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FINAL REPORT

RIO GRANDE WATER SUPPLY STUDY - PHASE I

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January, 1990

EXECUTIVE SUMMARY

RIO GRANDE WATER SUPPLY STUDY - PHASE I

Introduction

The Rio Grande Water Supply Study was a reconnaissance level determination of the physically and legally available flow (storable flow) at four potential reservoir sites in the Rio Grande Basin upstream of Del Norte, Colorado. The study, sponsored by the San Luis Valley Water Conservancy District and the Colorado Water Conservation Board, was performed by Leonard Rice Consulting Water Engineers, Inc.

Study Area

The Rio Grande Basin within Colorado is located in south central Colorado and encompasses approximately 7500 square miles . The primary feature of the basin is the relatively flat valley floor (known as the San Luis Valley or Valley). The major drainage features in the Valley are the Rio Grande which flows in a generally south-easterly direction to the Colorado-New Mexico stateline, and the Conejos River which is the major tributary to the Rio Grande.

Approximately 3,000 square miles in the northern part of the Valley is separated by a low divide formed by alluvial materials from the surrounding mountains. This area, known as the Closed Basin, is a natural sump.

The major water development features in the Basin include three reservoirs in the headwaters of the Rio Grande, a number of diversion structures and canals in the Conejos River and on the Rio Grande mainstem which provide water mainly for irrigation, and the Closed Basin Project which is currently being constructed. The Closed Basin Project will consist of a series of wells and conveyance structures to transfer water from the Closed Basin sump to the mainstem of the Rio Grande.

An important aspect of water administration in the San Luis Valley is the Rio Grande Compact between the states of Colorado, New Mexico and Texas. This Compact, which has been in effect since 1940, established a schedule of annual deliveries of water by Colorado at the Colorado-New Mexico stateline based on flows recorded at designated gaging stations in the Rio Grande Basin within Colorado.

Study Process

The Rio Grande Water Supply Study was conducted in two steps. In Step One, between January and October of 1987, preliminary analyses were performed to estimate the legal and physical availability of water at four potential reservoir sites based on certain assumptions. At the completion of Step One, a series of meetings were held with the State Engineer of Colorado and with representatives of various water user groups in the San Luis Valley. As a result of these meetings, the study sponsors decided to proceed to Step Two of the study to again estimate storable flows using certain refinements in the assumptions regarding the Rio Grande Compact and the future operation of the Closed Basin Project. The Step Two analyses were conducted from October of 1988 to October of 1989.

At the completion of each major task in the study, a task memorandum summarizing the analyses and results was distributed for review to a group of study advisors. Throughout the course of the study almost twenty meetings were held with the study advisory group which included the Colorado State Engineer's Office as well as representatives of water user groups in the San Luis Valley.

Study Approach

The estimation of storable flows was based on a number of complex institutional and technical factors including the hydrology of the San Luis Valley, water diversion and storage patterns over a number of years, the administration of water rights on the Rio Grande, provisions of the Rio Grande Compact, projected future operations of the Closed Basin Project, agreements between water users in the valley, and the policies and expectations of a number of organizations.

Each of these items was analyzed, reviewed with the Study Advisors and included in a model of the operation of the Rio Grande within Colorado. The model was then used to estimate storable flows at four potential reservoir sites for several water supply/demand scenarios. The analyses are summarized in the following paragraphs.

Reservoir Sites

Storable flow was investigated at the four potential reservoir sites indicated below. The latter two sites were selected during this study following a review of factors influencing physical and legal water availability in selected reaches.

1) the **Wagon Wheel Gap** site on the Rio Grande approximately 32 miles upstream from Del Norte, Colorado,
2) the **Vega Sylvestre** site on the Rio Grande approximately 49 miles upstream of Del Norte,
3) a site (called **RG1**) on the Rio Grande located approximately 14 miles upstream from Del Norte, and
4) a site (called **SF1**) on the South Fork approximately 6 miles upstream from the town of South Fork, Colorado.

Water Rights Administration

In Colorado, the basic water allocation principle is the prior appropriation doctrine which can be expressed as "first in time, first in right". The appropriation date and adjudication date of a water right become the basis for determining which users are entitled to the river flow during a period when there is insufficient water for all appropriators.

Water use and water rights administration in the Conejos Basin, the largest tributary to the Rio Grande within Colorado, have developed independently of water use and water rights administration on the mainstem of the Rio Grande. Legal water availability at the four potential reservoir sites would be affected by water rights administration of mainstem water rights but would be unaffected

by water rights administration of the Conejos Basin. Therefore, consideration of water rights administration in this study focused on mainstem water rights.

There are approximately 310 water rights on the mainstem of the Rio Grande which affect the legal water availability at an upstream potential reservoir site. Approximately 70 percent of the mainstem diversions are associated with the following eight ditch systems: Rio Grande Canal, Farmers Union Canal, Monte Vista Canal, Empire Canal, San Luis Canal, Prairie Ditch, Costilla Ditch and Rio Grande & Lariat Ditch. To ease the computational burden in modeling water rights administration, the water rights of these eight ditches were consolidated from approximately 110 water rights down to 40 water rights.

Water rights in the Del Norte to Alamosa reach associated with ditches other than the eight listed above were consolidated into a single water use for modeling purposes. Water rights outside the Del Norte to Alamosa reach were not modeled but their effect on the Rio Grande during the 1948 through 1985 study period was included in the generation of the flow base of the model through streamflow records.

Two scenarios of Rio Grande mainstem diversions between Del Norte and Alamosa were tested in the storable flow determinations. The **"Step One Mainstem Diversion"** scenario generally constrained mainstem ditch diversions to maximum levels experienced from 1950 through 1967, which was a period prior to active administration of the Rio Grande Compact. The **"Alternate Step Two Diversion"** scenario allowed diversions greater than the 1950 through 1967 maximum levels by four diversion systems which provide a majority of their diversions to the Closed Basin.

An integral part of the allocation of Rio Grande Basin water within Colorado is the effect of the Rio Grande Compact as discussed in the next section. The Rio Grande Compact is an obligation that Colorado is committed to satisfying. Curtailment of diversions of Colorado appropriators has often been required to satisfy Colorado's Compact obligation.

Rio Grande Compact

The Rio Grande Compact sets annual stateline delivery obligations for Colorado based on the amount of flow at various gaging stations within Colorado. Compact deliveries are not required to strictly adhere to the Compact delivery tables on an annual basis and, therefore, the Compact provides for accounting of over-deliveries (credits) or under-deliveries (debits) which may be carried forward into subsequent years. Provisions of the Compact relate Colorado's Compact obligations and its accumulation of credits and debits to storage levels at Rio Grande Project Storage, a major storage and irrigation project in New Mexico and Texas.

Major provisions of the Compact affecting storable flows at the potential reservoir site were investigated and translated into river basin model operating criteria. For example, the model incorporated the capture, at a potential reservoir site, of water which would have been required for Compact deliveries and release of that water from storage if needed by the Rio Grande Project.

The Conejos obligation under the Compact was assumed to be separate from the Rio Grande mainstem obligation (i.e. two river system). Since individual water uses in the Conejos Basin were not modeled, the Conejos Basin was assumed to always satisfy its Compact delivery obligation.

Another major provision of the Compact which may affect a new storage project is that the Compact permits Colorado to increase consumptive uses of water of the Rio Grande and Conejos River to the extent that water may be delivered at the stateline from the Closed Basin. The Closed Basin Project which provides such a delivery is described in the next section.

Closed Basin Project

The Closed Basin Project consists of numerous wells and a conveyance channel designed to salvage and deliver from the Closed Basin to the Rio Grande, water which would have been non-beneficially consumed. The total ultimate production capacity of the Closed Basin Project is presently estimated to be approximately

100,000 acre-feet (af) per year. The Closed Basin Project deliveries are categorized by type of use as follows:

Priority One - deliveries made to assist the State of Colorado in meeting its Compact commitments to New Mexico and Texas. Priority One deliveries are limited to an average 60,000 acre-feet/year over any 10 consecutive years.

Priority Two - deliveries made to enhance wildlife in the Alamosa National Wildlife Refuge and Blanca Wildlife Habitat Area. Priority Two deliveries are limited to 5,300 af annually. For the Rio Grande Water Supply Study, Priority Two deliveries were assumed to not contribute flow to the Rio Grande and, therefore, were not modeled.

Priority Three - deliveries available at a charge for general use by Rio Grande and Conejos water users after Priority One and Priority Two uses have been satisfied. In any given year, water available for Priority Three delivery will depend on the amount of Priority One and Priority Two water delivered. Priority Three water (as defined in this study) was described as Priority Four water in the authorizing legislation for the Closed Basin Project.

For each of the two mainstem diversion scenarios, Closed Basin Project deliveries for Priority One and Priority Three water were developed.

The Closed Basin Project Priority One deliveries were estimated to alleviate as much Compact curtailment of the mainstem diversions as possible while satisfying various operating guidelines of the Closed Basin Project. Most of the Priority One deliveries were generated for average or above average runoff years since those are the years in which Colorado has the greatest Compact obligations. Priority One deliveries were limited to an average of 60,000 af per year in any ten year period or 94,500 af in any one year.

The Priority Three deliveries were assigned any delivery capacity not used by Priority One and Priority Two uses in any given year. Since Priority One deliveries often filled much of the delivery capacity in above average runoff years, the Priority Three water availability occurred principally in average or below average (dry) hydrologic years when large Priority One deliveries did not occur.

Types of Storable Flow

Four types of storable flow were investigated at each potential reservoir site as discussed below.

- **Closed Basin Project Priority Three Exchange Flows** are the portion of the Priority Three deliveries from the Closed Basin Project which can be exchanged upstream of Del Norte to a new reservoir site.

- **Storable Flood Flows** are flows that are excess to Compact obligations, to downstream irrigation water use, and to an instream flow requirement at a potential reservoir site. Caution was exercised in the definition of storable flood flows since water surplus to the needs of the system in one month could accrue as a Compact credit and be used in subsequent months to offset Compact curtailment and, therefore, not be truly surplus. These flows are not intended for use in determinations of flood storage in a potential reservoir.

- **Storable Debit Flows** are that part of Colorado's Compact obligation which could be captured and held at a potential reservoir site and which would revert to Colorado's ownership with a spill of water at Rio Grande Project Storage in New Mexico.

- **Storable Seasonal Flows** are flows which exceed theoretical downstream diversion demands and which could be stored at a potential reservoir site instead of being diverted by existing direct flow diversion structures downstream. This water would then be released during a later time in the

same year and perhaps used more efficiently by existing diversion structures.

River Basin Modeling

The 1948 through 1985 period was selected as the historic hydrologic period for use in the river basin modeling. This period was selected based on statistical analyses and other factors including data availability, public perception, and inclusion of drought periods.

The computer model used for the storable flow analyses was the RIver Basin SImulation Model (RIBSIM) which allocates flow on a monthly basis by the prior appropriation doctrine. Modifications were made to the model to incorporate features such as administration of Rio Grande water rights, the Rio Grande Compact and the Closed Basin Project.

The primary data generated for the modeling effort consisted of:

1. a flow base containing monthly flows at various locations along the river on which to superimpose the modeled features of the basin. The flow base was generated by adjusting 1948 through 1985 gaged flows in the basin to remove the effects of man made structures included in the modeling.

2. a water user network which contains information on how the model is to operate the modeled features. This network contains such information as the location, priority, constraints, and return flow characteristics for each diversion. Additional information such as starting contents, area-capacity curves and evaporation rates are included for each modeled reservoir.

A process (called calibration) of checking and adjusting the model to reasonably match a historical record of diversions and streamflow yielded a model suitable for the storable flow determinations. The 1950 through 1967 period was chosen

as the calibration period since it represents a time in which mainstem water rights were unencumbered by active administration of the Rio Grande Compact.

For each of the two mainstem diversion scenarios, five storable flow simulations were performed with the river basin model. A base simulation was performed which estimated storable flow at the Wagon Wheel Gap site for each of the two mainstem diversion scenarios if no Closed Basin Project deliveries were made. Subsequent simulations estimated storable flows at the four damsites with Closed Basin Project deliveries.

Results

The results of the storable flow analyses at the four potential reservoir sites are summarized below.

- **There was little opportunity to exchange Closed Basin Project Priority Three water to a new storage vessel upstream of Del Norte.** For the Step One mainstem diversion scenario, it is estimated that the exchange ability approximates 3,000 af on an average (1948-1985) annual basis. For the Alternate Step Two mainstem diversion scenario, the exchange ability approximates 1,000 af on an average (1948-1985) annual basis. The opportunity to exchange Closed Basin Project water to a potential reservoir site typically occurred in less than half of the years of the study period. The primary reason for the limited exchange ability is that the periods in which there was adequate streamflow for exchange did not coincide with availability of Priority Three water. For example, in many above average runoff years, there was adequate streamflow for an exchange but most of the production capacity of the Closed Basin Project would be used for Priority One requirements. This is due to the fact that Compact delivery requirements are greater in above average runoff years.

- **Storable Flood Flows occurred in only two years of the 38 year study period for the Step One mainstem diversion scenario.** Storable Flood Flows approximated 75,000 af in 1948 and 30,000 af in 1985. No Storable Flood

Flows, surplus to downstream irrigation diversions and the Rio Grande Compact, existed in 36 consecutive years of the study period. **For the Alternate Step Two mainstem diversion scenario, no Storable Flood Flows occurred.**

- **No Debit Storable Flows occurred in the simulations.** The modeling indicated that the generally low levels of Rio Grande Project storage during the study period required that the captured amounts of Colorado's Compact obligation be subsequently released to downstream states.

- **There are potentially large volumes of Storable Seasonal Flow.** The average (1948-1985) annual Storable Seasonal Flow ranged from approximately 5,500 af to over 90,000 af depending on the assumed efficiency of the direct flow irrigation systems, the potential reservoir site, and the mainstem diversion scenario. Storable Seasonal Flows were available in greater than 65 percent of the years studied.

The analyses conducted for this study indicate that the downstream reservoir sites, RG1 on the Rio Grande and SF1 on the South Fork, would have the greatest potential for capturing storable flows. The RG1 site displays the greatest potential of all sites investigated. It should be kept in mind, however, that a number of factors in addition to water availability must be considered in the selection of a potential reservoir site. These other factors such as geotechnical suitability, construction costs and environmental considerations were beyond the scope of this study.

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ACKNOWLEDGEMENTS

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Sandy MacDougall, of Geddes & MacDougall, P.C., provided 1) assistance in directing the Study, 2) review of Study work products from a legal perspective, and 3) review of legal documents related to the Rio Grande Compact.

The contributions made to the study by members of the following organizations are greatly appreciated:

Colorado Water Conservation Board (Bill MacDonald, Bill Green & Randy Seaholm)
San Luis Valley Water Conservancy District (Floyd Getz and Board)
Bureau of Reclamation (LeRoy Buettner, Charles Gober and Emily Dowdy)
Rio Grande Water Conservation District (Ralph Curtis)
Colorado State Engineer (Jeris Danielson) and his staff (particularly Hal Simpson, Rao Suvarna, and Bob Hamburg)
Division 3 Engineer (Steve Vandiver)
Water District 20 Commissioner (Max Nash)
Agro Engineering (Lee Wheeler)

LRCWE Job No. 789SLV01
January, 1990

I. INTRODUCTION

This introduction provides general background and an overview of procedures for a study of physically and legally available stream flows at several locations in the Rio Grande Basin within Colorado. In addition, the selection of the sites for the available flow investigations are described.

I.1 BACKGROUND

Since the late 1800's, water users in the Rio Grande Basin within Colorado have expressed a desire for additional regulatory storage. Major studies of potential regulatory storage upstream of the town of Del Norte were conducted in 1938, 1939 and 1955 (NRC, 1938; Tipton, 1939; USBR, 1955). Significant developments in the water supply and use of the Rio Grande in recent years such as construction of the Closed Basin Project and elimination of Colorado's pre-1985 Compact debit have prompted this investigation of the volume of water which may be storable at several potential reservoir sites.

The objective of the study is to estimate the legally and physically available flow at four potential storage sites in the Rio Grande Basin upstream of the town of Del Norte, Colorado. The storable flow determination is one component of a reconnaissance level study for a potential reservoir. The present study does not include water demand analyses, reservoir sizing and operation, geologic and geotechnical investigations, or economic analyses. Such analyses might be included in future reconnaissance studies should the present study indicate that significant amounts of storable water are available at one or more of the potential reservoir sites. This Phase I study has been performed in such a manner as to allow incorporation of study products (including the computer modeling) in future studies.

While this study focuses on the mainstem of the Rio Grande within Colorado, other water systems, such as the Closed Basin Project and the Rio Grande Project, which would significantly influence water availability at a potential reservoir site were considered in the study.

The Rio Grande Water Supply Study is sponsored by the San Luis Valley Water Conservancy District (SLVWCD) and the Colorado Water Conservation Board (CWCB). The San Luis Valley Water Conservancy District (organized under Article 45, Title 37, Colorado Revised Statues) is responsible for the promotion and development of water projects in areas of Alamosa, Rio Grande and Saguache Counties. The Colorado Water Conservation Board is the State agency charged with the responsibility for the protection and development of Colorado's water resources. Through its Construction Fund, the CWCB assists local entities with the planning, development and financing of water projects.

The primary consultant for the study was Leonard Rice Consulting Water Engineers, Inc. (LRCWE). Sandy MacDougall, of Geddes & MacDougall, P.C., provided valuable assistance in the direction of the study, review of study work products from a legal perspective, and interpretation of legal documents related to the Rio Grande Compact. The U.S. Bureau of Reclamation (USBR, Amarillo office) provided technical assistance on selected tasks.

I.2 STUDY PROCESS

In November 1985, the CWCB gave tentative approval to a request by the SLVWCD for assistance in conducting a reconnaissance study for a new reservoir on the Upper Rio Grande in Colorado. In August through October of 1986, the SLVWCD solicited proposals from several engineering consulting firms and, based on a competitive selection process, selected LRCWE to conduct the study.

In November 1986, the CWCB approved a scope of work and budget for the study with the defined objective of determining the physical and legal availability of water at several potential reservoir sites in the Upper Rio Grande Basin. The scope of work was developed by the CWCB and LRCWE staffs in conjunction with the SLVWCD, the Colorado State Engineer's Office and the Amarillo, Texas office of the USBR. Study costs were apportioned between the CWCB and the SLVWCD with technical assistance to be provided by the USBR.

A Plan of Study dated November 12, 1986, consisted of the following major tasks which were conducted between January and October of 1987. Since subsequent

activities were also performed for the Rio Grande Water Supply Study, the following activities are referred to as Step One activities.

1. The collection and analysis of data necessary to conduct the study.

2. An analysis of those provisions of the Rio Grande Compact relating to water deliveries at the Colorado - New Mexico stateline and development and operation of post-compact reservoirs in Colorado.

3. A description of the proposed facilities and operating characteristics of the Closed Basin Project.

4. A Description of the manner in which water rights are administered on the Rio Grande in Colorado, and

5. An analysis of storable flows at four potential reservoir sites.

The storable flow analysis was conducted on a monthly basis for a 38-year study period. Three of the four potential reservoir sites were located on the mainstem of the Rio Grande in Colorado and one on the South Fork of the Rio Grande.

During Step One of the study, three meetings were held in Monte Vista to discuss the Plan of Study, work in progress and the Step One results with the SLVWCD, the Division Engineer for Water Diversion No. 3 and others. Two meetings were held with the State Engineer and Deputy State Engineer in Denver on the same items.

At the conclusion of Step One in late 1987, a series of meetings were held with the State Engineer and representatives of various San Luis Valley water user groups to discuss the Step One study results. Based on these discussions, the decision was made by the CWCB and the SLVWCD to proceed to Step Two of the study in order to refine some of the assumptions and analyses of Step One, particularly with regard to the future operation of the Closed Basin Project and certain provisions of the Rio Grande Compact.

In March 1988, the CWCB approved a preliminary scope of work and budget for the Step Two analyses. Study costs were apportioned between the CWCB and the SLVWCD. The June 1988 Plan of Study included the following major tasks:

1. A review of the assumptions used in Step One of the study,

2. Formulation of scenarios for future Closed Basin Project operations,

3. Refinement of study assumptions with regard to certain provisions of the Rio Grande Compact,

4. A reconnaissance investigation of the exchange potential from the Closed Basin Project on the Rio Grande mainstem to the Conejos River,

5. An investigation of alternative diversion levels on the Rio Grande mainstem,

6. Modifications to and operations with the hydrologic simulation model used in the study, and

7. Preparation of the final study report.

At the completion of each major task in Step One and Step Two of the study, a task memorandum was prepared and distributed to a group of Study Advisors. The memorandum summarized work conducted in the task.

Nine meetings were held with the Study Advisors in Step Two of the study. Six meetings were held in Denver and three were conducted in the San Luis Valley. The Study Advisors included representatives of the Conejos Water Conservancy District, the Division of Water Resources, the Rio Grande Water Users Association, the SLVWCD and (in Step One) the USBR.

