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No. 126, Original

Supreme Court, U.S.
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In The

Supreme Court of the United States

STATE OF KANSAS,

Plaintiff,

v.

STATE OF NEBRASKA

and

STATE OF COLORADO,

Defendants.

BEFORE THE HONORABLE VINCENT L. MCKUSICK
SPECIAL MASTER

FINAL SETTLEMENT STIPULATION
VOLUME 1 OF 5

December 15, 2002

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FINAL SETTLEMENT STIPULATION

The States of Kansas, Nebraska and Colorado, hereby enter into this Final Settlement Stipulation as of December 15, 2002:

I. General

A. The States agree to resolve the currently pending litigation in the United States Supreme Court regarding the Republican River Compact by means of this Stipulation and the Proposed Consent Judgment attached hereto as Appendix A.

B. The States agree to undertake the obligations set forth in this Stipulation. The States shall implement the obligations and agreements in this Stipulation in accordance with the schedule attached hereto as Appendix B.

C. Upon the Court's approval of this Stipulation and entry of the Proposed Consent Judgment, the States agree that all claims against each other relating to the use of the waters of the Basin pursuant to the Compact with respect to activities or conditions occurring before December 15, 2002, shall be waived, forever barred and dismissed with prejudice. These claims shall include all claims for Compact violations, damages, and all claims asserted or which could have been asserted in the pending proceeding, No. 126, Original.

D. With respect to activities or conditions occurring after December 15, 2002, the dismissal will not preclude a State from seeking enforcement of the provisions of the Compact, this Stipulation and the Proposed Consent Judgment. Nor will the dismissal preclude any State in such future action from asserting any legal theories it raised in the present proceeding, or any other legal theories,

with respect to activities or conditions occurring after the date of such dismissal. The States agree that this Stipulation and the Proposed Consent Judgment are not intended to, nor could they, change the States' respective rights and obligations under the Compact. The States reserve their respective rights under the Compact to raise any issue of Compact interpretation and enforcement in the future.

E. Specific information-sharing requirements are set forth in the RRCA Accounting Procedures, attached hereto as Appendix C. The States will provide each other with the opportunity to inspect and copy their records pertaining to water use in the Basin, other than privileged materials, upon request. The States will cooperate in arranging verification as reasonably necessary.

F. The RRCA may modify the RRCA Accounting Procedures, or any portion thereof, in any manner consistent with the Compact and this Stipulation.

G. Headings in this Stipulation are provided for convenience only and shall not affect the substance of any provision.

H. This Stipulation supersedes the Settlement Principles signed by the States on April 30, 2002.

I. The provisions of Subsection IV.C. relating to the development of the RRCA Groundwater Model shall be in effect and enforceable between December 15, 2002 and July 1, 2003 or until the Court's approval or disapproval of this Stipulation, whichever is later.

J. Within six months of the final dismissal of this case, the RRCA shall revise its existing rules and regulations as necessary to make them consistent

with this Stipulation and the RRCA Accounting Procedures.

II. Definitions

Wherever used in this Stipulation the following terms are defined as:

Acre-foot: The quantity of water required to cover an acre to the depth of one foot, equivalent to forty-three thousand, five hundred sixty (43,560) cubic feet;

Actual Interest: A State will be deemed to have an actual interest in a dispute if resolution of the dispute could require action by the State, result in increasing or decreasing the amount of water available to a State, affect the State's ability to monitor or administer water use or water availability, or increase the State's financial obligations;

Addressed by the RRCA: A matter is deemed to be addressed by the RRCA when the RRCA has taken final action by vote on such request or failed to take action by vote on the request after a Reasonable Opportunity to investigate and act on the request;

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

Annual: As defined in the RRCA Accounting Procedures Section II;

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

Beneficial Consumptive Use: That use by which the Water Supply of the Basin is consumed through the activities of man, and shall include

water consumed by evaporation from any reservoir, canal, ditch, or irrigated area;

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

Computed Beneficial Consumptive Use: The stream flow depletion resulting from the activities of man as listed in the definition of Computed Beneficial Consumptive Use in the RRCA Accounting Procedures Section II;

Computed Water Supply: As defined in the RRCA Accounting Procedures Section II;

Conservation Committee: The conservation measures study committee established in Subsection VI.B.1;

Court: The United States Supreme Court;

Designated Drainage Basins: The drainage basins of the specific tributaries and Main Stem of the Republican River as described in Article III of the Compact;

Dewatering Well: A Well constructed solely for the purpose of lowering the groundwater elevation;

Federal Reservoirs: Bonny Reservoir, Swanson Lake, Enders Reservoir, Hugh Butler Lake, Harry Strunk Lake, Keith Sebelius Lake, Harlan County Lake, Lovewell Reservoir;

Flood Flows: The amount of water deducted from the Virgin Water Supply as part of the computation of the Computed Water Supply due to a flood event as determined by the methodology described in the RRCA Accounting Procedures, Subsection III.B.1.;

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

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

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

Imported Water Supply Credit: The accretions to stream flow due to water imports from outside of the Basin as computed 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 that State's Allocation, except as provided in Subsection V.B.2. of this Stipulation and Subsections III.I. – J. of the RRCA Accounting Procedures;

Main Stem: The Designated Drainage Basin identified in Article III of the Compact as the

North Fork of the Republican River in Nebraska and the main stem of the Republican River between the junction of the North Fork and the Arikaree River and the lowest crossing of the river at the Nebraska-Kansas state line and the small tributaries thereof, and also including the drainage basin Blackwood Creek;

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

Modeling Committee: The joint groundwater modeling committee established in Subsection IV.C.;

Moratorium: The prohibition and limitations on construction of new Wells in the geographic area described in Section III;

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

Northwest Kansas: Those portions of the Subbasins within Kansas;

Proposed Consent Judgment: The document attached hereto as Appendix A;

Reasonable Opportunity: The RRCA will be deemed to have had a reasonable opportunity to investigate and act on a regular request when, at a minimum, the issue has been discussed at the next regularly scheduled annual meeting. If the RRCA agrees that an issue requires additional investigation, the RRCA may specify a period of time that constitutes a reasonable opportunity for

completion of such investigation and final action on the particular issue. The RRCA will be deemed to have had a reasonable opportunity to investigate and act on a "fast-track" request when the issue has been discussed at a meeting of the RRCA no later than 30 days after the "fast-track" issue has been raised. If the RRCA agrees that a "fast track" issue requires additional investigation, the RRCA may specify a period of time that constitutes a reasonable opportunity for completion of such investigation and final action on the particular issue;

Replacement Well: A Well that replaces an existing Well that a) will not be used after construction of the new Well and b) will be abandoned within one year after such construction or is used in a manner that is excepted from the Moratorium described in Subsections III.B.1.c.- f. of this Stipulation;

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

RRCA Accounting Procedures: The document titled "The Republican River Compact Administration Accounting Procedures and Reporting Requirements" and all attachments thereto, attached hereto as Appendix C;

RRCA Groundwater Model: The groundwater model developed under the provisions of Subsection IV.C. of this Stipulation;

State: Any of the States of Colorado, Kansas and Nebraska;

States: The States of Colorado, Kansas and Nebraska;

Stipulation: This Final Settlement Stipulation to be filed in *Kansas v. Nebraska and Colorado*, No. 126, Original, including all Appendices attached hereto;

Sub-basin: Any of the Designated Drainage Basins, except for the Main Stem, identified in Article III of the Compact;

Submitted to the RRCA: A matter is deemed to have been submitted to the RRCA when a written statement requesting action or decision by the RRCA has been delivered to the other RRCA members by a widely accepted means of communication and receipt has been confirmed;

Test hole: A hole designed solely for the purposes of obtaining information on hydrologic and/or geologic conditions;

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

Unallocated Supply: The "water supplies of upstream basins otherwise unallocated" as set forth in Article IV of the Compact;

Upstream of Guide Rock, Nebraska: Those areas within the Basin lying west of a line proceeding north from the Nebraska-Kansas state line and following the western edge of Webster County, Township 1, Range 9, Sections 34, 27, 22, 15, 10 and 3 through Webster County, Township 2, Range 9, Sections 34, 27 and 22; then proceeding west along the southern edge of Webster

County, Township 2, Range 9, Sections 16, 17 and 18; then proceeding north following the western edge of Webster County, Township 2, Range 9, Sections 18, 7 and 6, through Webster County, Township 3, Range 9, Sections 31, 30, 19, 18, 7 and 6 to its intersection with the northern boundary of Webster County. Upstream of Guide Rock, Nebraska shall not include that area in Kansas east of the 99° meridian and south of the Kansas-Nebraska state line. Attached to this Stipulation in Appendix D is a map that shows the areas upstream of Guide Rock, Nebraska. In the event of any conflict between this definition and Appendix D, this definition will control;

Virgin Water Supply: The Water Supply within the Basin undepleted by the activities of man.

Water Supply of the Basin or **Water Supply within the Basin**: The stream flows within the Basin, excluding Imported Water Supply;

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

III. Existing Development

A. Moratorium on New Wells

1. Except as provided below, the States hereby adopt a prohibition on the construction of all new Wells in the Basin upstream of Guide Rock, Nebraska (hereinafter "Moratorium"). The Moratorium may be modified, in whole or in part, by the RRCA if it determines that new information demonstrates that additional

groundwater development in all or any part of the Basin that is subject to the Moratorium would not cause any State to consume more than its Allocations from the available Virgin Water Supply as calculated pursuant to Section IV of this Stipulation. New information shall mean results from the RRCA Groundwater Model or any other appropriate information. Attached hereto in Appendix E, are such laws, rules and regulations in Nebraska concerning the prohibition on construction of new Wells in the Basin.

2. Nothing in this Stipulation, and specifically this Subsection III.A., shall extend the Moratorium or create an additional Moratorium in any of the States in any other river basin or in any other groundwater supply located outside of the Basin.

3. Notwithstanding the provision in Subsection III.A.1. of this Stipulation permitting the RRCA to modify the prohibition on construction of new Wells, the States will not increase the level of development of Wells as of July 1, 2002 in the following Designated Drainage Basins, subject to the exceptions set forth in Subsection III.B.1-2.:

North Fork of the Republican River in Colorado
Arikaree River
South Fork of the Republican River
Buffalo Creek
Rock Creek
That portion of the North Fork and Main Stem of the Republican River in Nebraska that lies upstream of Trenton Dam.

Any of the States may seek to amend this provision of this Stipulation by making application to the Court upon any change in conditions making modification of this Subsection III.A.3. necessary or appropriate.

B. Exceptions to Moratorium on New Wells

1. The Moratorium shall not apply to the following:

a. Any and all Wells in the Basin located within the current boundaries of the following Natural Resource Districts in Nebraska:

i. The Tri-Basin Natural Resource District;

ii. The Twin Platte Natural Resource District; and

iii. The Little Blue Natural Resource District.

Attached to this Stipulation in Appendix D is a map that shows the areas described in this Subsection III.B.1.a. In the event of any conflict between this Subsection and Appendix D, this Subsection will control;

b. Any and all Wells in the Basin in Nebraska located in the following described areas:

i. Lincoln County, Township 9, Range 27, Sections 5-7;

ii. Lincoln County, Township 9, Range 28, Sections 1-23, 28-30;

iii. Lincoln County, Township 9, Range 29, Sections 1-18, 21-26;

iv. Lincoln County, Township 9, Range 30, Sections 1-6, 8-13;

v. Lincoln County, Township 9, Range 31, Sections 1-2;

vi. Lincoln County, Township 10, Range 27, Sections 19-24, 27-33;

vii. Lincoln County, Township 10, Range 28, Sections 1-36;

viii. Lincoln County, Township 10, Range 29, Sections 1-36;

ix. Lincoln County, Township 10, Range 30, Sections 1-36;

x. Lincoln County, Township 10, Range 31, Sections 1-18, 20-27 and 34-36;

xi. Lincoln County, Township 10, Range 32, Sections 1-4 and 10-13;

xii. Lincoln County, Township 11, Range 28, Sections 28-35;

xiii. Lincoln County, Township 11, Range 29, Sections 19-36;

xiv. Lincoln County, Township 11, Range 30, Sections 19-36;

xv. Lincoln County, Township 11, Range 31, Sections 19-36;

xvi. Lincoln County, Township 11, Range 32, Sections 19-36;

xvii. Lincoln County, Township 11, Range 33, Sections 19-30, 32-36;

xviii. Lincoln County, Township 11, Range 34, Sections 21-27;

xix. Frontier County, Township 6, Range 24, Sections 1-36;

xx. Frontier County, Township 7, Range 24, Sections 1-36; and,

xxi. Frontier County, Township 8, Range 24, Sections 19-21 and 27-36.

Attached to this Stipulation in Appendix D is a map that shows the areas described in this Subsection III.B.1.b. In the event of any conflict between this Subsection and Appendix D, this Subsection will control.

c. Test holes;

d. Dewatering Wells with an intended use of one year or less;

e. Wells designed and constructed to pump fifty gallons per minute or less, provided that no two or more Wells that pump fifty gallons per minute or less may be connected or otherwise combined to serve a single project such that the collective pumping would exceed fifty gallons per minute;

f. Wells designed and constructed to pump 15 Acre-feet per year or less, provided that no two or more Wells that pump 15 Acre-feet per year or less may be connected or

otherwise combined to serve a single project such that the collective pumping would exceed 15 Acre-feet per year;

g. Replacement Wells, subject to all limitations or permit conditions on the existing Well, or in the absence of any limitation or permit condition only if the Beneficial Consumptive Use of water from the new Well is no greater than the Historic Consumptive Use of water from the Well it is to replace. Nebraska will calculate Historic Consumptive Use in the manner proposed in Appendix F. Nebraska shall not change its proposed method of calculating Historic Consumptive Use before providing notice to the RRCA;

h. Wells necessary to alleviate an emergency situation involving the provision of water for human consumption or public health and safety;

i. Wells to which a right or permit is transferred in accordance with state law, provided however, that the new Well:

(i) consumes no more water than the Historic Consumptive Use of water under the right or permit that is being transferred; and

(ii) is not a transfer of a right or permit that would cause an increased stream depletion upstream of Trenton Dam.

Nebraska will calculate Historic Consumptive Use in the manner proposed in Appendix F. Nebraska shall not change

its proposed method of calculating Historic Consumptive Use before providing notice to the RRCA;

j. Wells for expansion of municipal and industrial uses. Any new Wells for these purposes shall be counted against the State's Allocation and, to the extent a State is consuming its full Allocation, other uses shall be reduced to stay within the State's Allocation; and

k. Wells acquired or constructed by a State for the sole purpose of offsetting stream depletions in order to comply with its Compact Allocations. Provided that, such Wells shall not cause any new net depletion to stream flow either annually or long-term. The determination of net depletions from these Wells will be computed by the RRCA Groundwater Model and included in the State's Computed Beneficial Consumptive Use. Augmentation plans and related accounting procedures submitted under this Subsection III.B.1.k. shall be approved by the RRCA prior to implementation.

2. The Moratorium shall not apply to nor create any additional limitations on new Wells in Northwest Kansas and Colorado in the Basin other than those imposed by state laws, rules and regulations in existence as of April 30, 2002. Provided however, that the Historic Consumptive Use of a Well in Colorado or Northwest Kansas that is or would have been accounted for in Compact accounting as a stream depletion reaching the Republican River downstream of Trenton Dam may not

be transferred to a Well that would cause a depletion reaching the Republican River upstream of Trenton Dam. Further, neither Colorado nor Kansas shall change their laws, rules or regulations in existence as of April 30, 2002, to the extent that such changes would result in restrictions less stringent than those set forth in Subsection III.B.1. above. Attached hereto in Appendices G and H, respectively, are such laws, rules and regulations in Northwest Kansas and Colorado in existence as of April 30, 2002.

C. Surface Water Limitations

Each of the States has closed or substantially limited its portion of the Basin above Hardy, Nebraska to new surface water rights or permits. Each State agrees to notify each Official Member of the RRCA and the U. S. Bureau of Reclamation at least 60 days prior to a new surface water right or permit being granted or prior to adopting changes to its current restrictions related to granting new surface water rights or permits in the Basin above Hardy, Nebraska and provide the RRCA an opportunity for discussion. Each State, however, reserves the right to allow new surface water rights or permits to use additional surface water if such use can be made within the State's Compact Allocation.

D. Reporting

Beginning on April 15, 2003, or such other date as may be agreed to by the RRCA and on the same date each year thereafter, each State will provide the other States with an annual report for the previous year of all Well construction in the State within the Basin Upstream of Guide Rock, Ne-

braska and all denials of Well permits or other requests for Well construction. The report shall include such information as required by the RRCA Accounting Procedures, Section V.

IV. Compact Accounting

A. The States will determine Virgin Water Supply, Computed Water Supply, Allocations, Imported Water Supply Credit, augmentation credit and Computed Beneficial Consumptive Use based on a methodology set forth in the RRCA Accounting Procedures, attached hereto as Appendix C.

B. Water derived from Sub-basins in excess of a State's specific Sub-basin Allocations is available for use by each of the States to the extent that:

1. such water is physically available;

2. use of such water does not impair the ability of another State to use its Sub-basin Allocation within the same Sub-basin;

3. use of such water does not cause the State using such water to exceed its total statewide Allocation; and

4. if Water-Short Year Administration is in effect, such use is consistent with the requirements of Subsection V.B.

C. Determination of stream flow depletions caused by Well pumping and determination of Imported Water Supply Credit will be accomplished by the RRCA Groundwater Model as used in the RRCA Accounting Procedures.

1. Stream flow depletions caused by Well pumping for Beneficial Consumptive Use will be included in the determination of Virgin Wa-

ter Supply, Computed Water Supply, Allocations and Computed Beneficial Consumptive Use in accordance with the formulas in the RRCA Accounting Procedures provided that the RRCA may agree to exclude from such accounting minimal stream flow depletions. Stream flow depletions caused by Well pumping for Beneficial Consumptive Use will be counted as Virgin Water Supply and Computed Beneficial Consumptive Use at the time and to the extent the stream flow depletion occurs and will be charged to the State where the Beneficial Consumptive Use occurs.

2. The States agree to devote the necessary time and resources, subject to legislative appropriations, to complete the RRCA Groundwater Model in consultation with the appropriate United States agencies.

3. The States have created a Modeling Committee, comprised of members designated by the States and the United States. Each State may appoint at least one member but no more than three to the Modeling Committee. The United States may designate no more than two representatives to the Modeling Committee. The Modeling Committee shall develop a groundwater model acceptable to the States to accomplish the purposes set forth in this Subsection IV.C. The meetings and other work of the Modeling Committee shall be subject to the Confidentiality Agreement dated October 19, 2001, signed by the States and the United States, attached hereto as Appendix I.

