska	= 0.076 x CWS
1469		
1470	Unallocated	= 0.467 x CWS
1471	<b>13. The North Fork of the Republican River in Nebraska and the Main</b>	
1472	<b>Stem of the Republican River between the junction of the North Fork and</b>	
1473	<b>the Arikaree River and the Republican River near Hardy</b>	
1474		
1475	CBCU Colorado	= GWc
1476		
1477		
1478	CBCU Kansas	=
1479		(Deliveries from the Courtland Canal to Kansas above
1480		Lovewell) x (1-%BRF)
1481		+ Amount of transportation loss of Courtland Canal
1482		deliveries to Lovewell that does not return to the river,
1483		charged to Kansas
1484		+ (Diversions of Republican River water from Lovewell
1485		Reservoir by the Courtland Canal below Lovewell)
1486		x (1-%BRF)
1487		+ 0.6 x Dk
1488		+ % x Pk
1489		+ 0.5 x M&Ik
1490		+ EvNFRk
1491		+ Harlan County Lake Ev charged to Kansas
1492		+ Lovewell Reservoir Ev charged to the Republican River
1493		+ GWk
1494		
1495	CBCU Nebraska	=
1496		Deliveries from Courtland Canal to Nebraska lands x (1-
1497		%BRF)
1498		+ Superior Canal (IRR Season) x (1- %BRF) + Superior Canal
1499		(Non-IRR Season) x (1 - 92%)
1500		+ Franklin Pump Canal (IRR Season) x (1- %BRF) +
1501		Franklin Pump Canal (Non-IRR Season) x (1 - 92 %)
1502		+ Franklin Canal (IRR Season) x (1- %BRF) + Franklin Canal
1503		(Non-IRR Season) x (1 - 92%)
1504		+ Naponee Canal (IRR Season) x (1- %BRF) + Naponee
1505		Canal (Non-IRR Season) x (1 - 92%)
1506		+ Cambridge Canal (IRR Season) x (1- %BRF) + Cambridge

1507 Canal (Non-IRR Season) x (1 - 92%)  
 1508 + Bartley Canal (IRR Season) x (1- %BRF) + Bartley Canal  
 1509 (Non-IRR Season) x (1 - 92%)  
 1510 + Meeker-Driftwood Canal (IRR Season) x (1- %BRF) +  
 1511 Meeker-Driftwood Canal (Non-IRR Season) x (1- 92%)  
 1512 + 0.9 x Red Willow Canal CBCU  
 1513 + 0.6 x Dn  
 1514 + % x Pn  
 1515 + 0.5 x M&In  
 1516 + EvNFRn  
 1517 + 0.9 x Hugh Butler Lake Ev  
 1518 + Harry Strunk Lake Ev  
 1519 + Swanson Lake Ev  
 1520 + Harlan County Lake Ev charged to Nebraska  
 1521 + GWn  
 1522  
 1523 Notes:  
 1524 The allocation of transportation losses in the Courtland  
 1525 Canal above Lovewell between Kansas and Nebraska shall  
 1526 be done by the Bureau of Reclamation and reported in their  
 1527 “Courtland Canal Above Lovewell” spreadsheet. Deliveries  
 1528 and losses associated with deliveries to both Nebraska and  
 1529 Kansas above Lovewell shall be reflected in the Bureau’s  
 1530 Monthly Water District reports. Losses associated with  
 1531 delivering water to Lovewell shall be separately computed.  
 1532  
 1533 Amount of transportation loss of the Courtland Canal  
 1534 deliveries to Lovewell that does not return to the river,  
 1535 charged to Kansas shall be 18% of the Bureau’s estimate  
 1536 of losses associated with these deliveries.  
 1537  
 1538 Red Willow Canal CBCU = Red Willow Canal Diversion x  
 1539 (IRR Season) x (1- % BRF) + Red Willow Canal Diversion  
 1540 (Non-IRR Season) x (1 - 92%)  
 1541  
 1542 10% of the Red Willow Canal CBCU is charged to  
 1543 Nebraska’s CBCU in Red Willow Creek sub-basin  
 1544  
 1545 10% of Hugh Butler Lake Ev is charged to Nebraska’s  
 1546 CBCU in the Red Willow Creek sub-basin  
 1547  
 1548 None of the Harry Strunk Lake EV is charged to Nebraska’s  
 1549 CBCU in the Medicine Creek sub-basin  
 1550

1551	VWS	=
1552		Republican River near Hardy Gage Stn. No. 06853500
1553		- North Fork of the Republican River at the State Line,
1554		Stn. No. 06823000
1555		- Arikaree Gage at Haigler Stn. No. 06821500
1556		- Buffalo Creek near Haigler Gage Stn. No. 06823500
1557		- Rock Creek at Parks Gage Stn. No. 06824000
1558		- South Fork Republican River near Benkelman Gage Stn.
1559		No. 06827500
1560		- Frenchman Creek in Culbertson Stn. No. 06835500
1561		- Driftwood Creek near McCook Gage Stn. No. 06836500
1562		- Red Willow Creek near Red Willow Gage Stn.
1563		No. 06838000
1564		- Medicine Creek below Harry Strunk Lake Gage Stn.
1565		No. 06842500
1566		- Sappa Creek near Stamford Gage Stn. No. 06847500
1567		- Prairie Dog Creek near Woodruff, Kansas Stn. No.
1568		068485000
1569		
1570		+ CBCU <sub>c</sub>
1571		+ CBCU <sub>n</sub>
1572		
1573		+ 0.6 x Dk
1574		+ % x Pk
1575		+ 0.5 x M&Ik
1576		+ EvNFRk
1577		+ Harlan County Lake Ev charged to Kansas
1578		+ Amount of transportation loss of the Courtland Canal
1579		above the Stateline that does not return to the river, charged
1580		to Kansas
1581		+ <b>GWk</b>
1582		
1583		- 0.9 x Red Willow Canal CBCU
1584		- 0.9 x Hugh Butler Ev
1585		- Harry Strunk Ev
1586		
1587		+ 0.6 x Dn below Medicine Creek gage
1588		+ % x Pn below Medicine Creek gage
1589		+ 0.5 * M&In below Medicine Creek gage
1590		+ EvNFRn below Medicine Creek gage
1591		
1592		+ 0.6 x Dn below Beaver Creek gage
1593		+ % x Pn below Beaver Creek gage
1594		+ 0.5 * M&In below Beaver Creek gage

1595	+ EvNFRn below Beaver Creek gage
1596	
1597	+ 0.6 x Dn below Sappa Creek gage
1598	+ % x Pn below Sappa Creek gage
1599	+ 0.5 * M&In below Sappa Creek gage
1600	+ EvNFRn below Sappa Creek gage
1601	
1602	+ 0.6 x Dn below Prairie Dog Creek gage
1603	+ % x Pn below Prairie Dog Creek gage
1604	+ 0.5 * M&In below Prairie Dog Creek gage
1605	+ EvNFRn below Prairie Dog Creek gage
1606	
1607	+ Change in Storage Harlan County Lake
1608	+ Change in Storage Swanson Lake
1609	
1610	- Nebraska Haigler Canal RF
1611	- 0.78 x Riverside Canal RF
1612	- 0.17 x Culbertson Canal RF
1613	- Culbertson Canal Extension RF to Main Stem
1614	+ 0.24 x Meeker Driftwood Canal RF which returns to
1615	Driftwood Creek
1616	- 0.9 x Red Willow Canal RF
1617	
1618	+ Courtland Canal at Kansas-Nebraska State Line Gage Stn
1619	No. 06852500
1620	- Courtland Canal RF in Kansas above Lovewell Reservoir
1621	
1622	- IWS
1623	
1624	Notes:
1625	None of the Nebraska Haigler Canal RF returns to the North
1626	Fork of the Republican River
1627	
1628	83% of the Culbertson Diversion RF and none of the
1629	Culbertson Extension RF return to Frenchman Creek
1630	
1631	24 % of the Meeker Driftwood Canal RF returns to
1632	Driftwood Creek.
1633	
1634	10% of the Red Willow Canal RF returns to Red Willow
1635	Creek
1636	
1637	Courtland Canal RF in Kansas above Lovewell Reservoir =
1638	0.015 x (Courtland Canal at Kansas-Nebraska State Line

1639 Gage Stn No. 06852500)  
1640  
1641 CWS = VWS - Change in Storage Harlan County Lake - Change  
1642 in Storage Swanson Lake – FF + CWSA  
1643  
1644 Allocation Kansas = 0.511 x CWS  
1645  
1646 Allocation Nebraska = 0.489 x CWS

1647 **V. Annual Data/ Information Requirements, Reporting, and Verification**

1648  
1649 The following information for the previous calendar year shall be provided to the members of the  
1650 RRCA Engineering Committee by April 15<sup>th</sup> of each year, unless otherwise specified.

1651  
1652 All information shall be provided in electronic format, if available.

1653  
1654 Each State agrees to provide all information from their respective State that is needed for the  
1655 RRCA Groundwater Model and RRCA Accounting Procedures and Reporting Requirements,  
1656 including but not limited to the following:

1657  
1658 **A. Annual Reporting**

1659  
1660  
1661 **1. Surface water diversions and irrigated acreage:**

1662 Each State will tabulate the canal, ditch, and other surface water diversions that are  
1663 required by RRCA annual compact accounting and the RRCA Groundwater Model  
1664 on a monthly format (or a procedure to distribute annual data to a monthly basis)  
1665 and will forward the surface water diversions to the other States. This will include  
1666 available diversion, wasteway, and farm delivery data for canals diverting from the  
1667 Platte River that contribute to Imported Water Supply into the Basin. Each State  
1668 will provide the water right number, type of use, system type, location, diversion  
1669 amount, and acres irrigated.

1670  
1671  
1672 **2. Groundwater pumping and irrigated acreage:**

1673 Each State will tabulate and provide all groundwater well pumping estimates  
1674 that are required for the RRCA Groundwater Model to the other States.

1675  
1676 **Colorado** – will provide an estimate of pumping based on a county format  
1677 that is based upon system type, Crop Irrigation Requirement (CIR),  
1678 irrigated acreage, crop distribution, and irrigation efficiencies. Colorado  
1679 will require installation of a totalizing flow meter, installation of an hours  
1680 meter with a measurement of the pumping rate, or determination of a power  
1681 conversion coefficient for 10% of the active wells in the Basin by  
1682 December 31, 2005. Colorado will also provide an annual tabulation for

1683 each groundwater well that measures groundwater pumping by a totalizing  
1684 flow meter, hours meter or power conversion coefficient that includes: the  
1685 groundwater well permit number, location, reported hours, use, and  
1686 irrigated acreage.

1687  
1688 **Kansas** - will provide an annual tabulation by each groundwater well that  
1689 includes: water right number, groundwater pumping determined by a  
1690 meter on each well (or group of wells in a manifold system) or by reported  
1691 hours of use and rate; location; system type (gravity, sprinkler, LEPA,  
1692 drip, etc.); and irrigated acreage. Crop distribution will be provided on a  
1693 county basis.

1694  
1695 **Nebraska** – will provide an annual tabulation through the representative  
1696 Natural Resource District (NRD) in Nebraska that includes: the well  
1697 registration number or other ID number; groundwater pumping determined  
1698 by a meter on each well (or group of wells in a manifold system) or by  
1699 reported hours of use and rate; wells will be identified by; location; system  
1700 type (gravity, sprinkler, LEPA, drip, etc.); and irrigated acreage. Crop  
1701 distribution will be provided on a county basis.

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**3. Climate information:**

Each State will tabulate and provide precipitation, temperature, relative humidity or dew point, and solar radiation for the following climate stations:

State	Identification	Name
Colorado	C050109	Akron 4 E
Colorado	C051121	Burlington
Colorado	C054413	Julesburg
Colorado	C059243	Wray
Kansas	C140439	Atwood 2 SW
Kansas	C141699	Colby 1SW
Kansas	C143153	Goodland
Kansas	C143837	Hoxie
Kansas	C145856	Norton 9 SSE
Kansas	C145906	Oberlin1 E
Kansas	C147093	Saint Francis
Kansas	C148495	Wakeeny
Nebraska	C250640	Beaver City
Nebraska	C250810	Bertrand
Nebraska	C252065	Culbertson
Nebraska	C252690	Elwood 8 S
Nebraska	C253365	Gothenburg
Nebraska	C253735	Hebron

Nebraska	C253910	Holdredge
Nebraska	C254110	Imperial
Nebraska	C255090	Madrid
Nebraska	C255310	McCook
Nebraska	C255565	Minden
Nebraska	C256480	Palisade
Nebraska	C256585	Paxton
Nebraska	C257070	Red Cloud
Nebraska	C258255	Stratton
Nebraska	C258320	Superior
Nebraska	C258735	Upland
Nebraska	C259020	Wauneta 3 NW

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**4. Crop Irrigation Requirements:**

1711

Each State will tabulate and provide estimates of crop irrigation requirement information on a county format. Each State will provide the percentage of the crop irrigation requirement met by pumping; the percentage of groundwater irrigated lands served by sprinkler or flood irrigation systems, the crop irrigation requirement; crop distribution; crop coefficients; gain in soil moisture from winter and spring precipitation, net crop irrigation requirement; and/or other information necessary to compute a soil/water balance.

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**5. Streamflow Records from State-Maintained Gaging Records:**

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Streamflow gaging records from the following State maintained gages will be provided:

1722

1723

1724

<u>Station No</u>	<u>Name</u>
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1725

00126700	Republican River near Trenton
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1726

06831500	Frenchman Creek near Imperial
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1727

06832500	Frenchman Creek near Enders
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1728

06835000	Stinking Water Creek near Palisade
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1729

06837300	Red Willow Creek above Hugh Butler Lake
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1730

06837500	Red Willow Creek near McCook
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1731

06841000	Medicine Creek above Harry Strunk Lake
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1732

06842500	Medicine Creek below Harry Strunk Lake
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06844000	Muddy Creek at Arapahoe
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06844210	Turkey Creek at Edison
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06847000	Beaver Creek near Beaver City
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1736

	Republican River at Riverton
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06851500	Thompson Creek at Riverton
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06852000	Elm Creek at Amboy
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	Republican River at the Superior-Courtland
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Diversion Dam

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**6. Platte River Reservoirs:**

The State of Nebraska will provide the end-of-month contents, inflow data, outflow data, area-capacity data, and monthly net evaporation, if available, from Johnson Lake; Elwood Reservoir; Sutherland Reservoir; Maloney Reservoir; and Jeffrey Lake.

**7. Water Administration Notification:**

The State of Nebraska will provide the following information that describes the protection of reservoir releases from Harlan County Lake and for the administration of water rights junior in priority to February 26, 1948:

Date of notification to Nebraska water right owners to curtail their diversions, the amount of curtailment, and length of time for curtailment.

The number of notices sent.

The number of diversions curtailed and amount of curtailment in the Harlan County Lake to Guide Rock reach of the Republican River.

**8. Moratorium:**

Each State will provide a description of all new Wells constructed in the Basin Upstream of Guide Rock including the owner, location (legal description), depth and diameter or dimension of the constructed water well, casing and screen information, static water level, yield of the water well in gallons per minute or gallons per hour, and intended use of the water well.

Designation whether the Well is a:

- a. Test hole;
- b. Dewatering Well with an intended use of one year or less;
- c. Well designed and constructed to pump fifty gallons per minute or less;
- d. Replacement Water Well, including a description of the Well that is replaced providing the information described above for new Wells and a description of the historic use of the Well that is replaced;
- e. Well necessary to alleviate an emergency situation involving provision of water for human consumption, including a brief description of the nature of the emergency situation and the amount of water intended to be pumped by and the length of time of operation of the new Well;

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f. Transfer Well, including a description of the Well that is transferred providing the information described above for new Wells and a description of the Historic Consumptive Use of the Well that is transferred;

g. Well for municipal and/or industrial expansion of use;

Wells in the Basin in Northwest Kansas or Colorado. Kansas and Colorado will provide the information described above for new Wells along with copies of any other information that is required to be filed with either State of local agencies under the laws, statutes, rules and regulations in existence as of April 30, 2002, and; Any changes in State law in the previous year relating to existing Moratorium.

**9. Non-Federal Reservoirs:**

Each State will conduct an inventory of Non Federal Reservoirs by December 31, 2004, for inclusion in the annual Compact Accounting. The inventory shall include the following information: the location, capacity (in Acre-feet) and area (in acres) at the principal spillway elevation of each Non-Federal Reservoir. The States will annually provide any updates to the initial inventory of Non-Federal Reservoirs, including enlargements that are constructed in the previous year.

Owners/operators of Non-Federal Reservoirs with 200 Acre-feet of storage capacity or greater at the principal spillway elevation will be required to provide an area- capacity survey from State-approved plans or prepared by a licensed professional engineer or land surveyor.

**10. Augmentation Projects:**

Each State will provide a description of the wells, measuring devices, conveyance structure(s), and other infrastructure to describe the physical characteristics, water diversions, and consumptive use associated with each project. The States will provide daily pumping data for each augmentation project on an annual basis.

**B. RRCA Groundwater Model Data Input Files**

1. Monthly groundwater pumping, surface water recharge, groundwater recharge, and precipitation recharge provided by county and indexed to the one square mile cell size.
  
2. Potential Evapotranspiration rate is set as a uniform rate for all phreatophyte vegetative classes – the amount is X at Y climate stations and is interpolated

1828 spatially using kriging.