A draft of the final study report was distributed to the Study Advisors for comment in early November 1989. Final meetings with Advisors to review the draft report were held in November 1989 in Denver and Alamosa.

I.2.1 Study Advisors

Listed below are the primary individuals who served as Study Advisors for the Rio Grande Water Supply Study along with the names of the organizations they represented. It should be noted that a number of other individuals including the directors of the SLVWCD and certain members of the USBR staff of the Amarillo, Texas office of the USBR also served in an advisory capacity at various times during the course of the study.

John Carlson - Rio Grande Water Users Association

Ralph Curtis - Rio Grande Water Conservation District

Jeris Danielson - Colorado State Engineer

Floyd Getz - San Luis Valley Water Conservancy District

Duane Helton - Tipton & Kalmbach

Richard Messick - San Luis Valley Water Conservancy District

David Robbins - Rio Grande Water Conservation District

Harold Simpson - Deputy Colorado State Engineer

Steve Vandiver - Water Division No. 3 Engineer

I.2.2 Study Procedures

Literature Searches

Throughout the study, efforts were made to maximize the use of previous reports and data supplied by others. The libraries of LRCWE, CWCB, and the USBR (Amarillo Office) were searched for publications relevant to the study. In addition, computerized literature searches were made of local and national publication databases. The most relevant publications were obtained and reviewed. Reference lists in obtained publications were also reviewed for additional information sources. Bibliographies of relevant publications were attached to Step One Task Memorandums 1, 2, and 3. A bibliography of references follows the text of the report.

Study Area Mapping, Aerial Photography

U.S. Geological Survey (USGS) County Maps at a scale of 1:50,000 were found to be the most helpful in identifying general basin characteristics and in visually identifying the potential reservoir sites for use in the study.

A small scale (approximately 1:250,000) aerial photograph was acquired which covers the majority of the study area including the potential reservoir sites under

consideration. This photo was obtained from the National Cartographic Information Center and is a composite of satellite images taken in June, 1983.

The reconnaissance nature of this study dictated that a small scale base map be prepared on which could be shown the major features of the basin which influence water availability. The study base map, Figure I-1, was developed from the general map included in a USBR report (USBR,1955).

Interviews

During the course of the study, various interviews were conducted with parties knowledgeable about water resources of the Rio Grande Basin. Results of these interviews were incorporated into the study and are reflected in information contained in this report.

The interviewed parties included:

1) Jeris Danielson, Colorado State Engineer, and Hal Simpson, the Deputy State Engineer, who are responsible for administration of the Rio Grande Compact.
1) Colorado State Engineer's staff involved in data collection efforts in the San Luis Valley.
3) Steve Vandiver, the Division 3 Engineer, and Max Nash, the Water District 20 Commissioner, responsible for water administration of the Rio Grande mainstem.
4) Ralph Curtis of the Rio Grande Water Conservation District, who has personally developed extensive information on the agricultural base of the study area.
5) Lee Wheeler of Agro Engineering who, as a local agricultural consultant, has gained extensive familiarity with agricultural use efficiencies, cropping patterns, etc.
6) Duane Helton, Tipton & Kalmbach Engineers (T&K), representing the Rio Grande Water Users Association.

I.3 POTENTIAL RESERVOIR SITES

Two of the four potential reservoir sites at which water availability was to be investigated were indicated in the Request for Proposals while the remaining two specific sites were to be selected as part of this study.

The pre-determined potential reservoir sites to be investigated were described as follows:

1. On the mainstem of the Rio Grande immediately above the confluence with Goose Creek (referred to as Wagon Wheel Gap site).

2. On the mainstem of the Rio Grande immediately below the confluence with Trout Creek (referred to in previous studies as the Vega Sylvestre site).

The Request for Proposal identified two river reaches, as described below, for location of the remaining two potential reservoir sites (one in each reach):

3. On the mainstem of the Rio Grande from below the confluence with Goose Creek to above the confluence with the South Fork of the Rio Grande.

4. On the mainstem of the South Fork of the Rio Grande above the confluence with Beaver Creek.

The nature of this study dictates that site selection be based primarily on factors influencing physical and legal water availability rather than factors such as geologic conditions, road relocation, land ownership, cost of dams or environmental impact. Consideration of these other factors are left for subsequent studies.

Discussed below are 1) the Wagon Wheel Gap site, 2) the Vega Sylvestre site, 3) three potential storage sites on the Rio Grande reach from Goose Creek to South Fork, and 4) three potential storage sites on the South Fork upstream of its confluence with Beaver Creek. Based on the evaluations discussed below, the following four potential dam sites were included in the water availability analyses for the Rio Grande Water Supply Study - Phase I.

- Wagon Wheel Gap (WWG) dam site

- Vega Sylvestre (Vega) dam site
- Rio Grande 1 (RG1) dam site
- South Fork 1 (SF1) dam site

I.3.1 Wagon Wheel Gap Site

A large reservoir at the Wagon Wheel Gap site has been proposed for many years. In 1938, a report on the development of the entire Rio Grande Basin prepared by the National Resources Committee (NRC) recommended a Wagon Wheel Gap reservoir as part of Rio Grande Division of the San Luis Valley Project (NRC, 1938). In 1939, both the Bureau of Reclamation, in its Project Investigation Report No. 38, and R. J. Tipton (Tipton, 1939) prepared reports recommending the construction of a reservoir with 1,000,000 af capacity at the Wagon Wheel Gap site. The 1939 reports were used in the preparation of a report (printed as House Document 693, 76th Congress, 3rd Session) by the Bureau of Reclamation which served as the basis for the 1940 Congressional authorization of the San Luis Valley Project. The 1940 authorization included the construction of the Wagon Wheel Gap reservoir with a capacity of 1,000,000 af for joint irrigation and flood control purposes and provision for future development of power. In 1955, the Bureau of Reclamation prepared a report (USBR, 1955) to support a supplemental Congressional authorization for the construction of a 500,000 af reservoir at Wagon Wheel Gap. At the request of local interests in the San Luis Valley, the 1955 USBR report was never transmitted to Congress.

The Wagon Wheel Gap dam site is located on the Rio Grande mainstem approximately 32 miles upstream of Del Norte. The location of the dam would be in Section 26, Township 41 North, Range 1 East, New Mexico Principal Meridian. Previous studies have found the dam site to have satisfactory geological conditions which would allow little seepage. This dam site has been determined in previous studies to be well suited to a concrete - arch dam.

The general location of the dam site is shown on Figure I-2. Major characteristics for a 1,000,000 acre-foot reservoir (NRC, 1938) and a 500,000 acre-foot reservoir (USBR, 1955) are shown in Table I-1.

Table I-1
Wagon Wheel Gap Reservoir Characteristics

Storage capacity (af).....	1,000,000	500,000
Dam crest length (ft).....	1,200	975
Dam height (ft above river level).....	340	260
Top of dam - (ft above msl).....	8,780	8,700
Reservoir length (miles).....	11.8	9.8
Drainage Area (sq mi).....	------- 751	-------
Estimated Mean Annual Runoff (1948-85, af)..	------ 386,500	-------

A stream gage (USGS number 8217500) was placed in the vicinity of, but downstream of, the dam site in 1951 with a drainage area of 780 square miles. The average annual streamflow for 1952 through 1985 at this gaging site approximates 380,000 af.

I.3.2 Vega Sylvestre Reservoir Site

The Vega Sylvestre dam site is often considered an alternative to the Wagon Wheel Gap site. The primary dam site is located on the Rio Grande mainstem approximately 17 miles upstream of the Wagon Wheel Gap site in Section 18, Township 40 North, Range 1 West, New Mexico Principal Meridian. The reservoir proposed in the 1938 report would have required a saddle dam or dike west of the primary dam.

The approximate location of the dam site is shown on Figure I-2. Major characteristics of the reservoir proposed in the 1938 report are shown below:

Table I-2
Vega Sylvestre Reservoir Characteristics

Storage capacity.....	240,000 acre-feet
Primary dam crest length.....	3,700 feet
Primary dam height (above river level).....	125 feet
Top of dam elevation above mean sea level...	8,970 feet
Saddle dam crest length.....	2,700 feet
Reservoir length.....	7.1 miles
Drainage area.....	528 sq miles
Estimated Mean Annual Runoff (1948-85).....	281,100 acre-feet

Previous studies have classified the site as a poor geologic dam site since it would require extensive corrective designs to overcome inherently dangerous characteristics (including a fractured left abutment and a right abutment so deep

that it might not be economically reached by the dam). Previous plans for the dam have called for a rolled earth-fill and rock-fill dam.

I.3.3 Rio Grande Mainstem Potential Reservoir Sites

Three potential reservoir sites on the Rio Grande from Goose Creek to South Fork were visually identified using USGS county maps at a scale of 1:50,000. These three candidates are labeled starting with the most downstream site as Rio Grande 1 (RG1), Rio Grande 2 (RG2), and Rio Grande 3 (RG3). Figure I-2 shows the general location of the sites. Selected characteristics of a potential 500,000 acre-foot reservoir at each site are given in Table I-3 to allow comparisons between the sites.

Table I-3
Potential Rio Grande Mainstem Reservoir Characteristics

	RG1	RG2	RG3
Dam location (section,twn,rng).....	29,40N,3E	19,40N,3E	4,40N,2E
Storage capacity (af).....	500,000	500,000	500,000
Top of Dam elevation (ft,msl).....	8,500	8,555	8,630
Dam crest length (ft).....	3,160	2,660	1,670
Dam height (ft above river).....	300	315	300
Surface area (acres).....	4,100	4,470	5,030
Reservoir length (miles).....	15	16	12
Drainage area (square miles).....	925	905	894
Est. Mean Annual Runoff (1948-85,af)..	448,100	442,000	439,000

Investigations of water available to a new reservoir should consider both physical and legal constraints. It is worthwhile then to explore the three mainstem reservoir candidates for significant differences in major water rights or major inflows.

It is estimated that the unit runoff from the tributary area between RG1 and RG3 approximates 300 acre-feet per square mile. This is less than the unit runoff of approximately 480 acre-feet per square mile indicated by the gaging stations of the Rio Grande and Goose Creek near Wagon Wheel Gap and reflects the lesser mean altitude of the contributing area between RG1 and RG3. Using 300 acre-feet of runoff per square mile, it is estimated that the area between the RG1 and RG2 sites contributes approximately 6,000 af annually and the area between the RG2 and RG3

sites contributes approximately 3,000 af annually. These tributary inflows are not significant when one compares those inflows to the total average (1955-1984) annual runoff of approximately 420,000 acre-feet available to any of the sites.

The water rights listing has been reviewed for the reach between RG1 and RG3 and only one small ditch (less than 1 cubic feet per second (cfs) of decreed amount) was found. Therefore, it appears that the three potential reservoir sites have virtually the same legal water availability.

Since there are no major inflows or water rights on the Rio Grande from Goose Creek to the South Fork which would significantly influence water availability, it would make little difference for the water availability study whether RG1, RG2 or RG3 was selected for the analysis. Since RG1 has greater physical flow availability, the RG1 site was selected for the water availability analyses.

I.3.4 South Fork Potential Reservoir Sites

Three potential reservoir sites on the South Fork mainstem upstream of the confluence with Beaver Creek were visually identified using USGS county maps (scale of 1:50,000). These three candidates were labeled starting with the most downstream site as South Fork 1 (SF1), South Fork 2 (SF2), and South Fork 3 (SF3) and are shown on Figure I-2. To allow comparisons between the SF1 and SF2 sites, physical parameters were estimated for a 150,000 acre-foot reservoir at the SF1 and SF2 sites. Since the SF3 site would require an exceptionally high dam to store 150,000 af, parameters for the SF3 site were based on a reservoir of approximately 100,000 acre-feet. These parameters are presented in Table I-4.

Table I-4
Potential South Fork Reservoir Characteristics

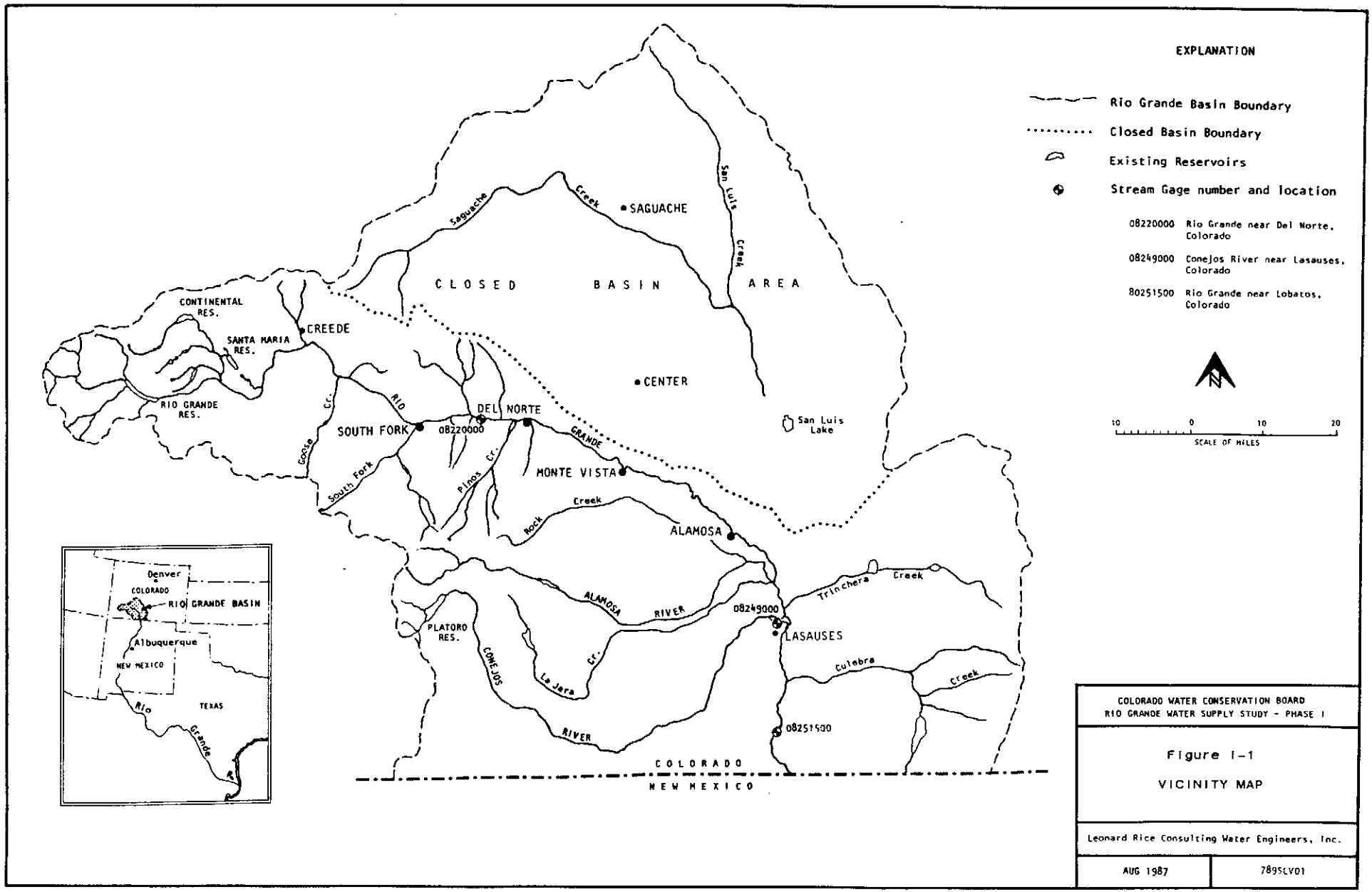
	SF1	SF2	SF3
Dam location (sec,twn,rng).....	19,39N,3E	25,39N,2E	9,38N,2E
Storage capacity (af).....	150,000	150,000	100,000
Top of Dam elevation (ft,msl)....	8,735	8,820	9,280
Dam crest length (ft).....	1,950	1,510	1,350
Dam height (ft above river).....	320	360	460
Surface area (acres).....	1,010	960	850
Reservoir length (miles).....	4.5	3.8	3
Drainage area (square miles).....	129	119	59
Est. Mean Runoff (1948-1985, af).	87,300	80,700	40,700

When considering which of the three South Fork sites to consider in the water availability analyses, an investigation was made of significant differences in flow or water rights among the sites.

Since the gaged South Fork average annual flow (1955-1984) at South Fork approximates 143,000 acre-feet and the reported drainage basin area is 216 square miles, the average yield per square mile in the basin is approximately 660 acre-feet. If one assumes this number is representative of drainage areas between SF1 and SF3, the tributary inflow between SF1 and SF2 is estimated to approximate 6,600 acre-feet on an average annual basis and the tributary inflow between SF2 and SF3 to approximate 40,000 acre-feet on an average annual basis. These tributary inflows are significant when compared to the flow of the South Fork Basin.

An inspection of the tabulation of South Fork water rights indicates that there are no direct flow or storage rights between SF1 and SF3. Therefore, it appears as though the three potential reservoir sites have virtually the same legal water availability.

While the legal water availability at each of the South Fork candidate dam sites is expected to be the same, the physical flow availability between the sites differs significantly. Considering the physical flow advantage which the SF1 site has, the SF1 site was selected for the water availability analyses.



COLORADO WATER CONSERVATION BOARD
RIO GRANDE WATER SUPPLY STUDY - PHASE I

Figure 1-1

VICINITY MAP

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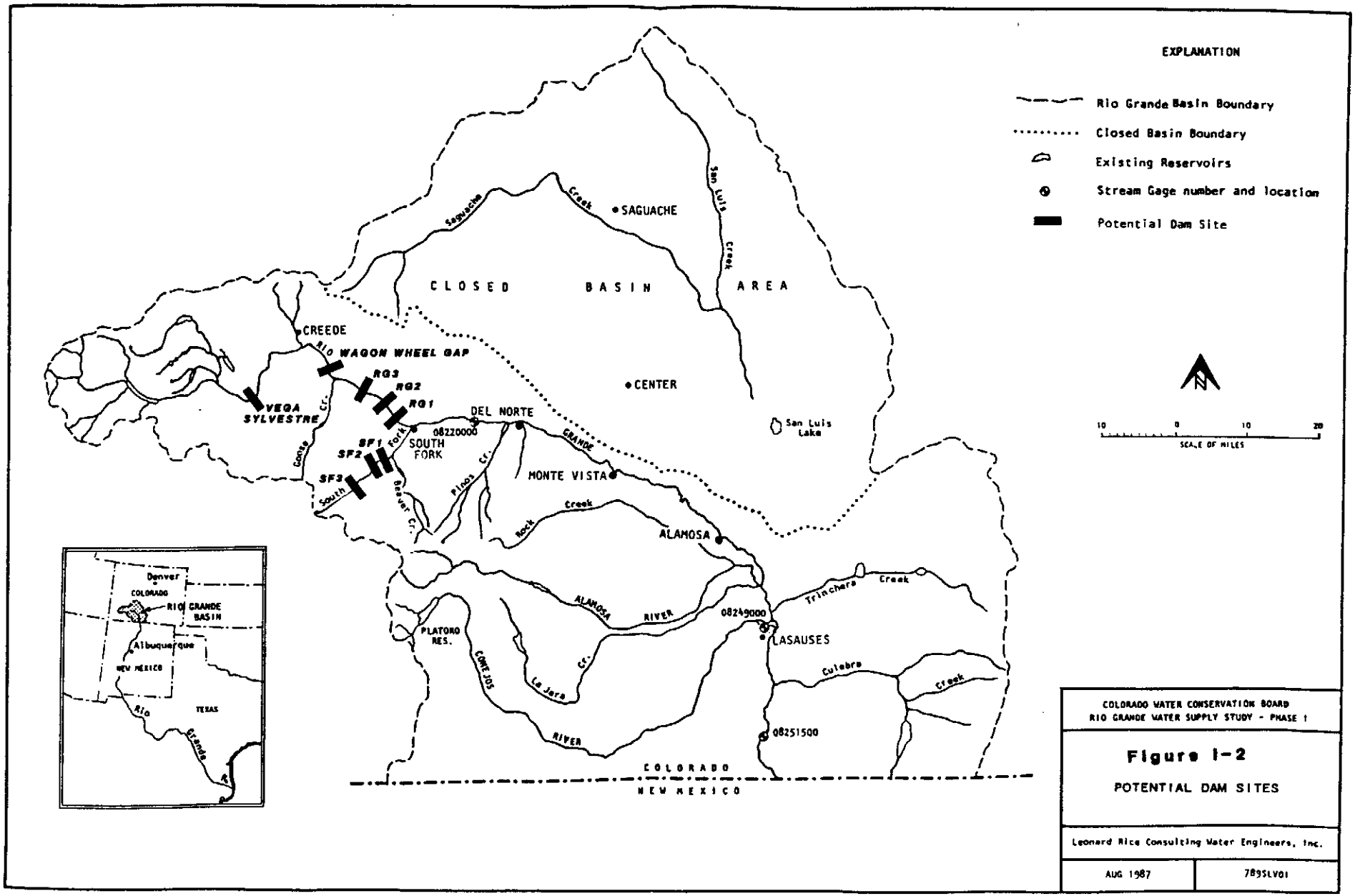
EXPLANATION
Rio Grande Basin Boundary
Closed Basin Boundary
Existing Reservoirs
Stream Gage number and location
Potential Dam Site
CLOSED BASIN AREA
CREEDE
WAGON WHEEL GAP
RG3
RG2
RG1
VEGA SYLVESTRE
SF1
SF2
SF3
SOUTH FORK
08220000
DEL NORTE
CENTER
SAGUACHE
San Luis Creek
San Luis Lake
MONTE VISTA
ALAMOSA
PLATORO RES.
ALAMOSA RIVER
08249000
LASAUSES
Trinchera Creek
Culebra Creek
08251500
COLORADO
NEW MEXICO
Denver
COLORADO
RIO GRANDE BASIN
Albuquerque
NEW MEXICO
TEXAS
10 0 10 20
SCALE OF MILES
COLORADO WATER CONSERVATION BOARD
RIO GRANDE WATER SUPPLY STUDY - PHASE I
Figure I-2
POTENTIAL DAM SITES
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II. BASIN SETTING

General knowledge about features of a river basin which influence water availability is a pre-requisite for a water availability study. The following sections describe aspects of the Rio Grande Basin which influence water availability and which have been incorporated into the Rio Grande Water Supply Study - Phase I.