Nothing in this Stipulation shall be construed as limiting the attendance and observation by non-member representatives of the participants at any meeting of the Modeling Committee or participation by non-members in the independent work of the States and United States representatives.

4. The States and the United States have agreed to freely and immediately share all available data, information, expert knowledge, and other information necessary for the Modeling Committee to complete the modeling work as requested by any member of the Modeling Committee. Data and information is considered to be "available" if it is not otherwise privileged and is (1) used by a State in the modeling process, or (2) is in the possession or control of a State, including its political subdivisions, in the form that the information exists at the time of the request. Data and information "necessary to complete the modeling work" also includes any available information to verify any other data and information. Shared information shall be subject to the Confidentiality Agreement dated October 19, 2001, signed by the States and the United States.

5. If at any time, the members of the Modeling Committee cannot reach agreement on necessary modifications to the RRCA Groundwater Model or any other issues, the Modeling Committee shall report the nature of the dispute to the States promptly and the States shall resolve the dispute as soon as possible.

6. The structure of the RRCA Groundwater Model, together with agreed upon architecture,

parameters, procedures and calibration targets as of November 15, 2002, are described in the memorandum attached hereto as Appendix J.

7. The Modeling Committee shall submit the RRCA Groundwater Model to the States in final form with sufficient time for the States to review and agree to the RRCA Groundwater Model by July 1, 2003.

8. Upon agreement by the States to the RRCA Groundwater Model, the States, through the RRCA, shall adopt the RRCA Groundwater Model for purposes of Compact accounting. Following final dismissal of this case, the RRCA may modify the RRCA Groundwater Model or the associated methodologies after discussion with the U.S. Geological Survey.

9. Between December 15, 2002 and July 1, 2003, if the States are unable to agree upon the final RRCA Groundwater Model or if any disputes arise in the Modeling Committee that the States cannot resolve, the dispute will be submitted to binding expert arbitration for resolution as set forth in this Subsection IV.C.9. No State may invoke binding arbitration unless it has first raised the issue it seeks to have arbitrated in the Modeling Committee and to the States as provided for in Subsection IV.C.5. For purposes of this Subsection IV.C.9., written communications required by this Subsection IV.C.9. shall be provided by both U.S. Mail and by facsimile to both counsel of record and the Official Member of the RRCA for each State and to counsel of record for the United States.

a. Initiation: Any State may invoke binding arbitration by providing written notice to the other States on or before July 1, 2003. A copy of any notice will be provided to the United States at the same time. Notice for the purposes of this Section shall include a written description of the scope of the dispute, with sufficient detail to provide the States with an understanding of the substance of the dispute and all related issues, a description of all attempts to resolve the dispute and sufficient information for the other States to identify the technical skills that should be possessed by potential arbitrators necessary to resolve the dispute. Upon receipt of notice, each State has five business days to amend the scope of the dispute in writing to address additional issues. If unforeseen issues are identified after the deadline for amending the scope of the dispute, they may be added upon agreement of the States or at the discretion of the arbitrator.

b. Selection: Upon receipt of notice of a dispute, the States shall confer within the deadlines set forth below to choose an arbitrator(s) and the States will in good faith attempt to agree on an arbitrator(s).

    i. Within seven business days of receipt of the initial notice, each State shall submit the names of proposed arbitrators, including qualifications, to the other States. Within seven

business days of receipt of the proposed names, the States will meet, in person or by telephone conference, and confer to agree on an arbitrator(s).

ii. If the States are unable to agree on an arbitrator(s), within seven business days each State will propose an arbitrator(s), not to exceed two and shall submit the proposed names to the other States and the United States in writing within the time set forth below. Upon receipt of each State's list of proposed arbitrators, within seven business days each State will rank and comment on each proposed arbitrator and submit those comments in writing to the Special Master. The United States, as amicus, may submit rankings and comments to the Special Master. The Special Master will initially eliminate any proposed arbitrators from consideration based upon objections by any State of conflict and/or bias. If all of a State's choices are eliminated by conflict and/or bias, a State may submit the name of an additional arbitrator and each State and the United States may provide comments and objections based on conflict and/or bias within a time limit set by the Special Master.

iii. Any person submitted as a possible arbitrator by any State shall not be an employee or agent of any State,

shall be a person knowledgeable in groundwater modeling, and shall disclose any actual or potential conflict of interest and all current or prior contractual and other relationships with any person or entity who could be directly affected by resolution of the dispute. Any person who has a contractual relationship with any State shall be automatically disqualified for conflict of interest unless the other States expressly agree in writing to submission of that person's name to the Special Master. Any other contested claims of conflict or bias will be resolved by the Special Master.

iv. The Special Master will then choose an arbitrator(s) from the remaining non-conflicted choices.

c. First Arbitration Meeting: Upon selection of an arbitrator(s), the arbitrator(s) shall, within seven business days, hold an initial meeting or conference with the States and the United States, as amicus, to determine a schedule and procedures for exchange of information necessary to resolve the dispute, and for submission and resolution of the pending dispute. The arbitrator(s) may also include disputes arising under Subsection IV.C.4. The arbitrator(s) will be subject to the Confidentiality Agreement dated October 19, 2001, signed by the States and the United States.

d. Costs: The arbitrator(s)' costs shall be paid equally by the States, subject to appropriations by the States' respective legislatures. Each State and the United States, as amicus, shall bear its own costs.

e. Reporting: The arbitrator(s)' decision will be provided to the States and the United States, as amicus, within ten business days of the close of submissions to the arbitrator(s) unless otherwise shortened or extended by agreement of all of the States. The arbitrator(s)' written report of decision and findings will be submitted to the States and the United States, as amicus, within thirty days of providing the arbitrator(s)' decision.

f. Implementation: If the dispute is one involving the ongoing work of the Modeling Committee, the decision of the arbitrator(s) as to the resolution of the dispute shall be implemented by the Modeling Committee and their efforts shall proceed. If the dispute resolves the final RRCA Groundwater Model, the decision of the arbitrator(s) as to the final RRCA Groundwater Model shall be adopted by the RRCA for the purposes of Compact accounting.

D. Except as described in Subsection V.B., all Compact accounting shall be done on a five-year running average in accordance with the provisions of the RRCA Accounting Procedures, attached as Appendix C. Flood flows will be removed as specified in the RRCA Accounting Procedures.

E. The States agree to pursue in good faith, and in collaboration with the United States, system improvements in the Basin, including measures to improve the ability to utilize the water supply below Hardy, Nebraska on the main stem. The States also agree to undertake in collaboration with the United States a system operations study and after completion of the study the States will revisit the five-year running average set forth in Subsection IV.D.

F. Beneficial Consumptive Use of Imported Water Supply shall not count as Computed Beneficial Consumptive Use or Virgin Water Supply. Credit shall be given for any remaining Imported Water Supply that is reflected in increased stream flow, except as provided in Subsection V.B. Determinations of Beneficial Consumptive Use from Imported Water Supply (whether determined expressly or by implication), and any Imported Water Supply Credit shall be calculated in accordance with the RRCA Accounting Procedures and by using the RRCA Groundwater Model.

G. Measurement techniques, data collection and reporting to facilitate implementation of the Stipulation are set forth in the RRCA Accounting Procedures.

H. Augmentation credit, as further described in Subsection III.B.1.k., shall be calculated in accordance with the RRCA Accounting Procedures and by using the RRCA Groundwater Model.

V. Guide Rock

A. Additional Water Administration

1. To provide for regulation of natural flow between Harlan County Lake and Superior-Courtland Diversion Dam, Nebraska will

recognize a priority date of February 26, 1948 for Kansas Bostwick Irrigation District, which is the same priority date as the priority date held by the Nebraska Bostwick Irrigation District's Courtland Canal water right.

2. When water is needed for diversion at Guide Rock and the projected or actual irrigation supply is less than 130,000 Acre-feet of storage available for use from Harlan County Lake as determined by the Bureau of Reclamation using the methodology described in the Harlan County Lake Operation Consensus Plan attached as Appendix K to this Stipulation, Nebraska will close junior, and require compliance with senior, natural flow diversions of surface water between Harlan County Lake and Guide Rock. A description of the implementation of the water administration obligations in this Subsection V.A.2. is attached hereto as Appendix L. The RRCA may modify Appendix L in any manner consistent with this Stipulation and the Compact.

3. Nebraska will protect storage water released from Harlan County Lake for delivery at Guide Rock from surface water diversions.

4. Kansas and Nebraska, in collaboration with the United States, agree to take actions to minimize the bypass flows at Superior-Courtland Diversion Dam. A description of the process for meeting the obligations in this Subsection V.A.4. is attached hereto as Appendix L. The RRCA may modify this process in any manner consistent with this Stipulation and the Compact.

B. Water-Short Year Administration

1. Identification of Water-Short Year Administration:

a. Water-Short Year Administration will be in effect in those years in which the projected or actual irrigation supply is less than 119,000 acre feet of storage available for use from Harlan County Lake as determined by the Bureau of Reclamation using the methodology described in the Harlan County Lake Operation Consensus Plan. If system operations enhancements below Harlan County Lake increase the useable supply to the Bostwick Irrigation Districts, the trigger for Water-Short Year Administration will be adjusted as agreed to by the States and the United States in order to equitably share the benefits of such enhancements. Following the determination that Water-Short Year Administration is in effect, the States will take the actions described in Subsections V.B.2-4.

b. Each year between October 1 and June 30, the Bureau of Reclamation will provide each of the States with a monthly or, if requested by any one of the States, a more frequent update of the projected or actual irrigation supply from Harlan County Lake for that irrigation season. The determination that Water-Short Year Administration is in effect, pursuant to Subsection V.B.1.a., will become final for that year as of June 30.

2. Nebraska action in Water-Short Year Administration:

   a. During Water-Short Year Administration, Nebraska will limit its Computed Beneficial Consumptive Use above Guide Rock to not more than Nebraska's Allocation that is derived from sources above Guide Rock, and Nebraska's share of any unused portion of Colorado's Allocation (no entitlement to Colorado's unused Allocation is implied or expressly granted by this provision). To accomplish this limitation, Nebraska may use one or more of the following measures:

      i. supplementing water for Nebraska Bostwick Irrigation District by providing alternate supplies from below Guide Rock or from outside the Basin;

      ii. adjusting well allocations for alluvial Wells above Guide Rock;

      iii. adjusting multi-year well allocations for non-alluvial Wells above Guide Rock;

      iv. reducing use of storage by Nebraska Bostwick Irrigation District above Guide Rock;

      v. dry year leasing of water rights that divert at or above Guide Rock, or;

      vi. any other measures that would help Nebraska limit Computed Beneficial Consumptive Use above Guide Rock to not more than that portion

of Nebraska's allocation that is derived from sources above Guide Rock and would (1) produce water above Harlan County Lake; (2) produce water below Harlan County Lake and above Guide Rock that can be diverted during the Bostwick irrigation season; or (3) produce water that can be stored and is needed to fill Lovewell Reservoir.

b. Nebraska may offset any Computed Beneficial Consumptive Use in excess of its Allocation that is derived from sources above Guide Rock with Imported Water Supply Credit. If Nebraska chooses to exercise its option to offset with Imported Water Supply Credit, Nebraska will receive credit only for Imported Water Supply that: (1) produces water above Harlan County Lake; (2) produces water below Harlan County Lake and above Guide Rock that can be diverted during the Bostwick irrigation season; (3) produces water that can be stored and is needed to fill Lovewell Reservoir; or (4) Kansas and Nebraska will explore crediting water that is otherwise useable by Kansas.

c. During Water-Short Year Administration, Nebraska will also limit its Computed Beneficial Consumptive Use in the Sub-basins to the sum of Nebraska's specific Sub-basin Allocations and 48.9% of the sum of the Unallocated Supply from those same Sub-basins.

d. In years projected to be subject to Water-Short Year Administration, Nebraska will advise the other States and the United States no later than April 30 of measures Nebraska plans to take for that year and the anticipated water yield from those measures. In each Water-Short Year Administration year, Nebraska will advise the other States and the United States no later than June 30 of the measures it has taken or will take for the year and the anticipated water yield from those measures.

e. For purposes of determining Nebraska's compliance with Subsection V.B.2.:

   i. Virgin Water Supply, Computed Water Supply, Allocations and Computed Beneficial Consumptive Use will be calculated on a two-year running average, as computed above Guide Rock, with any Water-Short Year Administration year treated as the second year of the two-year running average and using the prior year as the first year; or

   ii. as an alternative, Nebraska may submit an Alternative Water-Short Year Administration Plan to the RRCA in accordance with the procedures set forth in Appendix M. The RRCA may modify Appendix M in any manner consistent with this Stipulation and the Compact.

f. If, in the first year after Water-Short Year Administration is no longer in effect, the Compact accounting shows that Nebraska's Computed Beneficial Consumptive Use as calculated above Guide Rock in the previous year exceeded its annual Allocation above Guide Rock, and, for the current year, the expected or actual supply from Harlan County Lake, calculated pursuant to Subsection V.B.1.a., is greater than 119,000 Acre-feet but less than 130,000 Acre-feet, then Nebraska must either make up the entire amount of the previous year's Computed Beneficial Consumptive Use in excess of its Allocation, or the amount of the deficit needed to provide a projected supply in Harlan County Lake of at least 130,000 Acre-feet, whichever is less.

g. If in any month during the year, the projected or actual irrigation supply from Harlan County Lake is equal to or greater than 119,000 Acre-feet, Nebraska may, at its discretion, cease the administrative action called for in this agreement in Subsection V.B.2.a.; provided, however, that any Alternative Water-Short Year Administration Plan shall be subject to the requirements set forth in Appendix M.

3. Colorado action: In those years when Water-Short Year Administration is in effect, Colorado agrees to limit its use of the flexibility identified in Subsection IV.B., to the extent that any portion of Colorado's Allocation from

Beaver Creek cannot be used on any other Sub-basin in Colorado.

4. Northwest Kansas action: In those years when Water-Short Year Administration is in effect, Kansas agrees to (1) measure compliance in Northwest Kansas on a two-year average, using the current and the previous year, and (2) limit Computed Beneficial Consumptive Use in the Sub-basins to the sum of Kansas' specific Sub-basin Allocations and 51.1% of the sum of the Unallocated Supply from those same Sub-basins and 51.1% of any unused portion of Colorado's Allocation (no entitlement to Colorado's unused Allocation is implied or expressly granted by this provision), or determine compliance in such other manner as agreed to by the RRCA.

VI. Soil and Water Conservation Measures

A. For the purposes of Compact accounting the States will calculate the evaporation from Non-Federal Reservoirs located in an area that contributes run-off to the Republican River above Harlan County Lake, in accordance with the methodology set forth in the RRCA Accounting Procedures.

B. In order to attempt to develop information that may allow the States to assess the impacts of Non-Federal Reservoirs and land terracing on the water supply and water uses within the Basin, the States agree to undertake a study, in cooperation with the United States, of the impacts of Non-Federal Reservoirs and land terracing on the Virgin Water Supply.

1. The States, in cooperation with the United States, shall form a committee by January

31, 2003, to be known as the Conservation Committee. By April 30, 2004, the Conservation Committee will:

a. Evaluate the available methods and data relevant to studying the impacts of Non-Federal Reservoirs and land terracing practices on water supplies, including a review of any existing studies and their applicability to the Basin;

b. Determine the general types of data that are available and relevant to the study;

c. Determine the availability of data throughout the Basin, and assess the level of accuracy and precision of the data;

d. Agree on standards for data;

e. Identify additional data necessary to determine the quantitative effects of Non-Federal Reservoirs and land terracing practices on water supply;

f. Propose a methodology for assessing area-capacity relationships for Non-Federal Reservoirs; and

g. Submit to the RRCA a proposed study plan to determine the quantitative effects of Non-Federal Reservoirs and land terracing practices on water supplies, including whether such effects can be determined for each Designated Drainage Basin.

2. Following the RRCA's acceptance of the proposed study plan described in Subsection VI.B.1.g., the States and the United States

will undertake the study at a cost not to exceed one million dollars of which the United States will be responsible for 75% of the cost and each State will be responsible for one third of the remaining 25%. The States' portion may be provided entirely through in-kind contributions. If the cost of the study exceeds one million dollars, the United States will be responsible for the entire additional amount. The States, in cooperation with the United States, shall agree upon the timetable for the completion of such study, which shall be completed within five years of the date the proposed study plan is accepted by the RRCA.

3. Participation in the joint study does not commit any State or the RRCA to take any action or to include soil and water conservation measures in Compact accounting. Each State specifically reserves its position that it need not account for conservation measures as a Beneficial Consumptive Use under the Compact.

4. Participation in the joint study by the States or the United States is contingent upon the appropriation of funds by their respective State Legislatures and Congress. Participation by the States in this study is contingent upon participation and funding by the United States in accordance with this Subsection VI.B.

VII. Dispute Resolution

A. Initial Submission to the RRCA:

1. Any matter relating to Republican River Compact administration, including administration

and enforcement of the Stipulation in which a State has an Actual Interest, shall first be Submitted to the RRCA. The United States and its agencies may attend all meetings of the RRCA. Proposed agendas, including any regular issue that may be raised, shall be distributed by the chairperson to all RRCA members at least 30 days in advance of any regular meeting and as soon as possible prior to any special meeting.

2. Each member of the RRCA shall have one vote on each issue Submitted to the RRCA. RRCA action must be by unanimous vote. Action of the RRCA shall be by formal resolution or as reflected in the approved minutes. A request for formal resolution may be made by any member.

3. Any dispute that the State raising the issue for RRCA determination believes requires immediate resolution shall be designated as a "fast-track" issue. Any "fast-track" issue will be Addressed by the RRCA within 30 days of being Submitted to the RRCA unless otherwise agreed to by all States. Nothing in this Section shall prohibit the RRCA from Addressing a dispute prior to the expiration of the 30-day period.

4. Any dispute which the State raising the issue for RRCA determination believes does not require immediate resolution shall be designated as a "regular" issue. Any "regular" issue raised no later than 30 days prior to the next regularly scheduled meeting will be Addressed by the RRCA at that meeting.

5. The RRCA will hold regular meetings pursuant to its rules and regulations. Specially scheduled meetings to address any issue that is Submitted to the RRCA and designated as a "fast-track" issue or for any other emergency purposes shall be held if requested by any member. All members shall make a good faith effort to arrange a mutually agreeable date, time, and place for all meetings. A meeting may be conducted only when all members or their designees are available to attend. In the event a member requests a specially scheduled meeting to address a "fast-track" issue or for any other emergency purposes, such meeting shall be held as soon as reasonably possible, but in no event more than 30 days after the request is made unless more time is agreed to by all members. If scheduling a meeting in person is not possible within 30 days of a request, the members may conduct a telephone conference or use other means available. If any such meeting is not held within thirty days because of the failure of any member other than the requesting member to attend or to agree to the date and place for the meeting, the State represented by the requesting member shall be relieved of any obligation to submit any dispute to the RRCA for potential consideration and resolution pursuant to the Stipulation.