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1836 **C. Inputs to RRCA Accounting**

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1839 **1. Surface Water Information**

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1841 a. Streamflow gaging station records: obtained as preliminary USGS  
1842 or Nebraska streamflow records, with adjustments to reflect a  
1843 calendar year, at the following locations:

1844

1845 Arikaree River at Haigler, Nebraska

1846 North Fork Republican River at Colorado-Nebraska state line

1847 Buffalo Creek near Haigler, Nebraska

1848 Rock Creek at Parks, Nebraska

1849 South Fork Republican River near Benkelman, Nebraska

1850 Frenchman Creek at Culbertson, Nebraska

1851 Red Willow Creek near Red Willow, Nebraska

1852 Medicine Creek below Harry Strunk Lake, Nebraska\*

1853 Beaver Creek near Beaver City, Nebraska\*

1854 Sappa Creek near Stamford, Nebraska

1855 Prairie Dog Creek near Woodruff, Kansas

1856 Courtland Canal at Nebraska-Kansas state line

1857 Republican River near Hardy, Nebraska

1858 Republican River at Superior-Courtland Diversion Dam near

1859 Guide Rock,

1860 Nebraska (new)\*

1861

1862 b. Federal reservoir information: obtained from the United  
1863 States Bureau of Reclamation:

1864

1865 Daily free water surface evaporation, storage, precipitation,  
1866 reservoir release information, and updated area-capacity  
1867 tables.

1868 Federal Reservoirs:

1869 Bonny Reservoir

1870 Swanson Lake

1871 Harry Strunk Lake

- 1872 Hugh Butler Lake
- 1873 Enders Reservoir
- 1874 Keith Sebelius Lake
- 1875 Harlan County
- 1876 Lake Lovewell
- 1877 Reservoir
- 1878
- 1879 c. Non-federal reservoirs obtained by each state: an updated
- 1880 inventory of reservoirs that includes the location, surface area
- 1881 (acres), and capacity (in Acre-feet), of each non-federal reservoir
- 1882 with storage capacity of fifteen (15) Acre-feet or greater at the
- 1883 principal spillway elevation. Supporting data to substantiate the
- 1884 average surface water areas that are different than the presumptive
- 1885 average annual surface area may be tendered by the offering State.
- 1886
- 1887 d. Diversions and related data from USBR
- 1888
- 1889 Irrigation diversions by canal, ditch, and pumping station
- 1890 that irrigate more than two (2) acres
- 1891 Diversions for non-irrigation uses greater than 50 Acre-feet
- 1892 Farm Deliveries
- 1893 Wasteway measurements
- 1894 Irrigated acres
- 1895
- 1896 e. Diversions and related data – from each respective State
- 1897
- 1898 Irrigation diversions by canal, ditch, and pumping station
- 1899 that irrigate more than two (2) acres
- 1900 Diversions for non-irrigation uses greater than 50 Acre-feet
- 1901 Wasteway measurements, if available
- 1902
- 1903

1904 **2. Groundwater Information**

1905 (From the RRCA Groundwater model as output files as needed for the accounting

1906 procedures)

- 1907
- 1908 a. Imported water - mound credits in amount and time that occur in
- 1909 defined streamflow points/reaches of measurement or compliance
- 1910 – ex: gaging stations near confluence or state lines
- a. Groundwater depletions to streamflow (above points of
- measurement or compliance – ex: gaging stations near confluence
- or state lines)

**3. Summary**

The aforementioned data will be aggregated by Sub-basin as needed for RRCA accounting.

**D. Verification**

**1. Documentation to be Available for Inspection Upon Request**

- a. Well permits/ registrations database
- b. Copies of well permits/ registrations issued in calendar year
- c. Copies of surface water right permits or decrees
- d. Change in water right/ transfer historic use analyses
- e. Canal, ditch, or other surface water diversion records
- f. Canal, ditch, or other surface water measurements
- g. Reservoir storage and release records
- h. Irrigated acreage
- i. Augmentation well pumping and delivery records

**2. Site Inspection**

- a. Accompanied – reasonable and mutually acceptable schedule among representative state and/or federal officials.
- b. Unaccompanied – inspection parties shall comply with all laws and regulations of the State in which the site inspection occurs.

Table 1: Annual Virgin and Computed Water Supply, Allocations and Computed Beneficial Consumptive Uses by State, Main Stem and Sub-basin

Designated Drainage Basin	Col. 1: Virgin Water Supply	Col. 2: Computed Water Supply	Col. 3: Allocations				Col. 4: Computed Beneficial Consumptive Use		
			Colorado	Nebraska	Kansas	Unallocated	Colorado	Nebraska	Kansas
North Fork in Colorado									
Arikaree									
Buffalo									
Rock									
South Fork of Republican River									
Frenchman									
Driftwood									
Red Willow									
Medicine									
Beaver									
Sappa									
Prairie Dog									
North Fork of Republican River in Nebraska and Main Stem									
Total All Basins									
North Fork Of Republican River in Nebraska and Mainstem Including Unallocated Water									
Total									

Table 2: Original Compact Virgin Water Supply and Allocations

Designated Drainage Basin	Virgin Water Supply	Colorado Allocation	% of Total Drainage Basin Supply	Kansas Allocation	% of Total Drainage Basin Supply	Nebraska Allocation	% of Total Drainage Basin Supply	Unallocated	% of Total Drainage Basin Supply
North Fork - CO	44,700	10,000	22.4			11,000	24.6	23,700	53.0
Arikaree River	19,610	15,400	78.5	1,000	5.1	3,300	16.8	-90	-0.4
Buffalo Creek	7,890					2,600	33.0	5,290	67.0
Rock Creek	11,000					4,400	40.0	6,600	60.0
South Fork	57,200	25,400	44.4	23,000	40.2	800	1.4	8,000	14.0
Frenchman Creek	98,500					52,800	53.6	45,700	46.4
Driftwood Creek	7,300			500	6.9	1,200	16.4	5,600	76.7
Red Willow Creek	21,900					4,200	19.2	17,700	80.8
Medicine Creek	50,800					4,600	9.1	46,200	90.9
Beaver Creek	16,500	3,300	20.0	6,400	38.8	6,700	40.6	100	0.6
Sappa Creek	21,400			8,800	41.1	8,800	41.1	3,800	17.8
Prairie Dog Creek	27,600			12,600	45.7	2,100	7.6	12,900	46.7
Sub-total Tributaries	384,400							175,500	
Main Stem + Blackwood Creek	94,500								
Main Stem + Unallocated	270,000			138,000	51.1	132,000	48.9		
Total	478,900	54,100		190,300		234,500			

Table 3A: Table to Be Used to Calculate Colorado's Five-Year Running Average Allocation and Computed Beneficial Consumptive Use for Determining Compact Compliance for Averaging Periods with No Water Short Year Designations Pursuant to Section III.J.

Colorado				
	Col. 1	Col. 2	Col. 3	Col. 4
Year	Allocation	Computed Beneficial Consumptive	Imported Water Supply Credit and CORWS Credit	Difference between Allocation and the Computed Beneficial Consumptive Use offset by Imported Water Supply Credit and CORWS Credit Col 1 – (Col 2- Col 3)
Year t= -4				
Year t= -3				
Year t= -2				
Year t= -1				
Current Year t= 0				
Average				

Table 3B. Table to Be Used to Calculate Kansas's Five-Year Running Average Allocation and Computed Beneficial Consumptive Use for Determining Compact Compliance

Kansas				
	Col. 1	Col. 2	Col. 3	Col. 4
Year	Allocation	Computed Beneficial Consumptive	Imported Water Supply Credit	Difference between Allocation and the Computed Beneficial Consumptive Use offset by Imported Water Supply Credit Col 1 – (Col 2- Col 3)
Year T= -4				
Year T= -3				
Year T= -2				
Year T= -1				
Current Year T= 0				
Average				

Table 3C. Table to Be Used to Calculate Nebraska's Five-Year Running Average Allocation and Computed Beneficial Consumptive Use for Determining Compact Compliance

Nebraska				
	Col. 1	Col. 2	Col. 3	Col. 4
Year	Allocation	Computed Beneficial Consumptive	Imported Water Supply Credit and NERWS Credit	Difference between Allocation and the Computed Beneficial Consumptive Use offset by Imported Water Supply Credit and NERWS Credit Col 1 – (Col 2- Col 3)
Year T= -4				
Year T= -3				
Year T= -2				
Year T= -1				
Current Year T= 0				
Average				

Table 4A: Colorado Compliance with the Sub-basin Non-impairment Requirement

	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6
Sub-basin	Colorado Sub-basin Allocation (5-year running average)	Unallocated Supply (5-year running average)	Credits from Imported Water Supply and CORWS Credit (5-year running average)	Total Supply Available (5-year running average)	Colorado Computed Beneficial Consumptive Use (5-year running average)	Difference Between Available Supply and Computed Beneficial Consumptive Use (5-year running average)
North Fork Republican River Colorado						
Arikaree River			N/A			
South Fork Republican River			N/A			
Beaver Creek			N/A			

Note: In Table 4A, the CORWS Credit in Col 3 can only be applied to the North Fork Republican River Colorado. Table 4A is left unpopulated pursuant to the 2016 Colorado CCP/SF Resolution, paragraph E.

Table 4B: Kansas Compliance with the Sub-basin Non-impairment Requirement

	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7
Sub-basin	Kansas Sub-basin Allocation (5-year running average)	Unallocated Supply (5-year running average)	Unused Allocation from Colorado (5-year running average)	Credits from Imported Water Supply (5-year running average)	Total Supply Available = Col 1+ Col 2+ Col 3 + Col 4 (5-year running average)	Kansas Computed Beneficial Consumptive Use (5-year running average)	Difference Between Available Supply and Computed Beneficial Consumptive Use = Col 5 – Col 6 (5-year running average)
Arikaree River							
South Fork Republican River							
Driftwood Creek							
Beaver Creek							
Sappa Creek							
Prairie Dog Creek							

Table 5A: Table to Be Used to Calculate Colorado's Compact Compliance for Averaging Periods with Water Short Year Designations Pursuant to Section III.J.

Colorado							
	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7
Year	Is the year Water Short Pursuant to III.J?*( Yes or No)	Statewide Allocation	Beaver Creek Reduction Pursuant to Table 5F	Allocation – Beaver Creek Reduction (Col. 2 – Col. 3)	Computed Beneficial Consumptive (excluding the Beaver Creek Sub-basin)	Imported Water Supply Credit – IWS Beaver Creek $\pm$ <u>CORWS Credit</u>	Difference between Allocation and the Computed Beneficial Consumptive Use offset by Imported Water Supply Credit <u>and CORWS Credit</u> (Col. 4 – Col. 5 + Col. 6)
Year T= -4							
Year T= -3							
Year T= -2							
Year T= -1							
Current Year T= 0							
Average							

\* If the Column 1 entry is “No”, then the Beaver Creek Reduction in Column 3 will be zero for that year.

Table 5B: Kansas Compliance During Water-Short Year Administration

Kansas							
Year	Allocation				Computed Beneficial Consumptive Use	Imported Water Supply Credit	Difference Between Allocation and the Computed Beneficial Consumptive Use offset by Imported Water Supply Credit
Column	1	2	3	4	5	6	7
	Sum Sub-basins	Kansas's Share of the Unallocated Supply	Kansas' Share of Unused Colorado Allocation	Total Col 1 + Col 2 + Col 3			Col 4 – (Col 5 – Col 6)
Previous Year							
Current Year							
Average							

Note: In Table 5B, Column 3 values are the sum of Kansas' Share of Unused Colorado Allocations for the sub-basins listed in Table 4B. Kansas' share of the Unused Colorado Allocation is 51.1%.

Table 5C: Nebraska Compliance During Water-Short Year Administration

	Nebraska									
Year	Allocation				Computed Beneficial Consumptive Use			Imported Water Supply Credit and NERWS Credit	Difference Between Allocation and the Computed Beneficial Consumptive Use offset by Imported Water Supply Credit Above Guide Rock and NERWS Credit	
Column	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	
	State Wide Allocation	Allocation below Guide Rock	State Wide Allocation above Guide Rock	Nebraska's Share of Unused Colorado Allocation	State Wide CBCU	CBCU below Guide Rock	State Wide CBCU above Guide Rock	Credits above Guide Rock	Col 3 + Col 4 – (Col 7 – Col 8)	
Previous Year										
Current Year										
Average										

Note:

In Table 5C, Column 4 values are the sum of Nebraska's Share of Unused Colorado Allocations for the sub-basins listed in Table 4B and the North Fork Sub-basin. Nebraska's share of the Unused Colorado Allocation is 48.9%.

Table 5D: Nebraska Compliance Under an Alternative Water-Short Year Administration Plan

Year	Allocation				Computed Beneficial Consumptive Use			Imported Water Supply Credit and NERWS Credit	Difference Between Allocation and the Computed Beneficial Consumptive Use offset by Imported Water Supply Credit Above Guide Rock and NERWS Credit
Column	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9
	State Wide Allocation	Allocation below Guide Rock	State Wide Allocation above Guide Rock	Nebraska's Share of Unused Colorado Allocation	State Wide CBCU	CBCU below Guide Rock	State Wide CBCU above Guide Rock	Credits above Guide Rock	Col 3 + Col 4 – (Col 7- Col 8)
Year = -2									
Year = -1									
Current Year									
Three-Year Average									
	Sum of Previous Two-year Difference								
	Expected Decrease in CBCU Under Plan								

Note: In Table 5D, Column 4 values are the sum of Nebraska's Share of Unused Colorado Allocations for the sub-basins listed in Table 4B and the North Fork Sub-basin. Nebraska's share of the Unused Colorado Allocation is 48.9%.

Table 5E: Nebraska Tributary Compliance During Water-Short Year Administration

Year	Sum of Nebraska Sub-basin Allocations	Sum of Nebraska's Share of Sub-basin Unallocated Supplies	Total Available Water Supply for Nebraska	Computed Beneficial Consumptive Use	Imported Water Supply Credit and NERWS Credit generated in a Sub-basin	Difference between Allocation And the Computed Beneficial Consumptive Use offset by Imported Water Supply Credit and NERWS Credit
	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6
			Col 1 + Col 2			Col 3 -(Col 4-Col 5)
Previous Year						
Current Year						
Average						

Table 5F: Colorado's Beaver Creek Reduction During Water-Short Years

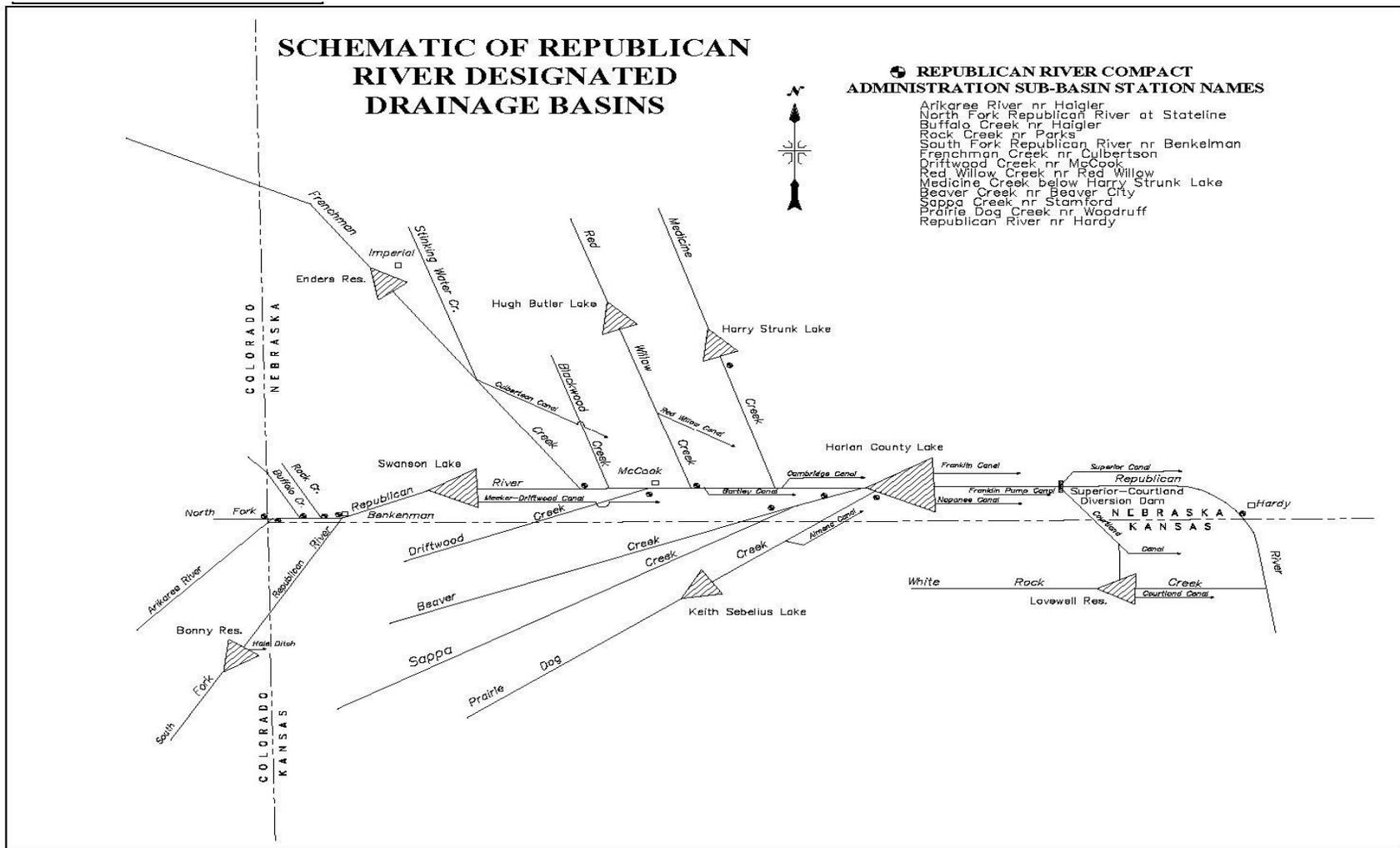
Colorado		
Water Short Year (WSY) Pursuant to III.J	Beaver Creek Allocation	Current Accounting Year Reduction = Average of last 5 WSY Beaver Creek Allocations
	Col. 1	Col. 2
Fifth Most Recent WSY		
Fourth Most Recent WSY		
Third Most Recent WSY		
Second Most Recent WSY		
Most Recent* WSY		
		Average of Col. 1

\*Most Recent WSY prior to the current accounting year.