II.1 LOCATION AND PHYSIOGRAPHY

The Rio Grande Basin within Colorado is located in south central Colorado and encompasses approximately 7500 square miles (USDA,1978). The primary feature of the basin is an open, almost treeless, relatively flat valley floor (known as the San Luis Valley) surrounded by mountains. The valley ranges in elevation from 7,440 feet to 8,000 feet and is bounded on the west by the San Juan Mountains and on the east by the Sangre de Cristo Mountains.

Approximately 3000 square miles (of the 7500 square miles) in the northern part of the valley (see Figure I-1) is separated from the lest of the valley by a low divide formed by the alluvial fan of the Rio Grande on the west and alluvial material from the Sangre de Cristo mountains on the east. This area is known as the Closed Basin.

The Rio Grande mainstem rises in the San Juan Mountains and flows easterly where it is joined by the South Fork of the Rio Grande at South Fork, Colorado. The mainstem continues east to Del Norte where the Rio Grande flows onto the San Luis Valley floor and begins flowing in a southeasterly direction. The mainstem continues this path through Monte Vista and Alamosa until near its confluence with the Conejos River, the most significant tributary to the Rio Grande in Colorado. The Rio Grande then flows south into the Rio Grande Canyon on its way to the state-line.

II.2 CLIMATE

Mean monthly temperatures, total monthly precipitation and dates of first and last frosts have been collected and placed on the LRCWE computer for the Alamosa, Center and Del Norte, weather stations. The valley floor is considered to be a high

mountain desert with cool summers and cold winters. Table II-1 indicates average annual temperatures, precipitation, and length of growing seasons at several weather stations on the valley floor.

Table II-1
Selected Rio Grande Basin Climate Characteristics
1948-1985

	Annual Mean Temperature (deg F)	Average Annual Precipitation (inches)	Growing Season between 28 deg frosts (Days/Year)
Alamosa	41.2	7.2	119
Center	41.0	6.9	122
Del Norte	43.1	9.8	144

Temperatures range from the extremely cold (it is not uncommon to have winter temperatures of 30 degrees below zero) to moderately hot (90 degrees Fahrenheit in summer). Most of the precipitation on the valley floor comes in the form of scattered summer afternoon rain showers. Monthly average temperatures and precipitation at Alamosa are presented in Table II-2.

Table II-2
Monthly Average Annual (1948-1985) Temperature and Precipitation
For Alamosa Weather Station

	Temperature (^{o}F)		Precipitation (inches)
January	16.0		.26
February	22.5		.27
March	31.6		.39
April	40.8		.47
May	50.4		.67
June	59.6		.60
July	65.0		1.15
August	62.4		1.11
September	55.1		.77
October	43.7		.67
November	29.5		.35
December	18.4		.37
Average	41.3	Total	7.08

Areas in the higher elevations of the Rio Grande Basin receive 14 to 45 inches of annual precipitation while the areas in the foothills receive 9 to 14 inches.

Despite its high altitude, low precipitation and relatively short growing season, the valley sustains a productive agricultural economy. The primary crops include potatoes, barley and alfalfa.

II.3 WATER SUPPLY

The valley derives its water from surface and ground water sources. Overall streamflow originates mainly from snowmelt on the San Juan and Sangre de Cristo Mountains. The average annual (1924-69) water supply these mountains contribute to the San Luis Valley has been estimated at 1.6 million acre-feet (Emery, 1973). Approximately 225,000 acre-feet of the 1.6 million acre-feet was estimated by Emery to accrue to the Closed Basin. A total annual water supply of 2.8 million acre-feet to the San Luis Valley was derived by Emery by adding the 1.6 million acre-feet of mountain contribution to 1.2 million acre-feet of estimated precipitation on the valley floor.

Data for selected gaging stations shown in Table II-3 were collected and placed on the LRCWE computer system. Of particular importance to this study is the gaging station on the Rio Grande near Del Norte because of its proximity to the potential reservoir sites and its importance in the Rio Grande Compact. The average annual monthly flow distribution for the 1890 to 1985 period of record at this gage is shown on Figure II-1.

The 6,000 feet of fill below the valley surface has been estimated to contain approximately two billion acre-feet of water (USDA, 1978). This water is considered to be located in two major aquifers, 1) a confined system existing below clay barriers, and 2) an unconfined aquifer above these barriers. The unconfined ground water system functions in a manner similar to a surface reservoir with a pattern of rising levels in the spring and early summer due to recharge from streams and irrigation return flows, followed by a decline as the streamflow decreases and pumping increases.

The relation of the ground water system to the surface water system is not well understood and has been the subject of various studies (Emery, 1972; Hearne,1988;

Table II-3

SELECTED STREAM GAGES OF THE UPPER RIO GRANDE BASIN IN COLORADO

USGS #	STREAM GAGING STATION	DRAINAGE AREA (SQUARE MI)	YEARS OF RECORD	AVG. FLOW (AF)	MAX. FLOW (CFS)
8217500	Rio Grande at Wagonwheel Gap, Co	780	1952-1985	378200	5190
8218500	Goose Creek at Wagonwheel Gap, Co	90	1955-1985	44260	879
8219500	S. Fork Rio Grande at S. Fork, Co	216	1911-22,37-85	153600	8000
8220000	Rio Grande near Del Norte, Co	1320	1890-1985	653500	18000
8221500	Rio Grande near Monte Vista, Co	1590	1927-1980	239800	18500
8223000	Rio Grande at Alamosa, Co	1710	1913-1985	181100	14000
8246500	Conejos River near Mogote, Co	282	1904-05,12-85	242000	9000
8247500	San Antonio River at Ortiz, Co	110	1940-1985	18690	1750
8248000	Los Pinos River near Ortiz, Co	167	1916-20,25-85	86940	3160
8249000	Conejos River near LaSauses, Co	887	1922-1985	135500	3890
8251500	Rio Grande near Lobatos, Co	4700(1)	1931-1985	313700	13200

(1) DOES NOT INCLUDE APPROXIMATELY 3,000 SQUARE MILES IN CLOSED BASIN.

etc.). Studies to date have yet to establish a definite relationship between surface and ground water, and ground water was not considered in this study except implicitly in the return flow analysis.

II.4 WATER USE

The following sections provide a perspective on the historic and current use of water in the Rio Grande Basin within Colorado.

II.4.1. Institutional Setting

Allocation of water to water rights in the Rio Grande Basin within Colorado is performed by the Colorado State Engineer and his agents: the Division 3 (Rio Grande Basin) Engineer, and several Water Commissioners. See Sections III and IV for additional information on water rights administration and the Rio Grande Compact.

The Rio Grande Water Conservation District was created in 1967 by Article 48, Title 37, Colorado Revised Statues. The functions of the Rio Grande Water Conservation District include promotion of water projects in the San Luis Valley, development of water policy, coordination of legal and engineering matters affecting the Valley and assistance to other entities in developing projects. The Rio Grande Water Conservation District, as primary sponsor of the Closed Basin Project, contracted with the U.S. Department of Interior, Bureau of Reclamation, to construct and operate the Closed Basin Project.

There are five conservancy districts (formed under Article 45, Title 37, CRS) in the Rio Grande Basin in Colorado. The San Luis Valley Water Conservancy District includes areas of Alamosa, Rio Grande and Saguache Counties, is active in matters related to mainstem and is the principal sponsor of this study. The Conejos Water Conservancy District includes essentially the southern half of Conejos County and is the entity which contracted with the Bureau of Reclamation to build and operate Platoro Reservoir. The other three conservancy districts are Alamosa-La Jara, Costilla, and Trinchera.

The Rio Grande Water Users Association is an organization of 20 of the largest ditches which divert from the mainstem of the Rio Grande, and includes companies which own and operate the Continental, Rio Grande (Farmer's Union), and Santa Maria Reservoirs. There are also other organizations of water users, including the San Luis Valley Irrigation Well Owners Association, and the Rio Grande Canal Water Users Association.

II.4.2. History of Water Development

Development of the water uses in the Rio Grande Basin within Colorado began in the early 1850's on the Conejos River. The first appropriation on the Rio Grande mainstem was in 1866. Extensive irrigation development on both rivers occurred in the period from 1880 to 1890. By 1900, all surface streams in the San Luis Valley were considered to be fully appropriated except during periods of much greater than average runoff.

Water development in Colorado accompanied by water development in New Mexico was cited as the cause of water shortages in the El Paso, Texas region and Mexico during the 1890's. In 1895, the Republic of Mexico filed a $ 35 million suit against the United States to recover the value of lost crops caused by water shortages on the Rio Grande. As a result of this claim, the US Secretary of the Interior imposed restrictions in 1896 on upper Rio Grande Basin reservoir construction by preventing the granting of rights-of-way over public lands (this restriction was removed in 1925).

After lengthy negotiations between the United States and the Republic of Mexico, the Treaty of 1906 was signed. The treaty provides that "the United States shall deliver to Mexico a total of 60,000 acre-feet annually in the bed of the Rio Grande...above the City of Juarez, Mexico ..."

As a means of enhancing the water supply to users on the Lower Rio Grande, the Rio Grande Project, a large irrigation and water storage project at Elephant Butte, New Mexico, was conceived (see Figure II-2). A feasibility report on the Rio Grande Project was prepared in 1904 and used to support the 1905 authorization of the Rio Grande Project. Physical features of the project include Elephant Butte and Caballo Reservoirs, 6 diversion dams, 141 miles of canal, 462 miles of laterals, 457 miles of drains, and a hydroelectric powerplant. Construction of the 2.1 million af capacity Elephant Butte Reservoir, was initiated in 1908 and completed in 1916. Caballo Reservoir (approximately 350,000 af capacity) was constructed from 1936 to 1938.

From 1912 to 1925, three reservoirs were constructed in the upper Rio Grande Basin (upstream of Del Norte, Colorado) to provide storage regulation of irrigation water. These reservoirs were the 51,110 af capacity Rio Grande Reservoir, the 43,570 af capacity Santa Maria Reservoir and the 26,720 af capacity Continental Reservoir.

When the United States Supreme Court articulated the doctrine of equitable apportionment in the 1906 case of Kansas v. Colorado, the door was opened for the assertion of rights to Rio Grande water by New Mexico and Texas. Following the signing of a temporary compact between Colorado, New Mexico and Texas in 1929,

compact commissioners were appointed and charged with preparing a compact which equitably apportioned the waters of the Rio Grande.

In 1935, a Presidential mandate dictated that water development projects involving the use of Rio Grande waters were not to be approved unless an opinion is obtained from the National Resources Committee. The study of the National Resources Committee, officially known as the Rio Grande Joint Investigation, was performed during 1936 and 1937. At the time, the investigation (NRC, 1938) was believed to have been the most comprehensive and detailed study ever made of water and land resources of a river basin in the arid West.

The Rio Grande Joint Investigation was provided to the Rio Grande Compact Commissioners in June, 1937 and provided factual data for further negotiations between the three states. The Rio Grande Compact was signed by the Compact Commissioners of Colorado, New Mexico and Texas on March 18, 1938. After ratification by the state legislatures and consent of the U.S. Congress, it became effective in 1940. A copy of the Compact is included as Appendix B.

The Rio Grande Joint Investigation also recommended a plan of development for the San Luis Valley Project. As authorized by Congress in 1940 and described in House Document 693, the San Luis Valley Project included a Rio Grande element (i.e. the Wagon Wheel Gap dam), a Conejos River element (Platoro Reservoir), and a Closed Basin element (i.e. Closed Basin Drain). The primary purposes of the San Luis Valley Project were to assist Colorado in meeting its commitments to New Mexico and Texas under the Rio Grande Compact and to assist the United States in meeting its commitments to Mexico under the Treaty of 1906.

A 1947 "Supplemental Report, Conejos Division, San Luis Valley Project, Rio Grande Basin, Colorado" prepared by the USBR recommended the construction of Platoro Reservoir in the Conejos River Basin. Construction of Platoro Reservoir (67,800 af capacity) was initiated in 1949 and completed in 1951. Reservoirs constructed after 1937 are subject to special restrictions of the Compact and therefore are referred to as post-1937 or post-Compact reservoirs.

Extensive development of ground water resources in the San Luis Valley for irrigation began about 1950. The number of large capacity (yield more than 300 gallons per minute) irrigation wells (unconfined or confined aquifers) increased from approximately 200 in 1940 to approximately 2,900 in 1969 (Emery, 1972).

Colorado had considerable difficulty in meeting its Rio Grande Compact obligations in many of the years from 1952 through the late 1960's. A lawsuit (Texas and New Mexico v. Colorado) was filed in the US Supreme Court in 1966 with Colorado's debt of almost 945,000 acre-feet as the central issue. This action led to a stipulation in which Colorado agreed to deliver its Compact Commitment without building up any further debt of water.

In 1970, the Colorado State Engineer restricted the issuing of new well permits for confined and unconfined aquifers outside of the Closed Basin and the confined aquifer in the Closed Basin.

The Closed Basin Division of the San Luis Valley Project was authorized by Congress on October 20, 1972. This authorization was subsequently amended in 1980, 1984 and 1988. This project is designed to salvage and deliver to the Rio Grande, water which would have been non-beneficially consumed in the Closed Basin of the northern San Luis Valley. Construction of the Closed Basin Project was initiated in 1980 and is expected to be completed some time in the 1990's.

Irrigation with sprinkler systems became common during the 1970's. The total number of sprinkler system increased from 262 in 1973 to 1,541 in 1980 (Hearne, 988). Most of the sprinkler systems are in the Closed Basin area.

In 1975, the State Engineer proposed rules for administration of ground water in the Valley. After a lengthy trial, the Colorado Supreme Court in 1983 disapproved rules for massive ground water curtailment and remanded the proposed rules to the State Engineer. In 1981, the State Engineer's office stopped issuing well permits for the Closed Basin unconfined aquifer. Resolutions of San Luis Valley water users in 1985 resolved much of the conflict which prompted the State Engineer's 1975 proposed rules.

With the 1985 spilling of Rio Grande Project Storage, Colorado's accrued Rio Grande Compact debits were eliminated and the US Supreme Court dismissed with prejudice the Texas and New Mexico v. Colorado lawsuit.

II.4.3. Basin Water Use

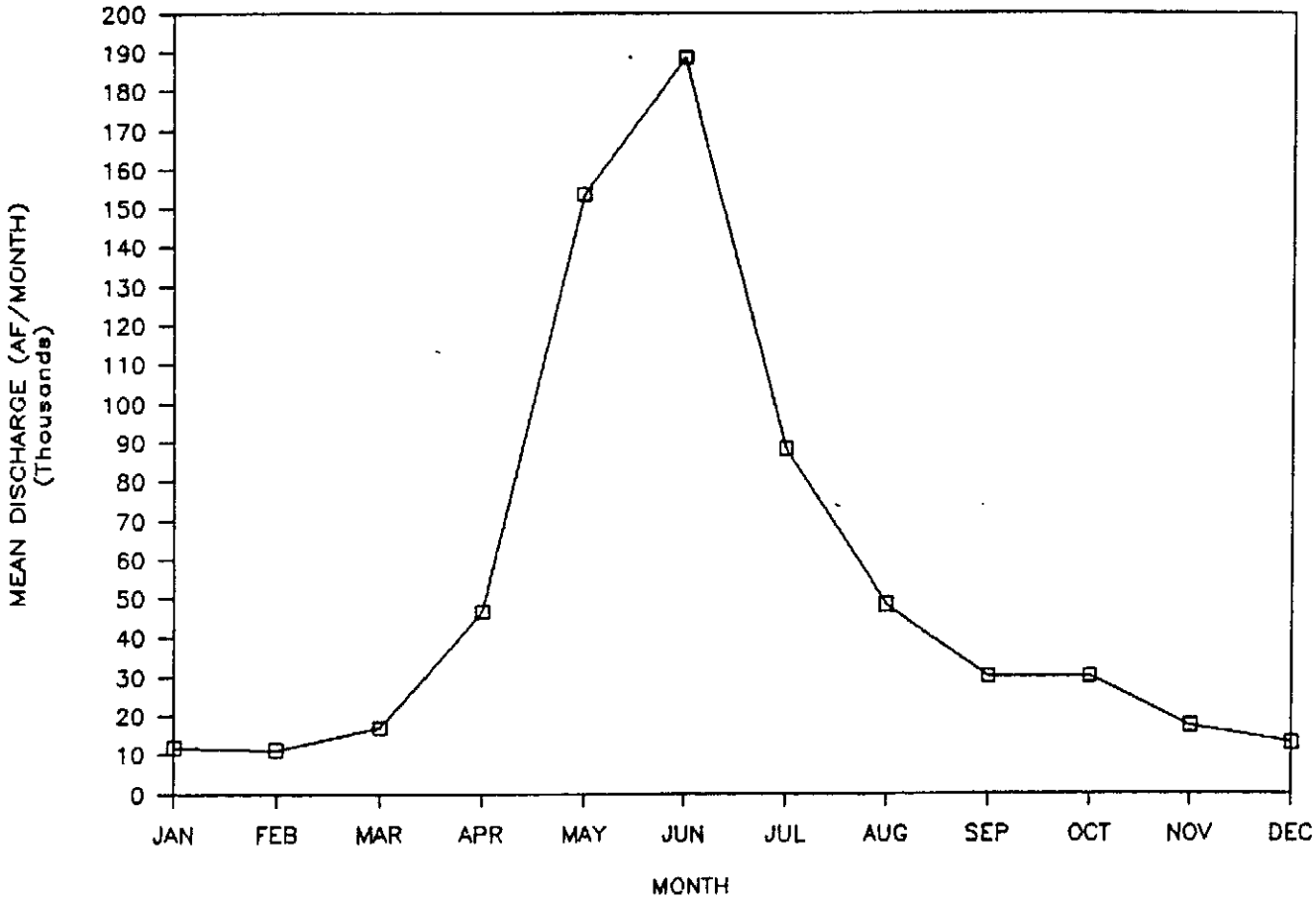
Agricultural activities account for greater than 95% of basin water consumption. Emery (1973) estimated that 1.4 million acre-feet on an average annual basis (1924-1969) is consumed by crops in the San Luis Valley and about 1 million acre-feet is consumed by non-crop vegetation. The total annual consumption (2.4 million acre-feet) is estimated at 86 percent of the water estimated to be entering the San Luis Valley.

During the 1961 through 1970 period, Emery estimated that total water diverted from streams and withdrawn from wells averaged 1.85 million acre-feet per year. Ground water withdrawals approximate 25 percent of the total water used for irrigation from 1950 through 1969 (Emery,1972). The unconfined aquifer is the principal source of ground water for irrigation, and in 1969 the unconfined aquifer supplied approximately 80 percent of the ground water withdrawn from large capacity wells.

Based on USBR compilations of 1950 through 1985 mainstem diversion records for direct flow water rights, average annual diversions were approximately 520,000 acre-feet. Active administration of the Rio Grande Compact began in 1968 and often required significant diversion curtailment of Colorado water users. Table II-4 lists the eleven mainstem ditches with the largest diversions. The ditches in the following list divert approximately 82 percent of the total direct flow mainstem diversions, with the Rio Grande Canal itself accounting for approximately one-third of the total. The following table also indicates whether the ditch diverts from the north or south bank of the Rio Grande. The majority of north bank diversions are transported into the Closed Basin (see Section V) and produce no return flows to the Rio Grande mainstem.