6. Any issue Submitted to the RRCA by a State will include a specific definition of the issue, supporting materials and a designated schedule for resolution.

7. The RRCA will attempt to resolve any dispute submitted to the RRCA pursuant to this

Section VII. If such a dispute cannot be resolved by the RRCA at the regular or special meeting at which the issue is addressed or within a schedule agreed to by all States, and the State raising the dispute desires to proceed, the dispute shall be submitted to non-binding arbitration unless otherwise agreed to by all States with an Actual Interest. The States involved in the dispute may agree that the arbitration shall be binding, but no State shall be subject to binding arbitration without its express written consent.

B. General Dispute Resolution Provisions:

1. Unless otherwise agreed to by all States, non-binding arbitration shall be initiated as follows: Any State, pursuant to Subsection VII.A.7., may invoke arbitration by providing written notice to the other States. A copy of any notice will be provided to the United States at the same time. Notice for the purposes of this Section shall include the time frame designation, a written description of the scope of the dispute, with sufficient detail to provide the States with an understanding of the substance of the dispute and all related issues, and sufficient information for the other States with an Actual Interest to identify the technical skills that should be possessed by potential arbitrators necessary to resolve the dispute.

2. The arbitrator(s) shall be selected as follows: Upon receipt of notice of a dispute, the States shall confer within the deadlines set forth below to choose an arbitrator(s) and the States will in good faith attempt to agree on an arbitrator(s).

3. Any person submitted as a possible arbitrator by any State, or selected by CDR Associates or other such entity, shall not be an employee or agent of any State, shall be a person generally knowledgeable of the principles of the issues in the dispute, and shall disclose any actual or potential conflict of interest and all current or prior contractual and other relationships with any person or entity who could be directly affected by resolution of the dispute. Any person who has a contractual relationship with any State shall be automatically disqualified for conflict of interest unless the other States expressly agree in writing.

4. The arbitrator(s)' decision shall include a determination of the merits of the dispute and determination of a proposed remedy.

5. The arbitrator(s)' decision shall be provided to the States and the United States by facsimile and mail or comparable means.

6. Within 30 days of the issuance of the arbitrator's decision, the States that are parties to the dispute shall give written notice to the other States and the United States as to whether they will accept, accept and reject in part, or reject the arbitrator's decision.

7. No State shall object to admission of the arbitrator(s)' decision in any subsequent proceedings before the Court, but no State shall assert that the decision is conclusive on any issue. Further, no State shall call the arbitrator(s) as a witness with regard to the dispute.

8. A State that has submitted a disputed issue to the RRCA and to arbitration as provided in this Section VII shall be deemed to have exhausted its administrative remedies with regard to such issue.

C. Fast Track Dispute Resolution Schedule:

1. Upon receipt of notice under Subsection VII.B.1., each State with an interest in the dispute will have ten business days to amend the scope of the dispute to address additional issues, unless all States agree to a longer schedule. If unforeseen issues are identified after the deadline for amending the scope of the dispute, they may be added upon agreement of all States or at the discretion of the arbitrator.

2. Within ten business days of receipt of the initial notice, each State shall submit the names of proposed arbitrators, including qualifications, to the other States. Within seven business days of receipt of the proposed names, the States will meet, in person or by telephone conference, and confer to agree on an arbitrator(s). If the States with an Actual Interest cannot agree on an arbitrator(s), the selection of the arbitrator(s) will be submitted to CDR Associates, of Boulder, Colorado, or such other person or entity that may be agreed to by the RRCA. Every two years the RRCA will review the entity that will select an arbitrator(s), if the States cannot choose. The States will be bound by the selection of an arbitrator(s) by CDR Associates or such other person or entity.

3. Upon selection of an arbitrator(s), the arbitrator(s) shall, within seven business days, hold an initial meeting/conference with the States, to set the schedule for submission and resolution of the pending dispute. The arbitrator(s) shall set a schedule not to exceed six months unless the States agree otherwise. The States agree to provide all information, except privileged information, requested by the arbitrator(s).

4. The arbitrator(s) shall issue a decision resolving the dispute within the shortest reasonable time, not to exceed 60 days from the date of final submission by the State parties.

D. Regular Dispute Resolution Schedule:

1. The States with an Actual Interest will agree upon the schedule for amending the scope of the dispute.

2. The States will agree upon the method and schedule for selecting an arbitrator(s).

3. The States and the arbitrator(s) will agree on a schedule for submission and resolution of the pending dispute.

4. The States will agree on a schedule for issuance of a decision by the arbitrator(s).

VIII. Non-Severability of Agreement

The agreement of the States to the terms of this Stipulation is based upon the inclusion of all of the terms hereof, and the rights and obligations set forth in this Stipulation are not severable. If for any reason, the Court should decline to approve this Stipulation in the form presented, the entire Stipulation shall be null and void and the terms

of this Stipulation may not be used as evidence in any litigation between the States.

IX. Entirety of Agreement

This Stipulation and the Proposed Consent Judgment, together constitute the entire agreement among the parties hereto. No previous representations, inducements, promises or agreements, oral or otherwise, among the parties not contained in the documents identified in this paragraph or made in compliance with the requirements and obligations contained in the documents identified in this paragraph shall be of any force or effect. Nothing in this Section IX shall be construed as preventing the States from modifying the rules and regulations of the RRCA.

X. Retention of Jurisdiction by the Special Master

The Special Master shall retain jurisdiction until adoption of the RRCA Groundwater Model to:

A. Select an arbitrator, if necessary, pursuant to Subsection IV.C.9.b.ii. - iv.; and

B. Resolve disputes, not then subject to arbitration pursuant to Subsection IV.C.9., concerning the exchange and availability of data and information consistent with Subsection IV.C.4.

State Approvals of Final Settlement Stipulation
***Kansas v. Nebraska & Colorado*, No. 126, Original,**
United States Supreme Court

The undersigned Governors and Attorneys General for the States of Kansas, Nebraska and Colorado, having authority to commit the States to a final settlement, hereby commit the States to the terms of this Final Settlement Stipulation reached by their respective Settlement Negotiation Teams. Approval of this Final Settlement Stipulation is conditioned upon the inclusion of all of the terms herein, and the rights and obligations set forth in this Final Settlement Stipulation are not severable. If for any reason, the Special Master or the United States Supreme Court should decline to approve this Stipulation in the form presented, the approvals of the undersigned Governors and Attorneys General for the States shall be null and void.

/s/ Bill Graves
Governor,
State of Kansas

/s/ Carla J. Stovall
Attorney General,
State of Kansas

/s/ Mike Johanns
Governor,
State of Nebraska

/s/ Don Stenberg
Attorney General,
State of Nebraska

/s/ Bill Owens
Governor,
State of Colorado

/s/ Ken Salazar
Attorney General,
State of Colorado

APPENDIX A

No. 126, Original

In The

SUPREME COURT OF THE UNITED STATES

STATE OF KANSAS,

Plaintiff,

v.

STATE OF NEBRASKA

And

STATE OF COLORADO,

Defendants.

BEFORE THE HONORABLE VINCENT L. MCKUSICK
SPECIAL MASTER

PROPOSED CONSENT JUDGMENT

This cause, having come to be heard on the Final Report of the Special Master appointed by this Court, and on the Parties' Joint Motion for Approval of Final Settlement Stipulation and Consent Judgment, IT IS HEREBY ORDERED THAT:

1. The Final Settlement Stipulation executed by all the Parties to this case and presented to the Special Master on December 15, 2002, is approved and adopted;

2. All claims, counterclaims and cross-claims for which leave to file was or could have been sought in this case arising prior to December 15, 2002, are hereby dismissed with prejudice effective upon receipt by the Clerk of this Court of notice from the States that they have adopted the RRCA Groundwater Model, a description of which shall be provided with the notice and attached to the RRCA Accounting Procedures as an appendix; and

3. The Parties shall share in the costs of the Special Master in the manner that this Court shall order following the entry of this judgment.

SO ORDERED THIS ___ DAY OF _____, 200_.

_____

APPENDIX B

Final Settlement Stipulation Implementation Schedule

Action	Date
Well Moratorium	By December 15, 2002
Regulate junior diverters Harlan County Dam to Guide Rock in Water-Short Years	January 1, 2003 and thereafter
Protect storage water Harlan County Dam to Guide Rock	January 1, 2004 and thereafter
Complete RRCA Groundwater Model and approval by the States	July 1, 2003 unless in arbitration
Nebraska advise on planned actions for Water-Short Year Administration	By April 30 of each Water-Short Year Administration year
Nebraska advise on actions that have or will be taken in Water-Short Year Administration	By June 30 of each Water-Short Year Administration year
First year Water-Short Year Administration compliance	2006 (if Water-Short Year Administration year, 2-year running average is 2005-2006)
First normal year compliance	2007 (5-year running average from 2003-2007)
Update RRCA Groundwater Model through 2002	Completed by December, 2003

Data exchange under RRCA Accounting Procedures Section V.	April 15, 2004 (for the 2003 year)
Non-Federal Reservoir inventory	By December 31, 2004
Conservation Measures Study	Within 5 years of RRCA approval

Planned and Proposed Actions –
For Information Purposes Only

Action	Date
System Improvement Study – Feasibility	October 2004 – September 2007
NE NRD actions	
Proposed revised rules and regulations for transfers and meters	December, 2003
Acres certified	December, 2004
Wells metered	December, 2005

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Republican River Compact Administration

ACCOUNTING PROCEDURES

AND

REPORTING REQUIREMENTS

December 15, 2002

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I. Introduction

This document 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 and Computed Beneficial Consumptive Use. These computations shall be used to determine supply, allocations, use and compliance with the Compact according to the Stipulation. These definitions, procedures, basic and specific formulas, data requirements and attachments may be changed by consent of the RRCA consistent with Subsection I.F of the Stipulation. This document will be referred to as the RRCA Accounting Procedures. Attached to these RRCA Accounting Procedures as Figure 1 is the map attached to the Compact that shows the Basin, its streams and the Basin boundaries.

II. Definitions

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

Additional Water Administration Year: a year when the projected or actual irrigation water supply is less than

130,000 Acre-feet of storage available for use from Harlan County Lake as determined by the Bureau of Reclamation using the methodology described in the Harlan County Lake Operation Consensus Plan attached as Appendix K to the Stipulation.

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

Annual: yearly from January 1 through December 31;

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

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

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

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

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

Irrigation of lands in excess of two acres;

Any non-irrigation diversion of more than 50 Acre-feet per year;

Multiple diversions of 50 Acre-feet or less that are connected or otherwise combined to serve a single project will be considered as a single diversion for accounting purposes if they total more than 50 Acre-feet;

Net evaporation from Federal Reservoirs;

Net evaporation from Non-federal Reservoirs within the surface boundaries of the Basin;

Any other activities that may be included by amendment of these formulas by the RRCA;

Computed Water Supply: the Virgin Water Supply less the Change in Federal Reservoir Storage in any Designated Drainage Basin, and less the Flood Flows;

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

Dewatering Well: a Well constructed solely for the purpose of lowering the groundwater elevation;

Federal Reservoirs:

Bonny Reservoir
Swanson Lake
Enders Reservoir
Hugh Butler Lake
Harry Strunk Lake
Keith Sebelius Lake
Harlan County Lake
Lovewell Reservoir

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

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

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

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

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

Imported Water Supply Credit: the accretions to stream flow due to water imports from outside of the

Basin as computed 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, except as provided in Subsection V.B.2. of the Stipulation and Subsections III.I. – J. of these RRCA Accounting Procedures;

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

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

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

Modeling Committee: the modeling committee established in Subsection IV.C. of the Stipulation;

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

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

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

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

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

RRCA Accounting Procedures: this document and all attachments hereto;

RRCA Groundwater Model: the groundwater model developed under the provisions of Subsection IV.C. of the Stipulation and as described in Attachment 8;

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

States: the States of Colorado, Kansas and Nebraska;

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

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

> North Fork of the Republican River in Colorado drainage basin is that drainage area above USGS gaging station number 06823000, North

Fork Republican River at the Colorado-Nebraska State Line,

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Unallocated Supply: the "water supplies of upstream basins otherwise unallocated" as set forth in Article IV of the Compact;

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

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

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

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

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

III. Basic Formulas

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

Basic Formulas for Calculating Virgin Water Supply, Computed Water Supply, Allocations and Computed Beneficial Consumptive Use	
Sub-basin VWS	= Gage + All CBCU +ΔS – IWS
Main Stem VWS	= Hardy Gage – Σ Sub-basin gages + All CBCU in the Main Stem +ΔS – IWS
CWS	= VWS - Δ S – FF
Allocation for each State in each Sub-basin And Main Stem	= CWS x %
State's Allocation	= Σ Allocations for Each State
State's CBCU	= Σ State's CBCUs in each Sub-basin and Main Stem

Abbreviations:

CBCU = Computed Beneficial Consumptive Use

FF = Flood Flows

Gage = Gaged Flow

IWS = Imported Water Supply Credit

CWS = Computed Water Supply

VWS = Virgin Water Supply

% = the ratio used to allocate the Computed Water Supply between the States. This ratio is based on the allocations in the Compact

ΔS = Change in Federal Reservoir Storage

A. Calculation of Annual Virgin Water Supply

1. Sub-basin calculation: The annual Virgin Water Supply for each Sub-basin will be calculated by adding: a) the annual stream flow in that Sub-basin at the Sub-basin stream gage designated in Section II., b) the annual Computed Beneficial Consumptive Use above that gaging station, and c) the Change in Federal Reservoir Storage in that Sub-basin; and from that total subtract any Imported Water Supply Credit. The Computed Beneficial Consumptive Use will be calculated as described in Subsection III. D. Adjustments for flows diverted around stream gages and for Computed Beneficial Consumptive Uses in the Sub-basin between the Sub-basin stream gage and the confluence of the Sub-basin tributary and the Main Stem shall be made as described in Subsections III. D. 1 and 2 and IV. B.

2. Main Stem Calculation: The annual Virgin Water Supply for the Main Stem will be calculated by adding: a) the flow at the Hardy gage minus the flows from the Sub-basin gages listed in Section II, b) the annual Computed Beneficial Consumptive Use in the Main Stem, and c) the Change in Federal Reservoir Storage from Swanson Lake and Harlan County Lake; and from that total subtract any Imported Water Supply Credit for the Main Stem. Adjustments for flows diverted around Sub-basin stream gages and for Computed Beneficial Consumptive Uses in a Sub-basin between the Sub-basin stream gage and the

confluence of the Sub-basin tributary and the Main Stem shall be made as described in Subsections III. D. 1 and 2 and IV.B.,

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 period 1940 to the current accounting year turned "on." This will be the same "base" run used to determine groundwater Computed Beneficial Consumptive Uses.

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."

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.

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.

1. Flood Flows: If in any calendar year there are five consecutive months in which the total actual stream flow[1] 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 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

[1] These actual stream flows reflect Gaged Flows after depletions by Beneficial Consumptive Use and change in reservoir storage above the gage.

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.

C. Calculation of Annual Allocations

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

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

D. Calculation of Annual Computed Beneficial Consumptive Use

1. Groundwater

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

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 period 1940 to the current accounting year "on".

The "no State pumping" run shall be the run with the same model inputs as the base run with the exception that all groundwater pumping and pumping recharge of that State shall be turned "off."

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

2. Surface Water

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

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

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

Each year, using the procedures described herein, the RRCA will calculate the Annual Allocations by Designated Drainage Basin and total for each State, the Computed Beneficial Consumptive Use by Designated Drainage Basin and total for each State and the Imported Water Supply Credit that a State may use in

that year. These results for the current Compact accounting year as well as the results of the previous four accounting years and the five-year average of these results will be displayed in the format shown in Table 3.

F. Calculations To Determine Colorado's and Kansas's Compliance with the Sub-basin Non-Impairment Requirement

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

G. Calculations To Determine Projected Water Supply

1. Procedures to Determine Water Short Years

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

Step 1. At the beginning of the calculation month (1) the total projected inflow for the calculation month and each succeeding month through the end of May shall be added to the previous end of month Harlan County Lake content and (2) the total projected 1993 level evaporation loss for the calculation month and each succeeding month through the end of May shall

then be subtracted. The total projected inflow shall be the 1993 level average monthly inflow or the running average monthly inflow for the previous five years, whichever is less.

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

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

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

Step 5. The final annual Water-Short Year Administration calculation determines the total estimated irrigation supply at the end of June (calculated in July). Use the result from Step 3 for the end of May irrigation release estimate, add the June computed inflow

to Harlan County Lake and subtract the June computed gross evaporation loss from Harlan County Lake.

2. Procedures to Determine 130,000 Acre Feet Projected Water Supply

To determine the preliminary irrigation supply for the October through June calculation months, follow the procedure described in steps 1 through 4 of the "Procedures to determine Water Short Years" Subsection III. G. 1. The result from step 4 provides the forecasted water supply, which is compared to 130,000 Acre-feet. For the July through September calculation months, use the previous end of calculation month preliminary irrigation supply, add the previous month's Harlan County Lake computed inflow and subtract the previous month's computed gross evaporation loss from Harlan County Lake to determine the current preliminary irrigation supply. The result is compared to 130,000 Acre-feet.

H. Calculation of Computed Water Supply, Allocations and Computed Beneficial Consumptive Use Above and Below Guide Rock During Water-Short Administration Years.

For Water-Short Administration Years, in addition to the normal calculations, the Computed Water Supply, Allocations, Computed Beneficial Consumptive Use and Imported Water Supply Credits shall also be calculated above Guide Rock as shown in Table 5C. These calculations shall be done in the same manner as in non-Water-Short Administration years except that water supplies originating below Guide Rock shall not be included in the calculations of water

supplies originating above Guide Rock. The calculations of Computed Beneficial Consumptive Uses shall be also done in the same manner as in non-Water-Short Administration years except that Computed Beneficial Consumptive Uses from diversions below Guide Rock shall not be included. The depletions from the water diverted by the Superior and Courtland Canals at the Superior-Courtland Diversion Dam shall be included in the calculations of Computed Beneficial Consumptive Use above Guide Rock. Imported Water Supply Credits above Guide Rock, as described in Sub-section III.I., may be used as offsets against the Computed Beneficial Consumptive Use above Guide Rock by the State providing the Imported Water Supply Credits.