Example calculation for Table 5F

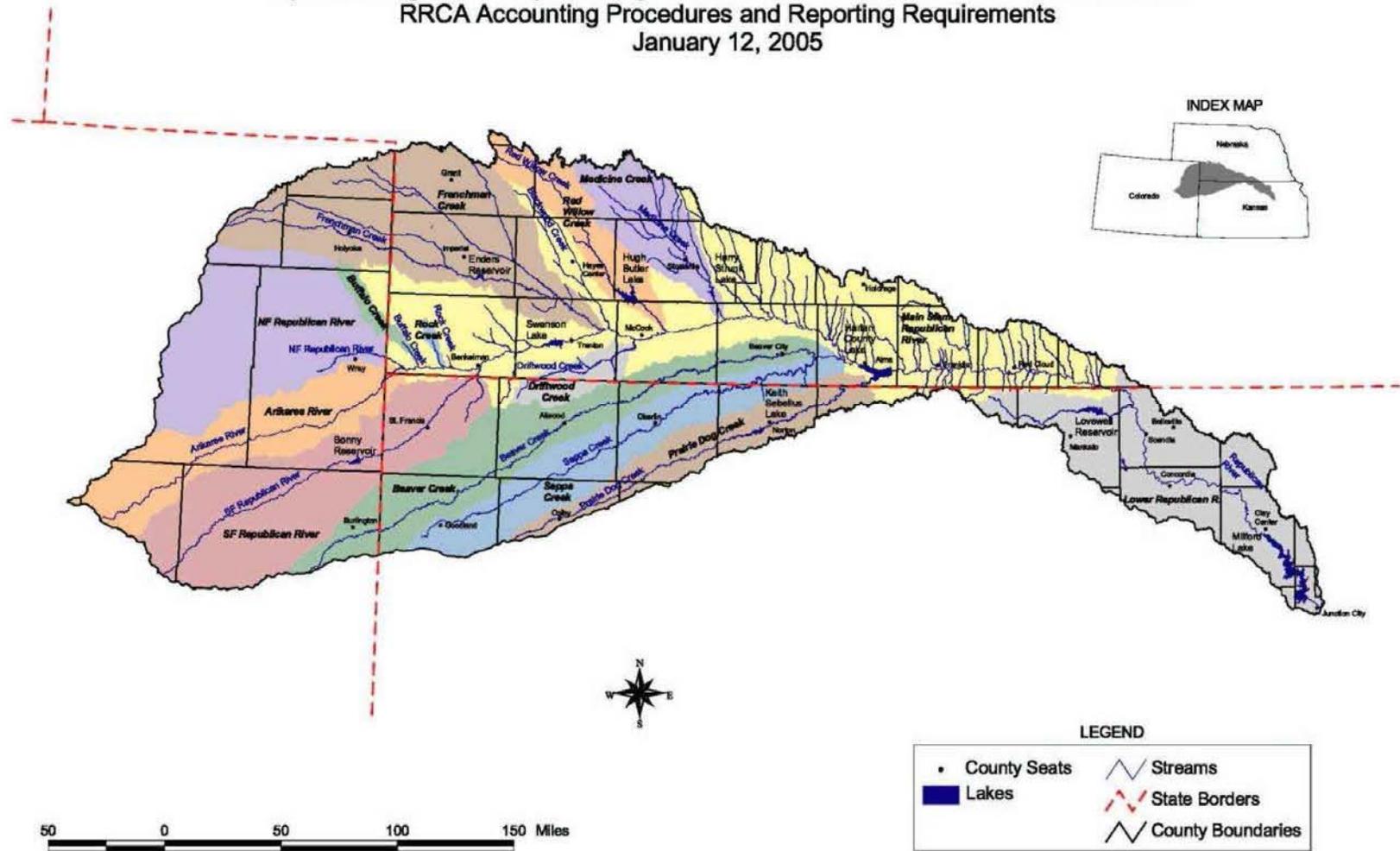
Colorado		
Water Short Year Pursuant to III.J	Beaver Creek Allocation	Reduction = Average of last 5 WSY Beaver Creek Allocations
	Col. 1	Col. 2
2002	770	
2003	260	
2004	360	
2005	910	
2006	1420	
2007	2320	744
2013	1130	1054
2014	1250	1228
2015	2130	1406
2016	2520	1650





Line Diagram of Designated Drainage Basins Showing Federal Reservoirs and Sub-basin Gaging Stations

Update of Figure 3 - Map Showing Sub-basins, Streams, and the Basin Boundaries  
 RRCA Accounting Procedures and Reporting Requirements  
 January 12, 2005



Map Showing Sub-basins, Streams, and the Basin Boundaries

Attachment 1: Sub-basin Flood Flow Thresholds

Sub-basin	Sub-basin Flood Flow Threshold Acre-feet per Year <sup>7</sup>
Arikaree River	16,400
North Fork of Republican River	33,900
Buffalo Creek	4,800
Rock Creek	9,800
South Fork of Republican River	30,400
Frenchman Creek	51,900
Driftwood Creek	9,400
Red Willow Creek	15,100
Medicine Creek	55,100
Beaver Creek	13,900
Sappa Creek	26,900
Prairie Dog	15,700

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<sup>7</sup> Flows considered to be Flood Flows are flows in excess of the 94% flow based on a flood frequency analysis for the years 1971-2000. The Gaged Flows are measured after depletions by Beneficial Consumptive Use and change in reservoir storage.

Attachment 2: Description of the Consensus Plan for Harlan County Lake

The Consensus Plan for operating Harlan County Lake was conceived after extended discussions and negotiations between Reclamation and the Corps. The agreement shaped at these meetings provides for sharing the decreasing water supply into Harlan County Lake. The agreement provides a consistent procedure for: updating the reservoir elevation/storage relationship, sharing the reduced inflow and summer evaporation, and providing a January forecast of irrigation water available for the following summer.

During the interagency discussions the two agencies found agreement in the following areas:

- The operating plan would be based on current sediment accumulation in the irrigation pool and other zones of the project.
- Evaporation from the lake affects all the various lake uses in proportion to the amount of water in storage for each use.
- During drought conditions, some water for irrigation could be withdrawn from the sediment pool.
- Water shortage would be shared between the different beneficial uses of the project, including fish, wildlife, recreation and irrigation.

To incorporate these areas of agreement into an operation plan for Harlan County Lake, a mutually acceptable procedure addressing each of these items was negotiated and accepted by both agencies.

1. Sediment Accumulation.

The most recent sedimentation survey for Harlan County project was conducted in 1988, 37 years after lake began operation. Surveys were also performed in 1962 and 1972; however, conclusions reached after the 1988 survey indicate that the previous calculations are unreliable. The 1988 survey indicates that, since closure of the dam in 1951, the accumulated sediment is distributed in each of the designated pools as follows:

Flood Pool	2,387 Acre-feet
Irrigation Pool	4,853 Acre-feet
Sedimentation Pool	33,527 Acre-feet

To insure that the irrigation pool retained 150,000 Acre-feet of storage, the bottom of the irrigation pool was lowered to 1,932.4 feet, msl, after the 1988 survey.

To estimate sediment accumulation in the lake since 1988, we assumed similar conditions have occurred at the project during the past 11 years. Assuming a consistent rate of deposition since 1988, the irrigation pool has trapped an additional 1,430 Acre-feet.

A similar calculation of the flood control pool indicates that the flood control pool has captured an additional 704 Acre-feet for a total of 3,090 Acre-feet since construction.

The lake elevations separating the different pools must be adjusted to maintain a 150,000-acre-foot irrigation pool and a 500,000-acre-foot flood control pool. Adjusting these elevations results in the following new elevations for the respective pools (using the 1988 capacity tables).

Top of Irrigation Pool	1,945.70 feet, msl
Top of Sediment Pool	1,931.75 feet, msl

Due to the variability of sediment deposition, we have determined that the elevation capacity relationship should be updated to reflect current conditions. We will complete a new sedimentation survey of Harlan County Lake this summer, and new area capacity tables should be available by early next year. The new tables may alter the pool elevations achieved in the Consensus Plan for Harlan County Lake.

## 2. Summer Evaporation.

Evaporation from a lake is affected by many factors including vapor pressure, wind, solar radiation, and salinity of the water. Total water loss from the lake through evaporation is also affected by the size of the lake. When the lake is lower, the surface area is smaller and less water loss occurs. Evaporation at Harlan County Lake has been estimated since the lake's construction using a Weather Service Class A pan which is 4 feet in diameter and 10 inches deep. We and Reclamation have jointly reviewed this information and assumed future conditions to determine an equitable method of distributing the evaporation loss from the project between irrigation and the other purposes.

During those years when the irrigation purpose expected a summer water yield of 119,000 Acre-feet or more, it was determined that an adequate water supply existed and no sharing of evaporation was necessary. Therefore, evaporation evaluation focused on the lower pool elevations when water was scarce. Times of water shortage would also generally be times of higher evaporation rates from the lake.

Reclamation and we agreed that evaporation from the lake during the summer (June through September) would be distributed between the irrigation and sediment pools based on their relative percentage of the total storage at the time of evaporation. If the sediment pool held 75 percent of the total storage, it would be charged 75 percent of the evaporation. If the sediment pool held 50 percent of the total storage, it would be charged 50 percent of the evaporation. At the bottom of the irrigation pool (1,931.75 feet, msl) all of the evaporation would be charged to the sediment pool.

Due to downstream water rights for summer inflow, neither the irrigation nor the sediment pool is credited with summer inflow to the lake. The summer inflows would be

assumed passed through the lake to satisfy the water right holders. Therefore, Reclamation and we did not distribute the summer inflow between the project purposes.

As a result of numerous lake operation model computer runs by Reclamation, it became apparent that total evaporation from the project during the summer averaged about 25,000 Acre-feet during times of lower lake elevations. These same models showed that about 20 percent of the evaporation should be charged to the irrigation pool, based on percentage in storage during the summer months. About 20 percent of the total lake storage is in the irrigation pool when the lake is at elevation 1,935.0 feet, msl. As a result of the joint study, Reclamation and we agreed that the irrigation pool would be credited with 20,000 Acre-feet of water during times of drought to share the summer evaporation loss.

Reclamation and we further agreed that the sediment pool would be assumed full each year. In essence, if the actual pool elevation were below 1,931.75 feet, msl, in January, the irrigation pool would contain a negative storage for the purpose of calculating available water for irrigation, regardless of the prior year's summer evaporation from sediment storage.

### 3. Irrigation withdrawal from sediment storage.

During drought conditions, occasional withdrawal of water from the sediment pool for irrigation is necessary. Such action is contemplated in the Field Working Agreement and the Harlan County Lake Regulation Manual: "Until such time as sediment fully occupies the allocated reserve capacity, it will be used for irrigation and various conservation purposes, including public health, recreation, and fish and wildlife preservation."

To implement this concept into an operation plan for Harlan County Lake, Reclamation and we agreed to estimate the net spring inflow to Harlan County Lake. The estimated inflow would be used by the Reclamation to provide a firm projection of water available for irrigation during the next season.

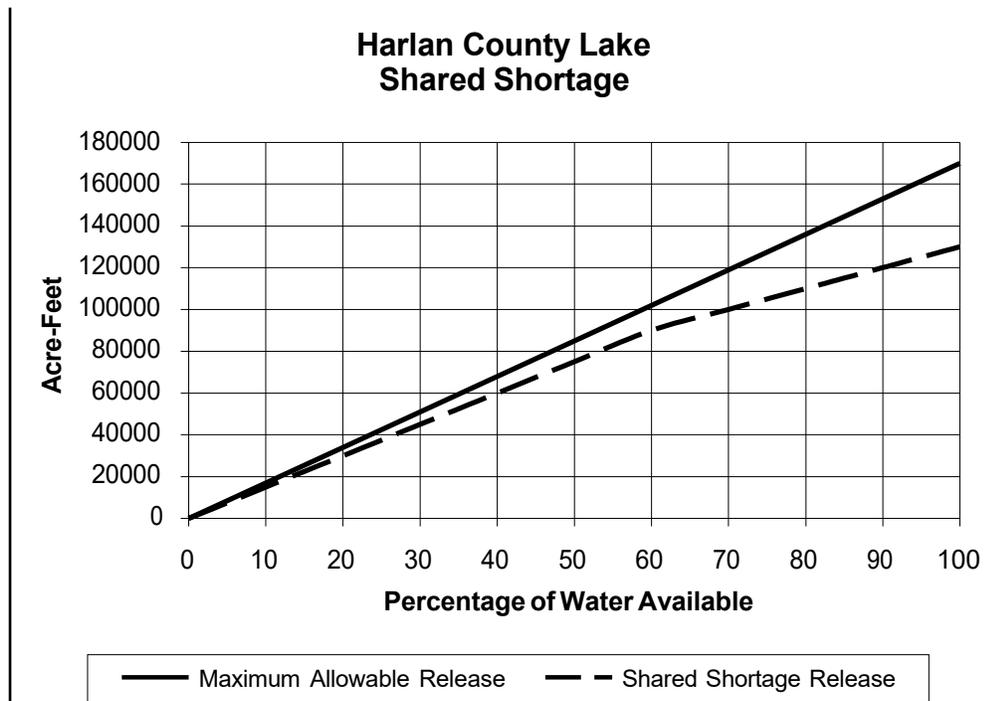
Since the construction of Harlan County Lake, inflows to the lake have been depleted by upstream irrigation wells and farming practices. Reclamation has recently completed an in-depth study of these depleted flows as a part of their contract renewal process. The study concluded that if the current conditions had existed in the basin since 1931, the average spring inflow to the project would have been 57,600 Acre-feet of water. The study further concluded that the evaporation would have been 8,800 Acre-feet of water during the same period. Reclamation and we agreed to use these values to calculate the net inflow to the project under the current conditions.

In addition, both agencies also recognized that the inflow to the project could continue to decrease with further upstream well development and water conservation farming. Due to these concerns, Reclamation and we determined that the previous 5-year inflow values would be averaged each year and compared to 57,600 Acre-feet. The inflow estimate for Harlan County Lake would be the smaller of these two values.

The estimated inflow amount would be used in January of each year to forecast the amount of water stored in the lake at the beginning of the irrigation season. Based on this forecast, the irrigation districts would be provided a firm estimate of the amount of water available for the next season. The actual storage in the lake on May 31 would be reviewed each year. When the actual water in storage is less than the January forecast, Reclamation may draw water from sediment storage to make up the difference.

4. Water Shortage Sharing.

A final component of the agreement involves a procedure for sharing the water available during times of shortage. Under the shared shortage procedure, the irrigation purpose of the project would remove less water than otherwise allowed and alleviate some of the adverse effects to the other purposes. The procedure would also extend the water supply during times of drought by “banking” some water for the next irrigation season. The following graph illustrates the shared shortage releases.



5. Calculation of Irrigation Water Available

Each January, the Reclamation would provide the Bostwick irrigation districts a firm estimate of the quantity of water available for the following season. The firm estimate of water available for irrigation would be calculated by using the following equation and shared shortage adjustment:

$$\text{Storage} + \text{Summer Sediment Pool Evaporation} + \text{Inflow} - \text{Spring Evaporation} = \text{Maximum Irrigation Water Available}$$

The variables in the equation are defined as:

- Maximum Irrigation Water Available. Maximum irrigation supply from Harlan County Lake for that irrigation season.
- Storage. Actual storage in the irrigation pool at the end of December. The sediment pool is assumed full. If the pool elevation is below the top of the sediment pool, a negative irrigation storage value would be used.
- Inflow. The inflow would be the smaller of the past 5-year average inflow to the project from January through May, or 57,600 Acre-feet.
- Spring Evaporation. Evaporation from the project would be 8,800 Acre-feet which is the average January through May evaporation.
- Summer Sediment Pool Evaporation. Summer evaporation from the sediment pool during June through September would be 20,000 Acre-feet. This is an estimate based on lower pool elevations, which characterize the times when it would be critical to the computations.

#### 6. Shared Shortage Adjustment

To ensure that an equitable distribution of the available water occurs during short-term drought conditions, and provide for a “banking” procedure to increase the water stored for subsequent years, a shared shortage plan would be implemented. The maximum water available for irrigation according to the above equation would be reduced according to the following table. Linear interpolation of values will occur between table values.

Shared Shortage Adjustment Table

Irrigation Water Available (Acre-feet)	Irrigation Water Released (Acre-feet)
0	0
17,000	15,000
34,000	30,000
51,000	45,000
68,000	60,000
85,000	75,000
102,000	90,000
119,000	100,000
136,000	110,000
153,000	120,000
170,000	130,000

7. Annual Shutoff Elevation for Harlan County Lake

The annual shutoff elevation for Harlan County Lake would be estimated each January and finally established each June.