Table II-4
Largest Rio Grande Mainstem Ditches

Ditch	Avg Diversions af (1950-85)	Diversion Location
Rio Grande Canal	179,954	North
Empire Canal	49,046	South
Farmers Union	48,275	North
Monte Vista Canal	34,004	South
Centennial Ditch	20,928	South
San Luis Valley Canal	19,683	North
Excelsior Ditch	19,603	North
Rio Grande Piedra Valley	17,321	South
Prairie Ditch	15,471	North
Costilla Canal	9,688	North
Rio Grande & Lariat Ditch	9,205	South
Total	423,178	



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RIO GRANDE WATER SUPPLY STUDY - PHASE I

Figure II-1

RIO GRANDE NEAR DEL NORTE, CO
MEAN MONTHLY FLOWS (1890-1985)

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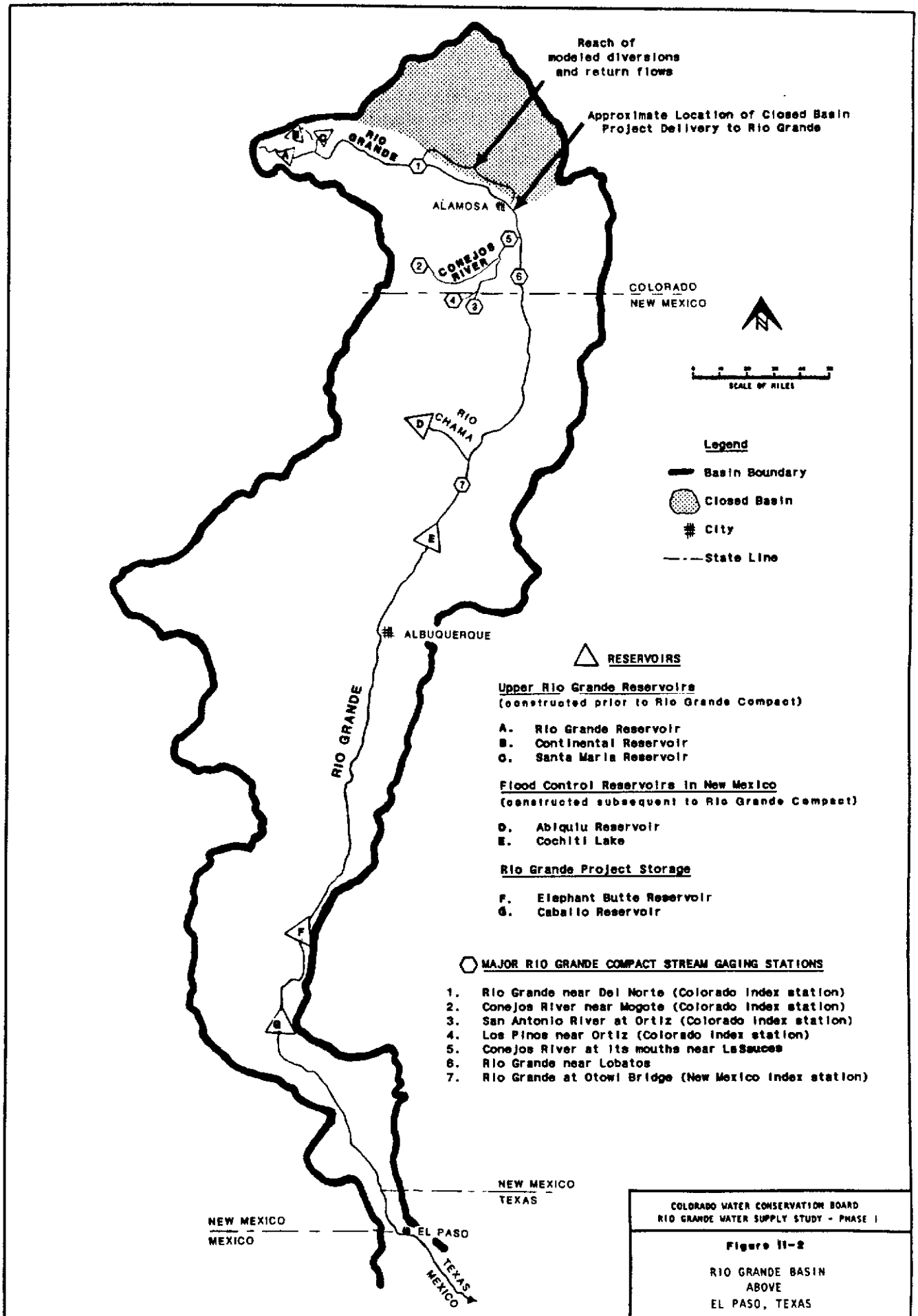

COLORADO WATER CONSERVATION BOARD
RIO GRANDE WATER SUPPLY STUDY - PHASE I

Figure II-2

RIO GRANDE BASIN
ABOVE
EL PASO, TEXAS

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III. WATER RIGHTS ADMINISTRATION

Water rights administration is an important consideration in an investigation of water availability. Information is given below to allow the reader to better understand the complicated nature of water rights administration in the Rio Grande Basin.

III.1 BACKGROUND

In Colorado, the basic water allocation principle is the prior appropriation doctrine which can be expressed as "first in time, first in right". The appropriation date (date of first plan, construction or use of structure to divert water) and adjudication date (date of judicial proceeding in which a decree is issued defining the right) become the basis for determining which users are entitled to the river flow during a period when there is insufficient water for all appropriators.

Diversions in the Conejos River Basin have not historically been subject to curtailment for the benefit of senior appropriators on the Rio Grande mainstem. Therefore, water use in the Conejos Basin has developed independently of water use on the Rio Grande mainstem and should not significantly affect water availability to a potential reservoir on the Rio Grande mainstem.

Rio Grande water administration is also greatly influenced by the Rio Grande Compact. In 1968, the US Supreme Court issued an order forcing Colorado to meet its Compact delivery. Therefore, since 1968, Colorado water administrators have considered the Rio Grande Compact as an obligation which the State is committed to satisfy, and have often curtailed diversions of Colorado water users to satisfy the Compact obligation. Between 1968 and the spilling of Rio Grande Project Storage in 1985, the State Engineer significantly curtailed diversions of surface water rights on the Rio Grande mainstem and the Conejos to satisfy the Compact. The spilling of Rio Grande Project Storage in 1985 and subsequent years may lead to greater flexibility in the way the river is administered. Additional information on the Compact is contained in Section IV.

III.2 GROUND WATER ADMINISTRATION

Ground water usage complicates water administration in the Rio Grande Basin. As previously indicated, the hydraulic connection between the surface water system and the confined and unconfined aquifers is not well defined. Due in part to this uncertainty, the drilling of irrigation wells, today, is restricted by the State Engineer's Office. Since 1970, no new well permits for new appropriations have been issued for the Closed Basin confined aquifer and any aquifers outside the Closed Basin. Since 1981, no new well permits have been issued for the Closed Basin unconfined aquifer.

The State Engineer proposed rules in the late 1970's which would have curtailed well diversions unless individual well owners could prove that either their wells do not injure senior rights or that sufficient water augmentation plans are in place to protect the senior rights. Litigation over the proposed rules and regulations resulted in a decision of the Colorado Supreme Court (Matter of Rules and Regulation, 674 P.2d 914, Colo. 1983) which remanded the rules and regulations to the State Engineer for further consideration. Meanwhile, Compact administration continued as before.

Since the Supreme Court ruling, water users in the basin have worked together to resolve many of the issues which prompted the State Engineer's proposed rules. Agreements signed in 1985 between representatives of the major San Luis Valley water users allowed for distribution of water from the Closed Basin (see Section V for a discussion of the Closed Basin Project) and continued ground water pumping. Since these agreements address some of the major issues involved in the rules and regulations remanded to the State Engineer, new rules and regulations have not been proposed by the State Engineer.

III.3 SURFACE WATER ADMINISTRATION

The potential reservoir sites at which water availability was investigated in this study are located in an administrative region referred to as Water District 20 or District 20 of Water Division No. 3. District 20 includes the headwaters of the Rio Grande and the Rio Grande mainstem to its confluence with the Conejos River as

shown on Figure II-3. Almost all of the mainstem water rights from the Rio Grande headwaters to the stateline are in District 20. Of the mainstem water rights from the confluence with the South Fork to the stateline, all but one are in District 20. The listing of approximately 310 mainstem water rights in District 20 (prepared by the water administrators) has been included as Appendix A.

Since water districts other than District 20 lack major mainstem water rights which would significantly affect water availability at the potential reservoir sites, investigations of water administration in these districts were not considered.

Interviews were conducted with Steve Vandiver, the Division 3 Engineer, and Max Nash, the District 20 Water Commissioner, to learn about water administration which would affect water availability to a new reservoir. The steps performed in allocating water in District 20 are summarized below.

1. Based on runoff forecasts issued prior to the runoff season, the Division Engineer estimates the portion of the Rio Grande flows at Del Norte which are required to satisfy the Rio Grande Compact and provides the Water District 20 Commissioner with a "curtailment percentage" of Del Norte flows which have to be passed during the irrigation season to satisfy Compact obligations. See Section IV for more detailed discussion of the factors involved in this determination.

2. In determining the Del Norte flows available for allocation, the water commissioner first subtracts the transmountain diversions and reservoir releases from the measured Del Norte flow. The transmountain diversions and reservoir releases are not available for general allocation since they are designated for particular diversion systems.

3. The water commissioner then determines the water available for allocation when considering the Compact. To do this the flow calculated in 2. (adjusted flow) is multiplied by the curtailment percentage and the result is calculated flow. This water is then made available to Colorado water users by proceeding down a list of decreed water rights ranked by priority (Appendix A) and

providing each water right with its decreed amount until all water has been allocated.

4. Periodically (currently every 10 days) during the diversion season, the Division Engineer reviews how well the Compact obligation is being met and may revise the curtailment percentage used by the water commissioner.

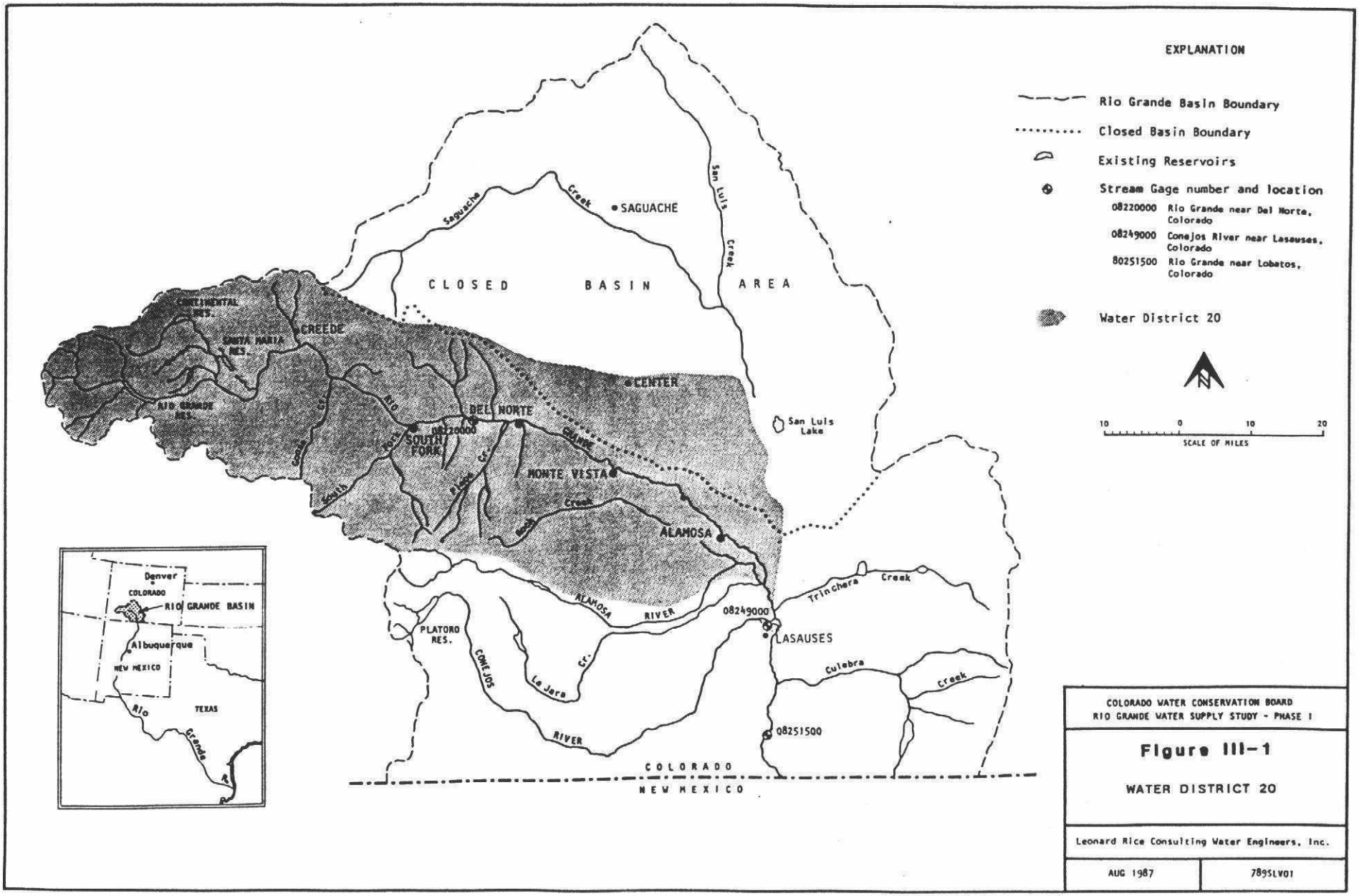
For an example of the process, consider the following information for August 8, 1979.

- Division Engineer's current estimate of curtailment percentage is 55 percent.
- Del Norte total daily flow volume is 983.0 second foot days (one cubic foot per second (cfs) times one day).
- Reservoir releases and transmountain diversions contained in the Del Norte gage total 137.8 second foot days.

With this information the water commissioner calculated that 845.2 second foot days (983.0 - 137.8) was available for allocation before consideration of the Compact and 380.3 second foot days (845.2 - (845.2 x .55)) are available for allocation to Colorado water users after consideration of the Compact. The water commissioner then proceeded down the list of water rights allocating water to those wanting water. His record for this day indicates that the last priority served was the 20 cfs decree of the Rio Grande Canal (District Priority No. 197).

Another factor which influences the determination of Del Norte flows required to satisfy the Compact is the importation of water to the Rio Grande by the Closed Basin Project. Closed Basin imports to the Rio Grande mainstem will mean that more of the mainstem and Conejos flows will be available for allocation to Colorado water users. Further discussion of the Closed Basin Project and its consideration in this study may be found in Section V.

The Compact disclaims effect on Indian water rights. For purposes of this study it has been assumed that Indian rights, Federal appropriative and reserved rights, or other presently unadjudicated rights will not affect the Colorado Compact schedules or obligations.



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RIO GRANDE WATER SUPPLY STUDY - PHASE I

Figure III-1

WATER DISTRICT 20

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IV. RIO GRANDE COMPACT

The Rio Grande Compact apportions the flows of the Rio Grande Basin originating above Fort Quitman, Texas, between the States of Colorado, New Mexico and Texas.

IV.1 HISTORY OF COMPACT DEVELOPMENT

When the United States Supreme Court articulated the doctrine of equitable apportionment in the 1906 case of Kansas v. Colorado, the door was opened for the assertion of rights to Rio Grande water by New Mexico and Texas. A temporary five year compact was signed by the legislatures of Colorado, New Mexico and Texas in February 1929. This temporary compact provided that compact commissioners would be appointed by the three states and the U.S. Government and that the commission was to prepare, by June 1935, a compact which equitably apportioned the waters of the Rio Grande. Negotiations between the Compact Commissioners were initiated in December 1934. The three states later extended the life of the temporary compact to June 1936.

The study of the National Resources Committee, officially known as the Rio Grande Joint Investigation, was performed during 1936 and 1937 and was provided to the Commissioners in June, 1937. At the time, the investigation (NRC, 1938) was believed to have been the most comprehensive and detailed study ever made of water and land resources of a river basin in the arid West. The study provided factual data to serve as the basis for further negotiations between the three states. The Colorado Compact obligations established at the Colorado-New Mexico stateline were based on flow relationships found to exist by the Engineer Advisors on the Rio Grande mainstem and Conejos River for the years of 1928 through 1937.

The Compact obligations of New Mexico are measured at the Rio Grande Project in Southern New Mexico (see Section II.4.2). New Mexico's Compact obligations are based on a relationship between the flow of the Rio Grande at Otowi Bridge (upstream of Elephant Butte Reservoir in New Mexico...see Figure II-2) and the Elephant Butte Reservoir effective water supply.

The Compact was signed by the Compact Commissioners of Colorado, New Mexico and Texas on March 18, 1938. After ratification by the state legislatures and consent of the U.S. Congress, it became effective in 1940. A copy of the Compact is included as Appendix B.

IV.2 PURPOSES OF COMPACT

The following two major purposes were indicated by Colorado's original Compact Commissioner, M. C. Hinderlider (1938).

1. To "protect the present and future use of water in the various sections of the Rio Grande Basin by setting up schedules of delivery of water at the Colorado-New Mexico stateline and at San Marcial, which is at the head of the Elephant Butte Reservoir, and by fixing the average annual releases from Elephant Butte Reservoir."

2. To "permit the construction and operation of additional reservoirs above Elephant Butte Reservoir to regulate the water that is being used at the present time, and to capture and make usable, water which otherwise would spill from Elephant Butte Reservoir and be lost for beneficial use in the basin."

IV.3 SUMMARY OF MAJOR COMPACT PROVISIONS AFFECTING NEW STORAGE

The following discussion is of the primary Compact provisions which affect water availability to a new storage project in Colorado. Although the Compact establishes obligations for both Colorado and New Mexico, the Compact provisions affecting Colorado are focused on for this study.

The Colorado-New Mexico stateline Compact obligation is comprised of two parts, one applying to the Conejos River (a major tributary of the Rio Grande in Colorado) and the other to the Rio Grande mainstem. The separation of the stateline obligation into two parts was thought to permit the fixing of responsibility for any depletion and for the proper allocation of credits resulting from new water

development. The Colorado Supreme Court has upheld the Compact administration of the Conejos River separately from that of the Rio Grande.

Figure II-2 is a schematic diagram of the Rio Grande basin upstream of El Paso, Texas and shows the location of gages used in Compact calculations. The amount of water which the Conejos must deliver to the Rio Grande as measured at its mouths near La Sauces is based on flows at the following three gages: a) Conejos at Mogote (full year flow), b) Los Pinos near Ortiz (April-October flow only), c) San Antonio at Ortiz (April-October flow only). The flows at these three gages are added together to obtain the "Conejos Index supply" which is used to determine the Conejos obligation under the Compact in accordance with the table on page B-3 in Appendix B.

The Rio Grande obligation as measured at Lobatos is based on the flow of the Rio Grande at the gaging station on the Rio Grande near Del Norte (full year flow). The table on page B-4 of Appendix B is used to calculate the Compact obligation of the Rio Grande to deliver water at Lobatos. Since the flow contributed by the Conejos is included in the Rio Grande flow measured at Lobatos, the Conejos flow is subtracted from the total flow at Lobatos in calculating the amount of water delivered by the Rio Grande mainstem.

The Compact obligation of the State of Colorado is the sum of the obligation of the Conejos River and the obligation of the Rio Grande mainstem less 10,000 acre-feet. Though the Compact makes no provision for the division of the 10,000 acre-feet between the Conejos and Rio Grande, Colorado's water administrators typically prorate the 10,000 acre-feet to the two rivers on the basis of their calculated Compact obligations.

Compact deliveries are not required to strictly adhere to the tables of delivery on an annual basis. The Compact allows for deviations from the obligations. A shortfall in Colorado's delivery (when compared to Compact obligations) will cause a debit to Colorado's account. Likewise, deliveries in excess of the obligations cause credits to accrue to the State making the deliveries. The credits and debits are allowed to accumulate subject to certain conditions discussed below.

Debits

In the case of Colorado, yearly or accumulated debit departures of as much as 100,000 af from the Compact obligations are allowable for any reason. An additional Compact provision allows the debit to accumulate to over 100,000 af provided that the accumulated debit greater than 100,000 is held in storage. However, Colorado is not to increase storage of post-compact water rights when Rio Grande Project Storage has less than 400,000 af of usable water in storage. If average annual Rio Grande Project releases exceed 790,000 af, then the 400,000 af value would be adjusted downward according to Article 7 of the Rio Grande Compact.

Debit water can be held in post-1937 reservoirs in Colorado subject to the condition that releases of that water may be requested to maintain contents in Rio Grande Project Storage of 600,000 af between March 1 and April 30.

A portion of the water withheld upstream in a "debit" account can be removed from the debit account if it is demonstrated that the water would have caused a spill if released to Rio Grande Project Storage. In any year in which there is an actual spill of usable water at Rio Grande Project Storage, accrued debits of Colorado at the beginning of the year will be cancelled.