The Computed Water Supply of the Main Stem reach between Guide Rock and the Hardy gage shall be determined by taking the difference in stream flow at Hardy and Guide Rock, adding Computed Beneficial Consumptive Uses in the reach (this does not include the Computed Beneficial Consumptive Use from the Superior and Courtland Canal diversions), and subtracting return flows from the Superior and Courtland Canals in the reach. The Computed Water Supply above Guide Rock shall be determined by subtracting the Computed Water Supply of the Main Stem reach between Guide Rock and the Hardy gage from the total Computed Water Supply. Nebraska's Allocation above Guide Rock shall be determined by subtracting 48.9% of the Computed Water Supply of the Main Stem reach between Guide Rock and the Hardy gage from Nebraska's total Allocation. Nebraska's Computed Beneficial Consumptive Uses above Guide Rock shall be determined by subtracting Nebraska's Computed Beneficial Consumptive Uses below Guide Rock from Nebraska's total Computed Beneficial Consumptive Use.

I. Calculation of Imported Water Supply Credits During Water-Short Year Administration Years.

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

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

1. Monthly Imported Water Supply Credits

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

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

2. Imported Water Supply Credits Above Harlan County Dam

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

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

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

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

c. Credit as an offset for a State's Computed Beneficial Consumptive Use above Guide Rock will be given to all the Imported Water Supply accruing in the reach between Harlan County Dam and Guide Rock during the irrigation season. If the period of the irrigation season does not coincide with the period of modeled flows, the amount of the Imported Water Supply credited during the irrigation season for that month shall be the total monthly modeled Imported Water Supply Credit times the number of days in the month occurring during the irrigation season divided by the total number of days in the month.

4. Imported Water Supply Credits Between Harlan County Dam and Guide Rock During the Non-Irrigation Season

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

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

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

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

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

f. The amount of the Imported Water Supply Credit that shall be credited against a State's Consumptive Use shall be the amount of water imported by that State that is available in the reach during the fill period or the amount of water needed to reach Lovewell Reservoir target elevations minus the amount of non-imported water available during the fill period, whichever is less.

5. Other Credits

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

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

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

If Nebraska is implementing an Alternative Water-Short-Year Administration Plan, data to determine Compact compliance will be shown in Table 5D.

Nebraska's compliance with the Compact will be determined in the same manner as Nebraska's Above Guide Rock compliance except that compliance will be based on a three-year running average of the current year and previous two year calculations. In addition, Table 5 D. will display the sum of the previous two-year difference in Allocations above Guide Rock and Computed Beneficial Consumptive Uses above Guide Rock minus any Imported Water Credits and compare the result with the Alternative Water-Short-Year Administration Plan's expected decrease in Computed Beneficial Consumptive Use above Guide Rock. Nebraska will be within compliance with the Compact as long as the three-year running average difference in Column 8 is positive and the sum of the previous year and current year deficits above Guide Rock are not greater than the expected decrease in Computed Beneficial Consumptive Use under the plan.

IV. Specific Formulas

A. Computed Beneficial Consumptive Use

1. Computed Beneficial Consumptive Use of Groundwater: the Computed Beneficial Consumptive Use caused by groundwater diversion shall be determined by the RRCA Groundwater Model as described in Subsection III.D.1.

2. Computed Beneficial Consumptive Use of Surface Water: the Computed Beneficial Consumptive Use of surface water shall be calculated as follows:

    a. Computed Beneficial Consumptive Use from diversions by non- federal canals shall be 60 percent of the diversion; the return flow shall be 40 percent of the diversion

    b. Computed Beneficial Consumptive Use from small individual surface water pumps shall

be 75 percent of the diversion; return flows will be 25 percent of the diversion unless a state provides data on the amount of different system types in a Sub-basin, in which case the following percentages will be used for each system type:

Gravity Flow.	30%
Center Pivot	17%
LEPA	10%

c. Computed Beneficial Consumptive Use of diversions by Federal canals will be calculated as shown in Attachment 7. For each Bureau of Reclamation Canal the field deliveries shall be subtracted from the diversion from the river to determine the canal losses. The field delivery shall be multiplied by one minus an average system efficiency for the district to determine the loss of water from the field. Eighty-two percent of the sum of the field loss plus the canal loss shall be considered to be the return flow from the canal diversion. The assumed field efficiencies and the amount of the field and canal loss that reaches the stream may be reviewed by the RRCA and adjusted as appropriate to insure their accuracy.

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

e. Net Evaporation from Federal Reservoirs will be calculated as follows:

1. Harlan County Lake, Evaporation Calculation

April 1 through October 31:

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 which varies by month. These values are:

March	.56
April	.52
May	.53
June	.60
July	.68
August	.78
September	.91
October	1.01

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%
JAN	.88	.87	.85	.84	.83
FEB	.90	.88	.87	.86	.85
MAR	1.29	1.28	1.27	1.26	1.25
OCT	4.87			NO ICE	
NOV	2.81			NO ICE	
DEC	1.31	1.29	1.27	1.25	1.24

	50%	60%	70%	80%	90%	100%
JAN	.82	.81	.80	.78	.77	.76
FEB	.84	.83	.82	.81	.80	.79
MAR	1.24	1.23	1.22	1.21	1.20	1.19
OCT		NO ICE				
NOV		NO ICE				
DEC	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 is subtracted from the monthly gross evaporation. The monthly precipitation is calculated by multiplying the sum of the month's daily precipitation in inches by the average of the end of the month lake surface area for the previous month and the end of the month lake surface area for the current month in acres and dividing the result by 12 to obtain the precipitation for the month in acre feet.

The total annual net evaporation (Acre-feet) will be charged to Kansas and Nebraska in proportion to the annual diversions made by the Kansas Bostwick Irrigation District and the Nebraska Bostwick Irrigation District during the time period each year when irrigation releases are being made from Harlan County Lake. In the event Nebraska chooses to substitute supply for the Superior Canal from Nebraska's allocation below Guide Rock in Water-Short Year Administration years, the amount of the substitute supply will be included in the calculation of the split as if it had been diverted to the Superior Canal at Guide Rock.

2. Evaporation Computations for Bureau of Reclamation Reservoirs

The Bureau of Reclamation computes the amount of evaporation loss on a monthly basis at Reclamation reservoirs. The following procedure is utilized in calculating the loss in Acre-feet.

An evaporation pan reading is taken each day at the dam site. This measurement is the amount of water lost from the pan over a 24-hour period in inches. The evaporation pan reading is adjusted for any precipitation recorded during the 24-hour period. Instructions for determining the daily pan evaporation are found in the "National Weather Service Observing Handbook No. 2 – Substation Observations." All dams located in the Kansas River Basin with the exception of Bonny Dam are National Weather Service Cooperative Observers. The daily evaporation pan readings are totaled at the end of each month and converted to a "free water surface" (FWS) evaporation, also referred to as "lake" evaporation. The FWS evaporation is determined by multiplying the observed pan evaporation by a coefficient of .70 at each of the reservoirs. This coefficient can be affected by several factors including water and air temperatures. The National Oceanic and Atmospheric Administration (NOAA) has published technical reports describing the determination of pan coefficients. The coefficient used is taken from the "NOAA Technical Report NWS 33, Map of coefficients to convert class A pan evaporation to free water surface evaporation". This coefficient is used for the months of April through October when evaporation pan readings are recorded at the dams. The monthly FWS evaporation is then multiplied by the average surface area of the reservoir during the month in acres. Dividing this value by twelve will result in the amount of water lost to evaporation in Acre-feet during the month.

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

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

f. Non-Federal Reservoir Evaporation: For Non-Federal Reservoirs with a storage capacity less than 200 Acre-feet, the presumptive average annual surface area is 25% of the area at the principal spillway elevation. Net evaporation for each such Non-Federal Reservoir will be calculated by multiplying the presumptive average annual surface area by the net evaporation from the nearest climate and evaporation station to the Non-Federal Reservoir. A State may provide actual data in lieu of the presumptive criteria.

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

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

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

Abbreviations:

CBCU = Computed Beneficial Consumptive Use
D = Small Surface Water Ditch Diversions for Irrigation
Ev = Evaporation from Federal Reservoirs
EvNFR = Evaporation from Non-Federal Reservoirs
FF = Flood Flow
GW = Groundwater Computed Beneficial Consumptive Use (includes irrigation and non-irrigation uses)
IWS = Imported Water Supply Credit
P = Small Surface Water Pump Diversions for Irrigation
RF = Return Flow
c = Colorado
k = Kansas
n = Nebraska

ΔS = Change in Federal Reservoir Storage
% = Average system efficiency for individual pumps in the Sub-basin
% BRF = Percent of Diversion from Bureau Canals that returns to the stream

1. North Fork of Republican River in Colorado[2]

CBCU Colorado = .6 x Haigler Canal Diversion Colorado + .6 x Dc + GWc + EvNFRc

CBCU Kansas = GWk

CBCU Nebraska = .6 x Haigler Canal Diversion Nebraska + % x Pn + GWn + EvNFRn

(The diversion for Haigler Canal is split between Colorado and Nebraska based on the percentage of land irrigated in each state)

VWS = North Fork of the Republican River at the State Line, Stn. No. 06823000 + CBCUc + CBCUk + CBCUn + Nebraska Haigler Canal RF to Main Stem – IWS

CWS = VWS – FF

Allocation Colorado = .224 x CWS

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[2] 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.

Allocation Nebraska = .246 x CWS

Unallocated = .53 x CWS

2. Arikaree River[2]

CBCU Colorado = GWc + EvNFRc

CBCU Kansas = % x Pk + GWk + EvNFRk

CBCU Nebraska = % x Pn + GWn + EvNFRn

VWS = Arikaree Gage at Haigler Stn. No. 06821500 + CBCUc + CBCUk + CBCUn – IWS

CWS = VWS – FF

Allocation Colorado = .785 x CWS

Allocation Kansas = .051 x CWS

Allocation Nebraska = .168 x CWS

Unallocated = -.004 x CWS

3. Buffalo Creek

CBCU Colorado = GWc

CBCU Kansas = GWk

CBCU Nebraska = % x Pn + GWn + EvNFRn

VWS = Buffalo Creek near Haigler Gage Stn. No. 06823500 + CBCUc + CBCUk + CBCUn – IWS

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[2] 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.

CWS = VWS – FF

Allocation Nebraska = .330 x CWS

Unallocated = .670 x CWS

4. Rock Creek

CBCU Colorado = GWc

CBCU Kansas = GWk

CBCU Nebraska = % x Pn + GWn + EvNFRn

VWS = Rock Creek at Parks Gage Stn. No. 06824000 + CBCUc + CBCUk + CBCUn – IWS

CWS = VWS – FF

Allocation Nebraska = .400 x CWS

Unallocated = .600 x CWS

5. South Fork Republican River

CBCU Colorado = .6 x Hale Ditch Diversion + .6 x Dc + GWc + EvNFRc+ Bonny Reservoir Ev

CBCU Kansas = % x Pk +GWk + EvNFRk

CBCU Nebraska = % x Pn + GWn + EvNFRn

VWS = South Fork Republican River near Benkelman Gage Stn. No. 06827500 + CBCUc + CBCUk + CBCUn + ΔS Bonny Reservoir – IWS

CWS = VWS – ΔS Bonny Reservoir – FF

Allocation Colorado = .444 x CWS

Allocation Kansas = .402 x CWS

Allocation Nebraska = .014 x CWS

Unallocated = .140 x CWS

6. Frenchman Creek in Nebraska

CBCU Colorado = GWc

CBCU Nebraska = .6 x Champion Canal Diversion + .6 x Riverside Canal Diversion + Culbertson Canal Diversions x (1-%BRF) + Culbertson Extension x (1-%BRF) +% x Pn + GWn + EvNFRn + Enders Reservoir Ev

VWS = Frenchman Creek in Culbertson, Nebraska Gage Stn. No. 06835500 + CBCUc + CBCUn + .17 x RF Culbertson Diversion, which goes to the Main Stem + 100% Culbertson Extension RF which goes to the Main Stem – IWS + ΔS Enders Reservoir

CWS = VWS – ΔS Enders Reservoir – FF

Allocation Nebraska = .536 x CWS

Unallocated = .464 x CWS

7. Driftwood Creek

CBCU Kansas =% x Pk + GWk + EvNFRk

CBCU Nebraska =% x Pn + GWn + EvNFRn

VWS = Driftwood Creek near McCook Gage Stn. No. 06836500 + CBCUk + CBCUn – RF from lands served by Meeker Driftwood Canal – IWS

(RF from Meeker Driftwood Canal to Driftwood Creek = .24 x RF from Diversion by Meeker Driftwood Canal)

CWS = VWS – FF

Allocation Kansas = .069 x CWS

Allocation Nebraska = .164 x CWS

Unallocated = .767 x CWS

8. Red Willow Creek in Nebraska

CBCU Nebraska = .1 x Red Willow Canal CBCU +% x Pn + GWn + EvNFRn + .1 x Hugh Butler Lake Ev

CBCU Red Willow Canal = Red Willow Canal Diversion x (1-% BRF)

VWS = Red Willow Creek near Red Willow Gage Stn. No. 06838000 + CBCUn + .9 x Red Willow Canal CBCU + .9 x Hugh Butler Lake Ev + ΔS Hugh Butler Lake – IWS

CWS = VWS – ΔS Hugh Butler Lake – FF

Allocation Nebraska = .192 x CWS

Unallocated = .808 x CWS

9. Medicine Creek

CBCU Nebraska = % x Pn above and below gage + GWn above and below gage + EvNFRn

(Note: Evaporation from Harry Strunk Lake charged to main stem)

VWS = Medicine Creek below Harry Strunk Lake Gage Stn. No. 06842500 + CBCUn + ΔS Harry Strunk Lake + Harry Strunk Lake Ev – IWS

CWS = VWS – ΔS Harry Strunk Lake – FF

Allocation Nebraska = .091 x CWS

Unallocated = .909 x CWS

10. Beaver Creek

CBCU Colorado = GWc + EvNFRc

CBCU Kansas =% x Pk + GWk + EvNFRk

CBCU Nebraska = % x Pn above and below gage + GWn above and below gage + EvNFRn

VWS = Beaver Creek near Beaver City gage Stn. No. 06847000 + CBCUc + CBCUk + CBCUn – IWS

CWS = VWS - FF

Allocation Colorado = .200 x CWS

Allocation Kansas = .388 x CWS

Allocation Nebraska = .406 x CWS

Unallocated = .006 x CWS

11. Sappa Creek

CBCU Kansas = % x Pk + GWk above and below gage + EvNFRk

CBCU Nebraska = % x Pn above and below gage + GWn above and below gage + EvNFRn

VWS = Sappa Creek near Stamford gage Stn. No. 06847500 – Beaver Creek near Beaver City gage Stn. No. 06847000 + CBCUk + CBCUn – IWS

CWS = VWS – FF

Allocation Kansas = .411 x CWS

Allocation Nebraska = .411 x CWS

Unallocated = .178 x CWS

12. Prairie Dog Creek

CBCU Kansas = % x Pk + Almena Canal Diversion x (1-%BRF) + GWk + EvNFRk + Keith Sebelius Lake Ev

CBCU Nebraska = % x Pn below gage + GWn below gage + EvNFRn

VWS = Prairie Dog Creek near Woodruff, Kansas USGS Stn. No. 06848500 + CBCUk + CBCUn + ΔS Keith Sebelius Lake – IWS

CWS = VWS – ΔS Keith Sebelius Lake – FF

Allocation Kansas = .457 x CSW

Allocation Nebraska = .076 x CWS

Unallocated = .467 x CWS

13. The North Fork of the Republican River in Nebraska and the Main Stem of the Republican River between the junction of the North Fork and the Arikaree River and the Republican River near Hardy

CBCU Colorado = GWc

CBCU Kansas =

(Courtland Canal at Kansas-Nebraska State Line Gage Stn No. 06852500

- deliveries of Republican River water to Lovewell Reservoir by the Courtland Canal) x (1-%BRF)

+ (Diversions of Republican River water from Lovewell Reservoir by the Courtland Canal below Lovewell) x (1-%BRF)

+ Net Harlan County Lake Ev charged to Kansas

+ Lovewell Reservoir Ev charged to the Republican River water

+ share of the transportation loss of the Courtland Canal through Nebraska
+ % x Pk
+ GWk

CBCU Nebraska =

% x Deliveries from Courtland Canal to Nebraska lands
+ Superior Canal x (1-%BRF)
+ Franklin Pump Canal x (1-%BRF)
+ Franklin Canal x (1-%BRF)
+ Naponee Canal x (1-%BRF)
+ Cambridge Canal x (1-%BRF)
+ Bartley Canal x (1-%BRF)
+ Meeker-Driftwood Canal x (1-%BRF)
+ .9 x CBCU Red Willow Canal
+ % x Pn
+ GWn
+ Harry Strunk Lake Ev
+ Swanson Lake Ev
+ .9 x Hugh Butler Lake Ev
+ Net Harlan County Lake Ev charged to Nebraska
+ share of the transportation loss of the Courtland Canal through Nebraska
+ EvNFRn

VWS =

Republican River near Hardy Gage Stn. No. 06853500
- North Fork of the Republican River at the State Line, Stn. No. 06823000
- Arikaree Gage at Haigler Stn. No. 06821500
- Buffalo Creek near Haigler Gage Stn. No. 06823500
- Rock Creek at Parks Gage Stn. No. 06824000
- South Fork Republican River near Benkelman Gage Stn. No. 06827500
- Frenchman Creek in Culbertson Stn. No. 06835500

- Driftwood Creek near McCook Gage Stn. No. 06836500
- Red Willow Creek near Red Willow Gage Stn. No. 06838000
- Medicine Creek below Harry Strunk Lake Gage Stn. No. 06842500
- Sappa Creek near Stamford Gage Stn. No. 06847500
- Prairie Dog Creek near Woodruff, Kansas Stn. No. 68-485000

+ Change in Storage Harlan County Lake
+ Change in Storage Swanson Lake
+ Harlan County Lake Ev
+ Swanson Lake Ev

+ Courtland Canal at State-line Gage – Return Flow to Republican River from Kansas Courtland Canal
+ Diversion Courtland Canal – Courtland Canal at State-line Gage
- Return flows to Republican River from Courtland Canal loss in Nebraska

+ % x Deliveries Courtland Canal to Nebraska lands

+ CBCU Superior Canal
+ CBCU Franklin Pump Canal
+ CBCU Franklin Canal
+ CBCU Naponee Canal
+ CBCU Cambridge Canal
+ CBCU Bartley Canal
+ CBCU Meeker-Driftwood Canal

- Red Willow Canal RF to Main Stem
- Culbertson Canal RF to Main Stem
- Culbertson Canal Extension RF to Main Stem
- Haigler Canal RF to Main Stem
+ .24 x Meeker Driftwood Canal RF which went to Driftwood Creek
+ GWn

+ EvNFRn
- IWS

CWS = VWS – Change in Storage Harlan County Lake – Change in Storage Swanson Lake – FF

Allocation Kansas = .511 x CWS

Allocation Nebraska = .489 x CWS

Return flow from Courtland Canal in Kansas above Lovewell = .015 x Courtland Canal at State Line

Return flow from Courtland Canal loss from head gate to the State Line =
(Diversion – Courtland Canal at State Line – Deliveries to Nebraska) x .82

Loss from Return flow from Courtland Canal loss from head gate to the State Line =
(Diversion – Courtland Canal at State Line – Deliveries to Nebraska) x .18

Courtland Canal loss from head gate to State Line charged to Kansas = Loss from Return flow from Courtland Canal loss from head gate to the State Line x (Courtland Canal at the State Line/ (Courtland Canal at the State Line + Deliveries to Nebraska))

Courtland Canal loss from head gate to the State Line Charged to Nebraska = Total loss minus loss charged to Kansas

Net Evaporation from Lovewell Reservoir charged to Republican River = Net Lovewell Ev x Inflow from the Courtland Canal/(Inflow from the Courtland Canal + Inflow from White Rock Creek)

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

The following information for the previous calendar year shall be provided to the members of the RRCA Engineering Committee by April 15th of each year, unless otherwise specified.