The annual shutoff elevation for irrigation releases will be estimated by Reclamation each January in the following manner:

1. Estimate the May 31 Irrigation Water Storage (IWS) (Maximum 150,000 Acre-feet) by taking the December 31 irrigation pool storage plus the January-May inflow estimate (57,600 Acre-feet or the average inflow for the last 5-year period, whichever is less) minus the January-May evaporation estimate (8,800 Acre-feet).
2. Calculate the estimated Irrigation Water Available, including all summer evaporation, by adding the Estimated Irrigation Water Storage (from item 1) to the estimated sediment pool summer evaporation (20,000 AF).
3. Use the above Shared Shortage Adjustment Table to determine the acceptable Irrigation Water Release from the Irrigation Water Available.
4. Subtract the Irrigation Water Release (from item 3) from the Estimated IWS (from item 1). The elevation of the lake corresponding to the resulting irrigation storage is the Estimated Shutoff Elevation. The shutoff elevation will not be below the bottom of the irrigation pool if over 119,000 AF of water is supplied to the districts, nor below 1,927.0 feet, msl. If the shutoff elevation is below the irrigation pool, the maximum irrigation release is 119,000 AF.

The annual shutoff elevation for irrigation releases would be finalized each June in accordance with the following procedure:

1. Compare the estimated May 31 IWS with the actual May 31 IWS.
2. If the actual end of May IWS is less than the estimated May IWS, lower the shutoff elevation to account for the reduced storage.
3. If the actual end of May IWS is equal to or greater than the estimated end of May IWS, the estimated shutoff elevation is the annual shutoff elevation.
4. The shutoff elevation will never be below elevation 1,927.0 feet, msl, and will not be below the bottom of the irrigation pool if more than 119,000 Acre-feet of water is supplied to the districts.

Attachment 3: Inflows to Harlan County Lake 1993 Level of Development

BASELINE RUN - 1993 LEVEL INFLOW TO HARLAN COUNTY RESERVOIR													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1931	10.2	10.8	13.4	5.0	18.8	15.8	4.3	1.8	1.8	0.0	0.1	0.1	82.1
1932	6.8	16.6	18.5	4.6	3.8	47.6	3.8	2.8	4.8	0.0	0.0	0.4	109.7
1933	0.4	0.0	3.9	30.2	31.0	5.4	1.8	0.0	10.4	0.0	2.6	5.5	91.2
1934	2.1	0.0	3.2	1.8	0.7	7.3	0.8	0.0	1.3	0.0	2.2	0.0	19.4
1935	0.3	0.1	0.7	4.2	0.8	389.3	6.1	19.1	26.1	2.4	5.2	0.9	455.2
1936	0.3	0.0	11.9	0.0	35.9	4.7	0.4	0.0	1.8	0.0	1.6	3.8	60.4
1937	4.8	12.9	6.0	2.5	0.0	12.6	6.3	6.9	2.4	0.0	0.0	12.4	66.8
1938	9.9	7.8	8.7	10.4	18.7	8.6	7.3	7.8	4.9	0.2	0.0	4.7	89.0
1939	2.7	7.5	9.6	12.2	6.6	13.3	5.0	4.1	0.0	0.0	0.0	0.0	61.0
1940	0.0	0.0	12.2	5.2	4.6	23.7	2.8	3.2	0.0	3.6	0.0	1.4	56.7
1941	0.0	10.6	10.6	7.7	17.2	67.1	28.9	19.7	14.9	8.3	6.7	7.1	198.8
1942	3.3	10.6	0.5	34.1	30.8	83.9	11.7	10.9	36.5	3.1	8.7	0.3	234.4
1943	1.2	11.2	14.6	31.4	4.7	28.3	4.8	0.3	0.9	0.0	0.0	11.8	109.2
1944	0.1	4.3	9.0	43.1	31.9	63.9	26.6	15.4	0.5	0.3	3.0	4.5	202.6
1945	4.3	7.8	5.7	9.5	4.1	53.5	5.0	0.9	1.5	5.0	6.0	6.3	109.6
1946	5.9	11.2	9.3	4.9	7.0	3.1	1.6	11.4	28.1	129.9	25.0	12.1	249.5
1947	1.1	3.2	10.4	8.2	11.9	195.4	22.3	5.9	2.9	0.2	0.3	0.3	262.1
1948	6.2	9.8	24.1	5.4	0.2	39.8	13.5	6.8	4.2	0.0	0.1	0.1	110.2
1949	2.0	1.5	25.2	16.3	49.0	57.4	9.2	5.5	2.1	3.0	2.8	0.3	174.3
1950	0.3	5.7	10.8	10.9	28.9	10.1	12.7	9.3	7.8	7.2	3.8	3.1	110.6
1951	3.8	3.4	7.1	5.3	42.0	39.9	42.1	10.1	36.0	15.5	14.8	8.9	228.9
1952	16.4	21.4	26.3	23.8	34.6	4.0	9.3	3.1	1.5	11.7	4.3	0.1	156.5
1953	1.8	4.6	5.3	3.3	15.1	9.5	1.8	0.2	0.0	0.0	2.8	0.1	44.5
1954	1.0	6.8	1.9	3.2	7.1	2.4	0.0	1.2	0.0	0.0	0.0	0.0	23.6
1955	0.0	4.0	6.3	4.8	2.9	6.4	2.7	0.0	1.4	0.0	0.0	0.0	28.5
1956	1.6	3.4	2.9	2.4	1.3	1.5	0.0	0.6	0.0	0.0	0.0	0.0	13.7
1957	0.0	4.1	6.2	12.8	3.5	62.4	21.3	1.2	2.0	3.4	4.5	4.7	126.1
1958	0.8	3.0	14.2	14.0	18.7	1.3	3.4	2.2	0.0	0.4	0.0	0.6	58.6
1959	1.9	15.4	16.4	8.5	13.6	4.2	1.4	1.2	0.0	4.3	1.0	4.5	72.4
1960	1.4	12.3	71.4	23.9	21.7	53.7	14.1	3.2	0.0	0.0	0.2	2.8	204.7
1961	2.3	6.4	7.7	7.4	26.5	24.0	7.2	4.9	0.0	2.3	4.8	1.7	95.2

Attachment 3: Inflows to Harlan County Lake 1993 Level of Development

BASELINE RUN - 1993 LEVEL INFLOW TO HARLAN COUNTY RESERVOIR

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1962	4.5	9.1	16.2	9.9	14.4	42.6	41.6	21.1	2.3	8.7	8.3	5.7	184.4
1963	3.4	18.2	18.2	15.0	12.7	14.7	3.4	6.1	8.7	0.8	5.3	1.8	108.3
1964	5.4	7.6	8.3	8.4	9.9	11.9	7.2	6.5	2.4	1.9	1.4	2.3	73.2
1965	6.0	8.1	11.1	12.8	32.8	40.0	22.9	6.5	37.2	53.7	19.5	11.0	261.6
1966	8.9	21.4	15.7	11.4	12.0	34.7	12.4	2.5	3.5	5.4	6.8	5.7	140.4
1967	7.2	11.5	11.5	12.9	9.1	75.3	43.7	15.3	4.4	7.3	6.9	5.4	210.5
1968	3.9	10.2	8.5	11.6	10.8	12.5	3.1	2.7	1.6	2.0	4.3	3.4	74.6
1969	4.2	10.8	24.5	15.1	18.9	17.5	17.0	12.6	16.6	9.2	11.8	9.9	168.1
1970	3.5	8.7	8.5	10.5	11.1	7.7	4.6	3.2	0.5	3.3	4.7	4.5	70.8
1971	4.1	10.3	12.4	12.8	18.3	7.2	8.4	6.2	1.9	4.2	7.3	7.1	100.2
1972	5.5	8.1	9.2	8.3	14.8	8.5	6.5	4.4	0.1	2.9	7.6	4.1	80.0
1973	11.4	14.2	19.0	16.2	17.4	20.9	9.1	1.9	8.4	19.6	11.9	13.2	163.2
1974	13.2	13.4	12.0	14.3	15.4	17.2	5.5	0.0	0.0	0.0	4.9	5.5	101.4
1975	7.2	8.2	13.6	14.8	12.0	48.1	11.6	7.4	0.1	3.0	6.2	7.3	139.5
1976	7.0	10.2	10.1	16.0	12.1	3.5	2.2	1.8	0.9	1.0	3.2	3.1	71.1
1977	4.4	9.6	12.9	21.2	31.5	12.1	5.9	1.9	10.6	4.1	5.5	5.3	125.0
1978	5.0	6.5	20.6	12.9	11.8	3.8	0.0	1.0	0.0	0.0	0.3	1.6	63.5
1979	1.3	7.6	21.5	18.8	15.9	5.4	10.4	10.6	1.6	0.9	3.6	6.2	103.8
1980	5.7	9.3	11.6	15.2	10.4	2.1	2.5	0.0	0.0	0.0	2.5	2.2	61.5
1981	5.5	6.0	11.6	14.9	22.5	6.4	11.5	16.3	4.3	2.5	6.7	6.2	114.4
1982	5.3	12.5	17.9	14.3	26.8	27.1	8.9	2.7	0.0	6.5	6.3	15.5	143.8
1983	6.5	9.7	27.2	16.4	41.4	74.2	10.7	7.6	3.8	3.1	6.7	5.2	212.5
1984	6.8	14.6	17.2	32.9	40.6	15.5	8.1	4.5	0.0	5.5	4.8	6.2	156.7
1985	6.9	14.1	13.6	11.9	27.4	9.9	10.0	2.0	6.0	8.5	5.6	5.8	121.7
1986	9.1	9.4	12.2	11.7	34.3	13.0	13.5	4.6	3.3	5.9	5.4	7.1	129.5
1987	5.9	9.2	19.7	24.1	24.3	11.7	19.0	5.7	2.3	2.7	8.2	7.0	139.8
1988	6.2	13.7	11.6	15.2	15.2	7.0	17.9	10.4	0.6	2.0	5.9	5.4	111.1
1989	5.4	5.9	10.5	9.1	11.4	11.8	14.0	6.2	0.2	3.1	3.1	3.5	84.2
1990	6.6	7.7	13.2	9.7	15.5	1.4	4.3	10.7	0.6	3.2	2.0	2.7	77.6
1991	2.4	8.0	9.0	10.6	15.2	3.9	1.9	0.5	0.0	0.0	2.7	4.8	59.0
1992	8.0	8.8	12.7	8.5	4.5	6.1	6.5	9.4	2.4	6.9	6.7	5.2	85.7
1993	5.2	14.4	71.6	22.7	21.0	17.0	68.0	37.5	23.3	16.8	30.1	17.7	345.3

Avg 4.5 8.8 14.1 13.0 17.2 30.6 11.0 6.2 5.4 6.3 5.0 4.7 126.8

Attachment 4: Evaporation Loss Harlan County Lake 1993 Level of Development

BASELINE - 1993 LEVEL FLOWS - HARLAN COUNTY EVAPORATION

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1931	0.7	0.9	1.6	2.9	4.2	7.4	6.9	5.2	2.7	2.1	1.2	0.4	36.2
1932	0.6	0.8	1.5	2.7	4.1	5.0	6.8	5.0	2.7	2.1	1.2	0.4	32.9
1933	0.6	0.8	1.4	2.5	3.8	7.8	6.1	4.2	2.7	2.1	1.2	0.4	33.6
1934	0.6	0.8	1.4	2.4	4.5	6.5	8.0	6.2	2.7	2.0	1.2	0.4	36.7
1935	0.6	0.8	1.3	2.3	2.2	3.6	9.7	6.2	3.1	2.5	1.4	0.5	34.2
1936	0.7	0.9	1.6	2.9	5.5	6.8	8.7	6.5	2.7	2.1	1.2	0.4	40.0
1937	0.6	0.8	1.4	2.5	3.6	4.0	6.2	6.5	2.7	2.1	1.2	0.4	32.0
1938	0.6	0.9	1.5	2.7	3.4	4.9	6.5	5.7	2.7	2.1	1.2	0.4	32.6
1939	0.6	0.8	1.4	2.6	4.3	4.9	6.8	4.6	2.7	2.1	1.2	0.4	32.4
1940	0.6	0.8	1.4	2.4	3.5	5.0	6.5	4.6	2.7	2.1	1.2	0.4	31.2
1941	0.6	0.8	1.4	2.5	3.9	4.2	6.7	5.3	2.8	2.1	1.3	0.5	32.1
1942	0.6	0.9	1.5	2.8	4.0	5.2	8.3	5.1	3.2	2.5	1.5	0.5	36.1
1943	0.7	1.0	1.8	3.2	4.3	5.7	7.9	6.3	2.7	2.1	1.2	0.4	37.3
1944	0.6	0.8	1.4	2.7	4.2	5.3	7.0	5.8	3.5	2.6	1.5	0.5	35.9
1945	0.7	1.0	1.8	3.1	3.8	3.0	6.7	5.7	2.9	2.2	1.3	0.5	32.7
1946	0.6	0.9	1.6	2.8	3.5	5.1	5.6	4.4	2.9	2.7	1.8	0.6	32.5
1947	1.0	1.5	2.9	3.2	3.4	-1.2	5.8	5.3	3.7	1.7	0.5	0.1	27.9
1948	0.8	0.7	1.5	3.6	3.1	2.4	4.2	4.7	3.0	2.7	0.8	0.3	27.8
1949	0.1	0.9	0.7	1.8	1.1	0.7	6.5	4.1	3.1	1.7	1.5	0.4	22.6
1950	0.7	0.1	0.8	2.8	2.0	5.6	0.8	2.8	4.5	2.3	1.6	0.6	24.6
1951	0.5	0.2	2.1	0.7	-0.1	1.9	3.5	4.1	0.4	3.1	2.2	0.9	19.5
1952	1.1	1.2	1.9	2.5	5.2	6.2	1.5	3.4	3.6	2.9	1.1	-0.1	30.5
1953	0.5	1.0	1.5	2.9	4.7	4.5	4.6	6.6	5.3	3.3	0.1	0.0	35.0
1954	0.7	0.6	2.2	3.6	0.3	4.9	6.7	1.6	3.6	1.6	1.5	0.6	27.9
1955	0.5	1.0	2.1	4.6	3.4	-0.5	7.3	6.9	2.7	2.6	1.4	0.4	32.4
1956	0.6	1.1	1.9	2.8	3.9	4.5	5.0	3.7	4.7	3.7	1.3	0.5	33.7
1957	0.7	1.0	1.3	0.5	-0.6	-1.1	6.1	3.7	2.3	1.7	1.2	0.4	17.2
1958	0.7	0.1	1.0	0.6	2.3	4.4	1.0	1.9	3.3	3.3	1.0	0.6	20.2
1959	0.4	1.0	1.1	2.1	1.0	3.5	5.0	4.8	2.3	0.7	1.5	0.6	24.0
1960	0.1	0.7	2.0	2.7	0.9	0.1	4.9	3.6	3.9	2.0	1.3	0.4	22.6
1961	0.9	1.0	1.4	2.7	-1.1	0.6	5.1	2.9	1.2	2.4	0.7	0.1	17.9

Attachment 4: Evaporation Loss Harlan County Lake 1993 Level of Development

BASELINE - 1993 LEVEL FLOWS - HARLAN COUNTY EVAPORATION

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1962	0.6	0.6	0.9	3.7	3.4	1.5	0.3	1.6	2.0	2.0	1.7	0.3	18.6
1963	0.7	1.4	1.3	4.5	4.6	6.3	6.1	3.1	-0.8	2.7	1.5	0.4	31.8
1964	0.8	0.8	1.7	3.2	5.6	1.2	6.9	3.0	3.0	3.3	1.2	0.6	31.3
1965	0.4	0.7	1.2	2.8	1.5	-0.5	2.0	2.8	-3.9	1.7	2.1	0.4	11.2
1966	0.9	0.8	2.9	2.7	7.5	2.8	5.8	3.7	2.7	2.8	1.5	0.4	34.5
1967	0.7	1.2	2.5	3.0	2.0	-2.9	1.6	4.5	3.5	2.0	1.6	0.4	20.1
1968	0.9	1.2	2.8	2.6	3.2	4.9	4.7	1.8	2.3	0.7	1.2	0.2	26.5
1969	0.4	0.6	2.4	3.3	0.1	3.8	-0.7	2.9	2.2	-1.0	1.5	0.4	15.9
1970	0.7	1.4	2.3	2.8	4.7	4.4	6.5	5.9	0.9	1.0	1.5	0.7	32.8
1971	0.7	0.2	2.0	2.9	0.7	5.1	3.4	4.5	1.4	1.5	0.2	0.5	23.1
1972	0.8	1.3	2.0	1.7	1.1	0.0	3.3	1.8	2.1	1.7	-0.4	0.1	15.5
1973	0.5	1.1	-0.7	2.5	3.4	6.7	-1.7	4.2	-3.0	0.2	0.2	0.2	13.6
1974	0.7	1.5	2.6	1.5	3.7	2.5	9.1	2.6	3.4	1.4	1.1	0.3	30.4
1975	0.7	0.7	2.0	2.1	0.8	1.1	4.3	2.7	3.0	3.4	0.7	0.6	22.1
1976	0.8	1.2	1.7	0.7	1.5	5.0	5.9	5.7	-0.2	1.4	1.4	0.7	25.8
1977	0.7	1.3	0.2	1.1	0.0	4.6	4.0	0.6	2.0	1.6	1.0	0.4	17.5
1978	0.5	0.7	1.2	3.4	3.9	6.2	7.1	4.5	4.5	3.0	1.1	0.5	36.6
1979	0.5	0.6	1.1	3.9	4.4	4.6	3.5	5.1	4.1	2.8	1.4	0.7	32.7
1980	0.5	0.6	1.2	3.4	3.7	4.7	6.8	6.0	3.9	2.7	1.3	0.6	35.4
1981	0.5	0.6	1.2	3.8	3.2	4.8	4.2	3.7	2.9	1.7	1.3	0.7	28.6
1982	0.5	0.7	1.2	3.9	3.8	3.9	5.1	3.8	2.9	2.2	1.4	0.8	30.2
1983	0.5	0.7	1.4	2.9	4.2	5.3	8.6	7.2	4.6	1.8	1.5	0.6	39.3
1984	0.6	0.8	1.4	2.9	4.2	5.8	7.2	5.7	4.7	1.4	1.4	0.7	36.8
1985	0.5	0.7	1.3	2.3	4.0	4.5	5.6	3.5	3.8	1.5	1.5	0.7	29.9
1986	0.6	0.7	1.3	2.8	4.4	5.8	6.7	4.0	2.7	1.3	1.4	0.7	32.4
1987	0.5	0.8	1.3	3.1	4.2	6.2	6.9	3.5	3.1	2.2	1.4	0.7	33.9
1988	0.5	0.7	1.3	3.5	4.9	6.6	4.6	4.8	3.5	2.2	1.4	0.7	34.7
1989	0.5	0.7	1.2	4.2	4.5	4.4	4.8	3.6	3.0	2.5	1.4	0.7	31.5
1990	0.5	0.7	1.2	3.0	3.5	5.6	6.4	4.0	5.0	3.4	1.4	0.6	35.3
1991	0.5	0.7	1.2	2.8	3.3	5.5	6.0	5.0	5.1	3.2	1.3	0.6	35.2
1992	0.6	0.7	1.2	1.8	3.2	2.2	4.1	3.5	4.2	2.9	1.9	1.0	27.3