Credits

Deliveries of water by Colorado in excess of the Compact obligation create a credit which can be generally used to reduce Colorado accumulated debits or, in the absence of an accumulated debit, can accumulate as credits. The following provisions affect the accumulation of Colorado's credits:

- annual credits are limited to 150,000 acre-feet.
- accrued credits are subject to reduction by evaporation calculated as a proportional share of evaporation incurred on Rio Grande Project Storage.
- accrued credits will be reduced by the amount of a spill at Rio Grande Project Storage.

Since 1) the ability to store debit water in post-1937 reservoirs, 2) the release of debit water stored in post-1937 reservoirs, and 3) the cancellation of accrued debits or credits are tied to capacities of Rio Grande Project Storage, the Compact sets the following limitations:

- a maximum average annual release from Rio Grande Project Storage to Project demand of 790,000 acre-feet. This 790,000 acre-feet includes the 60,000 acre-feet to be delivered to Mexico under the international treaty.
- Rio Grande Project Storage is not to exceed 2,638,860 acre-feet, the original capacity of Elephant Butte and Caballo Reservoirs.

Another major provision of the Compact which may affect a new storage project is that the Compact permits Colorado to increase its consumptive uses of water out of the Rio Grande and Conejos Rivers to the extent that water may be delivered at the stateline from the Closed Basin (subject to certain water quality provisions) (see Section V).

IV.4 COLORADO 1940-1985 OPERATION OF COMPACT

Colorado's credits and debits (as recorded in the annual Rio Grande Compact Commission Reports) of the Rio Grande Compact for 1940 through 1985 are shown in Figure IV-1. There were two years (1942 and 1985) where spill conditions at Rio Grande Project Storage caused the total elimination of accrued credits or debits.

Due to the large debits accrued by Colorado from 1952 through the mid-1960's, a lawsuit (Texas and New Mexico v. Colorado, 391 U.S. 901, 88 S.Ct. 1649, 20 L.Ed.2d 416) was filed in the US Supreme Court in 1966 with Colorado's debt of almost 945,000 acre-feet as the central issue. This action led to a variety of events in the following 13 years which are summarized below.

1968 Colorado entered a stipulation with New Mexico and Texas and agreed to deliver each year's Compact commitment without building up any further debt of water. As indicated in Figure IV-1, Colorado succeeded in meeting this obligation.

1970 The Colorado State Engineer's Office stopped issuing new well permits for the non-Closed Basin aquifers and the Closed Basin confined aquifer.

1975 The Colorado State Engineer proposed rules for administration of ground water in the Valley.

1981 State Engineer's Office stopped issuing well permits for the Closed Basin unconfined aquifer.

1983 After a lengthy trial initiated in 1979 on the proposed rules, the Colorado Supreme Court disapproved rules for massive ground water use curtailment and remanded the proposed rules to the State Engineer while Compact administration continued as before.

1985 Resolutions between San Luis Valley water users resolve much of the conflict which prompted the 1975 proposed rules.

1985 US Supreme Court dismissed with prejudice the Texas and New Mexico v. Colo. lawsuit following the spill of Rio Grande Project Storage.

Since the State Engineer's Office was not allowed to curtail ground water use for benefit of the Compact, the practice of curtailing surface water rights remains the cornerstone of Colorado's effort to satisfy the Compact provisions. This arrangement appears to have been accepted by major water users through resolutions regarding the Closed Basin Project yield (see Section V).

The Rio Grande Compact is considered by Colorado's water administrators to be an obligation the State is committed to satisfy and diversions of Colorado water users have often been curtailed to satisfy Compact obligations. In the spring of each year the Division Engineer estimates the annual index flow for each index station specified in the Compact by adding 1) the year-to-date flow, 2) the flow forecast for the runoff season, and 3) estimated flows for the months following the runoff season. The Compact's obligations are then applied to the estimated index flows to derive the State's estimated Compact obligation. Even though Colorado is entitled a 10,000 af credit to the values derived from Compact schedules, this relatively small portion of the total obligation is not considered by water administrators until late in the year. By comparing the estimated Compact obligations with estimated annual flows originating below the index stations, water administrators derive an estimate of the index flows which must be passed for benefit of the Compact (termed a "curtailment percentage"). The remaining index flows (the non-curtailed percentage) are available for distribution under the priority system to San Luis Valley water users.

As the irrigation season progresses, estimated index flows become known index flows and the Compact obligations are re-evaluated. The water administrators periodically (approximately every 10 days) compare the re-evaluated Compact obligations to actual deliveries and adjust the curtailment percentage if required.

IV.5 PREVIOUS STUDY TREATMENT OF COMPACT

Two previous studies of water availability to a new reservoir project in the San Luis Valley provide examples of consideration of the Rio Grande Compact. The following general descriptions are provided to illustrate the nature of the Compact consideration in these studies.

Tipton Study

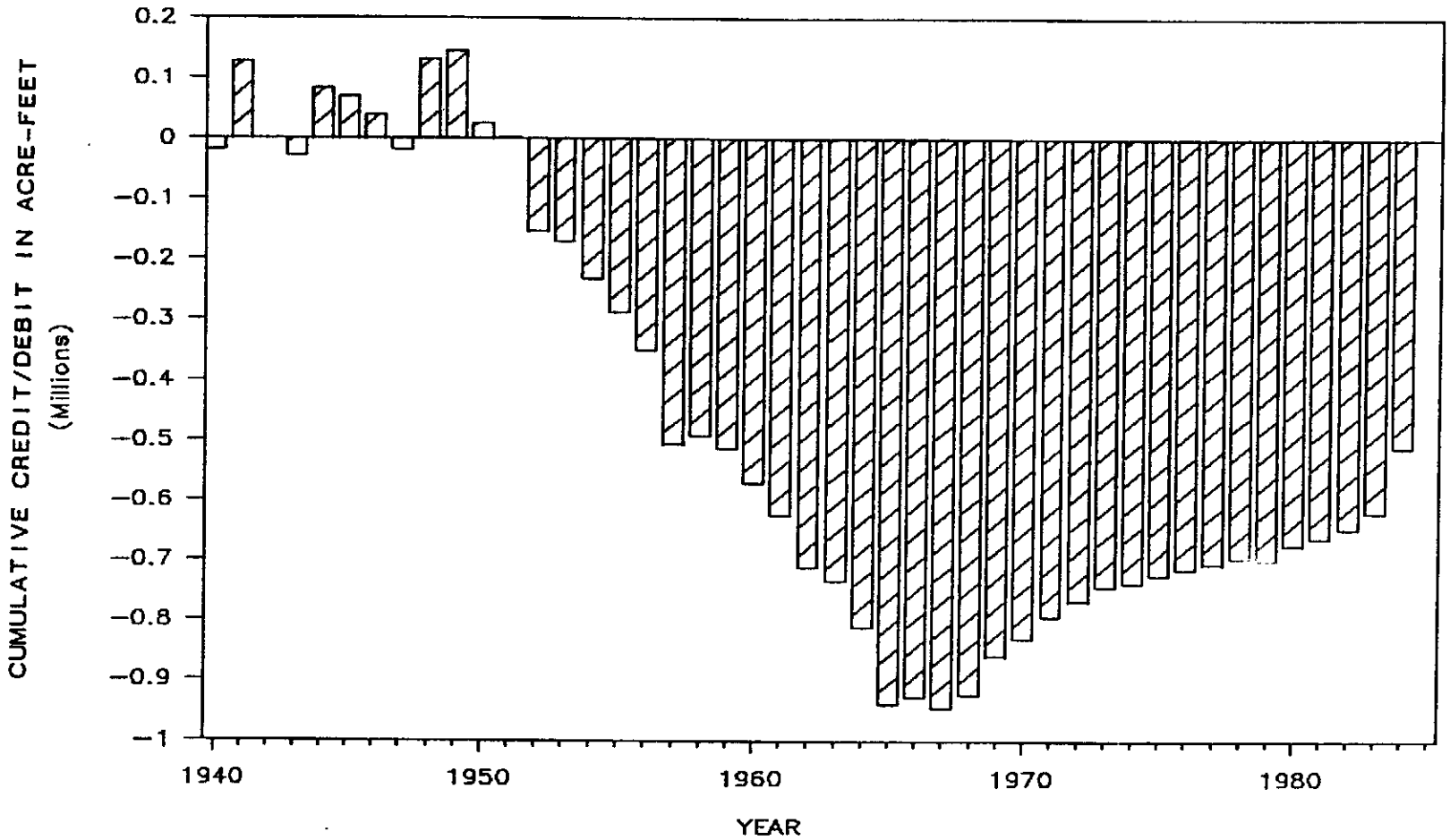
The Tipton Study (Tipton, 1939) investigated the effect of the proposed San Luis Valley Project (i.e. Wagon Wheel Gap Reservoir) on the stateline outflow under various assumed conditions and the resulting effect on the operation of Elephant Butte Reservoir. The investigation was based on the relatively high runoff hydrologic conditions of 1890 through 1938. Average annual flows at Del Norte during 1890-1938 averaged greater than 700,000 af compared to the 1948 -1985 annual average of less than 600,000 af. Given this high runoff study period, Tipton concluded that under any of the assumed conditions a reservoir at Wagon Wheel Gap could have operated most of the time without restriction for the Compact. In his scenario with the Closed Basin Project operating, Tipton concluded that a Wagon Wheel Gap Reservoir could have operated freely for the entire study period and substantial credits would have accrued to Colorado during those periods when Elephant Butte was not spilling.

The Tipton Study indicated that operation of a 1,000,000 af Wagon Wheel Gap reservoir would reduce water shortages from Del Norte to Alamosa from an average annual (1890-1938) value of approximately 180,000 af to less than 20,000 af. Operation of a 1,000,000 af Wagon Wheel Gap would create an average annual (1890-1938) supply of approximately 650,000 af to mainstem water users.

USBR Study

The USBR performed operation studies (USBR, 1955) of a 500,000 af Wagon Wheel Gap reservoir. The USBR consideration of the Compact was more limited than the 1938 Tipton study since the USBR considered Colorado's Compact deliveries at the stateline but did not transpose the effects of Wagon Wheel Gap operation to Rio Grande Project Storage. Therefore, an incomplete picture was obtained in this study of the impact of Compact provisions on the operation of a Wagon Wheel Gap Reservoir.

The USBR study concluded that the operation of a 500,000 af Wagon Wheel Gap Reservoir could provide a regulated average annual (1925-1951) mainstem divertable supply of approximately 569,000 af, compared to the estimated average annual (1925-1951) mainstem diversions of approximately 539,000 af. The 1925 through 1951 annual flows at Del Norte average 643,000 af which is considerably greater than the less than 600,000 af of average annual flows for the 1948-1985 period being used in this Study.



NOTE: RIO GRANDE PROJECT STORAGE SPILLED IN 1985.

DATA SOURCE: RIO GRANDE COMPACT COMMISSION ANNUAL REPORTS

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FIGURE IV-1

COLORADO'S RIO GRANDE COMPACT
CREDIT AND DEBIT HISTORY

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V. CLOSED BASIN PROJECT

The major feature of the Closed Basin Project is the physical transfer of water from the Closed Basin of the San Luis Valley to the mainstem of the Rio Grande. Water which collects in the Closed Basin sump area has historically been lost to evaporation and transpiration. The Closed Basin Project is intended to allow the capture and beneficial use of this water. With the introduction of a source of water from the Closed Basin into the Rio Grande, the Project will alter the historic administration of the river and therefore affect water availability to a potential new reservoir project.

V.1 HISTORY OF PROJECT DEVELOPMENT

The authorization of the San Luis Valley Project in 1940 (see Section II.4.3) recommended the construction of a drain generally through the sump area of the Closed Basin. The purpose of the drain was to deliver into the Rio Grande, water non-beneficially consumed within the Closed Basin.

Various investigations of the Closed Basin drain occurred after World War II including 1) cooperative ground water studies, 2) field observations of surface inflows to the sump area and 3) studies of ground water conditions outside the sump areas by the U.S Geological Survey. In 1952, more intense investigations were initiated on drain alignments and yields.

A "Reconnaissance Report on Closed Basin" was prepared by the USBR in 1956. This report was favorably received by the Colorado Water Conservation Board, the San Luis Valley Water Conservancy District and other local and State interests. Feasibility investigations to refine the reconnaissance findings were undertaken in July 1957 and resulted in a report entitled "Plan for Development of Closed Basin Division," dated July 1963.

At the urging of local water users, the Colorado General Assembly established the Rio Grande Water Conservation District (District) in 1967. The District is the primary sponsor of the Closed Basin Project.

The Closed Basin division of the San Luis Valley Project was authorized by Public Law 92-514, dated October 20, 1972 and modified by Public Law 96-375 (October 3, 1980) and Public Law 98-570 (October 30, 1984). The major modifications in PL 96-375 included the deletion of surface water salvage (as originally proposed in PL 92-514), and an increase in the size of the ground water salvage area and the number of wells to allow the project to achieve the yields previously estimated with surface water salvage. Public Law 98-570 set a 5,300 acre-foot annual limit on Closed Basin Project deliveries to the Alamosa and Blanca Wildlife areas.

Construction on the first of the five Closed Basin Project construction stages was initiated in 1980. The 10 year construction schedule will allow the design of each stage to be refined, if required, on the basis of data collected in the construction, testing and operation phases of previous stages. Construction is expected to be completed in the early 1990's.

V.2 PROJECT PURPOSES AND OBJECTIVES

The Project is a response to the Valley's need to develop a reliable source of water which (USBR, 1984):

1. Could assist the State of Colorado in meeting its commitments to the States of New Mexico and Texas as required by the Rio Grande Compact.
2. Could be developed a) without significantly disturbing the existing local pattern of water use, b) without disturbing the environment, c) without damage to important archeological and historic sites, and d) with minimum adverse social and economic effect.
3. Could enhance recreational opportunities.
4. Could provide wildlife benefits.

V.3 PROJECT FEATURES AND OPERATION

The Closed Basin Project design calls for approximately 170 wells spread out over an area of approximately 130,000 acres of sump area (see Closed Basin Division area on Figure V-1). The project design calls for the wells to be spaced and pumped at a rate so that over the Project area the water table will be lowered by an average

of 4 to 8 feet while not dropping more than 2 feet at or beyond the Project boundaries. Therefore, the water below and vegetation on top of land outside the Project boundaries should not be significantly affected by the operation of the Project.

Wells will be completed at depths from 65 to 125 feet in the unconfined (uppermost) aquifer. The yields on these wells are expected to vary from .75 to 2.25 cubic feet per second (cfs) (or 337 to 1010 gallons per minute). A turbine pump will deliver ground water from each well into a buried pipe system. The Project design calls for approximately 100 miles of pipe which will deliver the ground water to the primary conveyance channel.

The conveyance channel transports the salvaged water into the Rio Grande mainstem southeast of the town of Alamosa, Colorado (below the diversion dam for the New Ditch). This conveyance channel is approximately 42 miles long, varies from 8 to 22 feet in bottom width, 4.7 to 5.7 feet in depth, and is capable of carrying 20 to 160 cfs.

The USBR estimates 66,000 to 104,000 acre-feet of ground water will be pumped annually. The water delivered by the Closed Basin Project is categorized by the uses of the water as described below.

Priority One diversions are those made to assist the State of Colorado in meeting its commitments to the States of New Mexico and Texas as required by the Rio Grande Compact.

Priority Two diversions are made to enhance wildlife in the Alamosa National Wildlife Refuge and Blanca Wildlife Habitat Area.

Priority Three diversions are available at a charge for general use by Rio Grande and Conejos water users after Priority One and Priority Two uses have been satisfied. Priority Three water (as defined in this study) was labeled as Priority Four water in the authorizing legislation for the Closed Basin Project.

Since there are no major diversions in Colorado downstream of the Closed Basin Project delivery point to the Rio Grande, the Priority One and Priority Three Project deliveries will primarily allow greater mainstem flow diversions upstream of the delivery point by exchange (in meeting Colorado's Compact obligations).

Long term average annual delivery potential of the Closed Basin Project is estimated for the Rio Grande Water Supply Study as follows.

Priority One Use	60,000 af
Priority Two Use	5,300 af
Priority Three Use	34,500 af
Total	99,800 af

Principles of distribution of Priority One Project deliveries to the Rio Grande are contained in the authorizing legislation and subsequent resolutions among water users as discussed below.

1. The authorizing legislation for the Closed Basin Division of the San Luis Valley Project (Section 104 (b) (1) of the Reclamation Project Authorization Act of 1972, Public Law 92-514, 86 Stat. 964) provides (emphasis added):

   "(1) to assist in making the annual delivery of water at the gauging station on the Rio Grande near Lobatos, Colorado, as required by Article III of the Rio Grande Compact: provided, that the total amount of water delivered for this purpose shall not exceed an aggregate of 600,000 acre-feet for any period of ten consecutive years ..."

2. A February 19, 1985 Resolution (included as Appendix C) of the Rio Grande Water Conservation District regarding the Allocation of the Yield of the Closed Basin Project provides:

   a. Usable project yield is that quantity of water which can be made physically available to water users on the Rio Grande or on the Conejos by exchange. Usable yield shall not include deliveries pursuant to the terms of the Rio Grande Compact which are in excess of the obligations for the Rio Grande and for the Conejos River.

b. The usable yield from the Closed Basin Project will be divided, as nearly as possible, on a long term 60/40 basis with the Rio Grande being entitled to 60% of the usable project yield and the Conejos River being entitled to 40% of the usable project yield.

c. The Rio Grande shall be entitled to claim up to and including 80 % of the project production in any year to assist it in achieving its 60 % share over any 15 year period. The Conejos shall be entitled to at least 20 % of the project production in any year that said water is usable by the Conejos. If not claimed by the Rio Grande, the Closed Basin production may be used entirely by the Conejos.

d. Any project water not usable by one river system in a particular year may be used by the other river system so long as the long term 60/40 allocation between the rivers is maintained.

V.4 STATUS OF CLOSED BASIN PROJECT

As of the date of this report, the conveyance canal of the Project is essentially complete. Laterals and wells have been completed in Stages 1, 2 and 3 to the extent of enabling the delivery of approximately 50,000 acre-feet of salvaged water per year to the Rio Grande. Stages 4 and 5 are currently under construction.

V.5 CLOSED BASIN PROJECT/CONEJOS BASIN EXCHANGE INVESTIGATION

A reconnaissance investigation was performed of the ability to exchange the Conejos portion of the Priority One deliveries to Conejos users. This investigation was conducted in two parts. The first part estimated the Conejos Basin exchange potential (i.e. Conejos Basin outflows caused by Rio Grande Compact curtailment which could be made usable by Basin users if an alternate source of water is provided to satisfy the Compact). The second part compared the Conejos Basin exchange potential with the theoretical Conejos allocation of Closed Basin Project deliveries developed for the two mainstem diversion scenarios.

To determine the Conejos Basin exchange potential, the 1941-1967 Conejos Basin outflows were first adjusted to reflect the estimated flow which would have occurred with Rio Grande Compact administration. The difference between total outflow and estimated non-exchangeable outflow was tabulated as Conejos Basin exchange potential. The annual Conejos Basin exchange potential was estimated to range from less than 10,000 af to greater than 300,000 af and average approximately 115,000 af to 121,000 af, depending on the non-exchangeable flow level.

The amount of the Closed Basin Project deliveries which could be exchanged into the Conejos was estimated by comparing the Conejos Basin exchange potential with the annual theoretical Closed Basin Project deliveries for the Conejos Basin (shown in Table VI-5 in Section VI). This comparison indicated that in greater than 75 percent of the years, the full Closed Basin Project delivery for the Conejos Basin is exchangeable in the year in which it occurs. On an average annual basis, at least 90 percent of the Closed Basin Project delivery is exchangeable when it occurs. The deliveries which were not exchangeable in the years in which they occurred were carried as credits for a maximum of four years prior to being exchanged into the Conejos Basin.

With the results of the Closed Basin Project/Conejos Basin exchange investigation, a modeling assumption was made that the Conejos allocation of Closed Basin Project deliveries was fully exchangeable into the Conejos Basin if the allocation was less than or equal to the Conejos' Rio Grande Compact obligation. If the Conejos allocation was greater than the Conejos' Rio Grande Compact obligation, it was assumed that the exchange would be limited to the Conejos obligation and that the surplus Conejos allocation would accrue as a Rio Grande Compact credit to the Conejos Basin.