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

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

A. Annual Reporting

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

2. Groundwater pumping and irrigated acreage: each State will tabulate and provide all groundwater well pumping estimates that are required for the RRCA Groundwater Model to the other States.

Colorado – will provide an estimate of pumping based on a county format that is based upon system type, Crop Irrigation Requirement (CIR), irrigated acreage, crop distribution, and irrigation efficiencies. Colorado will require installation of a totalizing flow meter, installation of an hours meter with a measurement of the pumping rate, or determination of a power conversion coefficient for 10% of the active wells in the Basin by December 31, 2005. Colorado will also provide an annual tabulation for each groundwater well that measures groundwater pumping by a totalizing flow meter, hours meter or power conversion coefficient that includes: the groundwater well permit number, location, reported hours, use, and irrigated acreage.

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

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

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

4. Crop Irrigation Requirements: 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.

5. Streamflow Records from State-Maintained Gaging Records: streamflow gaging records from the following State maintained gages will be provided:

Station No	Name
00126700	Republican River near Trenton
06831500	Frenchman Creek near Imperial
06832500	Frenchman Creek near Enders
06835000	Stinking Water Creek near Palisade
06837300	Red Willow Creek above Hugh Butler Lake
06837500	Red Willow Creek near McCook
06841000	Medicine Creek above Harry Strunk Lake
06842500	Medicine Creek below Harry Strunk Lake
06844000	Muddy Creek at Arapahoe
06844210	Turkey Creek at Edison
06847000	Beaver Creek near Beaver City
	Republican River at Riverton
06851500	Thompson Creek at Riverton
06852000	Elm Creek at Amboy
	Republican River at the Superior-Courtland Diversion Dam

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. Wells 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;

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. Wells for municipal and/or industrial expansion of use;

h. Well 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;

i. 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.

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 spatially using kriging.

C. Inputs to RRCA Accounting

1. Surface Water Information

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

Arikaree River at Haigler, Nebraska
North Fork Republican River at Colorado-Nebraska state line
Buffalo Creek near Haigler, Nebraska
Rock Creek at Parks, Nebraska
South Fork Republican River near Benkelman, Nebraska
Frenchman Creek at Culbertson, Nebraska
Red Willow Creek near Red Willow, Nebraska
Medicine Creek below Harry Strunk Lake, Nebraska*
Beaver Creek near Beaver City, Nebraska*
Sappa Creek near Stamford, Nebraska
Prairie Dog Creek near Woodruff, Kansas
Courtland Canal at Nebraska-Kansas state line
Republican River near Hardy, Nebraska
Republican River at Superior-Courtland Diversion Dam near Guide Rock, Nebraska (new)*

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

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

Federal Reservoirs:
Bonny Reservoir
Swanson Lake
Harry Strunk Lake
Hugh Butler Lake

Enders Reservoir
Keith Sebelius Lake
Harlan County Lake
Lovewell Reservoir

c. Non-federal reservoirs obtained by each state: an updated inventory of reservoirs that includes the location, surface area (acres), and capacity (in Acre-feet), of each non-federal reservoir with storage capacity of fifteen (15) Acre-feet or greater at the principal spillway elevation. Supporting data to substantiate the average surface water areas that are different than the presumptive average annual surface area may be tendered by the offering State.

d. Diversions and related data from USBR

Irrigation diversions by canal, ditch, and pumping station that irrigate more than two (2) acres
Diversions for non-irrigation uses greater than 50 Acre-feet
Farm Deliveries
Wasteway measurements
Irrigated acres

e. Diversions and related data – from each respective State

Irrigation diversions by canal, ditch, and pumping station that irrigate more than two (2) acres
Diversions for non-irrigation uses greater than 50 Acre-feet
Wasteway measurements, if available

2. Groundwater Information (from the RRCA Groundwater model as output files as needed for the accounting procedures)

a. Imported water – mound credits in amount and time that occur in defined streamflow points/reaches of measurement or compliance – ex: gaging stations near confluence or state lines

b. 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

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.

TABLES

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	Unallo-cated	% of Total Drain-age 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

Colorado				
	Col. 1	Col. 2	Col. 3	Col. 4
Year	Allocation	Computed Beneficial Consumptive Use	Credits from Imported Water Supply	Difference between Allocation and Computed Beneficial Consumptive Use minus Imported Water Supply
Year t= -4				
Year t= -3				
Year t= -2				
Year t= -1				
CurrentYear 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 Use	Credits from Imported Water Supply	Difference between Allocation and Computed Beneficial Consumptive Use minus Imported Water Supply
Year t= -4				
Year t= -3				
Year t= -2				
Year t= -1				
CurrentYear 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 Use	Credits from Imported Water Supply	Difference between Allocation and Computed Beneficial Consumptive Use minus Imported Water Supply
Year T= -4				
Year T= -3				
Year T= -2				
Year T= -1				
CurrentYear 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 (5-year running average)	Total Supply Available = Col 1+ Col 2 + Col 3 (5-year running average)	Colorado Computed Beneficial Consumptive Use (5-year running average)	Difference Between Available Supply and Computed Beneficial Consumptive Use = Col 4 – Col 5 (5-year running average)
North Fork Republican River Colorado						
Arikaree River						
South Fork Republican River						
Beaver Creek						

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: Colorado Compliance During Water-Short Year Administration

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

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

Kansas						
Year	Allocation			Computed Beneficial Consumptive Use`	Credits from Imported Water	Difference Between Allocation and Consumptive Use Minus Imported Water Supply
Column	1	2	3	4	5	6
	Sum Sub-basins	Kansas's Share of the Unallocated Supply	Total Col 1 + Col 2			Col 3 – (Col 4 – Col 5)
Previous Year						
Current Year						
Average						

Table 5C Nebraska Compliance During Water-Short Year Administration

Nebraska								
Year	Allocation			Computed Beneficial Consumptive Use (CBCU)			Credits from Imported Water	Difference Between Allocation and Consumptive Use Minus Imported Water Supply Above Guide Rock
Column	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8
	Statewide Allocation	Allocation below Guide Rock	Statewide Allocation above Guide Rock	State-wide CBCU	CBCU below Guide Rock	Statewide CBCU above Guide Rock	Credits above Guide Rock	Col 3 – (Col 6 – Col 7)
Previous Year								
Current Year								
Average								

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

Year	Allocation			Computed Beneficial Consumptive Use (CBCU)			Credits from Imported Water	Difference Between Allocation and Consumptive Use Minus Imported Water Supply Above Guide Rock
Column	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8
	Statewide Allocation	Allocation below Guide Rock	Statewide Allocation above Guide Rock	State-wide CBCU	CBCU below Guide Rock	Statewide CBCU above Guide Rock	Credits above Guide Rock	Col 3 – (Col 6- Col 7)
Year = -2								
Year = -1								
Current Year								
Three-Year Average								
Sum of Previous Two-year Difference								
Expected Decrease in CBCU Under Plan								

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	Difference between Allocation And Computed Beneficial Consumptive Use with Imported Water Credit As an Offset
	Col 1	Col 2	`Col 3	Col 4	Col 5	Col 6
Previous Year						Col 3 -(Col 4-Col 5)
Current Year						
Average						

Figure 1

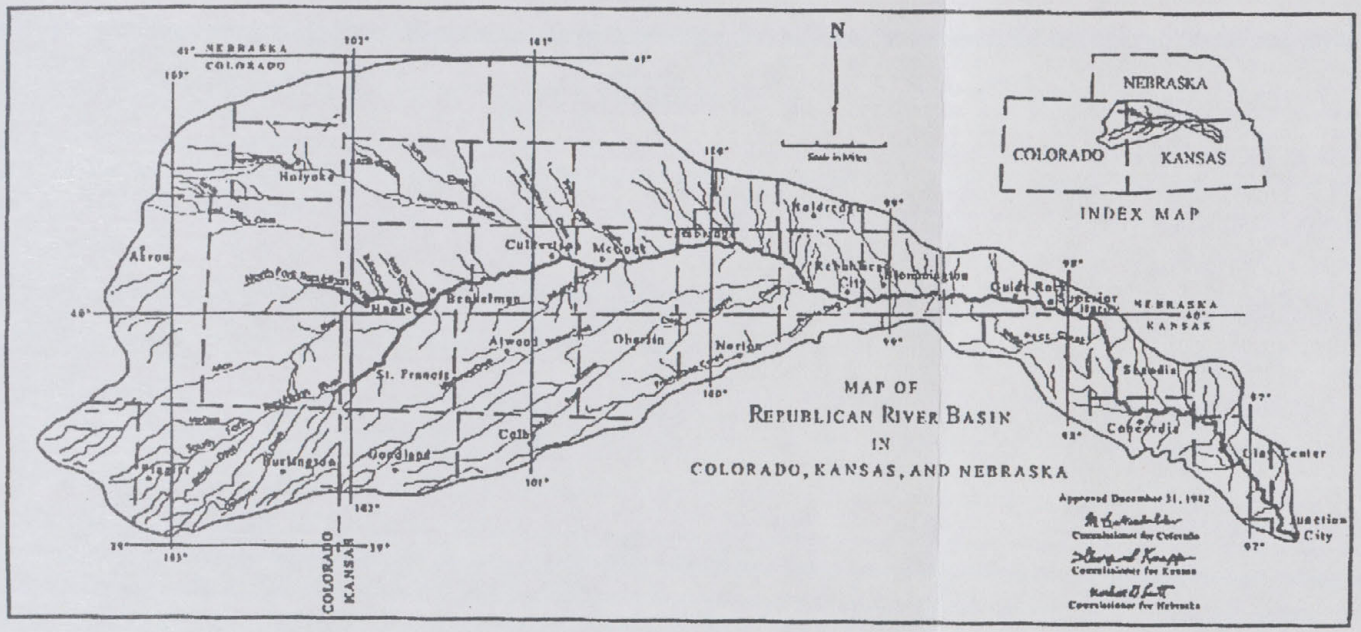

N
NEBRASKA
COLORADO
KANSAS
INDEX MAP
MAP OF
REPUBLICAN RIVER BASIN
IN
COLORADO, KANSAS, AND NEBRASKA
Approved December 31, 1942
Commissioner for Colorado
Commissioner for Kansas
Commissioner for Nebraska
Haxtun
Holyoke
Akron
Culbertson
McCook
Cambridge
Haigler
Benkelman
Alliance
Oberlin
Norton
St. Francis
Colby
Goodland
Burlington
Concordia
Clay Center
Junction City

Figure 2

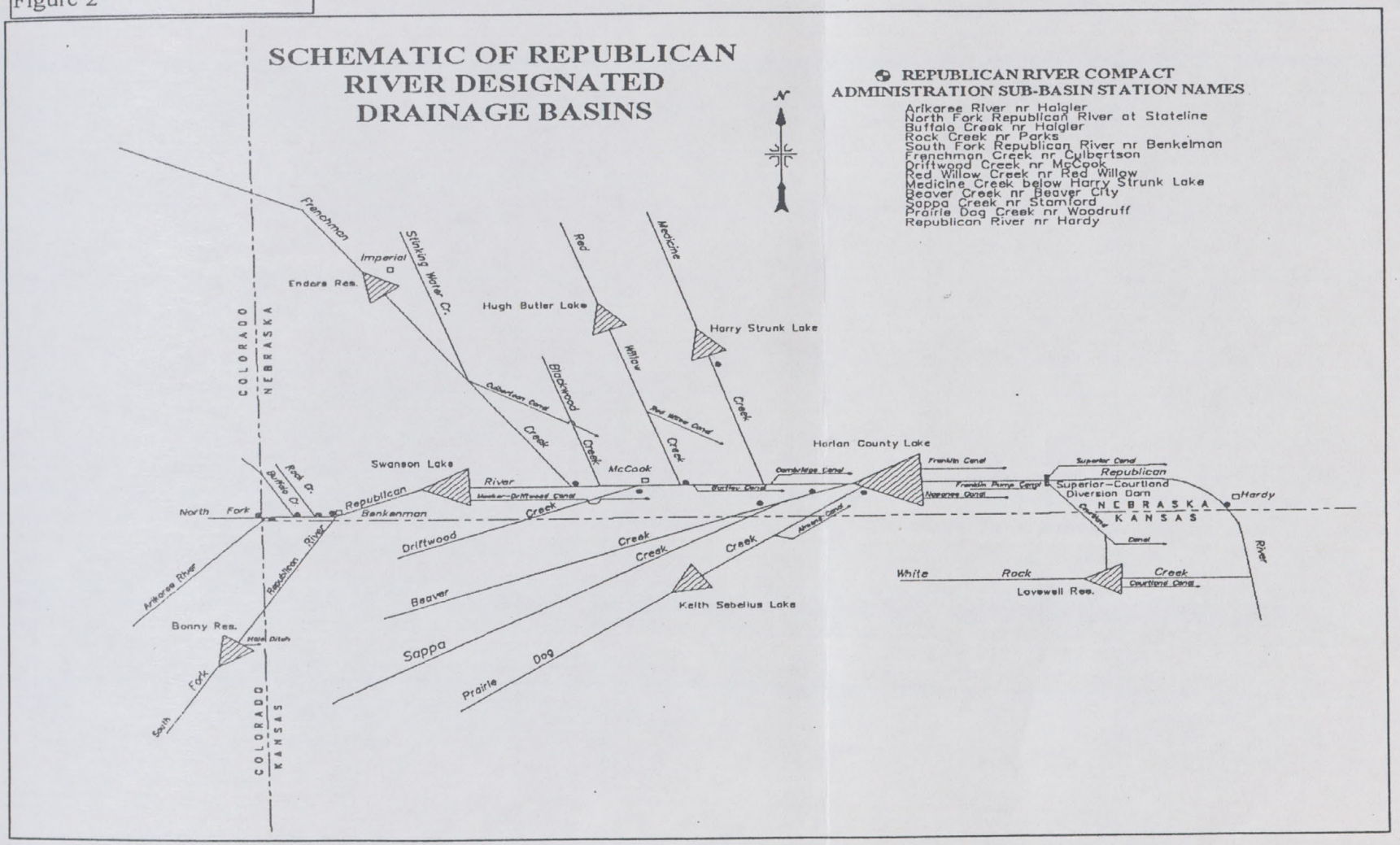
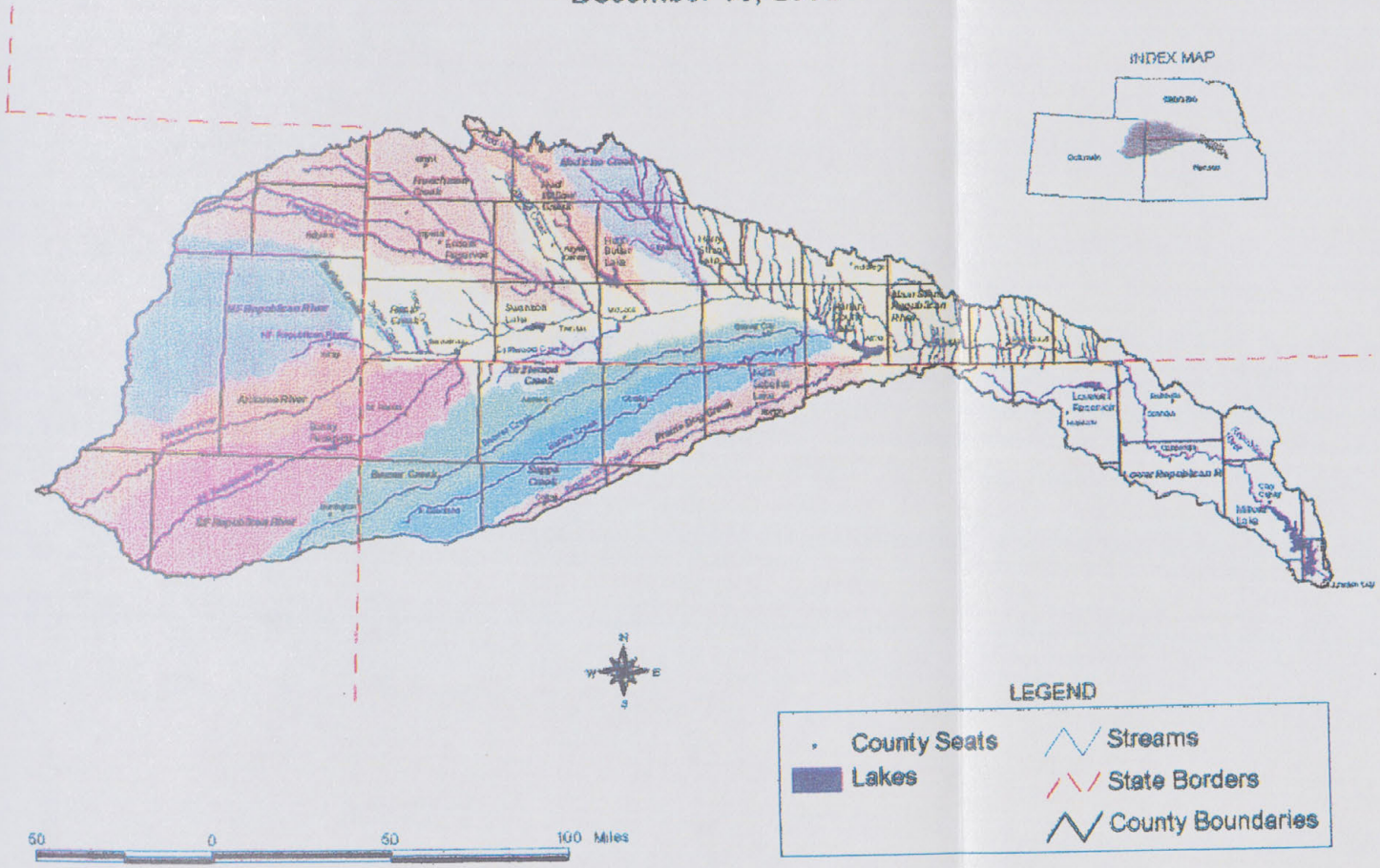