1993	0.6	0.5	1.0	2.2	3.1	4.6	4.2	4.9	4.5	4.4	3.1	1.2	34.3
Avg	0.6	0.8	1.5	2.7	3.2	3.9	5.3	4.3	2.8	2.2	1.3	0.5	29.1

Attachment 5: Projected Water Supply Spread Sheet Calculations

<b>Trigger Calculations Based on Harlan County Lake Irrigation Supply</b>	Units-1000 Acre-feet		<b>Irrigation Trigger</b>		119.0		Assume that during irrigation release season HCL Inflow = Evaporation Loss						
			<b>Total Irrigation Supply</b>		130.0								
			<b>Bottom Irrigation</b>		164.1								
			<b>Evaporation Adjust</b>		20.0								
	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun</b>	<b>Jul</b>	<b>Aug</b>	<b>Sep</b>	<b>Total</b>
1993 Level AVE inflow	6.3	5	4.7	4.5	8.8	14.1	13.0	17.2	30.6	11.0	6.2	5.4	126.8
1993 Level AVE evap (1931-93)	2.2	1.3	0.5	0.6	0.8	1.5	2.7	3.2	3.9	5.3	4.3	2.8	29.1
Avg. Inflow Last 5 Years	10.8	13.0	12.3	12.9	16.6	22.4	19.4	18.1	14.8	16.5	11.0	4.7	172.6

<b>Year 2001-2002 Oct - Jun Trigger and Irrigation Supply Calculation</b>									
<b>Calculation Month</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun</b>
Previous EOM Content	236.5	235.9	238.6	242.9	248.1	255.1	263.8	269.6	276.2
Inflow to May 31	73.6	67.3	62.3	57.6	53.1	44.3	30.2	17.2	0.0
Last 5 Yrs Avg Inflow to May 31	125.6	114.8	101.7	89.5	76.6	59.9	37.5	18.1	0.0
Evap to May 31	12.8	10.6	9.3	8.8	8.2	7.4	5.9	3.2	0.0
Est. Cont May 31	297.3	292.6	291.6	291.7	293.0	292.0	288.1	283.6	276.2
Est. Elevation May 31	1944.44	1944.08	1944.00	1944.01	1944.11	1944.03	1943.72	1943.37	1942.77
Max. Irrigation Available	153.2	148.5	147.5	147.6	148.9	147.9	144.0	139.5	132.1
Irrigation Release Est.	120.1	117.4	116.8	116.8	118.1	117.1	116.8	116.8	116.8
Trigger - Yes/No	NO	YES							
130 kAF Irrigation Supply - Yes/No	NO								

Attachment 5: Projected Water Supply Spread Sheet Calculations

<b>Year 2002</b>				
<b>Jul - Sep</b>				
<b>Final Trigger and</b>				
<b>Total Irrigation Supply</b>				
<b>Calculation</b>				
Calculation Month		<b>Jul</b>	<b>Aug</b>	<b>Sep</b>
Previous EOM Irrigation Release Est.		116.8	116.0	109.7
Previous Month Inflow		5.5	0.5	1.3
Previous Month Evap		6.3	6.8	6.6
Irrigation Release Estimate		116.0	109.7	104.4
Final Trigger - Yes/No		YES		
130 kAF Irrigation Supply - Yes/No		NO	NO	NO

Attachment 6: Computing Water Supplies and Consumptive Use Above Guide Rock

A	B	C	D	E	F	G	H	I	J	K	L	M	MN	NO	OP	PQ	QR	RS
Total Main Stem <del>VWS</del> <del>CWS</del>	Hardy gage	Superior-Courtland Diversion Dam Gage	Courtland Canal Diversions	Superior Canal Diversions	Courtland Canal Returns	Superior Canal Returns	Total Bostwick Returns Below Guide Rock	NE CBCU Below Guide Rock	KS CBCU Below Guide Rock	Total CBCU Below Guide Rock	Gain Guide Rock to Hardy	<a href="#">Flood Flow adjustment for the Mainstem Between Guide Rock and Hardy</a>	<del>VWS</del> <del>CSW</del> <del>S</del> Guide Rock to Hardy	Main Stem <del>Virgin</del> <del>Computed</del> Water Supply Above Guide Rock	Nebraska Main Stem Allocation Above <a href="#">HardyGuide Rock</a>	Kansas Main Stem Allocation Above <a href="#">HardyGuide Rock</a>	Nebraska Guide Rock to Hardy Allocation	Kansas Guide Rock to Hardy Allocation
							Col F+ Col G			Col I + Col J	+ Col B - Col C+ Col K - Col H		+ Col L + Col K - <a href="#">Col M</a>	Col A - Col <del>MN</del>	.489 x Col <del>NO</del>	.511 x Col <del>NO</del>	.489 x Col <del>MN</del>	.511 x Col <del>MN</del>

Note: At its Annual Meeting on August 21, 2020, the RRCA agreed that the Accounting Procedures (Rev. May 25, 2017) do not properly implement the Flood Flow provisions at the Hardy gage with respect to the calculation of Computed Water Supply above and below Guide Rock. The current implementation could impact Nebraska’s Table 5C compliance test, specifically the Allocation above Guide Rock. Nebraska and Kansas each offered proposals to resolve the issue but could not reach agreement on a solution. Due to the infrequent occurrence of Flood Flows, the RRCA deferred resolution of the matter to a future date necessitated by and preceding impact to Nebraska’s Table 5C compliance. The states wish to acknowledge and memorialize the issue to encourage work toward its resolution. ~~As it stands, Attachment 6 calculates the Virgin Water Supply Guide Rock to Hardy rather than Computed Water Supply Guide Rock to Hardy which would reduce the Virgin Water Supply by the relevant Flood Flows as described in Section II. Definitions and Section III. Basic Formulas.~~

Attachment 7: Calculations of Return Flows from Bureau of Reclamation Canals

Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	Col 10	Col 11	Col 12
Canal	Canal Diversion	Spill to Waste-way	Net Diversion	Field Deliveries	Canal Loss	Average Field Loss Factor	Field Loss	Total Loss from District	Percent field and Canal Loss That Returns to the Stream	Total return to Stream from Canal and Field Loss	Return as Percent of Canal Diversion
Name Canal	Headgate Diversion	Sum of measured spills to river	Col 2 - Col 3	Sum of deliveries to the field	Col 4 – Col 5	1 – Weighted Average Efficiency of Application System for the District*	Col 5 x Col 7	Col 6 + Col 8	Estimated Percent Loss*	Col 9 x Col 10 + Col 3	Col 11 / Col 2
∑ Irrigation Season											
∑ Non-Irrigation Season											
Example	100	5	95	60	35	30%	18	53	82%	48.46	48.5%
	100	5	95	0	95	30%	0	95	92%	87.4	87.4%
Culbertson						30%			82%		
						30%			92%		
Culbertson Extension						30%			82%		
						30%			92%		
Meeker - Driftwood						30%			82%		
						30%			92%		
Red Willow						30%			82%		
						30%			92%		
Bartley						30%			82%		
						30%			92%		
Cambridge						30%			82%		
						30%			92%		
Naponee						35%			82%		
						35%			92%		
Franklin						35%			82%		
						35%			92%		
Franklin Pump						35%			82%		
						35%			92%		
Almena						30%			82%		
Superior						31%			82%		
						31%			92%		
Nebraska Courtland						23%			82%		
Courtland Canal Above Lovewell (KS)						23%			82%		
Courtland Canal Below Lovewell						23%			82%		

\*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.

Attachment 8: Calculation of the Computed Water Supply Adjustment and Remaining Compact Compliance Volume for Implementation of 2016 RRCA Resolution

	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	Col 10	Col 11	Col 12
	Start of Year RCCV	RCCV Adjustment	CCV	CCV Inflow Into HCL	RCCV Inflow Into HCL	Total CCV and RCCV Inflow Into HCL	Total CCV and RCCV Available for Release	CCV Released from HCL as Flow	CCV Released from HCL as Evaporation	CCV Retained in HCL (at End of Year)	CWSA	End of Year RCCV <sup>8</sup>
	=Col. 12 of previous year	<sup>9</sup>	<sup>10</sup>			= Col. 4 + Col. 5	=Col. 6 + Col. 10 of previous year			= Col. 7 – (Col. 8 + Col. 9)	=Col. 10 – Col. 10 of previous year	= Col. 1 – Col. 2 + Col. 3 – Col. 6
Year 1												
Year 2												
Year 3												
Year 4												
Year 5												

This attachment provides definitions and example calculations for determining the Computed Water Supply Adjustment (CWSA), Remaining Compact Compliance Volume (RCCV), and other calculations necessary for implementation of the RRCA Resolution signed August 24, 2016, titled “Resolution Approving Long-Term Agreement Related to the Operation of Harlan County Lake for Compact Call Years.” An electronic copy of the spreadsheet containing the live formulas in this Attachment is included with the May 25, 2017, Accounting Procedures adopted by the RRCA and will be used as Attachment 8.

<sup>8</sup> The formula for calculation of RCCV is based on calendar year operations and will vary when operations occur in a different calendar year than NERWS Credit is applied.

<sup>9</sup> See Provision 10 of the RRCA Resolution signed August 24, 2016, titled “Resolution Approving Long-Term Agreement Related to the Operation of Harlan County Lake for Compact Call Years” for the terms of assigning RCCV Adjustment. The RCCV Adjustment for each year is equal to 20% of the unadjusted portion of the RCCV, if it is a non-Compact Call Year, plus any remaining volumetric reductions from the previous four years.

<sup>10</sup> In years when the contributions from Nebraska’s water management activities, consistent with the 2016 CCY HCL Operations Resolution, are greater than CCV and the NERWS is equal to the greater contribution volume, CCV in Column 3 should also be set equal to the contribution.

### **Definitions**

The definitions below identify additional terms from the Accounting Procedures and Resolution that are utilized in the calculations.

**CCV Inflow Into HCL** is the Compact Compliance Volume made available in HCL for Kansas exclusive use pursuant to the 2016 CCY HCL Operations Resolution;

**CCV Released from HCL** is the volume of CCV Inflow Into HCL and RCCV Inflow Into HCL that is released from HCL in a calendar year;

**CCV Retained in HCL** is the volume of CCV Inflow Into HCL and RCCV Inflow Into HCL that is not released from HCL in a calendar year;

**RCCV Inflow Into HCL** is the Remaining Compact Compliance Volume made available in HCL for Kansas exclusive use pursuant to 2016 CCY HCL Operations Resolution;

### **CWSA and RCCV Example Calculations**

Five examples representing various conditions have been developed to illustrate calculations of the CWSA and RCCV. These examples are applicable to calculations based on calendar year operations and will vary when CCV and RCCV Inflow Into HCL occurs in a different calendar year than NERWS Credit is applied. The five examples are presented below:

- Example 1: **All CCV Inflow Into HCL is Passed Through HCL**
- Example 2: **A Portion of CCV Inflow Into HCL is Retained in HCL**
- Example 3: **A Portion of CCV Inflow Into HCL is Retained in HCL and Released in a Subsequent Calendar Year**
- Example 4: **RCCV Inflow Into HCL and CCV Inflow Into HCL**
- Example 5: **HCL Reservoir Accounting for CWSA**
- **RCCV Example Calculation**

Evaporation losses have been ignored in these examples for simplicity. In reality, any water stored in HCL, including water from CCV or RCCV sources, is subject to evaporation, per the current RRCA Accounting Procedures.

**Example 1: All CCV Inflow Into HCL is Passed Through HCL**

In this example, all CCV inflow into HCL is released in the same year (Year = 1) that the APV occurred.

**Assumptions**

- RCCV = 0
- CCV = 20,000 Acre-feet
- APV = 20,000 Acre-feet
- CCV Inflow Into HCL = 20,000 Acre-feet
- RCCV Inflow Into HCL = 0
- CCV Released from HCL = 20,000 Acre-feet
- CCV Retained in HCL = 0
- NERWS Credit = 20,000 Acre-feet

**Computed Water Supply Adjustment (CWSA)**

The Computed Water Supply Adjustment (CWSA) can simply be calculated by subtracting the CCV Released from HCL from the CCV Inflow into HCL:

$$\begin{aligned} \text{CWSA} &= \text{CCV Inflow Into HCL} + \text{RCCV Inflow Into HCL} - \text{CCV Released from HCL} \\ &= 20,000 + 0 - 20,000 = 0 \end{aligned}$$

Since all CCV inflow into HCL is passed through the reservoir within the same year, there is no CWSA adjustment necessary in Year 1 or in any subsequent year's accounting.

**Example 2: A Portion of CCV Inflow Into HCL is Retained in HCL**

This example includes some of the same initial conditions as in Example 1, except that a portion of the CCV Inflow Into HCL is retained into a subsequent year. Additional accounting adjustments are required as a result and are illustrated below:

**Assumptions**

- RCCV = 0
- CCV = 20,000 Acre-feet
- APV = 20,000 Acre-feet
- CCV Inflow Into HCL = 20,000 Acre-feet
- RCCV Inflow Into HCL = 0
- CCV Released from HCL = 15,000 Acre-feet
- CCV Retained in HCL = 5,000 Acre-feet
- NERWS Credit = 20,000 Acre-feet

**Computed Water Supply Adjustments (CWSA)**

Because a portion of the CCV Inflow Into HCL is retained in HCL, a positive CWSA results:

$$\begin{aligned} \text{CWSA} &= \text{CCV Inflow Into HCL} + \text{RCCV Inflow Into HCL} - \text{CCV Released from HCL} \\ &= 20,000 + 0 - 15,000 = 5,000 \text{ Acre-feet} \end{aligned}$$

The accounting adjustment to the Main Stem CWS in this example would be made through applying a CWSA of 5,000 acre-feet through the calculations in Subsection IV.B of the RRCA Accounting Procedures.

**Example 3: A Portion of CCV Inflow Into HCL is Retained in HCL and Released in a Subsequent Calendar Year**

This example is identical to the situation in Example 2 above, with the exception that we will also consider what accounting adjustments are needed in the subsequent year (Year 2) once CCV Retained in HCL is released from the reservoir.

**Assumptions**

- RCCV = 0
- CCV = 20,000 Acre-feet
- APV = 20,000 Acre-feet
- CCV Inflow Into HCL = 20,000 Acre-feet
- RCCV Inflow Into HCL = 0
- CCV Released from HCL = 25,000 Acre-feet
- CCV Retained in HCL = 0
- NERWS Credit = 20,000 Acre-feet

**Computed Water Supply Adjustment (CWSA)**

Because the CCV Released from HCL includes CCV water stored over from a previous year, the CCV Released from HCL is greater than the CCV and RCCV Inflow Into HCL, resulting in a negative CWSA:  
 $CWSA = 20,000 + 0 - 25,000 = -5,000$  Acre-feet

The accounting adjustment to the Main Stem CWS in this example would be made through applying a CWSA of -5,000 acre-feet through the calculations in Subsection IV.B of the RRCA Accounting Procedures.