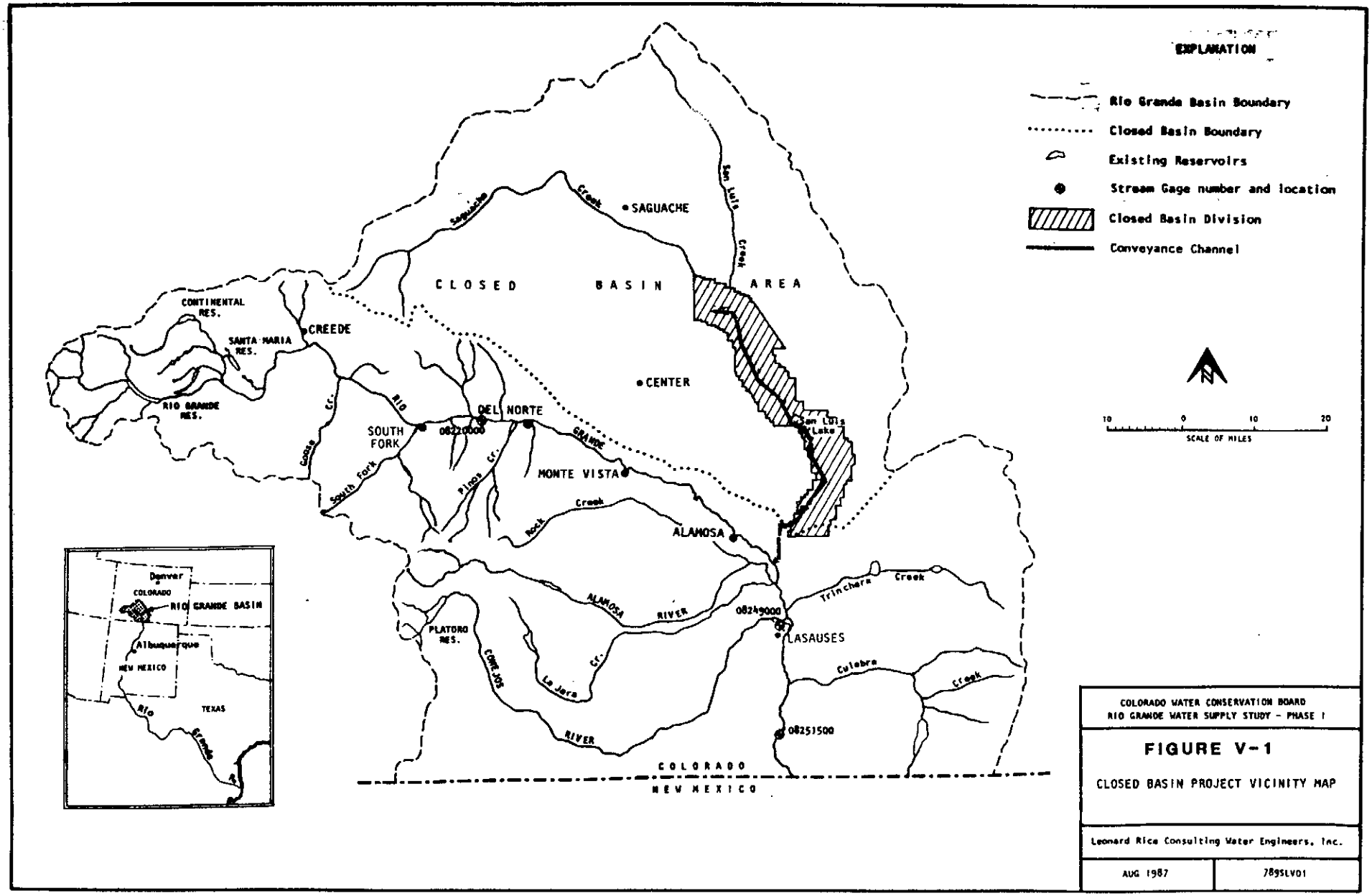

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FIGURE V-1

CLOSED BASIN PROJECT VICINITY MAP

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VI. RIVER BASIN MODELING

Given the complexity of water supplies and uses in the Rio Grande Basin and the number of potential reservoir sites under investigation, a computer tool to organize and analyze the collected information was warranted. The following sections briefly describe aspects of modeling the Rio Grande Basin performed for this study.

VI.1 SELECTION OF A HISTORIC MODELING PERIOD

One of the first work items was the selection of a suitable period of historic record for data collection and the modeling effort. A historic modeling period for the Rio Grande Water Supply Study was selected based primarily on a statistical review of unadjusted gaging records for the Rio Grande near Del Norte (USGS number 08220000). Annual flows for the calendar years of 1890 to 1985 were collected from the USGS's WATSTORE system and are presented in Table VI-1. The mean annual flow for the Rio Grande near Del Norte, Colorado is approximately 654,000 af. A graph of the annual flows is presented in Figure VI-1.

Other factors considered in the selection of a modeling period were the availability of diversion and water use records, inclusion of drought years, consistency with previous studies in the Basin, public perceptions of the study period and the desirability of including recent years to make best use of the most reliable data relating to water supply and use.

The most valuable statistics for the evaluation of study periods were found to be the arithmetic mean, median, standard deviation and skewness. No recent time interval of 10, 20 or 30 years has a mean flow similar to the 1890 through 1985 average due to an extremely wet period from 1905 through 1929. The 1909 through 1977 or 1909 through 1985 periods have means similar to the 1890 through 1985 mean but because of their length (more than 60 years) and lack of data availability they were not considered viable study period candidates.

For the 25-year wet period from 1905 through 1929, the annual flow is less than the 1890 through 1985 average in only three years. Since wet conditions prior to 1930 are not representative of long-term flow conditions, time periods starting in

TABLE VI-1

RIO GRANDE NEAR DEL NORTE, COLORADO
ANNUAL FLOWS IN ACRE-FEET

YEAR	FLOW	YEAR	FLOW	YEAR	FLOW
1890	821100	1931	361300	1972	477600
1891	863500	1932	885300	1973	833100
1892	532600	1933	505100	1974	337500
1893	392100	1934	321200	1975	808000
1894	424600	1935	685600	1976	591700
1895	649300	1936	472300	1977	215200
1896	487200	1937	577800	1978	406600
1897	824000	1938	829600	1979	954400
1898	797700	1939	518900	1980	751000
1899	393600	1940	312400	1981	409500
1900	506700	1941	1025700	1982	697700
1901	477300	1942	848900	1983	674600
1902	251800	1943	498500	1984	762200
1903	784200	1944	850700	1985	1010400
1904	428600	1945	538200		
1905	847200	1946	428700	AVERAGE	654200
1906	948000	1947	639800		
1907	1102200	1948	907900		
1908	568000	1949	919500		
1909	905200	1950	470300		
1910	655300	1951	309200		
1911	1075900	1952	826400		
1912	812200	1953	401500		
1913	559700	1954	381300		
1914	814500	1955	368500		
1915	670200	1956	333900		
1916	931500	1957	843500		
1917	895400	1958	724100		
1918	522900	1959	367000		
1919	772200	1960	602300		
1920	1001500	1961	501200		
1921	1038700	1962	758200		
1922	950500	1963	329500		
1923	836800	1964	370000		
1924	771200	1965	931300		
1925	702000	1966	579500		
1926	667900	1967	399300		
1927	966400	1968	668400		
1928	677500	1969	658800		
1929	899700	1970	655700		
1930	550400	1971	484600		

1930 rather than 1890 were used for study period comparisons. The 1930-1985 mean annual average flow of the Rio Grande near Del Norte is approximately 599,000 af/yr or eight percent lower than the 1890 through 1985 average.

A very important consideration in the study period selection was the inclusion of the 1953 through 1956 drought period. A drought is a year or series of consecutive years when annual streamflows are below an average annual flow. Typically, droughts can be categorized by four parameters: cumulative deficit, duration, average annual deficit, and annual deficits. The importance of the 1953 through 1956 period is reflected in the following summary of extreme events in the 1890 through 1985 period.

- Largest Cumulative Deficit (1953 to 1956)..... 1,131,500 af
- Maximum Average Annual Deficit (1963 to 1964).... 304,500 af
- Longest Duration (1899-1902, 1953-1956)..... 4 years
- Maximum Single-Year Drought (1977)..... 439,000 af

Initial consideration of statistics, record availability, and drought characteristics led to the suggestion that the 1952 through 1980 study period be adopted for the Rio Grande Water Supply Study.

Even though the years prior to 1950 were originally excluded from the suggested study period (due to poor ditch diversion record availability), it was suggested by the USBR that the years of 1948 through 1951 be added to the study period. After further comparisons of the statistics of periods including the 1948 through 1951 period, it was decided that the addition of two consecutive above average flow years in 1948 and 1949 and the dry year of 1951 (which might extend the mid-1950's drought) outweighed the consideration of poor record availability.

The State Engineer's Office suggested including more recent years in the study period. After consideration of the statistics of various periods which included years up through 1985 with statistics for the 1930 through 1985 period, it was concluded that the 1948 through 1985 period was as suitable as the originally suggested 1952 through 1980 period.

Therefore, after consideration of comments made by reviewers and further analysis, a study period of 1948 through 1985 for the Rio Grande Water Supply Study - Phase I was selected. The annual average flow for the selected period approximates 598,000 acre-feet or 99.7% of the annual average flow for the 1930 through 1985 period.

VI.2 TWO MAINSTEM DIVERSION SCENARIOS

The level of simulated mainstem diversions between Del Norte and Alamosa influences the amount of legally available water at potential reservoir sites, the exchange ability of the river, and the calculation of Rio Grande Compact credits and debits. While the actual magnitude of future mainstem diversion is unknown, an attempt has been made in this study to project future conditions through development of two mainstem diversion scenarios.

VI.2.1 Step One Mainstem Diversion Scenario

The first of the two mainstem diversion scenarios used in this study, the **Step One Diversion Scenario**, simulates mainstem diversions at levels similar to those recorded in the years of 1950 through 1967. A simulation for 1968 through 1985 using a calibrated model (see Section VI.4) with curtailment for the Rio Grande Compact showed closed similarity to historic 1968 to 1985 diversions.

A variation of this scenario simulated total mainstem diversions for the Step One mainstem diversion scenario without curtailment for the Rio Grande Compact. Results are shown in Table VI-2 for 1948 through 1985. In a simulation with curtailment for the Rio Grande Compact, the modeled diversions would be less than those shown in Table VI-2 by the amount of the curtailment.

VI.2.2 Alternate Step Two Mainstem Diversion Scenario

The underlying factors which influence mainstem diversion levels and patterns may change in the future. For example, as more conjunctive use of surface and ground water supplies occur, the potential exists to extend the mainstem diversion season

TABLE VI-2

STEP ONE MODELED MAINSTEM DIVERSIONS
WITHOUT RIO GRANDE COMPACT ADMINISTRATION
All values in acre-feet

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1948	520	1,020	7,530	66,385	174,510	233,630	123,512	68,957	22,556	19,325	7,130	1,060	726,135
1949	520	1,020	7,530	54,003	166,930	233,630	156,788	80,681	27,800	21,972	7,130	1,060	759,064
1950	520	1,020	7,530	67,207	113,865	122,806	55,821	25,247	13,600	14,644	7,130	1,060	430,450
1951	520	1,020	7,530	19,130	78,512	95,289	26,906	20,253	13,294	10,642	7,130	1,060	281,286
1952	520	1,020	7,530	62,258	174,510	233,630	131,941	70,409	27,381	20,701	7,130	1,060	738,090
1953	520	1,020	7,530	33,177	78,440	147,245	41,559	21,919	12,111	11,935	7,130	1,060	363,646
1954	520	1,020	7,530	45,898	108,282	65,961	40,662	28,743	19,184	22,878	7,130	1,060	348,868
1955	520	1,020	7,530	22,753	84,766	125,941	35,152	31,143	14,311	10,583	7,130	1,060	341,909
1956	520	1,020	7,530	25,491	108,088	106,843	21,498	11,830	8,171	8,362	6,846	1,060	307,259
1957	520	1,020	7,530	38,050	83,121	233,630	187,340	107,467	42,547	26,470	7,130	1,060	735,885
1958	520	1,020	7,530	42,528	174,510	199,755	105,118	48,702	23,563	17,189	7,130	1,060	628,625
1959	520	1,020	7,530	22,875	77,559	118,380	25,191	28,002	13,713	26,937	7,130	1,060	329,917
1960	520	1,020	7,530	68,686	146,034	207,500	70,434	22,984	13,620	15,213	7,130	1,060	561,731
1961	520	1,020	7,530	36,954	150,985	139,443	33,073	27,776	28,426	28,924	7,130	1,060	462,841
1962	520	1,020	7,530	82,479	174,510	201,344	116,365	62,661	18,865	20,223	7,130	1,060	693,707
1963	520	1,020	7,530	40,193	117,777	49,906	19,198	17,301	20,252	13,960	7,130	1,060	295,847
1964	520	1,020	7,530	24,061	130,816	83,775	31,390	30,352	17,109	14,338	7,130	1,060	349,101
1965	520	1,020	7,530	57,169	174,510	233,630	180,642	76,320	44,360	37,948	7,130	1,060	821,839
1966	520	1,020	7,530	49,423	174,510	143,161	81,408	29,698	16,412	15,398	7,130	1,060	527,270
1967	520	1,020	7,530	23,403	98,317	109,404	37,855	40,245	25,974	15,874	7,130	1,060	368,332
1968	520	1,020	7,530	26,267	135,082	232,913	92,710	77,344	31,186	19,155	7,130	1,060	631,917
1969	520	1,020	7,530	44,516	174,510	144,224	104,841	46,795	34,265	37,948	7,130	1,060	604,359
1970	520	1,020	7,530	21,501	174,510	141,666	94,319	43,102	44,360	30,407	7,130	1,060	567,125
1971	520	1,020	7,530	41,374	75,385	157,054	76,118	24,321	16,456	20,976	7,130	1,060	428,944
1972	520	1,020	7,530	57,262	138,602	118,660	29,128	15,598	15,148	29,898	7,130	1,060	421,556
1973	520	1,020	7,530	27,422	174,510	233,630	154,505	70,907	26,788	20,702	7,130	1,060	725,724
1974	520	1,020	7,530	21,990	117,364	79,244	23,203	19,581	10,971	12,236	7,130	1,060	301,849
1975	520	1,020	7,530	25,848	160,953	233,630	181,683	65,430	24,759	20,025	7,130	1,060	729,588
1976	520	1,020	7,530	36,322	163,301	182,662	74,732	33,505	23,974	23,457	7,130	1,060	555,213
1977	520	1,020	7,530	26,731	46,133	41,223	17,157	18,390	15,300	14,314	7,130	1,060	196,508
1978	520	1,020	7,530	22,475	77,742	173,888	42,747	13,678	11,398	22,881	7,130	1,060	382,069
1979	520	1,020	7,530	55,543	174,510	233,630	172,213	55,658	21,551	14,431	7,130	1,060	744,796
1980	520	1,020	7,530	33,654	155,183	233,630	129,847	30,928	27,433	16,270	7,130	1,060	644,205
1981	520	1,020	7,530	31,855	89,877	103,512	37,302	26,470	23,353	37,086	7,130	1,060	366,715
1982	520	1,020	7,530	33,641	111,469	206,759	86,417	64,854	44,360	37,948	7,130	1,060	602,708
1983	520	1,020	7,530	22,831	110,215	233,630	123,580	58,217	23,086	30,585	7,130	1,060	619,404
1984	520	1,020	7,530	28,963	174,510	194,627	116,115	67,210	41,895	37,948	7,130	1,060	678,528
1985	520	1,020	7,530	67,802	174,510	233,630	131,702	63,711	43,392	37,948	7,130	1,060	769,955
AVG	520	1,020	7,530	39,687	132,077	164,819	84,478	43,326	23,761	22,046	7,123	1,060	527,446

or increase the rate of mainstem diversions. The greatest potential for surface water/ground water conjunctive use is in the Closed Basin. To reflect this potential for increased mainstem diversions to the Closed Basin, an alternate mainstem diversion scenario was developed.

In this alternate mainstem diversion scenario the simulated diversion restrictions (derived from the 1950-1967 period) were removed from the four mainstem ditches which provide a majority of their supply to irrigated lands in the Closed Basin. Four ditches were allowed to divert up to the limit of their decrees. They were: the Rio Grande Canal, Farmers Union Canal, Prairie Ditch and San Luis Valley Canal. The diversion scenario which replaces the 1950-1967 diversion limits with decreed diversion limits is referred to as the "**Alternate Step Two Mainstem Diversion Scenario**". Simulated total mainstem diversion results for the Alternate Step Two mainstem diversion scenario without curtailment for the Rio Grande Compact are shown in Table VI-3. Curtailment for the Rio Grande Compact would reduce the values shown in Table VI-3.

VI.3 RIBSIM MODEL CONFIGURATION

The River Basin Simulation (RIBSIM) model is a generalized computer program well suited to estimating storable flows at potential reservoir sites considering various water supply and water use scenarios. The model was developed by a staff member of Leonard Rice Consulting Water Engineers (LRCWE) and has been successfully applied to recent storable flow analyses in various river basins in Colorado.

The model is configured to a river basin (or portion thereof) by the definition of water uses, return flows, reservoirs, instream flow requirements, etc. to be superimposed on a flow network. The model uses traditional "bookkeeping" or accounting methodology to allocate water supplies to uses by the prior appropriation doctrine. The allocation is performed for each month of the modeled period based on user assigned priorities of the water rights. A description of the RIBSIM model (including definition of input data, general operation of the model, model output, limitations of the model, and source code as used for the Rio Grande Water Supply Study) is available for inspection at the Colorado Water Conservation Board, San

TABLE VI-3

ALTERNATE STEP TWO MODELED MAINSTEM DIVERSIONS
WITHOUT RIO GRANDE COMPACT ADMINISTRATION
All values in acre-feet

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1948	600	1,300	7,530	66,384	250,207	281,778	123,534	68,976	22,571	19,362	12,233	1,083	855,558
1949	537	1,098	7,680	54,047	166,945	281,778	156,807	80,685	27,808	21,998	16,341	1,086	816,810
1950	537	1,091	7,669	67,218	113,879	122,806	55,821	25,247	13,600	14,645	8,638	1,080	432,231
1951	535	1,082	7,641	19,130	78,512	95,289	26,906	20,253	13,294	10,642	9,944	1,079	284,307
1952	534	1,080	7,632	62,259	187,169	273,647	131,954	70,412	27,386	20,705	13,719	1,084	797,581
1953	537	1,091	7,667	33,182	78,450	147,245	41,559	21,919	12,111	11,936	10,483	1,080	367,260
1954	535	1,080	7,637	45,898	108,282	65,961	40,662	28,744	19,184	22,879	11,787	1,081	353,730
1955	536	1,082	7,634	22,753	84,766	125,941	35,152	31,143	14,311	10,584	8,994	1,080	343,976
1956	535	1,080	7,635	25,492	108,088	106,843	21,498	11,830	8,171	8,362	6,846	1,074	307,454
1957	531	1,079	7,635	38,050	83,121	271,784	212,493	107,469	42,550	26,473	22,351	1,088	814,624
1958	538	1,082	7,651	42,531	233,595	199,790	105,121	48,714	23,571	17,199	10,733	1,083	691,608
1959	536	1,095	7,665	22,901	77,561	118,380	25,191	28,002	13,713	26,937	18,875	1,081	341,937
1960	536	1,081	7,634	68,686	146,035	207,500	70,429	22,984	13,619	15,213	10,136	1,081	564,934
1961	535	1,088	7,654	36,954	150,981	139,449	33,074	27,779	28,427	28,926	15,664	1,082	471,613
1962	537	1,090	7,651	82,484	192,161	201,352	116,362	62,664	18,867	20,268	13,946	1,083	718,465
1963	537	1,092	7,664	40,198	117,775	49,906	19,198	17,302	20,252	13,961	10,472	1,078	299,435
1964	535	1,082	7,632	24,062	130,816	83,775	31,390	30,352	17,110	14,339	9,170	1,080	351,343
1965	535	1,085	7,640	57,169	197,924	268,775	180,653	76,325	47,026	44,876	21,282	1,087	904,377
1966	539	1,094	7,670	49,432	180,037	143,165	81,409	29,700	16,415	15,402	9,295	1,081	535,239
1967	535	1,090	7,655	23,406	98,317	109,404	37,855	40,245	25,975	15,874	10,363	1,081	371,800
1968	536	1,081	7,635	26,267	135,082	232,912	92,696	77,344	31,181	19,153	13,414	1,084	638,385
1969	537	1,088	7,653	44,515	175,035	144,227	104,841	46,797	34,266	39,079	22,154	1,086	621,278
1970	538	1,092	7,656	21,505	180,784	141,669	94,319	43,104	75,762	30,413	18,344	1,085	616,271
1971	537	1,092	7,653	41,377	75,385	157,055	76,118	24,324	16,456	20,977	15,842	1,082	437,898
1972	536	1,081	7,637	57,262	138,602	118,660	29,128	15,598	15,148	29,900	14,946	1,080	429,578
1973	536	1,089	7,648	27,423	196,450	280,971	154,523	70,912	26,796	20,709	11,697	1,085	799,839
1974	537	1,091	7,668	22,001	117,377	79,245	23,203	19,581	10,971	12,237	9,761	1,078	304,750
1975	533	1,081	7,632	25,848	160,953	273,635	181,696	65,433	24,765	20,029	20,502	1,086	783,193
1976	536	1,089	7,663	36,329	163,310	182,672	74,735	33,508	23,977	23,462	10,673	1,082	559,036
1977	536	1,089	7,657	26,740	46,135	41,223	17,157	18,391	15,300	14,315	8,864	1,077	198,484
1978	535	1,075	7,619	22,475	77,742	173,888	42,747	13,678	11,398	22,936	9,835	1,079	385,007
1979	533	1,080	7,640	55,543	233,005	281,739	172,233	55,671	21,564	14,443	12,708	1,085	857,244
1980	536	1,095	7,674	33,683	155,198	281,742	131,101	30,932	27,441	16,276	11,754	1,083	698,515
1981	536	1,089	7,664	31,865	89,890	103,512	37,302	26,470	23,354	37,086	18,758	1,082	378,608
1982	537	1,082	7,636	33,642	111,469	206,759	86,410	64,854	70,685	54,015	21,986	1,086	660,161
1983	538	1,085	7,646	22,830	110,210	242,171	123,571	58,219	23,086	30,586	13,833	1,084	634,859
1984	537	1,082	7,647	28,961	205,350	194,640	116,117	67,215	41,898	39,579	18,712	1,085	722,823
1985	538	1,093	7,662	67,812	223,729	281,739	131,722	63,720	43,404	47,154	38,360	1,087	908,020
AVG	538	1,092	7,646	39,692	141,588	176,659	85,176	43,329	25,353	22,972	14,300	1,082	559,427

Luis Valley Water Conservancy District or Leonard Rice Consulting Water Engineers. The RIBSIM model requires the following two primary types of data to operate:

Flow Base - a set of monthly flows at various locations in the river basin on which to superimpose the modeled features of the basin. These flows usually consist of historic gaged flows adjusted for the historic operation of modeled features.