SCHEMATIC OF REPUBLICAN RIVER DESIGNATED DRAINAGE BASINS
REPUBLICAN RIVER COMPACT ADMINISTRATION SUB-BASIN STATION NAMES
Arikaree River nr Haigler
North Fork Republican River at Stateline
Buffalo Creek nr Haigler
Rock Creek nr Parks
South Fork Republican River nr Benkelman
Frenchman Creek nr Culbertson
Driftwood Creek nr McCook
Red Willow Creek nr Red Willow
Medicine Creek below Harry Strunk Lake
Beaver Creek nr Beaver City
Sappa Creek nr Stamford
Prairie Dog Creek nr Woodruff
Republican River nr Hardy
N
Frenchman
Stinking Water Cr.
Imperial
Enders Res.
Hugh Butler Lake
Red Willow Creek
Medicine Creek
Harry Strunk Lake
Culbertson Canal
Blackwood Creek
Red Willow Canal
COLORADO
NEBRASKA
Harlan County Lake
Swanson Lake
McCook
Rock Cr.
Buffalo Cr.
Republican River
Bartley Canal
Cambridge Canal
Franklin Canal
Franklin Pump Canal
Naponee Canal
Superior Canal
Republican
Superior-Courtland Diversion Dam
Hardy
NEBRASKA
KANSAS
North Fork
Republican River
Benkelman
Driftwood Creek
Beaver Creek
Sappa Creek
Prairie Dog Creek
Arikaree River
Bonny Res.
Hale Ditch
South Fork
Keith Sebelius Lake
Almena Canal
Courtland Canal
White Rock Creek
Lovewell Res.
COLORADO
KANSAS

Figure 3 - Map Showing Sub-basins, Streams, and the Basin Boundaries
RRCA Accounting Procedures and Reporting Requirements
December 15, 2002



Attachment 1: Sub-basin Flood Flow Thresholds

Sub-basin	Sub-basin Flood Flow Threshold Acre-feet per Year[3]
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

[3] 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 the 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

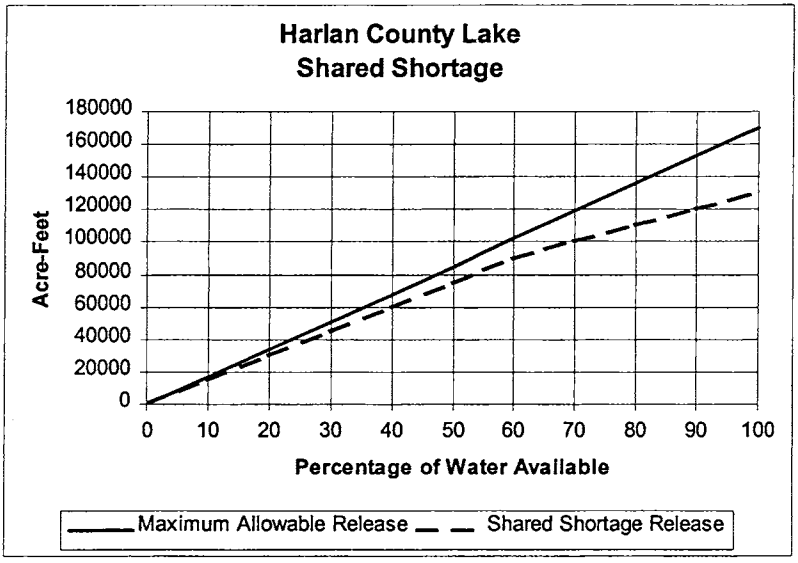
8,800 Acre-feet of water during the same period. Reclamation and we agreed to use these values to calculate the net inflow to the project under the current conditions.

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:

Storage + Summer Sediment Pool Evaporation + Inflow – Spring Evaporation = 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 elevation1,927.0 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

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
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

Trigger Calculations	Units-1000 Acre-feet	Irrigation Trigger	119.0		Assume that during irrigation release season							
Based on Harlan County Lake		Total Irrigation Supply	130.0		HCL Inflow = Evaporation Loss							
Irrigation Supply		Bottom Irrigation	164.1									
		Evaporation Adjust	20.0									

	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Total**
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

Year 2001-2002 Oct - Jun Trigger and Irrigation Supply Calculation

Calculation Month	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**
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	YES	YES	YES	YES	YES	YES	YES
130 kAF Irrigation Supply - Yes/No	NO	NO	NO	NO	NO	NO	NO	NO	NO

Attachment 5 Projected Water Supply Spread Sheet Calculations

Year 2002	
Jul - Sep	
Final Trigger and	
Total Irrigation Supply	
Calculation	

Calculation Month	Jul	Aug	Sep
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	N	O	P	Q	R
Total Main Stem VWS	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	VWS Guide Rock to Hardy	Main Stem Virgin Water Supply Above Guide Rock	Nebraska Main Stem Allocation Above Hardy	Kansas Main Stem Allocation Above Hardy	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	Col A - Col M	.489 x Col N	.511 x Col N	.489 x Col M	.511 x Col M

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
Canal	Canal Diversion	Spill to Waste-way	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	Sum of deliveries to the field	+Col 2 - Col 4	1 -Weighted Average Efficiency of Application System for the District*	Col 4 x Col 6	Col 5 + Col 7	Estimated Percent Loss*	Columns 8 x Col 9	Col 10/Col 1
Example	100	5	60	40	30%	18	58	82%	48	48%
Culbertson					30%					
Culbertson Extension					30%					
Meeker-Driftwood					30%					
Red Willow					30%					
Bartley					30%					
Cambridge					30%					
Naponne					35%					
Franklin					35%					
Franklin Pump					35%					
Almena					30%					
Superior					31%					
Courtland Canal Above Lovewell					23%					
Courtland Canal Below Lovewell					23%					

*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

STATUS OF AGREEMENT ON RRCA
GROUND WATER MODEL
As of November 15, 2002

DOCUMENT CONTEXT

The purpose of this document is to summarize the status of the RRCA Ground Water Model. Agreement has been reached among the State of Colorado, State of Kansas, and State of Nebraska in consultation with the United States in the selection of model calibration targets and methods to estimate groundwater pumping and recharge. The RRCA Ground Water Model will be applied in a consistent manner with the RRCA Accounting and Reporting Procedures to ensure consumptive uses from surface water and ground water are properly accounted for. General agreement has also been reached on the process to calibrate the RRCA Ground Water Model. The States and United States agree that coordinated efforts will continue to refine data inputs and model calibration until completion, on or before July 1, 2003.

MODEL DESCRIPTION

The primary purpose of the RRCA Ground Water Model is to quantify within the Republican River Basin the amount, location, and timing of depletions to stream flow from ground water pumping and accretions to stream flows due to imported water supply from outside the basin. The major structural components of the model are:

The model uses MODFLOW 2000 with the following modules: BAS1, RCH, WEL, STR, EVT, DRN, CHD, and LPF.

The model domain extends beyond the Republican River watershed from the Platte River in the north and to the Ogallala aquifer outcrops on the southern, eastern, and western boundaries. The model domain coincides with that described in USGS Open File Report 02-175 except in the eastern portion of the Basin where it was extended eastward to the eastern edge of Kearney County, Nebraska and into Adams County, Nebraska to reflect increased water table elevations caused by imported water supplies from the Platte River. The model domain encompasses approximately 30,000 square miles.

Constant head boundary conditions for the model were assigned along the Platte River, the eastern boundary of Kearney, Clay, Nuckolls, and Adams Counties, Nebraska; and in Cheyenne County, Colorado where the Republican River exits the domain. All other boundaries are no-flow boundaries. See attachment RRCA Ground Water Model Domain.

The model represents the long term steady-state conditions up to 1940 and transient conditions from 1940 to 2000. Transient conditions are discretized into monthly stress periods. The model will be updated annually by the RRCA to reflect data from 1940 to the current accounting year.

The model is discretized into one-square mile grid cells.

The model is a single layer bounded on the bottom by the impermeable Pierre Shale.

As an interim measure, Saturated Thickness is based upon an average saturated thickness for the period 1940-2000; values were obtained by kriging across the model domain between known data points. The minimum saturated thickness in a model cell is 10 feet.

Stream Network was taken from USGS File Report 02-175.

The interim aquifer base was taken from USGS File Report 02-175, and is subject to adjustment to reflect elevation variances near streams.

Land surface elevations were obtained from the National Elevation Dataset (NED) one arc second Digital Elevation Model (DEM).

The aquifer is represented as confined in the present model structure, but will be changed to unconfined aquifer conditions prior to final model calibration.

Initial hydraulic conductivity and specific yield estimates were taken from USGS File Report 02-175 and are subject to adjustment in model calibration.

CALIBRATION TARGETS

WATER LEVEL

Ground water levels have been measured throughout the Basin since the early 1900's, but the number of sites increased dramatically post-World War II. The source of ground water level information used in the RRCA Ground Water Model is the Ground Water Site Inventory (GWSI) maintained by the United States Geological Survey (USGS) in cooperation with all three States. The tenure of static ground water level data ranges from a single-year measurement at a discrete location to a continuum of annual measurements that began in the early 1950's and continues to date at the same well. Ground water levels are typically measured once each year, usually in the non-irrigation season when effects from irrigation pumping are minimized. The RRCA Ground Water Model is calibrated to a ground water level data set that contains a total of

350,233 water level records at 10,835 different sites. The GWSI dataset was converted from latitude/longitude to a X-Y coordinate system. The entire dataset, including one-measurement water levels, is available for model calibration except for wells that were determined by the representative State to be clearly erroneous. Water level data from continuous recorders are not presently being applied. A procedure to weight water level targets during the calibration process may be utilized. Additional water level targets may be included upon agreement by all States.

BASEFLOW

Hydrograph separation is a technique that partitions the amount of surface water and ground water that is measured as total streamflow at a river gaging station. Determining the component of total streamflow that is contributed by ground water (also called baseflow) requires professional expertise and judgment. The hydrograph separation analysis used in this application is referred to as the Pilot Point method. This procedure was adopted for application in this ground water model since it combines the increased accuracy of graphical baseflow analysis with the computational efficiency afforded by electronic spreadsheets. Daily streamflow information for one, or multiple years, is easily tabulated in a Microsoft Excel© electronic spreadsheet. Daily hydrographs are subsequently plotted using the graphics package. The analyst performing the baseflow separation uses the tools available in the electronic graphics package to select pilot or turning points that signify the baseflow component in the total amount of streamflow measured at a river gaging station. A significant contribution of the graphics and computational package afforded by Microsoft Excel© is the

flexibility to easily change the assignment of each pilot or turning point upon comparative review with other nearby streamflow hydrographs or in collaboration with another analyst. The analyst may change one or multiple pilot points using the click-and-drag tool to another turning point and instantly recalculate the amount of baseflow for a defined period of time – from a month up to decades. Use of the electronic graphical/computational Pilot Point method also dampens the objectivity criticism of the traditional hand-graphics technique performed by an individual analyst.

For the RRCA Ground Water Model, fifty-seven (57) independent baseflow analyses were performed and adopted as calibration targets. A summary of the estimated monthly baseflows of each analysis is attached. Existing baseflow targets may be revised if found to be flawed, and additional baseflow targets may be adopted upon unanimous agreement by the RRCA Ground Water Modeling Committee. Adjustments for surface water diversions may also be considered and adopted by the RRCA Ground Water Modeling Committee, upon unanimous agreement.

As a supplement to the baseflow separation information developed for selected gaging stations and stream segments, Nebraska compiled miscellaneous streamflow measurements and synoptic baseflow survey data available from the USGS and State of Nebraska into a Microsoft Access© electronic database. The data were collected periodically since 1975, except for the data provided in the USGS Water Supply Paper 779, which were collected in the late 1920's and early 1930's. The synoptic baseflow data has not been included in model calibration to date,

but is available for review and consideration in the final model calibration.

PUMPING

The pumping for municipal and industrial purposes was obtained from the USGS. Each State developed its own estimate of gross irrigation pumping. The following general methodologies for estimating ground water pumping have been agreed to by the States. The States commit to mutual verification of pumping datasets, primarily by comparison to meter records (where available) and to a lesser extent by power records, and independent CIR calculations. The RRCA Ground Water Modeling Committee will continue to refine pumping estimates on commingled irrigated lands in Nebraska.

Colorado

The State of Colorado employed a seven-step procedure to estimate ground water pumping:

1. Total acres irrigated by surface and ground water is estimated for each county based upon data from the respective County Assessor's Office for the area contained in the RRCA Ground Water Model boundaries.

2. The acreage irrigated by surface water is identified from the County Assessor's Records

3. The acreage irrigated by ground water is calculated as the difference between the total acreage and the acreage irrigated by surface water.

4. The maximum farm efficiency for center-pivot sprinkler irrigation and flood irrigation is estimated for each year.

5. The percent of acreage irrigated by center-pivot sprinkler is estimated for each county for each year.

6. The crop water requirement is estimated for each county using the Hargreaves empirical formula calibrated to the Penman-Montieth method for reference crop evapotranspiration. The crop mix for each county is determined from County Assessor records. The effective precipitation is estimated using the procedure outlined in Irrigation Water Requirements, Technical Release No. 21, United States Department of Agriculture, April 1967 (Revised September 1970). The crop irrigation requirement is calculated as the total or potential crop water requirement minus the effective precipitation.

7. Pumping for each county is estimated as Irrigated Ground water Acreage multiplied by Crop Irrigation Requirement multiplied by Fraction of Crop Irrigation Requirement satisfied. This total is then divided by the maximum farm efficiency. The maximum farm efficiency is a weighted average based on the amount of sprinkler and flood irrigation.

Kansas

The State of Kansas uses the following procedure to estimate irrigation pumping for the period of 1940-1988:

1. Determine the potential evapotranspiration (PET) for the irrigated area and crops determined for the study area.

   a. Compute reference ET with the Penman-Montieth method for years when detailed climate data are available.

b. Develop calibration coefficients for the Hargreaves method to use prior to availability of detailed weather data.

c. Compute crop PET for study period.

d. Compute effective precipitation.

e. Determine crop distribution from county level crop statistics.

f. Compute crop demand for irrigation water (CIR) on a unit basis (inches per acre).

2. Compile a history of well development, including location, date and source. The main data source is the Kansas water right information system, including its water use database.

3. Compile irrigated area estimates, based on county crop statistics, previous studies and water use reports.

4. Compute the volume of crop demand for irrigation (CIR) on a countywide basis, and use this as an initial estimate of the net irrigation pumping.

5. Compare the estimated net irrigation pumping to the water use reports for 1989-1999. This comparison was used to calculate factors by county, averaged over the period.

6. Use the comparison of estimated to reported pumping to develop a factor to multiply by the crop demand to estimate the actual net pumping for 1940-1988.

The State of Kansas uses the following procedure to estimate irrigation pumping for the period of 1989-2000:

Kansas has received water use reports from water right holders since 1957. In 1989, the Kansas

Division of Water Resources (KDWR) was given additional enforcement authority and resources to require, obtain, and review water user reports of all water right holders. As a result, for the period 1989-2000, Kansas relied on the water use reports as its basis for estimating irrigation pumping. The water use report includes the total metered quantity or hours of operation, pumping rate, irrigated acreage, and crop type. Water users with meters are expected to report metered quantity; while those without meters report hours of pumping and diversion rate. Each water use report received by KDWR is reviewed for accuracy and completeness. All wells in the alluvium of the Republican River and its tributaries have been metered since 1998.

Net pumping was determined by multiplying the total pumping by an estimated irrigation efficiency (which includes evaporative spray loss and runoff loss). Recognizing that the type of irrigation has changed over time, Kansas assumed that all irrigation was flood until 1959, with an efficiency of 65%. Center pivots (85% efficiency) and other sprinklers (75% efficiency) were in use starting in 1960, and Low-Energy Precision Application systems (LEPA, 90% efficiency) use began in 1990. For 1960 to 1993, the proportion of center pivot and other sprinklers was interpolated from zero in 1959 to the value reported in the Kansas Water Rights Information System in 1993. The same procedure was applied to LEPA for the period 1990-1993. Flood irrigation was assumed to comprise the remainder each year to bring the sum to 100%.

Nebraska

Nebraska estimates pumping by a method that uses power records to estimate the hours of pumping for

irrigation wells in a given area by year. The reported pumping rate for each registered irrigation well is adjusted in accordance with an empirically derived relationship between registered rates and actual rates, as determined through field-testing. The estimated pumping rates are multiplied by scalars that are based primarily on comparisons to metered data. The scalars are required because some wells in Nebraska are supplemental to surface water, because of possible inconsistencies in the registration database, and/or where pumping capacity exceeds potential beneficial use. The hours and rates are combined with the well database to determine pumping amounts, assuming the same hours per well. Scalars are determined based on comparison of countywide pumping totals in the Upper Republican Natural Resources District. An additional scalar is proposed to account for commingled lands in the alluvium. Nebraska will continue its verification of its pumping estimates after 15 November, but does not propose to change its method.

IRRIGATED ACREAGE ESTIMATES

The States agree to the following methodologies for estimating irrigated acreage. The States commit to mutual verification and improving the accuracy of irrigated acreage datasets.

COLORADO

Estimates of the irrigated acreage for 1940 through 2000 in Colorado for the area covered by the RRCA Ground Water Model include lands in Kit Carson, Yuma, and Phillips Counties and parts of Sedgwick, Logan, Washington, Lincoln, and Cheyenne Counties. A small

area of Elbert County is located in the RRCA Ground Water Model area, but since there are no irrigation wells or ditches in that area, it was excluded.

The estimates are based on the County Assessors' records of irrigated acreage and well permit information contained in the Colorado Ground Water Commission's Northern High Plains Well Database with adjustments for irrigated fields set aside under federal farm programs. The results were compared to irrigated crop statistics compiled and published by the Colorado Department of Agriculture and the National Agricultural Statistics Service (NASS) and irrigated acreage records for farms participating in federally subsidized programs that were provided by local Farm Service Agency offices through the U.S. Department of Agriculture. Descriptions of these sources and procedures follow.