**Example 4: RCCV Inflow Into HCL and CCV Inflow Into HCL**

This example includes the additional consideration of Remaining Compact Compliance Volume (RCCV). The CCV in this example will also be greater than that used in the previous examples:

**Year 1**

**Assumptions**

- RCCV = 0
- CCV = 55,000 Acre-feet
- APV = 20,000 Acre-feet
- CCV Inflow Into HCL = 20,000 Acre-feet
- RCCV Inflow Into HCL = 0
- CCV Released from HCL = 15,000 Acre-feet
- CCV Retained in HCL = 5,000 Acre-feet
- NERWS Credit = 55,000 Acre-feet

In this example the Year 1 NERWS Credit is larger than the CCV Inflow Into HCL because Kansas has determined that a portion of the Compact Compliance Volume will be carried over as RCCV in Year 2.

**Computed Water Supply Adjustment (CWSA)**

$$CWSA = 20,000 + 0 - 15,000 = 5,000 \text{ Acre-feet}$$

**Remaining Compact Compliance Volume (RCCV) for Following Year**

$$\begin{aligned} \text{Year 2 RCCV} &= \text{Start of Year 1 RCCV} - \text{RCCV Adjustment} + \text{CCV} - (\text{CCV Inflow Into HCL} + \\ &\text{RCCV Inflow Into HCL}) \\ &= 0 - 0 + 55,000 - (20,000 + 0) = 35,000 \text{ Acre-feet} \end{aligned}$$

The accounting adjustment to the Year 1 Main Stem CWS in this example would be made through applying a CWSA of 5,000 acre-feet through the calculations in Subsection IV.B of the RRCA Accounting Procedures.

## Year 2

### Assumptions

- RCCV = 35,000
- CCV = 10,000 Acre-feet
- APV = 45,000 Acre-feet
- CCV Inflow Into HCL = 10,000 Acre-feet
- RCCV Inflow Into HCL = 35,000 Acre-feet
- CCV Released from HCL = 50,000 Acre-feet
- CCV Retained in HCL = 0
- NERWS Credit = 10,000 Acre-feet<sup>11</sup>

### Computed Water Supply Adjustment (CWSA)

As the CCV Released from HCL is greater than CCV and RCCV Inflow into HCL, a negative CWSA results.

$$\text{CWSA} = 10,000 + 35,000 - 50,000 = -5,000 \text{ Acre-feet}$$

The accounting adjustment to the Year 2 Main Stem CWS in this example would be made through applying a CWSA of -5,000 acre-feet through the calculations in Subsection IV.B of the RRCA Accounting Procedures.

### Example 5: HCL Reservoir Accounting for CWSA

Because some of the accounting adjustments required under the examples described above involve multi-year operations, and because the current HCL water supply accounting methodologies under the Consensus Plan and the NBID-KBID MOA do not include consideration of several of the accounting components required under the new RRCA Resolutions, a reservoir accounting system may be needed for tracking certain portions of HCL content (CCV Retained in HCL). This example shows how this tracking might operate for HCL content, using a simple tabular format.

## Year 1

### Assumptions

- RCCV = 0
- CCV = 55,000 Acre-feet
- APV = 20,000 Acre-feet
- CCV Inflow Into HCL = 20,000 Acre-feet
- RCCV Inflow Into HCL = 0
- CCV Released from HCL = 15,000 Acre-feet
- CCV Retained in HCL = 5,000 Acre-feet
- NERWS Credit = 55,000 Acre-feet

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<sup>11</sup> With respect to the NERWS Credit in Year 2, the value is only 10,000 Acre-feet, despite the fact that 45,000 Acre-feet of the CCV and RCCV water from Years 1 and 2 were made available in HCL during Year 2. This is because the credit is applied in the years in which it is needed for compliance purposes, and not necessarily in the same year as when releases are made from HCL or augmentation water is pumped.

As with Example 4, this example represents a situation in which Kansas determines that not all of the CCV is required in Year 1, leading to RCCV that carries over into Year 2. In addition, Kansas determines that not all of the CCV delivered to HCL would need to be released in Year 1, resulting in a CWSA of 5,000 Acre-feet.

**Year 2**

**Assumptions**

- RCCV = 35,000 Acre-feet
- CCV = 10,000 Acre-feet
- APV = 11,000 Acre-feet
- CCV Inflow Into HCL = 10,000 Acre-feet
- RCCV Inflow Into HCL = 1,000 Acre-feet
- CCV Released from HCL = 16,000 Acre-feet
- CCV Retained in HCL = 0
- NERWS Credit = 10,000 Acre-feet

**Remaining Compact Compliance Volume (RCCV) for Following Year**

$$\begin{aligned} \text{Start of Year 3 RCCV} &= \text{Start of Year 2 RCCV} - \text{RCCV Adjustment} + \text{CCV} - (\text{CCV Inflow} \\ &\text{Into HCL} + \text{RCCV Inflow Into HCL}) \\ &= 35,000 - 0 + 10,000 - (10,000 + 1,000) = 34,000 \text{ Acre-feet} \end{aligned}$$

**Table 1. Example of HCL Accounting for CWSA**

**Table 1: Example HCL Accounting for CWSA**

	CCV Inflow Into HCL	RCCV Inflow Into HCL	Total CCV and RCCV Inflow Into HCL	Total CCV and RCCV Available for Release	CCV Released from HCL	CCV Retained in HCL (at End of Year)	CWSA
<b>Year 0</b>	0 af	0 af	0 af	0 af	0 af	0 af	0 af
<b>Year 1</b>	20,000 af	0 af	20,000 af	20,000 af	15,000 af	5,000 af	5,000 af
<b>Year 2</b>	10,000 af	1,000 af	11,000 af	16,000 af	16,000 af	0 af	-5,000 af

Table 1 above illustrates that once the RCCV or CCV water reaches HCL as inflow, there is no need to differentiate between the two sources, since both will be treated the same in terms of accounting adjustments, including when those supplies are released from the reservoir. It is sufficient, as a result, to include both water sources as one common pool for accounting purposes once they reach HCL. That is why both the last two terms in the table above (“CCV Released from HCL” and “CCV Retained in HCL”) only include the abbreviation “CCV”, even though they may include water from both CCV and RCCV inflows.

The examples contained in this attachment did not account for reservoir evaporation as a means to simplify the calculations. In reality, evaporation may impact the quantity of CCV water remaining within HCL. This evaporation will be assessed to the CCV Retained in HCL pool in proportion to the volume contained in this portion of the pool relative to the entire contents of the irrigation pool, consistent with methods employed by the Bureau of Reclamation to assess evaporation on water supplies within the reservoir.

**CWSA and RCCV Tracking Example Calculations**

This section contains an example of the calculations used to determine the CWSA, CCV, and RCCV and track how the RCCV changes year to year and between Compact Call Years and non-Compact Call Years.

Table 2. Example of Relationship between CCV and RCCV and annual tracking of CWSA

	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12
	Start of Year RCCV	RCCV Adjustment	CCV	CCV Inflow Into HCL	RCCV Inflow Into HCL	Total CCV and RCCV Inflow Into HCL	Total CCV and RCCV Available for Release	CCV Released from HCL as Flow	CCV Released from HCL as Evaporation	CCV Retained in HCL (at End of Year)	CWSA	End of Year RCCV
	=Col. 12 of previous year					= Col. 4 + Col. 5	=Col. 6 + Col. 10 of previous year			= Col. 7 – (Col. 8 + Col. 9)	=Col. 10 – Col. 10 of previous year	= Col. 1 – Col. 2 + Col. 3 – Col. 6
<b>Year 0</b>	0	0	0	0	0	0	0	0	0	0	0	0
<b>Year 1*</b>	0	0	23,000	20,000	0	20,000	20,000	15,000	0	5,000	5,000	3,000
<b>Year 2*</b>	3,000	0	10,000	10,000	1,000	11,000	16,000	15,000	1,000	0	-5,000	2,000
<b>Year 3*</b>	2,000	0	15,000	15,000	0	15,000	15,000	15,000	0	0	0	2,000
<b>Year 4</b>	2,000	400	0	0	0	0	0	0	0	0	0	1,600
<b>Year 5</b>	1,600	400	0	0	0	0	0	0	0	0	0	1,200
<b>Year 6</b>	1,200	400	0	0	0	0	0	0	0	0	0	800
<b>Year 7*</b>	800	400	15,000	10,000	0	10,000	10,000	10,000	0	0	0	5,400
<b>Year 8</b>	5,400	1,400	0	0	0	0	0	0	0	0	0	4,000
<b>Year 9</b>	4,000	1,000	0	0	0	0	0	0	0	0	0	3,000

\*Indicates Compact Call Year

**Kansas Proposal on Flood  
Flows Accounting Issue  
emailed on 06/21/2021**

**Burgert, Kari**

---

**From:** Beightel, Chris [KDA] <Chris.Beightel@ks.gov>  
**Sent:** Monday, June 21, 2021 10:14 AM  
**To:** Burgert, Kari; Franco - DNR, Ivan  
**Subject:** Flood Flows issue - Kansas proposal to cap GRtoHdy allocation

**Follow Up Flag:** Follow up  
**Flag Status:** Completed

Kari and Ivan,

After considering our EC discussion on May 20, it appears to Kansas that in lieu of developing a new Flood Flows adjustment for the Computed Water Supply of the Guide Rock to Hardy reach, the issue of increasing allocation in that reach could be solved by simply agreeing to cap the allocation.

In 2015, Nebraska's allocation below Guide Rock was 33,485 acre-feet, the highest non-Flood Flows-year allocation reported since 1995. Kansas proposes that in a Flood Flows year, Nebraska's allocation below Guide Rock be calculated as it currently is but capped at 33,485 acre-feet. I think this is a reasonable compromise that addresses both Nebraska's and Kansas' concerns.

Regards,  
Chris

Chris Beightel, PE  
Program Manager - Water Management Services  
Kansas Department of Agriculture  
Division of Water Resources  
785.564.6659

Follow-up on Kansas  
Proposal on Flood Flows  
Accounting Issue emailed  
on 07/02/2021

## Burgert, Kari

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**From:** Beightel, Chris [KDA] <Chris.Beightel@ks.gov>  
**Sent:** Friday, July 2, 2021 2:59 PM  
**To:** Burgert, Kari; Franco - DNR, Ivan; Erickson, Chelsea [KDA]; Willem Schreuder; Davis, Alexa; Bradley, Jesse; Engelhaupt, David [KDA]; Hickman, Elizabeth [KDA]  
**Cc:** Lewis, Earl [KDA]  
**Subject:** Re: RRCA EC - Flood Flows discussion 2  
**Attachments:** 20210628.GR-HdyCapProposal-KS.xlsx

**Follow Up Flag:** Follow up  
**Flag Status:** Completed

Kari and Ivan,

Attached is the spreadsheet showing the impact of Kansas' proposal with varying Guide Rock and Hardy flows as the group has seen in the past. The implementation of Kansas' proposed cap is shown in tab "CapProposal...". There is a note at the lower right-hand area of the worksheet that explains how it was implemented. Let me know if you have any questions about it.

And Kari, thanks for the summary notes from the 21 June meeting. They look fine to Kansas.

Chris Beightel, PE  
Program Manager - Water Management Services  
Kansas Department of Agriculture  
Division of Water Resources  
785.564.6659

---

**From:** Burgert, Kari <kari.burgert@nebraska.gov>  
**Sent:** Tuesday, June 22, 2021 4:10 PM  
**To:** Beightel, Chris [KDA] <Chris.Beightel@ks.gov>; Franco - DNR, Ivan <ivan.franco@state.co.us>; Erickson, Chelsea [KDA] <Chelsea.Erickson@ks.gov>; Willem Schreuder <willem@prinmath.com>; Davis, Alexa <Alexa.Davis@nebraska.gov>; Bradley, Jesse <Jesse.Bradley@nebraska.gov>; Engelhaupt, David [KDA] <David.Engelhaupt@ks.gov>; Hickman, Elizabeth [KDA] <Elizabeth.Hickman@ks.gov>  
**Cc:** Lewis, Earl [KDA] <Earl.Lewis@ks.gov>  
**Subject:** RE: RRCA EC - Flood Flows discussion 2

**EXTERNAL:** This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Chris and Ivan –

Please see the attached summary of this morning's meeting. Please let me know if you have any edits.  
Thanks!  
Kari

*Attachment 3 Flood Flows Documents*

-----Original Appointment-----

**From:**

**Sent:** Thursday, May 27, 2021 9:20 AM

**To:** Burgert, Kari; Beightel, Chris [KDA]; Franco - DNR, Ivan; Erickson, Chelsea [KDA]; Willem Schreuder; Davis, Alexa; Bradley, Jesse; david.engelhaupt@ks.gov; elizabeth.hickman@ks.gov

**Cc:** Lewis, Earl [KDA]

**Subject:** RRCA EC - Flood Flows discussion 2

**When:** Tuesday, June 22, 2021 11:00 AM-12:00 PM America/Chicago.

**Where:** <https://us02web.zoom.us/j/83870713940?pwd=NTZMZEM2ZktDaGlla3Zna1RkUFdCdZ09>

Agenda

1. Welcome/Introductions
2. Draft Notes from 5/18/21 meeting
3. Kansas' 6/21/21 proposal
4. Annual meeting
  - a. Bring to Commissioners?
  - b. Assignment for next year?
5. Next Steps

DNR Water Planning is inviting you to a scheduled Zoom meeting.

Join Zoom Meeting

<https://us02web.zoom.us/j/83870713940?pwd=NTZMZEM2ZktDaGlla3Zna1RkUFdCdZ09>

Meeting ID: 838 7071 3940

Passcode: 080498

One tap mobile

+13462487799,,83870713940# US (Houston)

+16699009128,,83870713940# US (San Jose)

Dial by your location

+1 346 248 7799 US (Houston)

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+1 253 215 8782 US (Tacoma)

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+1 646 558 8656 US (New York)

+1 301 715 8592 US (Washington DC) Meeting ID: 838 7071 3940 Find your local number:

<https://us02web.zoom.us/j/kf1ewfA6a>

Main Stem Flood Flow Adjustment (when applicable) assume subbasin FF										41278
1	Guide R	400,000	450000	502276	550000	600,000	650000	700,000	750000	800,000
Hardy										
400000		-41278	-41278	-41278	-41278	-41278	-41278	-41278	-41278	-41278
450000		8722	8722	8722	8722	8722	8722	8722	8722	8722
500000		58722	58722	58722	58722	58722	58722	58722	58722	58722
550000		108722	108722	108722	108722	108722	108722	108722	108722	108722
625,783		184505	184505	184505	184505	184505	184505	184505	184505	184505
650000		208722	208722	208722	208722	208722	208722	208722	208722	208722
700000		258722	258722	258722	258722	258722	258722	258722	258722	258722
750000		308722	308722	308722	308722	308722	308722	308722	308722	308722
800000		358722	358722	358722	358722	358722	358722	358722	358722	358722
850000		408722	408722	408722	408722	408722	408722	408722	408722	408722
900000		458722	458722	458722	458722	458722	458722	458722	458722	458722

Computed water supply GRtoHdy (assume CBCU GRtoHdy =										3840 AF)
3	Guide R	400,000	450000	502276	550000	600,000	650000	700,000	750000	800,000
Hardy										
400000		-6,519	-56,519	-108,795	-156,519	-206,519	-256,519	-306,519	-356,519	-406,519
450000		43,481	-6,519	-58,795	-106,519	-156,519	-206,519	-256,519	-306,519	-356,519
500000		93,481	43,481	-8,795	-56,519	-106,519	-156,519	-206,519	-256,519	-306,519
550000		143,481	93,481	41,205	-6,519	-56,519	-106,519	-156,519	-206,519	-256,519
625,783		219,264	169,264	116,988	69,264	19,264	-30,736	-80,736	-130,736	-180,736
650000		243,481	193,481	141,205	93,481	43,481	-6,519	-56,519	-106,519	-156,519
700000		293,481	243,481	191,205	143,481	93,481	43,481	-6,519	-56,519	-106,519
750000		343,481	293,481	241,205	193,481	143,481	93,481	43,481	-6,519	-56,519
800000		393,481	343,481	291,205	243,481	193,481	143,481	93,481	43,481	-6,519
850000		443,481	393,481	341,205	293,481	243,481	193,481	143,481	93,481	43,481
900000		493,481	443,481	391,205	343,481	293,481	243,481	193,481	143,481	93,481

WSY allocation (Swide alloc - BlwGR alloc)										SW alloc	391940
5	Guide R	400,000	450000	502276	550000	600,000	650000	700,000	750000	800,000	
Hardy											
400000		395,128	419,578	445,141	468,478	492,928	517,378	541,828	566,278	590,728	
450000		370,678	395,128	420,691	444,028	468,478	492,928	517,378	541,828	566,278	
500000		346,228	370,678	396,241	419,578	444,028	468,478	492,928	517,378	541,828	
550000		321,778	346,228	371,791	395,128	419,578	444,028	468,478	492,928	517,378	
625,783		284,720	309,170	334,733	358,070	382,520	406,970	431,420	455,870	480,320	
650000		272,878	297,328	322,891	346,228	370,678	395,128	419,578	444,028	468,478	
700000		248,428	272,878	298,441	321,778	346,228	370,678	395,128	419,578	444,028	
750000		223,978	248,428	273,991	297,328	321,778	346,228	370,678	395,128	419,578	
800000		199,528	223,978	249,541	272,878	297,328	321,778	346,228	370,678	395,128	
850000		175,078	199,528	225,091	248,428	272,878	297,328	321,778	346,228	370,678	
900000		150,628	175,078	200,641	223,978	248,428	272,878	297,328	321,778	346,228	