Water Use Network - information on the features (ditches, reservoirs, instream flows, etc.) to be operated in a simulation. This includes their location, priority, maximum water use level, type of right, etc.

The following sections describe the generation of RIBSIM data sets and modification of the RIBSIM model's logic for use in this study. These descriptions include descriptions of modeled water rights, the modeling of the Rio Grande Compact, and the modeling of the Closed Basin Project.

VI.3.1 Flow Base Generation

The Rio Grande Basin has been divided into stream reaches called flow sectors. A flow sector was created where there is a significant change in the flow regime which affects modeled basin features. The flow base was generated by estimating monthly incremental flow originating in each flow sector during the study period. During model operation, the incremental sector flows above a given point are summed to arrive at the total flow available at that point. A description of the methodology used in developing the modeled sector flows is provided in Appendix D.

Figure VI-2 is a schematic of the average annual (1948-1985) flow base of the RIBSIM model on which modeled water uses (from the headwaters of the Rio Grande in Colorado to Rio Grande Project Storage in southern New Mexico) are imposed.

An average annual amount of modeled depletions for the Rio Grande Basin within Colorado may be derived by differencing the average annual (1948-1985) base flow amount of approximately 970,000 af for the Rio Grande at Lobatos and the average

annual (1948-1985) Lobatos gaged flow of approximately 310,000 af for a modeled depletion of approximately 660,000 af.

VI.3.2 Simplification of Modeled Water Rights

RIBSIM allocates water by user assigned priorities of the water rights (similar to the prior appropriation doctrine) and, therefore, was used in investigating water allocation in the Rio Grande Basin. Inclusion of approximately 310 mainstem water rights indicated in Section III of this report would cause extensive calculation and interpretation efforts which would not be justifiable given the reconnaissance nature of the study.

In modeling a river basin, it is often appropriate due to time and budget constraints to group the most senior water rights whose diversion pattern is unlikely to be unaffected by model assumptions. It is also often appropriate to group smaller water rights to ease the computation and interpretation burden. For this study, the number of modeled water rights were limited in the following described manner with the objective of creating a model which reasonably reflects the present water allocation and yet is efficient (i.e. model setup, execution time, interpretation time).

1. The modeling included the operation for the major water rights located between Del Norte and Alamosa in Water District 20 which could significantly affect water availability at potential reservoir sites. Though there are numerous other water rights in other areas, they do not have a significant effect on water availability at the potential reservoir sites and, therefore, need not be modeled. In reaches other than the Del Norte to Alamosa reach, the modeling considered flow gain or loss conditions experienced during the 1948-1985 period to exist. Operation of rights in these reaches was implicitly considered in the model by the incorporation of gains or losses from the 1948-1985 period in the model's flow base. For example, the contribution of the Alamosa River (after consideration of its water rights) to the Rio Grande was reflected in the difference of the Lobatos and Alamosa gages incorporated into the model's flow base.

2. Storage releases from major reservoirs upstream of Del Norte (i.e. Rio Grande, Santa Maria and Continental Reservoirs) delivered to ditches downstream of Del Norte have made significant contributions to the yield of several ditches. These releases during the 1950-1985 period were removed from the 1950-1985 gaged flows at Del Norte and set aside in a special account for delivery to the appropriate ditches in the pattern experienced during the 1950-1985 period.

3. Modeling the approximately 300 water rights in the Del Norte to Alamosa reach would create a model whose detail is not required or desirable for a reconnaissance study. The following approaches were taken in simplifying the water rights to be modeled to a manageable number to allow concentration on those major water rights most likely to be affected by alterations in the flow regime.

   a. Three of the largest mainstem ditches (Centennial, Excelsior and Rio Grande Piedra) generally have senior priority water rights when compared with the rights of the other eight ditches. Because of this seniority, there is little benefit to modeling these ditches individually since modeled diversion patterns for 1948-1985 will likely be very similar to actual 1948-1985 diversions. Therefore, the water rights of these ditches were grouped into a single senior priority water use which was assigned typical diversion levels experienced in the 1950-1985 period.

   b. There exist approximately 150 water rights on the Rio Grande between Del Norte and Alamosa which are not associated with the largest ditches. Since many of these water rights are typically senior in priority to the primary 11 ditch rights and since the diversions associated with these rights comprise only 15 percent of the total mainstem diversion, the diversions associated with these approximately 150 water rights were grouped into the same senior priority water use assigned to the Centennial, Excelsior and Rio Grande Piedra systems described in the previous paragraph.

4. Approximately 70 percent of the mainstem diversions are associated with the following canals and ditches: Rio Grande, Empire, Farmers Union, Monte Vista, San Luis Valley, Prairie, Costilla, and Rio Grande & Lariat.

   The relative junior priorities of water rights associated with these ditches make them candidates to be most affected by modeled flow changes and, therefore, the best candidates for modeling. However, instead of modeling the approximately 110 water rights associated with these ditches, their water rights were combined into 40 water rights. The combination process preserved the nature of the major rights (greater than 20 cfs) by combining the smaller decrees with the larger decrees for a given ditch. To preserve as much of the priority nature of the smaller water rights as possible, the smaller rights were generally assigned to the nearest (in the priority ranking) larger decree modeled.

   The 40 combined water rights associated with the eight ditches are shown in Table VI-4. The total decreed amounts of these rights approximates 4500 cfs. These combined water rights adequately reflect the approximately 110 water rights actually associated with these ditches.

5. Water available for allocation to Colorado water users after satisfying the Rio Grande Compact was determined by special logic integrated with the RIBSIM model as described in Section VI.3.3. Water then determined to be available for allocation to Colorado water users was allocated by the RIBSIM model using its prior appropriation logic.

VI.3.3 Rio Grande Compact

The Rio Grande Compact plays a very important part in the determination of water which may be available to a post-Compact (post-1937) constructed reservoir. Due to the complexity of the Rio Grande Compact, additional model logic was added to consider the Compact. To assist in developing this logic, interviews were held with Colorado's Compact Commissioner and Compact Engineer. The strategy used in considering the Compact is outlined below.

Table VI-4

Modeled Water Rights - Eight Modeled Ditches
Rio Grande Water Study - Phase I

Ditch	Modeled Priority Relative Rank	Modeled Amt (cfs)
Rio Grande Canal	1	379.90
Rio Grande & Lariat	2	53.02
Monte Vista Canal	3	132.20
Empire	4	326.68
San Luis Canal	5	92.90
Rio Grande Canal	6	46.10
Costilla	7	103.30
Prairie	8	108.10
Farmers Union	9	139.30
Monte Vista Canal	10	125.30
Rio Grande Canal	11	100.60
Empire Canal	12	185.32
Rio Grande Canal	13	389.10
Prairie	14	52.26
San Luis Canal	15	165.56
Farmers Union	16	111.81
Rio Grande & Lariat	17	30.24
Rio Grande Canal	18	45.00
San Luis Canal	19	49.48
Prairie	20	102.87
Farmers Union	21	280.47
Monte Vista Canal	22	43.37
Rio Grande Canal	23	84.96
Farmers Union	24	159.69
San Luis Canal	25	68.37
Farmers Union	26	149.69
Rio Grande & Lariat	27	23.54
Rio Grande Canal	28	129.07
Prairie	29	61.78
Rio Grande Canal	30	88.14
San Luis Canal	31	39.08
Monte Vista Canal	32	39.90
Rio Grande Canal	33	81.71
Prairie	34	26.05
Rio Grande Canal	35	183.60
San Luis Canal	36	71.63
Rio Grande Canal	37	82.68
Prairie	38	15.96
San Luis Canal	39	37.76
Rio Grande Canal	40	88.54
	Total	4,495.03

A. At the beginning of each study year, an estimate was made of the amount of Rio Grande flows at the Del Norte gage which must be passed if the Compact obligation is to be satisfied. This calculation includes:

1. Compilation of the compact obligations for each year of the 1948-1985 study period as given in the Annual Compact reports.

2. Subtraction of the following water sources, which sources partially satisfy the Rio Grande mainstem Compact obligation, 1. above.
   a. An estimate of the annual volume of water which returns from modeled diversions in the Del Norte to Alamosa reach. This estimate is based on relationships between i) 1950-1967 Del Norte gage flows, ii) 1950-1967 diversions (Del Norte to Alamosa reach) and iii) the Alamosa gage flows for 1950 through 1967 (prior to active diversion curtailment for benefit of the Compact).
   b. Annual inflow (from 1948-1985 streamflow records) below Alamosa excluding the Conejos River inflow (Lobatos Gage minus Alamosa and Conejos gages). Records used for the Alamosa gage from 1981-1985 were unpublished.
   c. Estimated annual deliveries of the Closed Basin Project for mainstem users. See Section VI.3.4 for additional information on modeling of the Closed Basin Project.
   d. Estimated flows in excess of Del Norte to Alamosa mainstem diversion capacities for the months of April through October. April through October Del Norte flows in excess of 730,000 af for the Step One mainstem diversion scenario and in excess of 830,000 af for the Alternate Step Two mainstem diversion scenario were considered as flood flows that would be available to the Compact with or without curtailment.

3. Subtraction of a portion of the 10,000 acre-feet available for Compact obligation reduction from the result of 2. above. The value to subtract is determined by multiplying 10,000 acre-feet by the proportion of the Rio Grande mainstem Compact obligation to the sum of the Rio Grande

mainstem and Conejos obligation under the Compact (derived from schedules on pages 3 and 4 of Appendix B).

4. Any previous accrued credits from previous years attributed to the Rio Grande mainstem were subtracted from the current year's Rio Grande mainstem Compact obligation calculated in the preceding step. Any accrued debits from previous years are added to the mainstem's Compact obligation.

5. The monthly portion of the Rio Grande flow at Del Norte required to satisfy the Compact was determined by taking the monthly Del Norte index flow multiplied by the ratio of the result from 4. to the total annual Del Norte index flow as reported in the Compact reports.

B. During each month of the study period, a portion (or all) of the water which would have to be passed if the Compact obligation were to be satisfied was available for theoretical capture at a potential reservoir site. The amount of water would be the lesser of the following:

- physical flow at a new reservoir site minus an in-stream flow requirement.
- the portion of the Rio Grande flows at Del Norte required to satisfy the Compact (item A.4. above).

with the additional condition that no capture of curtailment flows will occur when Rio Grande Project Storage (see C. below) is less than 400,000 acre-feet.

C. Rio Grande Project Storage was operated on a monthly basis to determine if reservoir conditions occur which influence the storage in or release from post-1937 reservoirs; or the cancellation of accrued debits or credits.

1. Rio Grande Project Storage was assumed to have a capacity of 2,297,800 af and start the study period with contents equal to 90 percent of that capacity or 2,070,000 af.

2. Because inflow to Rio Grande Project Storage is not measured the inflow was calculated through the following process:

   a. 1948-1985 effective supplies to Elephant Butte Reservoir were compiled (as defined by the Compact and provided in the annual Compact Commission reports).

   b. 1948-1985 effective supplies were adjusted by adding back in estimated evaporation.

   c. Further adjustments were made to the 1948-1985 effective supply by adding back in the 1948-1985 change in contents of Abiquiu and Cochiti flood control reservoirs in New Mexico.

   d. Further adjustments were made to the 1948-1985 effective supply to reflect the difference of modeled and actual flows at Lobatos for the 1948-1985 period. The modeled flows at Lobatos differ from 1948-1985 flows primarily due to the storage of debit water in a new reservoir and the use of Closed Basin deliveries to allow greater than the consumptions experienced in the 1948-1985 period on both the Rio Grande mainstem and the Conejos.

3. The following demands on Rio Grande Project Storage were modeled.

   a. Rio Grande Project demands of 650,000 acre-feet per year were imposed in the modeling. Both the 650,000 af per year demand and the monthly distribution of that demand were derived from 1980 through 1985 releases from Rio Grande Project Storage.

   b. Net evaporation based on 1948-1985 Elephant Butte pan evaporation multiplied by a pan coefficient.

D. Water assumed captured in item B. above was added to a Colorado debit account and kept in that debit account until one of the following situations occur.

1. Debit water was removed from the account if needed to maintain Rio Grande Project Storage at 600,000 acre-feet in March and April. Removal assumed that the water last diverted into the debit account will be the first removed.

2. Spills of Rio Grande Project Storage caused a cancellation of accrued debits and therefore, any previously captured debit water was redefined as water available to Colorado water users.

E. A Compact credit account was maintained for both the Rio Grande mainstem and the Conejos and included any deliveries at the stateline in excess of Compact obligations. Annual Compact credits were limited to 150,000 af. For this study, accumulated credits exceeding 150,000 af were assumed to be transferred into a storable flood flow account owned by Colorado water users. The evaporation charge on accrued credits was calculated by multiplying estimated Project Storage evaporation by the ratio of Colorado's credit water to total Rio Grande Project Storage.

VI.3.4 Closed Basin Project

In all likelihood, the future operation of the Closed Basin Project will evolve as operational experience is gained. The general approach used in generating Closed Basin Project delivery scenarios for the Rio Grande Water Supply Study was to formulate assumptions and objectives for a historic time period and then develop a theoretical delivery scenario to satisfy those objectives. The results of this theoretical analysis should be considered just one of many possible delivery scenarios for the Closed Basin Project. The Closed Basin Project delivery patterns resulting from this theoretical analysis would be difficult to match with general operating guidelines. However, as guidelines for operating the Closed Basin Project are refined through experience, it is expected that one would move closer to Project delivery scenarios similar to those used in this study.

Priority One Deliveries

While Priority One water is the most significant part of the Closed Basin Project to Rio Grande water users, it is also the most difficult component of Project deliveries for which to make projections. The use of multiyear volumetric and percentage limits on Priority One water as indicated in Section V.3 are difficult to model since the deliveries in one year may affect delivery capability during the next 10 or 15 years.

The general steps in developing a delivery schedule for Priority One water were as follows.

1. Estimate the potential curtailments of Rio Grande mainstem diversions and Conejos diversions for the years 1948 through 1985. Diversion curtailments were estimated for both mainstem diversion scenarios assuming (initially) no deliveries from the Closed Basin Project.
2. Estimate the total Priority One deliveries for each mainstem diversion scenario which would minimize the estimated curtailments and maximize the average annual Priority One delivery. Annual Priority One deliveries are assumed to range from 10,000 af to 94,500 af, and 10 year running averages of Priority One deliveries are not to exceed 600,000 af.
3. Distribute the estimated total Priority One delivery between the mainstem and Conejos users by maximizing the benefit of the Closed Basin deliveries to the Rio Grande mainstem users given that the mainstem users are not to annually take more than 80 percent of total Priority One delivery and that the mainstem users are limited to 60 percent of the volume of Priority One deliveries in any 15 year period.

The derived Priority One Closed Basin Project delivery schedules are shown in Table VI-5 for the two mainstem diversion scenarios.

Priority Two Deliveries

The volume and timing of return flows to the Rio Grande from the Priority Two use have not been determined. For the purposes of the Rio Grande Water Supply Study, a simplifying assumption has been made that the Priority Two water is fully consumed in the wildlife areas and need not be included in the simulations. This assumption is conservative for storable flow determinations since any return flows from the Priority Two use would constitute a water source to the Rio Grande and tend to increase storable flows.

TABLE VI-5
CLOSED BASIN PROJECT DELIVERY SCENARIOS
FOR RIO GRANDE WATER SUPPLY STUDY
VALUES IN THOUSAND ACRE-FEET

	STEP ONE MAINSTEM DIVERSION SCENARIO				ALT STEP TWO DIVERSION SCENARIO			
	PRIORITY ONE DELIVERIES			PRIORITY 3	PRIORITY ONE DELIVERIES			PRIORITY 3
YEAR	TOTAL (1)	MAINSTEM (2)	CONEJOS (3)=(1-2)	AVAILABILITY (4)=94.5-(1)	TOTAL (5)	MAINSTEM (6)	CONEJOS (7)=(5-6)	AVAILABILITY (8)=94.5-(5)
1948	31.5	21.1	10.4	63.0	80.3	51.4	28.9	14.2
1949	94.5	34.6	59.9	0.0	80.3	64.2	16.1	14.2
1950	82.8	66.2	16.6	11.7	24.4	7.9	16.5	70.1
1951	30.0	24.0	6.0	64.5	25.7	15.4	10.3	68.8
1952	92.1	63.6	28.5	2.4	94.5	75.6	18.9	0.0
1953	55.5	23.9	31.6	39.0	74.0	36.7	37.3	20.5
1954	50.9	21.0	29.9	43.6	40.4	21.3	19.1	54.1
1955	39.7	31.8	7.9	54.8	63.9	21.3	42.6	30.6
1956	37.9	11.7	26.2	56.6	36.0	9.5	26.5	58.5
1957	85.1	47.1	37.9	9.5	80.3	51.4	28.9	14.2
1958	31.5	20.0	11.5	63.0	80.3	51.4	28.9	14.2
1959	30.3	18.8	11.5	64.2	19.6	10.4	9.2	74.9
1960	94.5	45.4	49.1	0.0	56.3	36.0	20.3	38.2
1961	82.4	35.6	46.8	12.1	54.6	30.1	24.5	39.9
1962	85.1	55.6	29.4	9.5	94.5	60.5	34.0	0.0
1963	10.0	8.0	2.0	84.5	27.0	4.2	22.8	67.5
1964	58.2	33.5	24.7	36.3	56.9	45.5	11.4	37.6
1965	85.1	68.1	17.0	9.5	94.5	69.8	24.7	0.0
1966	30.0	24.0	6.0	64.5	36.0	21.6	14.4	58.5
1967	35.7	0.0	35.7	58.8	22.4	6.1	16.3	72.1
1968	85.1	68.1	17.0	9.5	94.5	60.5	34.0	0.0
1969	34.1	27.3	6.8	60.4	55.0	25.7	29.3	39.5
1970	90.9	62.5	28.4	3.6	64.6	36.6	28.0	29.9
1971	51.0	0.0	51.0	43.5	16.8	2.2	14.6	77.7
1972	30.0	5.8	24.2	64.5	64.7	24.3	40.4	29.8
1973	94.5	48.6	45.9	0.0	94.5	72.8	21.7	0.0
1974	35.1	0.0	35.1	59.4	43.2	0.0	43.2	51.3
1975	94.5	75.6	18.9	0.0	94.5	60.5	34.0	0.0
1976	49.2	39.4	9.8	45.3	49.7	31.8	17.9	44.8
1977	30.0	5.8	24.2	64.5	10.0	0.0	10.0	84.5
1978	39.5	28.7	10.8	55.0	40.6	26.0	14.6	53.9
1979	85.1	68.1	17.0	9.5	82.2	52.6	29.6	12.3
1980	91.1	48.8	42.3	3.4	80.3	51.4	28.9	14.2
1981	10.7	8.6	2.1	83.8	24.6	15.7	8.9	69.9
1982	70.3	47.5	22.8	24.2	80.3	51.4	28.9	14.2
1983	65.5	52.4	13.1	29.0	53.3	31.4	21.9	41.2
1984	64.0	44.5	19.5	30.5	84.5	67.6	16.9	10.0
1985	94.5	69.3	25.2	0.0	94.5	60.5	34.0	0.0
AVG	59.4	35.7	23.8	35.1	59.7	35.8	23.9	34.8

NOTE: A SIMPLIFYING ASSUMPTION WAS MADE THAT PRIORITY TWO USE WATER WOULD BE FULLY CONSUMED BY THE WILDLIFE AREAS AND COULD BE DISREGARDED IN THE SIMULATIONS.