County Assessor Records

The county assessor is an elected official in county government and their duties are prescribed by Colorado Revised Statutes. Succinctly, the county assessor must discover, list, classify, and value all taxable real and personal property within their respective county. Procedures for classifying and valuing property are set forth in the "Personal Property Valuation Manual", the "Land Valuation Manual", and other references prepared by the Colorado Division of Taxation. The assessor's appraised property values form the basis for taxing districts to set mill levies and taxes. The county treasurer is responsible for collecting all property taxes.

For agricultural land, the assessor must determine the value of the land based on its production capability by

considering soils, irrigation sources and methods, crop yields, crop values and farm sales. The assessor relies on aerial photographs, county clerk records, the county soil survey, agricultural statistics from NASS, climatological records, interviews with local farmers, and other locally available information. Since 1989, all property is appraised every other year based on sales of equivalent property during the preceding two years. Provisions are allowed to conduct interim appraisals if necessary to reflect a change in property values assessment such as conversion from irrigated cropland to dry land pasture.

The county assessors must publish an "Abstract of Assessment" by August 25 of each year that summarizes the amount and value of various categories of property as of the previous January 1. The abstracts also document the valuation, mill levy, and revenue for each taxing district in the county. Categories of property include irrigated farmland, meadow hay land, dry farm land, grazing land, and other agricultural land. Since 1993, the abstracts tabulate acreage by sprinkler and flood irrigation. The Colorado Department of Local Affairs summarizes the abstracts and submits an annual report to the Colorado General Assembly.

Irrigated land that is taken out of production due to farm programs, such as the Payment in Kind (PIK) and Conservation Reserve Program (CRP), remain classified as irrigated by the county assessor pursuant to requirements in federal authorizing legislation for these programs. They remain classified as irrigated to assure payment to the farm owner by the federal government is commensurate with irrigated land production capability and to maintain the assignment of tax burden. The Farm Service Agency (FSA) of the US Department of Agriculture (USDA)

administers the federal crop programs. Each year, program participants must report crop acreage to the local FSA office that compiles records of irrigated and non-irrigated croplands. Federal farm program acreage records for 1990 through 2000 were available and summarized for each county as CRP fields and fallow fields. Those annual values were deducted from the assessors' irrigated acreage. The PIK Program reduced irrigated acreage significantly in the 1980s. Since the USDA does not retain records for more than 10 years, Colorado estimated the PIK acreage using NASS records as described later in this document.

Colorado Ground Water Commission's Northern High Plains Well Database

The Northern High Plains Well Database covers the entirety of the RRCA Ground Water Model area in Colorado. The information contained in the well database for the model area includes 3,967 ground water well records. Each record includes the well location, use of the water, place of use, pumping rate, irrigated acreage, owner, and priority date. The records for each county were sorted by use, priority date, and location. For each county and priority year, the number of irrigation wells is counted and the acreage shown on the well permits is quantified.

The irrigated acreage identified in the well permits exceeds the actual irrigated acreage identified through County Assessor data. Review of well permit acreage information indicates most cite a square quarter-section of land, or 160 acres. Center-pivot sprinkler systems are the prevalent water application method in the model area and a typical circular quarter-section system irrigates only 130 acres. Comparison of permitted irrigated acreage with

NASS data also indicates the well permit information exceeds the irrigated crop acreage reported by NASS.

Estimate of Surface Water Irrigated Acreage

Surface water irrigation in the Basin in Colorado occurs only in Yuma and Kit Carson Counties. The surface water acreage was obtained from the respective County Assessor's records that documented a total of 2,902 (Yuma) and 1,861 (Kit Carson) acres in 1940. These quantities were carried forth to date and do not reflect the small decrease in surface water irrigation that has occurred since 1940.

Estimate of Irrigated Acreage by County Over Time

The assessors' records of irrigated acreage for Kit Carson and Yuma Counties include land irrigated from surface water sources that precede 1940. Irrigation of additional acreage after 1940 can be attributed exclusively to ground water development. Review of historic county assessor records confirms there has been little change in irrigated acreage since 1979 and the Assessors' records for recent years provide the most accurate quantification of irrigated acreage in each county.

To estimate the irrigated acreage over time, the ratio of the assessors reported acreage in 2000 to the cumulative acreage under all well permits for irrigation is calculated. For Phillips, Sedgwick, Logan, Washington, Lincoln, and Cheyenne Counties, that ratio is multiplied by the annual cumulative well permit acreage to determine the acreage in a specific year. For Kit Carson and Yuma Counties, the ratio was multiplied by the yearly permitted acreage and the resultant was added to the previous year's

acreage to account for surface-water irrigated land developed before 1940. For 1990 through 2000, the fallow irrigated fields and fields idled due to farm programs (USDA records) were deducted from the calculated acreage to determine the net irrigated acreage for those years. From 1982 through 1988, significant acreage was taken out of production through the USDA's Payment in Kind (PIK) program. The USDA represents that it does not have records of the county acreage idled by this program during the 1980's because it retains records on individual farms for only 10 years. The NASS records show significant reductions in irrigated acreage, up to 110,000 acres in 1983, in Kit Carson, Yuma, and Phillips Counties. To reflect this program, Colorado combined the NASS acreage for the three counties[4] and calculated the annual reduction percentage from the acreage in 1981.

	Total Irrigated	**Reduction as Percent of 1981**
Year	Acres	
1981	507,774	0.0
1982	480,443	5.4
1983	392,562	22.7
1984	426,248	16.1
1985	431,243	15.1
1986	416,416	18.0
1987	465,633	8.3
1988	468,627	7.7

[4] The NASS records for the other five counties were not used for these calculations because the irrigated acreage in these counties overlaps into other river basins.

The annual reduction percentages were multiplied by the irrigated acreage in each county and the resultant was subtracted to determine net irrigated acreage.

Colorado Irrigated Acres Summary

The total irrigated acreage in the Basin in Colorado in 2000 was 572,483 acres. Surface water irrigated lands are located only in Kit Carson and Yuma Counties and account for 4,763 acres. The total for lands irrigated by ground water is the difference, or 567,720 acres in 2000. No lands were identified that were irrigated by a combination of surface water and ground water pumping.

KANSAS

For the period 1989-1999, irrigated acres from the Water Use Reports were used. Data for 1999 was used for 2000, as the 2000 data have not been compiled yet. The National Agricultural Statistics Service (NASS) Agricultural Statistics provide countywide data that is most complete in Kansas after 1972; however, some irrigated crops are not tracked individually. The Census of Agriculture data from 1987, 1992 and 1997 were used to distribute some acreage to irrigated crops from the total acreage given in the Agricultural Statistics for the years 1972 to 1988. The revised acreages were then multiplied by an estimate of the percentage of each county's irrigated acreage in the model area, determined from the Water Use Report data, and used as the irrigated acres for 1972-1988. For the pre-1972 acreage, the annual well count was multiplied by a ratio of acres per well determined from either the Water Use Reports or the adjusted Agricultural Statistics for 1972, whichever gave a better fit to the

subsequent year's estimates. Irrigated acreage for each section was calculated by multiplying the annual well count by the irrigated acres per well, with a maximum of 520 irrigated acres per section. All remaining acreage above the 520 limit was assigned pro rata to other sections with less than 416 irrigated acres (80% of 520 acres).

Kansas Irrigated Acres Summary

The total irrigated acreage for Kansas's counties in 2000 is 449,891 acres.

NEBRASKA

National Agricultural Statistics Service (NASS) is an agency of the US Department of Agriculture (USDA). In cooperation with the Nebraska Department of Agriculture (NDA), NASS prepares an estimate of crop acreage by county. Annually they produce "Nebraska Agricultural Statistics" which is a compilation of information about farms, crops, and livestock. Every five years, NASS produces the Census of Agriculture, which is a detailed counting of farms, crops, and livestock. For the intervening four years, the estimates are prepared using a much smaller sample than the census. Periodically, NASS presents revisions to the annual estimates based on the results of the most recent census.

Reports are prepared annually for Nebraska and the data are collected and summarized statewide and by county. Farmers are surveyed each fall following harvest. Those surveys are supplemented with surveys of grain elevators and mills for volumes of grain received, meat packing plants, and other agribusiness. Crops are added and deleted from the annual report as cropping patterns

change. For example, broom corn was deleted from the surveys in the 1960s and sunflowers were added in 1990. Generally, the USDA is most interested in farm program crops such as corn and wheat and the NDA is interested in other crops such as alfalfa, grass hay, fruits, and table vegetables.

The annual reports break out irrigated and non-irrigated acreage for some crops. For other crops, such as alfalfa and corn for silage, NASS reports total acreage harvested every year but reports irrigated acreage periodically. In these cases, estimates of the irrigated acreage for the crop is based on the ratio of reported irrigated acreage and total harvested acreage in other years.

Nebraska Irrigated Acres Summary

The total irrigated acreage for Nebraska counties in the ground water model domain in 2000 is 1,692,521 acres.

CROP IRRIGATION REQUIREMENTS (CIR)

Colorado

The potential irrigation requirements for each crop for each county and year was estimated using the Hargreaves equation calibrated to the Penman-Monteith equation. The crop mix was obtained by County Assessor data. Effective rainfall was estimated using the procedure outlined in Technical Report 21. The gain in soil moisture from winter and spring precipitation was an average of 2.0 inches (source: Republican River Basin Water Management Study, Steven J. Vandas, United States Bureau of Reclamation, March 1983). The net crop irrigation requirement is calculated as the potential consumptive use minus

effective precipitation minus the gain in soil moisture from winter and spring precipitation.

Kansas

Using the Penman-Monteith calculations, the composite crop-weighted unit CIR was obtained for each year. Requisite data to calculate the CIR for 1945-1949 was not available, so the average for 1950-1959 was substituted for these years. The unit CIR for 1945-2000, was multiplied by the irrigated acreage described above to obtain volume of irrigation demand for each county. To account for winter soil moisture, a preliminary soil moisture factor was applied to each county in April and, if necessary, May, and was used to offset the CIR at the beginning of the irrigation season. The remaining CIR was then used as an initial estimate of net pumping.

RECHARGE

Estimated recharge is the result of two sources of water: recharge from precipitation and recharge from human activities such as irrigation. Recharge from irrigation is further segmented into two principal components based upon the source of water, surface or groundwater.

PRECIPITATION RECHARGE

Precipitation recharge is a significant variable in the overall water budget because its effect encompasses the entire model domain of over 19 million acres. Average precipitation between 1940 and 2000 varies from approximately 16 inches per year in the western part of the study area to approximately 27 inches per year in the eastern

part of the Basin. Recharge from precipitation generally increases from west to east across the domain. Recharge from precipitation is also influenced by soil type. More recharge is generated on sandy soils than clay soils for the same amount of precipitation. Therefore, STATSGO soil maps were used to locate sandy soils in the domain. These areas are commonly referred to as the *sand hills* of Colorado and western Nebraska. Different precipitation to recharge mathematical relationships are assigned to sandy and non-sandy soils.

More complex relationships may be considered, i.e. to account for additional variations in soil types, for non-linear precipitation effects, and for topography. A change in precipitation recharge over time, due to construction of farm terraces and ponds, may be considered.

GROUNDWATER IRRIGATION RECHARGE

The following methodologies are generally agreed upon. The RRCA Ground Water Modeling Committee will develop a common set of procedures and recharge values by system type.

Colorado – Recharge from ground water pumping in Colorado is calculated for each year and for each county. Groundwater recharge from sprinkler irrigation is calculated by multiplying the product of the gross pumping for sprinkler irrigation by the percentage that returns as deep percolation. In a similar manner, the amount of groundwater recharge from flood irrigation is calculated by multiplying the product of the gross pumping for flood irrigation by the percentage that returns to the aquifer as deep percolation. The total amount of recharge from groundwater per

county and year is the sum of the returns to deep percolation from sprinkler and flood irrigation.

Kansas – Return flow from groundwater irrigation was calculated by subtracting the net pumping from the gross pumping. Once the county monthly pumping and return flow values were calculated, they were distributed to the sections within the county using the annual well count and irrigated acreage. A section's percentage of the county's total irrigated acreage was calculated and multiplied by the county pumping and return flows to obtain values for the section

Nebraska – Based on professional judgment, Nebraska has assumed recharge rates that are generally inverse to assumed farm efficiency. From 1940-1970, recharge is assumed to be 30% of pumping, a value representative of gravity irrigation. Thereafter efficiency is assumed to increase, and recharge to decrease, with implementation of sprinkler irrigation and improvements to gravity irrigation systems. The recharge rate is assumed to be 20% in 2000, and the annual values 1970-2000 are determined by interpolation.

SURFACE WATER IRRIGATION RECHARGE

Estimates of surface water recharge that were used in the RRCA Ground Water Model are calculated as follows:

Forty (40) percent of diversions for small non-federal ditches and canals.

Twenty-five (25) percent for small surface water pumping plants.

As provided by the United States Bureau of Reclamation for federal irrigation projects (reference Section IV.A.2.c in the RRCA Accounting Procedures).

PHREATOPHYTES

The potential evapotranspiration rate for the various classifications of phreatophyte vegetation (forest, woody, and marsh) was collapsed into a single ET rate obtained from CROPSIM (Martin, 1984) results for the Akron, McCook, and Red Cloud climate stations on a monthly time step. The maximum phreatophyte ET rate elevation is set at two (2) feet below ground surface and the extinction depth is at twelve (12) feet below the ground surface. For the initial ground water model runs, the change or encroachment of phreatophytes over time was adjusted in accordance with the curvilinear time-relationship developed from aerial photographic data provided by Michaela Johnson in a published Master's Thesis (Johnson, 2001). The method to quantify the aerial coverage of phreatophytes and the distribution over time is subject to review and adoption by the RRCA Ground Water Modeling Committee, upon unanimous agreement.

Colorado – The Colorado Gap Analysis Project (CO-GAP) was initiated in 1991 as a cooperative effort among federal, state, and private natural resource groups in Colorado. The major objectives of the project are to: map actual land cover as closely as possible and make all GAP Project information available to users in a readily accessible format to institutions, agencies, and private land owners. Landsat imagery was acquired or interpreted to establish a baseline map of vegetation and land cover. Attributes

were assigned to each polygon describing primary, secondary, and other land cover, crown closure for forested primary types, and the types of wetlands and/or disturbance found in the polygon, if any. Polygon attributes were assigned using image interpretation, existing maps, field reconnaissance, digital reference layers from Federal land management agencies, and literature sources.

Kansas – Landsat TM7 imagery from 2000 was obtained covering most of the RRCA Ground Water area, except for the far south-central and far-eastern portions. Tributaries with visible phreatophyte cover were mapped as a subset of the hydrographic drainage network available as a digital line graph from the USGS. Tributaries were then divided according to the relative width of the riparian cover. Within each of these discrete reaches, cross sections from the outside boundaries of the riparian vegetation were then mapped and the average cross section within the reach was calculated. One-half of this average cross section was used as the distance from the hydrographic channel mapped by the USGS to map a polygon to enclose the riparian phreatophyte corridor along the reach. These polygons were merged with the Nebraska polygons denoting woody phreatophytes because some areas mapped as woody phreatophytes lay well outside of the riparian corridor. For evaluation of the change in phreatophyte ET over time, Kansas is using two techniques: (1) the Normalized Difference Vegetation Index (NDVI) satellite index to evaluate the change in relative water use between 1974 and 2000 on selected major tributaries, and (2) a time series of air photos for 16 main stem and tributary locations spread throughout the basin on which the vegetation will be evaluated using intercept methods

Nebraska – the Nebraska Department of Natural Resources (NDNR), in association with the Nebraska Conservation and Survey Division maintain a collection of digitally rectified aerial photography for landscape analysis. This data has a resolution of 20-ft. and was projected in UTM, Nad83. The NDNR digitized the 1993 Digital Orthophoto Quarter Quadrangle to identify phreatophyte forests from visual examination of the black and white aerial photography at a scale of 1:15,000. Polygons were fit over the photographs in ESRI's Arc View GIS then reprojected into the RRCA Groundwater Model projection (UTM, Nad27). Approximately 100 sites were visually inspected during field reconnaissance to verify the distribution of woody phreatophytes obtained from the aerial photography. The polygon output provided by Kansas was combined with the aerial photography analysis by Nebraska to include wetland areas in the minor tributaries, with corrections to exclude polygons of irrigated croplands. To accommodate the synoptic biases due to scale, polygon correction was performed at a scale of 1:50,000. Polygons to represent the phreatophyte areas downstream of Red Cloud, Nebraska and the extended groundwater mound area in Kearney and Adams County, Nebraska were derived from aerial photography at a scale of 1:50,000.

CALIBRATION PARAMETERS

Calibration parameters are physical, climatic, and/or aquifer properties that can be adjusted to so that the mathematical representation of a ground water model better represents actual conditions. Selection of final values for calibration parameters requires consideration of the match between model outputs and calibration targets, and whether such values are reasonable considering

geologic, climatic, and other conditions in the Basin. Calibration parameters may vary in a spatial context to reflect different physical and/or geographic conditions. The two principal calibration parameters used in application to the RRCA Groundwater Model are hydraulic conductivity and precipitation recharge.

Hydraulic Conductivity: hydraulic conductivity may be defined as the measure of the ease in which water can be transmitted through a porous material, i.e. flow through an aquifer. The hydraulic conductivity values applied in the model are based upon professional expertise and vary across the model domain. The values were distributed spatially using a parameter estimation (PEST) algorithm. Hydraulic conductivity will continue to be refined and statistically distributed throughout the model domain during the calibration process.

Precipitation Recharge: the amount of precipitation that percolates into the ground water aquifer is expressed as a percentage of effective precipitation and is segmented into monthly distributions. Two general soil classifications were identified with the following preliminary precipitation recharge rates: 4% of annual precipitation for sandy soils, and 1% for non-sandy soils, distributed throughout the year. The precipitation recharge rates may change upon final model calibration. An empirical relationship to reflect the non-linear precipitation/recharge rate was developed to satisfy the physical reality that the recharge rate increases in a curvilinear function with increasing precipitation. In general, the relationship adopted for the calibrated model will be expected to corroborate the basin water budget and the space and time distribution of both runoff and recharge.