Gain GRtoHdy (assume Bostwick returns of										10359 AF)
2	Guide R	400,000	450000	502276	550000	600,000	650000	700,000	750000	800,000
Hardy										
400000		-10,359	-60,359	-112,635	-160,359	-210,359	-260,359	-310,359	-360,359	-410,359
450000		39,641	-10,359	-62,635	-110,359	-160,359	-210,359	-260,359	-310,359	-360,359
500000		89,641	39,641	-12,635	-60,359	-110,359	-160,359	-210,359	-260,359	-310,359
550000		139,641	89,641	37,365	-10,359	-60,359	-110,359	-160,359	-210,359	-260,359
625,783		215,424	165,424	113,148	65,424	15,424	-34,576	-84,576	-134,576	-184,576
650000		239,641	189,641	137,365	89,641	39,641	-10,359	-60,359	-110,359	-160,359
700000		289,641	239,641	187,365	139,641	89,641	39,641	-10,359	-60,359	-110,359
750000		339,641	289,641	237,365	189,641	139,641	89,641	39,641	-10,359	-60,359
800000		389,641	339,641	287,365	239,641	189,641	139,641	89,641	39,641	-10,359
850000		439,641	389,641	337,365	289,641	239,641	189,641	139,641	89,641	39,641
900000		489,641	439,641	387,365	339,641	289,641	239,641	189,641	139,641	89,641

Allocation GRtoHdy =										0.489 X CWS GRtoHdy
4	Guide R	400,000	450000	502276	550000	600,000	650000	700,000	750000	800,000
Hardy										
400000		-3,188	-27,638	-53,201	-76,538	-100,988	-125,438	-149,888	-174,338	-198,788
450000		21,262	-3,188	-28,751	-52,088	-76,538	-100,988	-125,438	-149,888	-174,338
500000		45,712	21,262	-4,301	-27,638	-52,088	-76,538	-100,988	-125,438	-149,888
550000		70,162	45,712	20,149	-3,188	-27,638	-52,088	-76,538	-100,988	-125,438
625,783		107,220	82,770	57,207	33,870	9,420	-15,030	-39,480	-63,930	-88,380
650000		119,062	94,612	69,049	45,712	21,262	-3,188	-27,638	-52,088	-76,538
700000		143,512	119,062	93,499	70,162	45,712	21,262	-3,188	-27,638	-52,088
750000		167,962	143,512	117,949	94,612	70,162	45,712	21,262	-3,188	-27,638
800000		192,412	167,962	142,399	119,062	94,612	70,162	45,712	21,262	-3,188
850000		216,862	192,412	166,849	143,512	119,062	94,612	70,162	45,712	21,262
900000		241,312	216,862	191,299	167,962	143,512	119,062	94,612	70,162	45,712

Reduction to Statewide allocation from flood flow year										SW alloc	391940
5	Guide R	400,000	450000	502276	550000	600,000	650000	700,000	750000	800,000	
Hardy											
400000		-3,188	-27,638	-53,201	-76,538	-100,988	-125,438	-149,888	-174,338	-198,788	
450000		21,262	-3,188	-28,751	-52,088	-76,538	-100,988	-125,438	-149,888	-174,338	
500000		45,712	21,262	-4,301	-27,638	-52,088	-76,538	-100,988	-125,438	-149,888	
550000		70,162	45,712	20,149	-3,188	-27,638	-52,088	-76,538	-100,988	-125,438	
625,783		107,220	82,770	57,207	33,870	9,420	-15,030	-39,480	-63,930	-88,380	
650000		119,062	94,612	69,049	45,712	21,262	-3,188	-27,638	-52,088	-76,538	
700000		143,512	119,062	93,499	70,162	45,712	21,262	-3,188	-27,638	-52,088	
750000		167,962	143,512	117,949	94,612	70,162	45,712	21,262	-3,188	-27,638	
800000		192,412	167,962	142,399	119,062	94,612	70,162	45,712	21,262	-3,188	
850000		216,862	192,412	166,849	143,512	119,062	94,612	70,162	45,712	21,262	
900000		241,312	216,862	191,299	167,962	143,512	119,062	94,612	70,162	45,712	

Values for subbasin flood flows (K2), Bostwick Returns (H18), CBCU CRtoHdy(U2) are from <https://www.republicanrivercompact.org/restricted/acct/13jan2020-f1.htm> on January 21,2020  
Values for 2019 gaged flow at Hardy and Guide Rock are included in highlighted cells

This method allows the Guide Rock adjustment to grow with the increasing difference between the Hardy and Guide Rock gages. It does appear that at the extremes, this proposal probably takes too much from NE's allocation. This was the phenomenon that they were trying to address.  
  
In the example above, by the time the difference between Hardy and Guide Rock gages is 350,000 AF, NE's statewide allocation is reduced by nearly 120,000 AF for purposes of the WSY test. This is unlikely to happen, nevertheless there's probably a better solution.

Main Stem Flood Flow Adjustment (when applicable) assume subbasin FF										41278
1	Guide R	400,000	450000	502276	550000	600,000	650000	700,000	750000	800,000
Hardy										
400000		-41278	-41278	-41278	-41278	-41278	-41278	-41278	-41278	-41278
450000		8722	8722	8722	8722	8722	8722	8722	8722	8722
500000		58722	58722	58722	58722	58722	58722	58722	58722	58722
550000		108722	108722	108722	108722	108722	108722	108722	108722	108722
625,783		184505	184505	184505	184505	184505	184505	184505	184505	184505
650000		208722	208722	208722	208722	208722	208722	208722	208722	208722
700000		258722	258722	258722	258722	258722	258722	258722	258722	258722
750000		308722	308722	308722	308722	308722	308722	308722	308722	308722
800000		358722	358722	358722	358722	358722	358722	358722	358722	358722
850000		408722	408722	408722	408722	408722	408722	408722	408722	408722
900000		458722	458722	458722	458722	458722	458722	458722	458722	458722

Computed water supply GRtoHdy (assume CBCU GRtoHdy =										3840 AF)
3	Guide R	400,000	450000	502276	550000	600,000	650000	700,000	750000	800,000
Hardy										
400000		-6,519	-56,519	-108,795	-156,519	-206,519	-256,519	-306,519	-356,519	-406,519
450000		43,481	-6,519	-58,795	-106,519	-156,519	-206,519	-256,519	-306,519	-356,519
500000		93,481	43,481	-8,795	-56,519	-106,519	-156,519	-206,519	-256,519	-306,519
550000		143,481	93,481	41,205	-6,519	-56,519	-106,519	-156,519	-206,519	-256,519
625,783		219,264	169,264	116,988	69,264	19,264	-30,736	-80,736	-130,736	-180,736
650000		243,481	193,481	141,205	93,481	43,481	-6,519	-56,519	-106,519	-156,519
700000		293,481	243,481	191,205	143,481	93,481	43,481	-6,519	-56,519	-106,519
750000		343,481	293,481	241,205	193,481	143,481	93,481	43,481	-6,519	-56,519
800000		393,481	343,481	291,205	243,481	193,481	143,481	93,481	43,481	-6,519
850000		443,481	393,481	341,205	293,481	243,481	193,481	143,481	93,481	43,481
900000		493,481	443,481	391,205	343,481	293,481	243,481	193,481	143,481	93,481

WSY allocation (Swide alloc - BlwGR alloc)										SW alloc	391940
5	Guide R	400,000	450000	502276	550000	600,000	650000	700,000	750000	800,000	
Hardy											
400000		395,128	419,578	445,141	468,478	492,928	517,378	541,828	566,278	590,728	
450000		370,678	395,128	420,691	444,028	468,478	492,928	517,378	541,828	566,278	
500000		358,455	370,678	396,241	419,578	444,028	468,478	492,928	517,378	541,828	
550000		358,455	358,455	371,791	395,128	419,578	444,028	468,478	492,928	517,378	
625,783		358,455	358,455	358,455	358,455	382,520	406,970	431,420	455,870	480,320	
650000		358,455	358,455	358,455	358,455	370,678	395,128	419,578	444,028	468,478	
700000		358,455	358,455	358,455	358,455	358,455	370,678	395,128	419,578	444,028	
750000		358,455	358,455	358,455	358,455	358,455	358,455	370,678	395,128	419,578	
800000		358,455	358,455	358,455	358,455	358,455	358,455	370,678	395,128	419,578	
850000		358,455	358,455	358,455	358,455	358,455	358,455	358,455	370,678	370,678	
900000		358,455	358,455	358,455	358,455	358,455	358,455	358,455	358,455	358,455	

Gain GRtoHdy (assume Bostwick returns of										10359 AF)
2	Guide R	400,000	450000	502276	550000	600,000	650000	700,000	750000	800,000
Hardy										
400000		-10,359	-60,359	-112,635	-160,359	-210,359	-260,359	-310,359	-360,359	-410,359
450000		39,641	-10,359	-62,635	-110,359	-160,359	-210,359	-260,359	-310,359	-360,359
500000		89,641	39,641	-12,635	-60,359	-110,359	-160,359	-210,359	-260,359	-310,359
550000		139,641	89,641	37,365	-10,359	-60,359	-110,359	-160,359	-210,359	-260,359
625,783		215,424	165,424	113,148	65,424	15,424	-34,576	-84,576	-134,576	-184,576
650000		239,641	189,641	137,365	89,641	39,641	-10,359	-60,359	-110,359	-160,359
700000		289,641	239,641	187,365	139,641	89,641	39,641	-10,359	-60,359	-110,359
750000		339,641	289,641	237,365	189,641	139,641	89,641	39,641	-10,359	-60,359
800000		389,641	339,641	287,365	239,641	189,641	139,641	89,641	39,641	-10,359
850000		439,641	389,641	337,365	289,641	239,641	189,641	139,641	89,641	39,641
900000		489,641	439,641	387,365	339,641	289,641	239,641	189,641	139,641	89,641

Allocation GRtoHdy =										0.489 X CWS GRtoHdy
4	Guide R	400,000	450000	502276	550000	600,000	650000	700,000	750000	800,000
Hardy										
400000		-3,188	-27,638	-53,201	-76,538	-100,988	-125,438	-149,888	-174,338	-198,788
450000		21,262	-3,188	-28,751	-52,088	-76,538	-100,988	-125,438	-149,888	-174,338
500000		33,485	21,262	-4,301	-27,638	-52,088	-76,538	-100,988	-125,438	-149,888
550000		33,485	33,485	20,149	-3,188	-27,638	-52,088	-76,538	-100,988	-125,438
625,783		33,485	33,485	33,485	33,485	9,420	-15,030	-39,480	-63,930	-88,380
650000		33,485	33,485	33,485	33,485	21,262	-3,188	-27,638	-52,088	-76,538
700000		33,485	33,485	33,485	33,485	33,485	21,262	-3,188	-27,638	-52,088
750000		33,485	33,485	33,485	33,485	33,485	21,262	-3,188	-27,638	-52,088
800000		33,485	33,485	33,485	33,485	33,485	21,262	-3,188	-27,638	-52,088
850000		33,485	33,485	33,485	33,485	33,485	33,485	33,485	21,262	21,262
900000		33,485	33,485	33,485	33,485	33,485	33,485	33,485	33,485	33,485

Reduction to Statewide allocation from flood flow year										SW alloc	391940
5	Guide R	400,000	450000	502276	550000	600,000	650000	700,000	750000	800,000	
Hardy											
400000		-3,188	-27,638	-53,201	-76,538	-100,988	-125,438	-149,888	-174,338	-198,788	
450000		21,262	-3,188	-28,751	-52,088	-76,538	-100,988	-125,438	-149,888	-174,338	
500000		33,485	21,262	-4,301	-27,638	-52,088	-76,538	-100,988	-125,438	-149,888	
550000		33,485	33,485	20,149	-3,188	-27,638	-52,088	-76,538	-100,988	-125,438	
625,783		33,485	33,485	33,485	33,485	9,420	-15,030	-39,480	-63,930	-88,380	
650000		33,485	33,485	33,485	33,485	21,262	-3,188	-27,638	-52,088	-76,538	
700000		33,485	33,485	33,485	33,485	33,485	21,262	-3,188	-27,638	-52,088	
750000		33,485	33,485	33,485	33,485	33,485	21,262	-3,188	-27,638	-52,088	
800000		33,485	33,485	33,485	33,485	33,485	21,262	-3,188	-27,638	-52,088	
850000		33,485	33,485	33,485	33,485	33,485	33,485	33,485	21,262	21,262	
900000		33,485	33,485	33,485	33,485	33,485	33,485	33,485	33,485	33,485	

Values for subbasin flood flows (K2), Bostwick Returns (H18), CBCU CRtoHdy(U2) are from <https://www.republicanrivercompact.org/restricted/acct/13jan2020-f1.htm> on January 21,2020  
Values for 2019 gaged flow at Hardy and Guide Rock are included in highlighted cells

At the 22 June 2021 meeting of the RRCA EC, Kansas proposed to cap the allocation between Guide Rock and Hardy at **33,485** acre-feet in a Flood Flows year.

2021-06-28: This Kansas-proposed method allows the Guide Rock to Hardy allocation to increase according to the original accounting procedures, but caps the allocation at 33,485 acre-feet. 33,485 is the greatest allocation for the Guide Rock to Hardy reach in a non-Flood Flows year on record (2015) since 1995.  
  
To apply the cap, the only difference between this worksheet and the "Current method" worksheet is that a formula was added to table 4 on this sheet (O21:W31) which uses the MIN function to implement the cap.

Flood Flows Focused  
05/18/2021 Meeting Summary

### *Attachment 3 Flood Flows Documents*

Focused Flood Flows accounting assignment meeting  
RRCA Engineering Committee  
May 18, 2021  
10:00 am Central  
*Virtual*

Attendees: Chris Beightel, Ivan Franco, Hongsheng Cao, Willem Schreuder, Kari Burgert, Jesse Bradley, Alexa Davis, Elizabeth Hickman, Sam Perkins

#### Summary:

Members of the Engineering Committee and additional state representatives met to focus on the Flood Flows accounting assignment.

Nebraska reviewed the issue described at the 2019 RRCA Working Session. In short, the issue described by Nebraska is that application of the Flood Flow adjustment did not appear to be contemplated in calculation of Above Guide Rock allocations, which manifested in Above Guide Rock allocations decreasing with increasing flow below Guide Rock.

Nebraska also reviewed their most recent proposal to calculate allocation between Guide Rock and Hardy from Computed Water Supply including a Flood Flow adjustment rather than from Virgin Water Supply. Nebraska proposed the Guide Rock and Hardy Flood Flow adjustment, when applicable, be calculated as the minimum of the Main Stem Flood Flow adjustment and the Guide Rock to Hardy Virgin Water Supply. Nebraska reiterated that this proposal appears maintain consistency with the FSS, addresses Nebraska's issue of decreasing Above Guide Rock allocations with increasing flow below Guide Rock in the current Accounting Procedures, and addresses Kansas's issue with Nebraska's original proposal by not allowing the Guide Rock to Hardy Computed Water Supply be negative when there are Flood Flows. Kansas maintains that their issue with this proposal is they do not see the justification for an allocation of 0 acre-feet between Guide Rock and Hardy in a Flood Flow year. Schreuder reviewed conceptualization of how an allocation, particularly for that of a portion of a subbasin, could be negative.

Kansas reviewed their latest proposal and noted some inconsistencies in the description provided. Kansas committed to sending out an updated proposal.

All parties discussed that the spreadsheets provided by Kansas showing the sensitivity of the proposed allocation calculations to Guide Rock and Hardy streamflows were useful and recommended continued display of the proposals in this manner.

Nebraska stated that their first two criteria for evaluating a proposed solution would be to determine if the FSS is being followed and to determine if the original issue observed of the allocation above Guide Rock decreasing with increasing flows below Guide Rock is resolved. Nebraska asked if any others would like to provide their criteria for evaluating a proposed solution. No additional criteria were provided at that time.

Kari asked that the Engineering Committee members think about what the Engineering Committee would be bringing to the Commissioners at this year's annual meeting and what assignment the Engineering Committee would want to recommend having for the next year to be included in the annual report.

**Flood Flows Focused  
06/22/2021 Meeting Summary**

*Attachment 3 Flood Flows Documents*

Focused Flood Flows accounting assignment meeting  
RRCA Engineering Committee  
June 22, 2021  
11:00 am Central  
*Virtual*

Attendees: Chris Beightel, Ivan Franco, Willem Schreuder, Kari Burgert, Jesse Bradley, Alexa Davis, Elizabeth Hickman, Chelsea Erickson, Earl Lewis, David Engelhaupt

Summary:

Members of the Engineering Committee and additional state representatives met for a second time to focus on the Flood Flows accounting assignment.

The EC members agreed that the draft summary of the 5/18/21 meeting emailed out by Kari on 5/24/21 is final.

Chris summarized Kansas' 6/21/21 proposal (Attachment). Kansas' proposal is to set a cap of 33,485 acre-feet Nebraska's Below Guide Rock Allocation when there is a Flood Flows adjustment. Kansas' proposal does not require any additional changes to the calculations described in the Accounting Procedures.

Chris agreed to send out a spreadsheet showing the impact of Kansas' proposal with varying Guide Rock and Hardy flows as the group has seen in the past.

Nebraska committed to evaluating Kansas' proposal. Kari will let the group know if it seems like a meeting prior to the scheduled July 21 EC meeting is necessary based on Nebraska's evaluation.

## REPUBLICAN RIVER COMPACT ADMINISTRATION (RRCA)

### SUMMARY OF HISTORICAL CHANGES TO THE RRCA'S ACCOUNTING PROCEDURES AND REPORTING REQUIREMENTS

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#### I. Background and Purpose

The Republican River Compact Administration (RRCA) Accounting Procedure and Reporting Requirements (Accounting Procedures) describes the definitions, procedures, basic formulas, specific formulas, and data requirements and reporting formats to be used by the RRCA to compute the Virgin Water Supply, Computed Water Supply, Allocations, Imported Water Supply Credit, Resolution Water Supply Credits, and Computed Beneficial Consumptive Use (CBCU). These computations are used to determine supply, allocations, use and compliance with the Compact according to the Final Settlement Stipulation (FSS) and RRCA Resolutions. The Accounting Procedures may be changed by consent of the RRCA and formally adopted with an update to the RRCA Rules and Regulations. Since the FSS, the computations described in the Accounting Procedures have been implemented primarily through an accounting spreadsheet shared among the states.

The Accounting Procedures have been the subject of numerous assignments to the RRCA Engineering Committee (EC) with subsequent actions by the RRCA including the formal adoption of amended versions with update of the RRCA Rules and Regulations. In addition, the

RRCA has instructed the EC to make certain accounting adjustments in particular years, which allowed the accounting to be changed without changing the Accounting Procedures.

At the August 27, 2015, RRCA annual meeting, the RRCA assigned the EC the task of summarizing historical changes that have been made to the Accounting Procedures. This document serves to fulfill this assignment. . This document is only intended to summarize changes to the Accounting Procedures for educational purposes to aid in understanding the changes. Any omissions or characterizations contained in this document shall not supersede or alter the official actions taken by the RRCA to amend the Accounting Procedures or be used as evidence by any RRCA member state in future disputes.

This tracking document will continue to be updated with future changes to the Accounting Procedures or Groundwater Model Versions as a means to provide a general summary of relevant changes through time. Future updates to this document are the responsibility of the RRCA Engineering Committee Chair and will be reviewed and agreed upon by all three states.

This document includes the following sections: First Version of the Accounting Procedures, Changes to the Accounting Procedures, RRCA Groundwater Model Versions, and Accounting Adjustments. Many of the referenced documents are located on the RRCA official website, specifically on the Documents webpage (<http://republicanriver.org/rrca-documents-2/>) as well as on the Annual Reports webpage (<http://republicanriver.org/rrca-documents-2/rrca-documents/rrca-annual-reports-1960-to-present/>).

## **II. First Version of the Accounting Procedures**

The first version of the Accounting Procedures was agreed upon by the States on December 15, 2002, as Appendix C to the Final Settlement Stipulation (FSS), replacing previous methods of the RRCA to determine virgin water supplies and consumptive use by the States.

As provided in the FSS, the States agreed on June 30, 2003, to accept the RRCA groundwater model developed by the Groundwater Model committee formed for this purpose.

At the 2003 annual meeting, the RRCA formally adopted the Accounting Procedures and the RRCA groundwater model as the official procedures for calculating water supplies and water consumption, including approving changes to its rules and regulations that specifically cited them. *Republican River Compact Administration Forty-Second Annual Report for the Year 2002. Alma, Nebraska. August 22, 2003. Pages 7-9, New Business section.*

## **III. Changes to the Accounting Procedures**

### ***January 2005 Accounting Procedures Update***

At the 2003 Annual Meeting, the RRCA, in addition to adopting the initial Accounting Procedures, assigned its Engineering Committee to review the Accounting Procedures and make

recommendations for needed corrections and improvements. The recommended assignments were then approved by the administration. *Republican River Compact Administration Forty-Second Annual Report for the Year 2002. Alma, Nebraska. August 22, 2003. Pages 7-9, Engineering Committee Report section.*

At the 2004 annual meeting, the Engineering Committee reported progress on the Accounting Procedure assignment. The Engineering Committee and technical representatives from the States of Colorado, Kansas, and Nebraska participated in numerous collaborative work activities and phone conferences and met May 3-4, 2004. Based upon a review of the Accounting Procedures and Formulas, the EC recommended the adoption of eleven editorial changes. *Republican River Compact Administration. Forty-Third Annual Report for the Year 2004. Burlington, Colorado. June 9, 2004. Pages 32 & 33, Engineering Committee Report.*

The Commissioners approved the EC's report at the 2004 annual meeting, specifically noting that the RRCA was approving the changes to the Accounting Procedures as recommended in the report. However, no revised Accounting Procedures document was provided or adopted until January 2005.

At the January 12, 2005, Special Meeting of the RRCA the Engineering Committee produced a revised version of the Accounting Procedures with all recommended changes to date. *Republican River Compact Administration. Forty-Fourth Annual Report for the Year 2004. Special Meeting Denver, Colorado. January 12, 2005. Annual Meeting Burlington, Colorado June 9, 2005. Page 2.*

The revised version of the Accounting Procedures dated January 12, 2005, was approved and attached to the Minutes of the Special Meeting of the RRCA. Also, at the 2005 Special Meeting, the RRCA Administration approved a change in the RRCA Rules and Regulations that specifically adopted the 2005 version of the Accounting Procedures and Groundwater Model version 12s (discussed below).

### ***August 2006 Accounting Procedures Update***

At the RRCA's regular annual meeting on July 27, 2005, the RRCA Engineering Committee developed a recommendation for proportioning annual net evaporation from Harlan County Lake to Kansas and Nebraska CBCU in years when no irrigation releases are made from Harlan County Lake, a situation that was not previously addressed in the Accounting Procedures. The specific language is detailed in the Engineering Committee's July 27, 2005, report, which is attached to the RRCA 44<sup>th</sup> Annual Report. The 2005 Engineering Committee report was approved by the RRCA. However, there was no official change to the Accounting Procedures, with revision date January 12, 2005.

The Accounting Procedures, containing this language, with revision date August 10, 2006, was officially adopted by the Commissioners at the next annual meeting in Phillipsburg, Kansas. *Annual Report August 10, 2006 pages 8 & 9 – Engineering Committee report to the Commissioners.*

### ***August 2007 Annual Meeting Discussion***

At the August 15, 2007, annual meeting in Junction City, Kansas, the Engineering Committee report stated that during the committee's work, it was discovered that Table 5B, *Kansas Compliance During Water-Short Year Administration*, in the Accounting Procedures did not allow Kansas to use 51.1% of any unused portion of Colorado's allocations as per Settlement Stipulation in the water-short year test. The Engineering Committee recommended that this change be made in the accounting spreadsheet. The Table 5B issue was remedied in the new business section of the annual meeting when the RRCA assigned the Engineering Committee to make the necessary change in the accounting spreadsheet. *Republican River Compact Administration. Forty-Sixth Annual Report for the Year 2006. Junction City, Kansas. August 15<sup>th</sup>, 2007. Pages 10 and 12 of the report.*

### ***August 2010 Accounting Procedures Update***

Two changes to the Accounting Procedures occurred in 2010 via RRCA resolution titled "Changes to the RRCA's Accounting Procedures and Reporting Requirements," signed by the Compact commissioners on August 12, 2010. The Engineering Committee recommended in its August 12, 2010, report to amend the Accounting Procedures to correct the formulas used to compute the Virgin Water Supply for both Frenchman Creek and the Main Stem to properly account for return flows from the Riverside Canal. The Engineering Committee also recommended in the same report to amend the Accounting Procedures to include the groundwater impact attributed to Kansas well pumping (GWk), as calculated by the RRCA Groundwater Model, in the formula to compute the Main Stem Virgin Water Supply. The proposal by the Engineering Committee was included as Attachment A to the August 12, 2010, Engineering Committee report and formally adopted by the RRCA Administration on August 12, 2010. The Accounting Procedures were updated with these changes and approved by the RRCA as the August 12, 2010 version, which replaced the January 12, 2005 version.

### ***August 2015 Accounting Procedures Update***

The August 2015 Accounting Procedures changes were implemented due to the United States Supreme Court decision of February 24, 2015, that accepted the recommendations contained in the November 15, 2013, Report of the Special Master, including modification of the Accounting Procedures. The EC provided a memorandum dated May 14, 2015, where the State of Nebraska proposed a revised version of the Accounting Procedures to include the changes stipulated in Appendix F, Exhibit A of the Report of the Special Master dated November 15, 2013, as well as proposed changes to Attachment 7 regarding spill to waste-way data.

The changes to the Accounting Procedures were enacted via resolution adopted by the RRCA at the RRCA annual meeting on August 27, 2015, and are attached to the 2015 RRCA annual report. The resolution is titled "Resolution of the Republican River Compact Administration Regarding Required Changes to the RRCA Accounting Procedures and Reporting Requirements

Document Proposed in the Report of the Special Master and Proposed Edits to Attachment 7 Regarding Spill to Waste-Way Data.”

The changes contained in the Report of the Special Master were enacted for accounting years 2007 and forward, while the changes to Attachment 7 were enacted for accounting years 2015 and forward.

### ***August 2016 Accounting Procedures Update***

At the August 24, 2016, annual meeting of the RRCA, the Administration approved three resolutions that resulted in changes to the Accounting Procedures.

The first resolution, “Resolution of the Republican River Compact Administration Regarding Required Changes to the RRCA Accounting Procedures and Reporting Requirements Regarding Non-Irrigation Season Canal Diversions for Groundwater Recharge Purposes”, approved August 24, 2016) required changes to the Accounting Procedures for non-irrigation season canal diversions for groundwater recharge purposes. The State of Nebraska provided documentation, reformed Accounting Procedures, and edits to the implementation of Attachment 7 in the accounting spreadsheet in a memorandum dated July 7, 2016, attached to the resolution. The proposed changes documented in the memorandum were approved with an additional provision. That provision was that non-irrigation season canal recharge diversions shall be limited to 10,000 acre-feet. If canal recharge diversions exceed 10,000 acre-feet, then the method established for irrigation season canal diversion shall apply. Amended RRCA Rules and Regulations were approved to enact the Accounting Procedures proposed in the non-irrigation season canal diversions for groundwater recharge purposes resolution.

The second resolution approved a long-term agreement related to the operation of Harlan County Lake for Compact Call Years. The RRCA previously enacted temporary resolutions to modify the operations of Harlan County Lake and the Accounting Procedures for the years 2014, 2015, and 2016. The long-term resolution includes 15 provisions, including specifications for the timing and location of Nebraska’s compliance activities, creation of additional terms for the accounting, and modification to the application of Nebraska’s compliance tests.

The third resolution approved a long-term agreement related to operation and accounting for the Colorado Compact Compliance Pipeline (CCP) and Colorado compliance efforts in the South Fork Republican River Basin. The RRCA approved terms and conditions for CCP operations and the related accounting procedures changes, provided as an appendix to the resolution. For Bonny Reservoir, the agreement was to develop options to maximize the use of the reservoir. Colorado agreed to work with state and federal partners to maintain the flow of water through Bonny Reservoir. The resolution described how Colorado plans to utilize the USDA (Conservation Reserve Enhancement Program (CREP) or other programs to retire up to 25,000 acres in the South Fork Republican River basin by 2027. The resolution also included plans for the States to meet to resolve the Beaver Creek issue for all Water Short Years with unapproved accounting. The resolution concluded with details about how to resolve any disputes between

the states that may arise, procedure for termination of the agreement and reviewing the resolution and progress in 2024.

### ***May 2017 Accounting Procedures Update***

At a special meeting of the RRCA on May 25, 2017, the RRCA approved and adopted the revised Accounting Procedures and a resolution specifying that the changes should be used for accounting for 2007 and subsequent years until amended by the RRCA.

The same resolution also clarified that if a state provides a notice of intent to terminate for the August 24, 2016, resolution related to Harlan County Lake for Compact Call Years or the resolution related to operation of Colorado Compact Compliance Pipeline and Colorado's Compliance efforts in the South Fork Republican River Basin, then Nebraska or Colorado, respectively, shall not receive Resolution Water Supply Credit after December 31 of the second full year following the RRCA's receipt of a Notice of Intent to Terminate.

### ***August 2020 Accounting Procedures Update***

An update to the Accounting Procedures was made at the August 21, 2020, annual meeting in recognition that the Accounting Procedures do not properly implement the Flood Flow provisions at the Hardy gage with respect to the calculations of the Computed Water Supply above and below Guide Rock, a solution for which had not been obtained prior to the annual meeting. The Engineering Committee's annual report included an attachment documenting the exchanges between the states that had occurred to date towards resolution of the issue. (Reference 2020 annual report when available).

The update to the Accounting Procedures included footnotes to Section III.B.1. – the section describing Flood Flows in the calculation of Computed Water Supply, Section III.H. – the section describing calculations above and below Guide Rock during Water-Short Years, and Attachment 6 – a table outlining the calculations for computing water supplies and consumptive use above Guide Rock. The footnotes reflect the Engineering Committee's findings as described in their annual report.

## IV. Groundwater Model Versions

Three versions of the RRCA Groundwater Model, officially designated as 12p, 12s and 12s2, have been used by RRCA to compute each state's CBCU and imported water supply credit. The three versions differ in how streams and reservoirs and associated accounting points are represented. The model versions are listed below, starting with the first version designated 12p. That version was replaced by version 12s in 2005 and then by the current version 12s2 in 2010. Follow the provided links for full details on each version of the model.

1. Original model version 12p was adopted as the final version for the accounting years 1918-2000; click the link for full details on this original model version.  
<http://www.republicanrivercompact.org/v12p/index.html>.
2. The next model version 12s, approved January 12, 2005 and used for accounting years 2001-2006, corrected stream routing errors discovered in the 12p version along Medicine Creek above Harry Strunk Reservoir; click the link for full details on this model update for 2005. <http://www.republicanrivercompact.org/2003/index.html>.
3. Currently used (2010) model version 12s2, approved August 12, 2010 and used for accounting years 2007 to present day, involved only changes to accounting point locations for Guide Rock and the North Fork Republican River, and did not involve model changes to how streams and reservoirs are represented; click the link for full details on this current model version.  
<http://www.republicanrivercompact.org/2007/index.html>.
  - a. Parameter-elevation Regressions on Independent Slopes Model (PRISM) (August 30, 2011) - Missing Precipitation Data for RRCA Groundwater Model 2008-Onward. Beginning in 2008, monthly precipitation data became unavailable for several of the 34 National Weather Service weather stations used in the RRCA groundwater model. For years 2009 and 2019, the RRCA agreed to use monthly PRISM data as a substitute for missing months used to calculate the annual sums. The RRCA approved using this method for missing precipitation data at the RRCA annual meeting on October 16, 2012. The entire PRISM discussion is found as Exhibit A to the Engineering Committee report to RRCA on pages 801-822 in the 52<sup>nd</sup> annual report.

## V. Accounting Adjustments

This section provides an overview of accounting provisions impacted by a series of agreements implemented by the states starting in December 2013 and continuing through until the adoption of long-term agreements approved at the 2016 annual meeting, which were incorporated into the August 24, 2016, version of the Accounting Procedures. While the official accounting of the RRCA did not ultimately reflect the accounting provisions contained in the interim agreements, this section outlines those accounting provisions that were impacted through each successive

agreement to provide context to the preliminary accountings that were being developed and reviewed by the states during this timeframe.

- December 2013 – At a special telephonic meeting on December 19, 2013, the States approved a resolution for a Temporary Augmentation Plan and Related Accounting Procedures for the Colorado Compact Compliance Pipeline for 2014.
- October 2014 – At a special telephonic meeting on October 22, 2014, the States approved a resolution that included adding water to the “Imported Water Supply Credit” and the “Imported Water Supply Credit Above Guide Rock” and reducing the “Virgin Water Supply” of Rock Creek and Medicine Creek for 2014 only. An account was established in Harlan County Lake for use by Kansas during the irrigation season.
- October 2014 – At a special telephonic meeting on October 22, 2014, the States approved a resolution for a Temporary Augmentation Plan and Related Accounting Procedures for the Colorado Compact Compliance Pipeline. The plan description and related changes to the accounting procedures and groundwater model were attached as exhibits. There were twenty-three terms and conditions outlined in the resolution.
- November 2014 – The next Harlan County Lake agreement was signed at a special telephonic RRCA meeting on November 19, 2014. The States approved a resolution detailing how Nebraska’s 2015 compliance operations shall be recorded in the “Imported Water Supply Credit” and the “Imported Water Supply Credit Above Guide Rock” while at the same time reducing the “Virgin Water Supply” of Rock Creek and Medicine Creek by the amount of 2015 augmentation discharges to those creeks. Water delivered to Harlan County Lake and deposited into a Kansas account would be assessed a portion of the monthly evaporation charges based on the amount of water in the account.
- March 2015 – On March 6, 2015, at a special telephonic RRCA meeting the States approved an addendum to the November 19, 2014, resolution that provided Nebraska additional flexibility to achieve compact compliance if there is a shortfall as well as detailing adjustments to the compact accounting as a result of compliance actions.
- August 2015 – A resolution was approved on August 27, 2015, regarding accounting adjustments and agreements related to the operation of Harlan County Lake for Compact Year 2016. Specifically, the accounting offset for Nebraska’s 2016 compliance operations shall be recorded in the “Imported Water Supply Credit” and “Imported Water Supply Credit Above Guide Rock” columns of Nebraska’s Take 3 and Table 5c respectively, which, for the 2016 Compact Accounting for Nebraska, will be increased by the amount of augmentation water delivered into the Kansas Account pursuant to Provisions 3 and 5 of the resolution. In 2016 and, as necessary, the 2015 and 2017 Virgin Water Supply of Rock Creek and Medicine Creek will be reduced by the amount of augmentation water supplied between October 1, 2015, and April 1, 2017, in the year pumped.