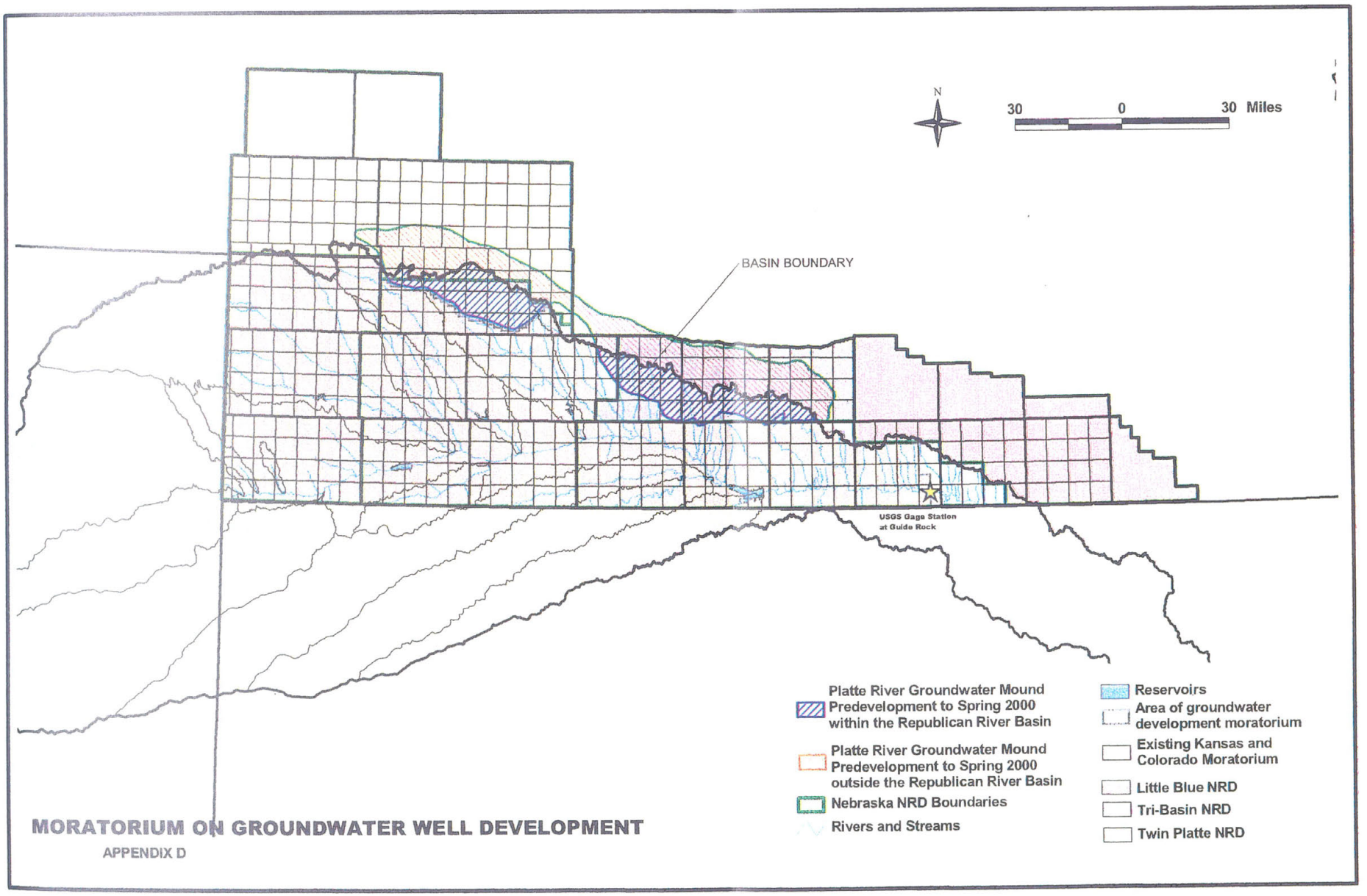
Lesser calibration parameters that are used to further refine the ground water model include:

Canal seepage: will be calculated using a water budget approach of the basic form: *Seepage is equal to Diversions minus Net Evaporation minus Other Net Outflows minus Change in Storage*, when adequate data is available. If only diversions are known, canal seepage will be estimated using the unit loss rates calculated by nearby canals that have sufficient data to employ the water budget approach.

Phreatophyte potential evapotranspiration rate is indexed to the Red Cloud, Nebraska and Akron, Colorado climate stations with annual rates of 18-36 inches and 30-48 inches respectively. The annual potential evapotranspiration rates were kriged across the model domain.

Specific yield estimates will continue to be refined during model calibration.

Residuals: it is recognized that the calibrated model may not perfectly match all the calibration targets, and that residuals (differences between model predictions and target values) may be positive in some sub-basins and negative in others. If necessary, the RRCA Ground Water Modeling Committee will codify a procedure that fairly distributes the residuals among contributory sub-basins and among the three States.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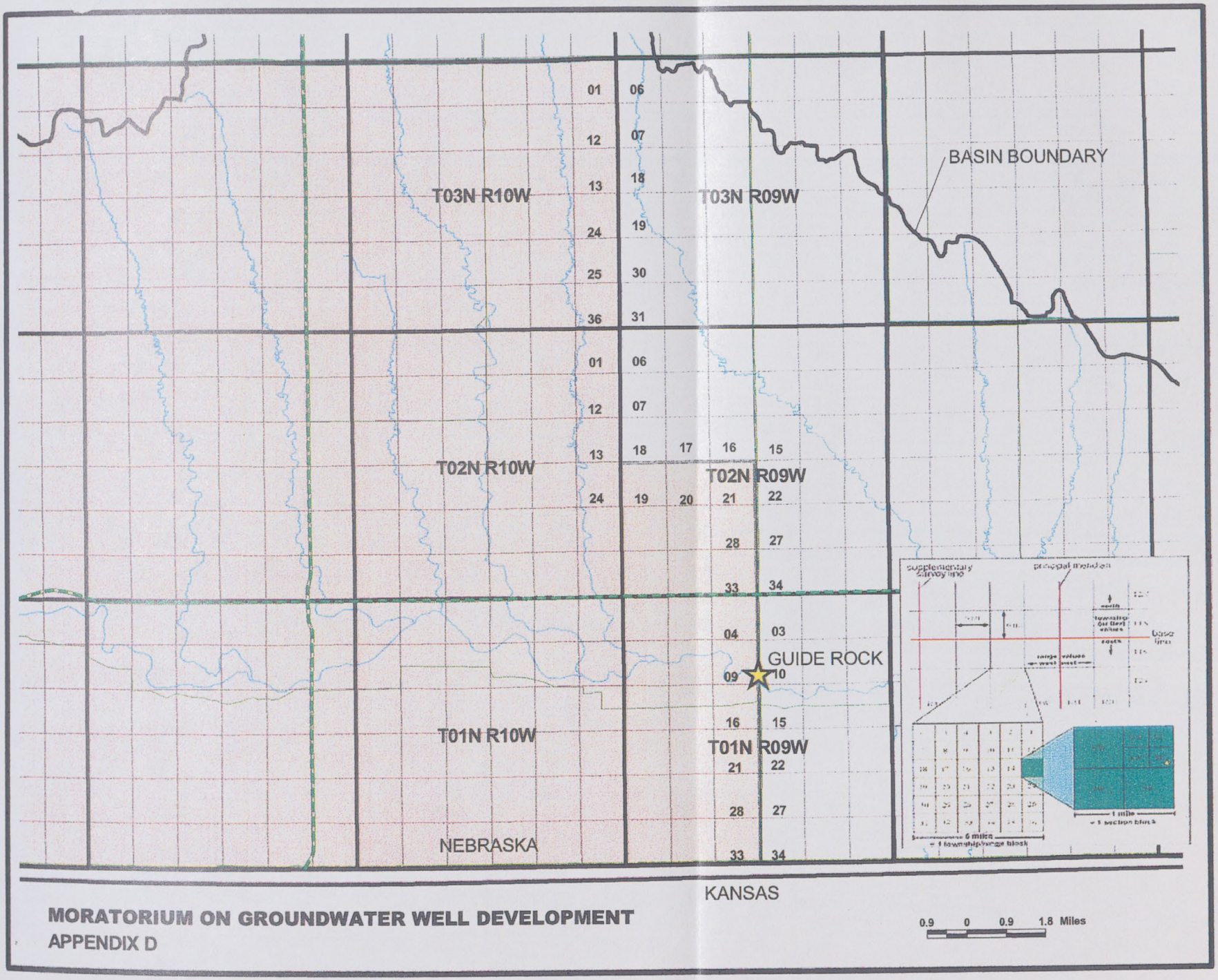
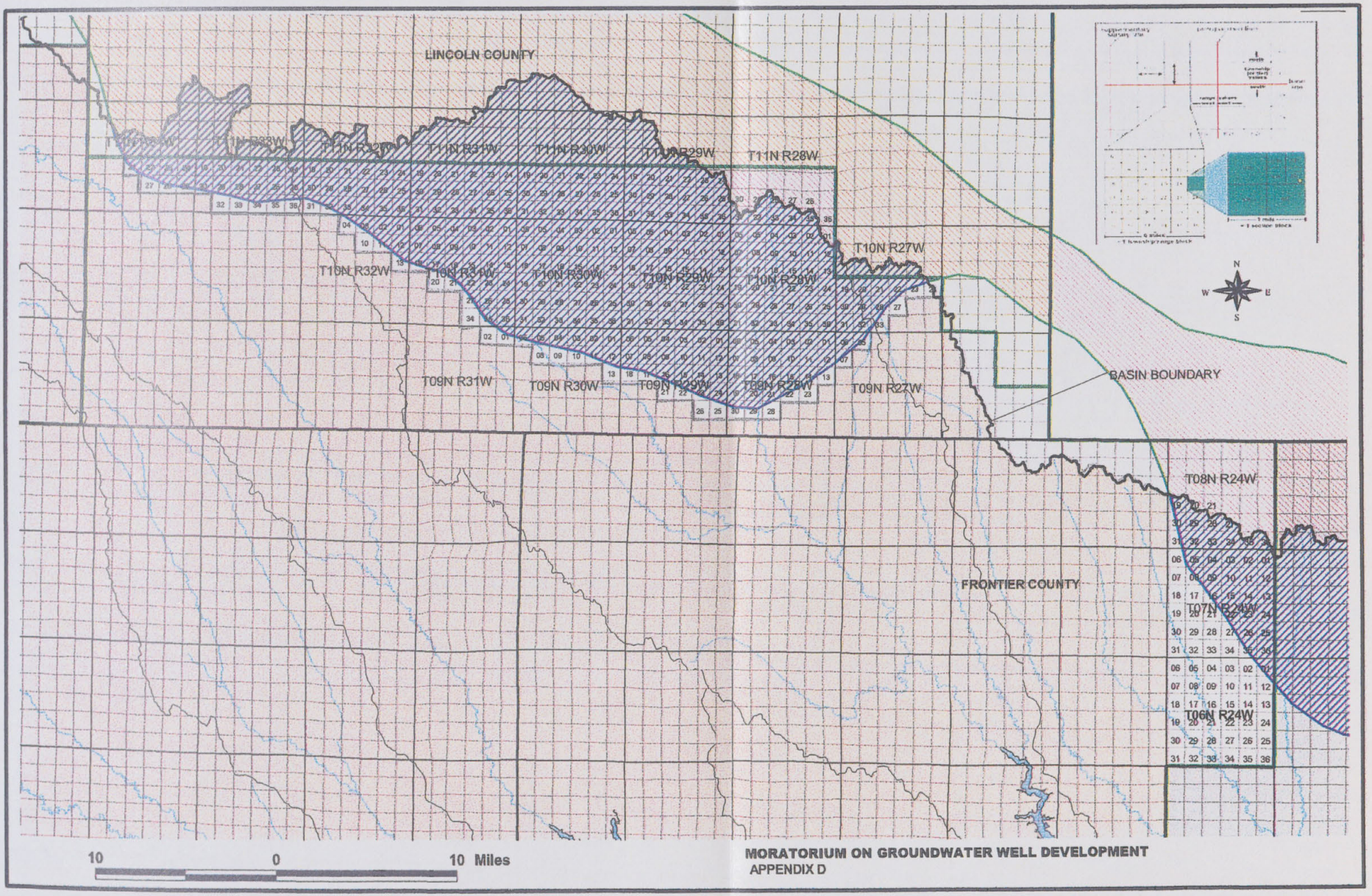
Platte River Groundwater Mound Predevelopment to Spring 2000 outside the Republican River Basin
Nebraska NRD Boundaries
Rivers and Streams
Reservoirs
Area of groundwater development moratorium
Existing Kansas and Colorado Moratorium
Little Blue NRD
Tri-Basin NRD
Twin Platte NRD
MORATORIUM ON GROUNDWATER WELL DEVELOPMENT
APPENDIX D



MORATORIUM ON GROUNDWATER WELL DEVELOPMENT
APPENDIX D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MORATORIUM ON GROUNDWATER WELL DEVELOPMENT
APPENDIX D

APPENDIX K

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.

Sediment Accumulation.

The most recent sedimentation survey for Harlan County project was conducted in 1988, 37 years after the 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.

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.

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

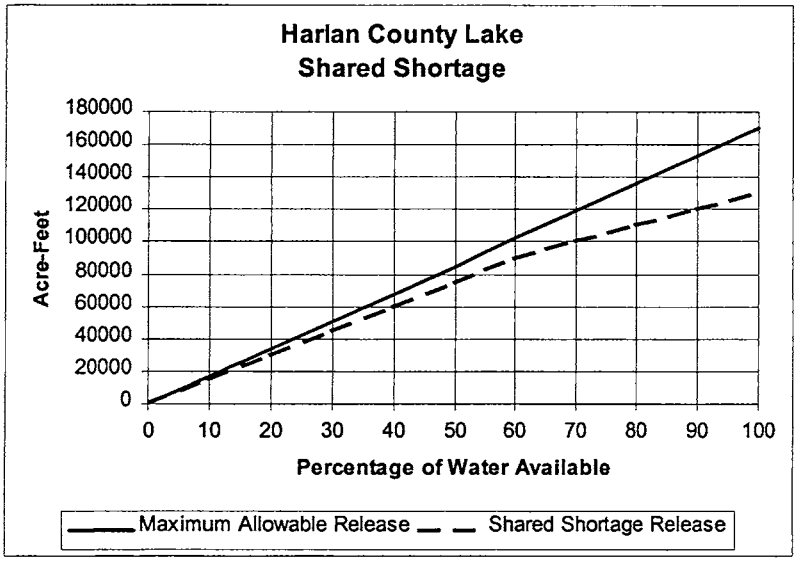
8,800 acre-feet of water during the same period. Reclamation and we agreed to use these values to calculate the net inflow to the project under the current conditions.

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.

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 then 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.



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:

Storage + Summer Sediment Pool Evaporation + Inflow – Spring Evaporation = 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.

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

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.

APPENDIX L

Implementation of Additional Water Administration Under Subsections V.A.2. and V.A.4

When the projected or actual irrigation supply is less than 130,000 acre-feet as determined by Subsection V.A.2. of the Stipulation, Nebraska will continue to limit diversions by senior permit holders to their permitted diversion rate in accordance with Nebraska law. In addition, if water is needed for direct diversions at Guide Rock, Nebraska will close all natural flow permit diversions of surface water junior to February 26, 1948, on the tributaries to and on the Main Stem of the Republican River between Harlan County Lake and Guide Rock unless a significant runoff event is occurring and is expected to produce runoff in excess of the useable diversion at the Superior-Courtland Diversion Dam or water can not be diverted due to an unusual operational problem. In such cases, Nebraska will notify the U.S. Bureau of Reclamation and Managers of Kansas Bostwick Irrigation District and Nebraska Bostwick Irrigation District that junior permits will be allowed to divert up to a specified flow rate not to exceed the average daily flow of water that would otherwise pass the Superior-Courtland Diversion Dam during the time of the event. If requested, the parties will promptly exchange information and attempt to resolve any concerns. At the end of the period specified in Nebraska's notice, Nebraska will again close all juniors unless conditions warrant an additional notice of Nebraska's intent to allow some junior permits to divert.

As indicated in Subsection V.A.4. of the Stipulation, Kansas and Nebraska agree to work with the U. S. Bureau of Reclamation to minimize the bypass flows at the Superior-Courtland Diversion Dam. If any party believes good

faith efforts have not been made to minimize the bypass flows, it shall notify the other parties and a joint determination shall be made on action to implement subsection V.A.4.

APPENDIX M

Alternative Water-Short Year Administration

1. When the projected water supply pursuant to the methodology described in Subsection V.A.2. in the Stipulation is less than 130,000 Acre-feet, in lieu of the requirements of Subsection V.B.2.e.i. of the Stipulation, Nebraska may elect to implement a Plan for Reduction of Computed Beneficial Consumptive Uses (Plan) approved pursuant to paragraph 3.

2. Each Plan shall indicate the actions which Nebraska would undertake to reduce its Computed Beneficial Consumptive Uses from the base condition and the amount of reduction expected from those actions. A Plan's designed reductions in Computed Beneficial Consumptive Uses shall be evaluated by the RRCA using methods consistent with the RRCA Accounting Procedures and the RRCA Groundwater Model.

3. Nebraska may submit one or more Plans to the RRCA and the RRCA shall take action regarding such Plan(s) pursuant to the schedule below. Nebraska must submit new plans or modifications to existing Plans to the RRCA prior to August 1 for the RRCA's consideration. The RRCA must take action on new Plans or modifications to existing plans prior to Nov. 1 of that same year. Once approved, a Plan shall expire three years from the January 1 following the Plan's approval. After a Plan expires, Nebraska may submit the same Plan to the RRCA according to the above schedule. The RRCA may approve multiple Plans.

4. If Nebraska elects to implement a Plan, Nebraska will provide notice to the RRCA by April 1 of its intention to implement a Plan for that year. If an approved Plan is

implemented, Nebraska's Computed Beneficial Consumptive Use of its Allocation above Guide Rock in Water-Short Year Administration shall be calculated on a three year running average of the current year plus the previous two years. Notwithstanding compliance under a three year running average, the two year sum of Nebraska's current and previous year's Computed Beneficial Consumptive Use in excess of its Allocation above Guide Rock, pursuant to Subsection V.B.2., of the Stipulation shall not exceed the amount of Computed Beneficial Consumptive Use that the Plan was designed to reduce above Guide Rock.

5. For any year in which Nebraska implements an approved Plan, such Plan shall be in effect for the remainder of the year unless the projected supply rises above 130,000 Acre-feet. At such time, Nebraska may revoke the Plan by notifying the RRCA. If Nebraska revokes a Plan, the provisions of Subsection V.B.2.e.i., if applicable, shall be in effect. If Nebraska revokes a Plan during the year, it may not resume the Plan in that year.

6. Nebraska may not elect this Alternative Water-Short Year Administration in any year if in the previous year, Water-Short Year Administration was in effect pursuant to Subsection V.B.1.b. and Nebraska failed to elect the Alternative Water-Short Year Administration in that year.