Priority Three Deliveries

The use of Priority Three water from the Closed Basin Project depends not only on the availability of Priority Three water but also on the willingness of the water users to pay. For this study, it has been assumed that Priority Three water availability is equal to the combined Priority One and Priority Three annual delivery capability (94,500 af) not used to deliver Priority One water. This water is shown in Table VI-5 for the two mainstem diversion scenarios.

To determine the amount of Priority Three available to a new reservoir upstream of Del Norte, the Priority Three available deliveries will be compared to the ability to exchange that water against the Compact.

VI.3.5 Summary of Water Use Network

Briefly discussed below are the major modeled features of the basin proceeding from the headwaters of the Rio Grande downstream. Figure VI-3 presents a schematic of the major water uses in the basin.

Historic Storage Diversions captures modeled flows released from major storage above Del Norte (Rio Grande, Santa Maria, and Continental Reservoirs) and delivers that water to users (Rio Grande Canal, Farmers Union Canal and Monte Vista Canal). Thus the storage water releases recorded for the 1948-1985 period are removed from the direct flow priority system and distributed to the Rio Grande Canal, Farmers Union and Monte Vista Canal.

At each of the four modeled potential reservoir sites in the upper Rio Grande Basin, three storable flow accounts, an instream flow requirement and a flow monitor were established to assist in the determination of storable flow.

1. The Closed Basin Project Priority 3 Exchange occurred when Priority 3 water from the Closed Basin Project was released to the Rio Grande in exchange for water which would have had been passed by the reservoir site to satisfy the Rio Grande Compact obligation.

2. A "Flood" monitor records the amount of water not required in a particular month of the study period to satisfy either the Compact obligation or downstream irrigation water uses. Note: these flows do not contain debit water which was captured and then released in a subsequent month as described in the following paragraph.

3. A "Debit" monitor is used by special logic in the model to record the portion of the Compact obligation at Del Norte which could be captured in a given month and held in an account for possible conversion to Colorado ownership (or release to downstream states). Values recorded in this account include water later released to fill Rio Grande Project Storage up to the 600,000 af level.

4. An instream flow monitor (senior in priority to other water rights associated with a potential reservoir) was established at each potential reservoir site based on the following values from "Instream Flow Appropriations", Colorado Water Conservation Board, January, 1987.

Table VI-6
Instream Flows at Potential Reservoir Sites

Potential Site	April - October (cfs)	November - March (cfs)
Vega Sylvestre	90	45
Wagon Wheel Gap	150	65
Rio Grande 1	160	80
South Fork 1	45	20

5. A flow monitor was established downstream of the potential reservoir site to record the modeled flow passing the potential reservoir site.

The Historic Net Depletion removes water from the flow base such that if the model was operated to simulate 1948-1985 historic conditions, the modeled flows at Del Norte would equal 1948-1985 gaged records. These depletions were necessary to correct for inaccuracies in gage records and correlations used in the flow base generation.

The mainstem Rio Grande Compact obligation as measured at Del Norte captures the estimated portion of the Del Norte flows required for the Compact obligation and transfers that water either to a debit account at the potential reservoir or releases it back to the river below Alamosa.

The water rights administration section described the rationale for simplifying the approximately 310 irrigation water rights in the Del Norte to Alamosa reach of the Rio Grande down to 41 consolidated modeled water rights. Forty of these rights are associated with the Rio Grande Canal, San Luis Canal, Prairie Ditch, Farmers Union Canal, Monte Vista Canal, Rio Grande and Lariat Ditch, Empire Canal and Costilla Canal as presented in Table VI-4.

Diversions for the eight ditch systems listed in the previous paragraph were generally the lessor of 1) the physical flow at their diversion point, 2) the legally available flow (determined by decrees and the priority system), 3) a monthly constraint on diversions. The monthly diversion constraints were formulated to generally reflect the maximum diversions experienced from 1950-1967 for each structure. For the Alternate Step Two mainstem diversion scenario, the monthly constraints on diversions were removed for the Rio Grande Canal, Farmers Union Canal, San Luis Canal and Prairie Ditch. See Section VI.2 for further description of the development of the two mainstem diversion scenarios.

An additional "Other" irrigation water use senior in priority to any of the 40 rights has been added to represent water rights other than the eight modeled ditches in the Del Norte to Alamosa reach. The assigned diversion water use reflects an average annual diversion for the 1967 through 1985 period with the monthly distribution given in Table VI-7. This assignment was valid since the use of the senior priority water use during the 1950-1985 period did not vary significantly with the Del Norte flow (remained fairly constant from year to year).

Table VI-7
Senior Priority "Other" Water Use
(thousands of acre-feet)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
0	0	0	6	23	27	21	17	12	9	1	0	116

The determination of flood flows required the inclusion in the modeling of a Flood Flow Sector downstream of Alamosa.

Modeling of the Closed Basin Project was accomplished by establishing two reservoir accounts, one for Priority One type water and one for Priority Three type water. These reservoir accounts were initialized at the beginning of each modeled year with the annual amounts described in Section VI.3.4. With large existing senior priority water users between Del Norte and Alamosa, the available times to exchange Priority Three water to a potential reservoir site is much more limited than for an exchange of Priority One water to existing mainstem diversion structures. Therefore, to maximize the Priority Three exchange, the model in a given month operated a Priority Three exchange to a potential reservoir site prior to operating any exchanges with Priority One water.

The Conejos Compact Obligation under the Compact is first contributed to by the Conejos Closed Basin deliveries and secondly, if necessary, by the "Conejos Inflow" sector. When the Conejos Closed Basin deliveries exceed the Conejos obligation under the Compact, the excess is recorded as a credit and used in subsequent years to reduce the Conejos obligation under the Compact. Conversely, when the Conejos Closed Basin deliveries are inadequate to satisfy the Conejos obligation under the Compact, the shortfall is obtained from the Conejos Inflow sector. Any Conejos Inflow not required for the Compact obligation is consumed (by the Conejos Consumption) in the model.

Historic Net Depletions are modeled net depletions above Lobatos and downstream of Alamosa obtained by differencing 1948-1985 streamgaging records. These net depletions occurred when the sum of the flows of the Rio Grande at Alamosa and of the Conejos River near La Sauses exceeded the recorded flow of the Rio Grande at Lobatos.

Abiquiu Reservoir is modeled on the Rio Chama tributary to the Rio Grande as discussed in the section on model modifications. Cochiti Reservoir is modeled on the Rio Grande downstream of Otowi as described in the model modification section.

Rio Grande Project Storage and its associated Project Demand were modeled. The modeling of the Rio Grande Project system influences whether water capturable at a potential upper Rio Grande basin reservoir site will need to be released to a downstream state or whether that water will revert to Colorado ownership as discussed under the Rio Grande Compact in Section VI.3.3. Some important modeling considerations for the Rio Grande Project were:

1. The capacities of Elephant Butte and Caballo Reservoirs were combined in assigning a total (1985) capacity of 2,297,000 af to Rio Grande Project Storage. Beginning of study period contents of Rio Grande Project Storage was assumed to be 90 percent of capacity or 2,070,000 af.

2. Evaporation of the Rio Grande Project Storage was modeled by translating modeled contents into surface area (using an area-capacity curve consolidated from recent area-capacity surveys of the two reservoirs) and multiplying the estimated surface area by estimated lake monthly evaporation rates. Lake evaporation rates were estimated by multiplying reported monthly pan evaporation rates for the Elephant Butte station (taken directly from the Rio Grande Compact Commission annual reports) by an estimated pan coefficient of .68. Lake evaporation rates in the Elephant Butte area are estimated to average 6.5 feet annually for the 1948 through 1985 study period. The Rio Grande Project Storage evaporation rate is estimated to be approximately 4 times the evaporation rate experienced at reservoir sites upstream of Del Norte.

3. A Rio Grande Project demand level of 650,000 af per year was imposed on Rio Grande Project Storage. This level reflects the approximate average annual delivery experienced in the period of 1980 through 1985 and is considerably greater than the 1948-1985 average of 540,000 af/year.

A Project Spill monitor was added to monitor the timing and volume of any spills from Rio Grande Project Storage.

Several special water rights were added as described below to the bottom of the network to monitor accounts related to the Rio Grande Compact and capture of Compact obligation water at potential reservoir sites.

- "Cumulative Debit Water in Storage" reflects the cumulative amount of Rio Grande Compact water which is being held for possible release to downstream states or conversion to Colorado ownership. This account represents the contents of a potential reservoir which captures only Compact obligation water.
- "Converted Debit Water" reflects the monthly volumes of water which convert to Colorado ownership due to a spill of water at Rio Grande Project Storage.
- "Debit Water Released" reflects the amount of Compact obligation water held at a potential reservoir site which is released to Rio Grande Project Storage during the study period to fill storage to 600,000 af during April and May.
- "Cumulative Conejos Credits" monitors the cumulative credits or debits of the Conejos Basin. Credits may accrue if the Conejos Closed Basin delivery exceeds the Conejos obligation under the Compact. Accumulated credits are used in subsequent years to reduce the Compact requirement of flows from the Conejos Basin.
- "Rio Grande Mainstem Credits and Debits" monitors the Compact credits and debits of the Rio Grande Mainstem as if there were no retained Compact obligation water at a potential reservoir site. This account was used to monitor how well the model satisfies the mainstem Compact requirements.
- "Colorado Lost Credits" monitors the accrued credits of Colorado which exceed 150,000 af, an assumption which was used to transform debit water into Colorado's ownership.

VI.4 CALIBRATION OF MODEL

Calibration is the process of checking and adjusting the computer model to reasonably "match" some portion of the historical record. Generally, calibration involves a trial and error procedure of adjusting input data or model parameters and comparing model results to historical activity.

The first activity in calibration was to select the 1950 through 1967 period in which to compare modeled to actual records. This period was selected since

- it is a period in which diversion records are readily available (since 1950)
- it reflects a period of little, if any, curtailment of diversions in the Del Norte to Alamosa reach to satisfy the Rio Grande Compact. Use of an historic period prior to administration to satisfy the Compact is desired for calibration since it provides information about ditch diversions unconstrained by Compact restrictions and allows a more straightforward calculation of return flows. The maximum monthly diversions in the 1950 through 1967 period are typically the maximum monthly diversions on record. Due to variations in the methods of compact curtailment which have been used since 1968, it would have been very difficult to ascertain what portion of the flows since 1968 were attributed to return flows and what portion was water being passed to satisfy the Compact.

Two tests were used during calibration:

1. Are the modeled ditch diversions for the eight modeled ditches a reasonable approximation of diversion recorded for the modeled period?
2. Are the modeled flows at Alamosa a reasonable reflection of flows recorded at Alamosa for the modeled period?

VI.4.1 Ditch Diversion Comparison

The first part of the calibration effort involved matching modeled with recorded diversions for the 1950-1967 period in the Del Norte to Alamosa reach of the Rio Grande. The adjusted parameter was a monthly constraint on the total diversions on a ditch by ditch basis. Initially, the diversion constraints were set at the maximum monthly ditch diversions recorded during the 1950 through 1967 period. Computer simulations with these initial constraints indicated modeled diversions which significantly exceeded the recorded (1950-1967) diversions. Therefore, the monthly ditch constraints were reduced in selected months to improve the comparisons. Following several adjustment iterations, a suitable match was obtained between modeled and recorded diversions for the 1950-1967 period. The suitable

match of modeled with recorded diversions for 1950-1967 is shown in the following table.

Table VI-8
Comparison of Modeled vs. 1950-1967 Ditch Diversions
(average annual)

	Modeled af	1950-1967 af	Difference %
Rio Grande Canal	183,200	187,500	2
Empire Canal	47,800	46,800	2
Farmers Union	42,000	41,800	less than 1
Monte Vista Canal	33,800	32,200	5
San Luis Valley Canal	19,700	19,900	1
Prairie Ditch	15,000	14,000	7
Costilla Canal	10,500	12,200	14
Rio Grande & Lariat	9,400	9,500	1
Senior Priority Water Use	115,500	116,600	1
Total	476,900	480,500	less than 1

Figure VI-4 presents a monthly comparison of modeled versus 1950-1967 diversions for ditches in the Del Norte to Alamosa reach on an average annual basis. A comparison of monthly total diversions for the full calibration period is shown in Figure VI-5.

VI.4.2 Alamosa Return Flow Analysis

The modeled flows at Alamosa include return flows from irrigation applications and water which passes through the Del Norte to Alamosa reach without being diverted. A monthly return flow analysis for the 1950 through 1967 period was performed on the Del Norte to Alamosa reach to better understand return flows and generate depletion and return flow parameters for use in the modeling.

This analysis was based on the following assumptions:

1. Flows at the Del Norte gage in excess of recorded diversions were assumed to pass directly through to Alamosa.

2. Recorded total diversions in the Del Norte to Alamosa reach which exceeded the Del Norte gage flows were assumed to be diverted return flows.

The return flows in the Del Norte to Alamosa reach are estimated as the sum of 1) the recorded total diversions which exceed the Del Norte gage flows and 2) the Alamosa gage flows excluding the Del Norte flows not diverted. An average annual summary of the key parameters involved in the monthly return flow analysis is presented below.

Table VI-9
Average Annual (1950-1967) Return Flow Analysis Summary
Rio Grande From Del Norte to Alamosa

Data Sets Used in Analysis		
1.	Del Norte Gaged Flow	528,000 af
2.	Total Del Norte to Alamosa Diversions	480,000 af
3.	Gaged Alamosa Flow	86,000 af
Derived by Analysis		
4.	Del Norte Flows Diverted (derived on a monthly basis as the lessor of Del Norte gaged flows and Del Norte to Alamosa Diversions)	465,000 af
5.	Del Norte Flows Not Diverted (1. minus 4.)	63,000 af
6.	Diversions exceed Del Norte Flow (derived on monthly basis as flow at Del Norte which exceeds Del Norte to Alamosa diversions)	15,000 af
7.	Return Flows at Alamosa (3. minus 5.)	23,000 af
8.	Total Return Flows (6. plus 7.)	38,000 af

Since the gaged Alamosa flow is less than 20 percent of either the Del Norte Flows or the recorded total diversions, small gaging inaccuracies in the Del Norte flow or total diversions could cause significant variations in the return flow conclusions.

The purpose of the return flow analysis was to gain information which would allow an estimate of ditch use efficiency and return flow parameters to apply to the modeled diversions so that modeled Alamosa flows would reasonably match recorded values from the 1950-1967 period. Modeled return flows are a function of the diversions applied to lands tributary to the Rio Grande above Alamosa. The portion of the modeled diversions applied to lands tributary to the Rio Grande upstream of Alamosa was estimated from irrigated acreage maps compiled by the State Engineer's Office in 1985. For the major ditches in the Del Norte to Alamosa reach of the Rio Grande, Table VI-10 shows the estimated percent of irrigated lands under each ditch system tributary to the Rio Grande in 1985.

Table VI-10
Percent of Irrigated Lands Tributary
to Rio Grande Upstream of Alamosa

Ditch	%	Diversion Location
Rio Grande Canal	12*	North
Farmers Union	0	North
Prairie Ditch	5	North
San Luis Valley Canal	20	North
Costilla Canal	0	North
Rio Grande Lariat Canal	100	South
Empire Canal	5	South
Monte Vista Canal	5	South
Senior Priority "Other" Water Use	100	North & South

* - percentage based on the 120,000 acres the Rio Grande Canal is obligated to serve through its bylaws, stock issues and assessments.

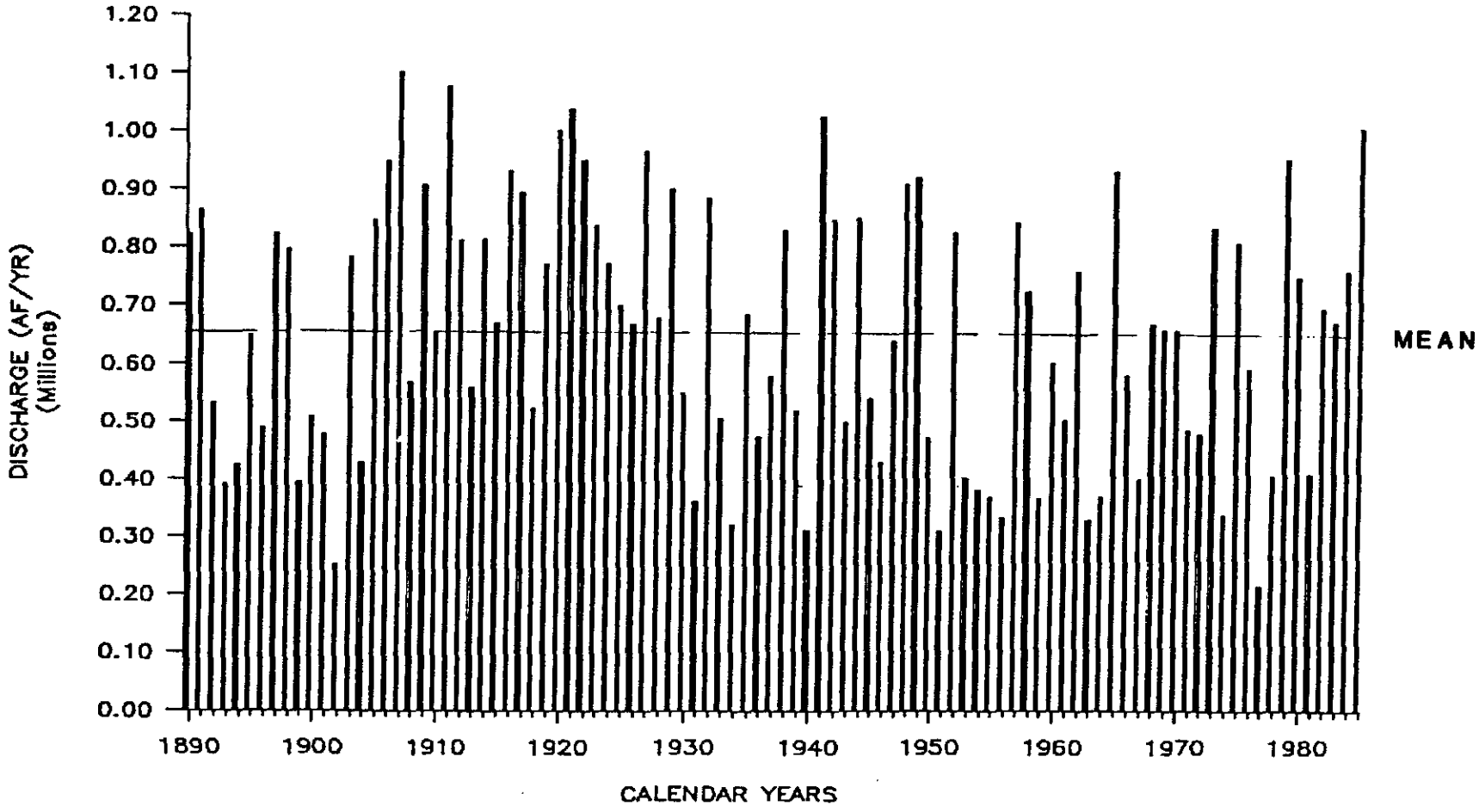
Assuming the diversions are applied in more or less equal amounts over the irrigated areas indicated on the maps, then application of the above percentages to the modeled diversions indicates that an average (1950-67) of approximately 161,000 acre-feet per year was applied to lands tributary to the Rio Grande upstream of Alamosa. The monthly modeled diversions (tributary to the Rio Grande upstream of Alamosa) and the estimated monthly average 1950-1967 return flow at Alamosa were input to a linear programming optimization tool which derived generalized efficiency

of use and return flow parameters such that the difference between modeled and estimated flows at Alamosa would be minimized.

The generated efficiency of use and return flow parameters were then input to a simulation with historic sources and diversions of water. A comparison of the monthly modeled flows and recorded flows at Alamosa for 1950-1967 on an average annual basis is shown in Figure VI-6 and indicates a well calibrated model as related to return flows. Figure VI-7 shows a comparison of the monthly modeled Alamosa flows with the monthly gaged record for the 1950 through 1967 period. Again, a reasonable match of modeled flows to gaged flows was obtained.

The return flow analysis indicated the following return flow characteristics of water applied to lands tributary to the Rio Grande upstream from Alamosa.

1. Approximately 24 percent of diversions applied to lands tributary to the Rio Grande upstream of Alamosa are returned to the Rio Grande during the study period.
2. It is estimated that use of diversions in the months of July through April is very efficient with less than 10 percent of diversions during those months returning to the Rio Grande.
3. It is estimated that water use in the month of May is relatively inefficient with approximately 50 percent of diversions returning to the Rio Grande. Returns of June diversions are estimated at approximately 30 percent.
4. The estimated return flow pattern returns more than half of the return flow in the first 6 months following a diversion.



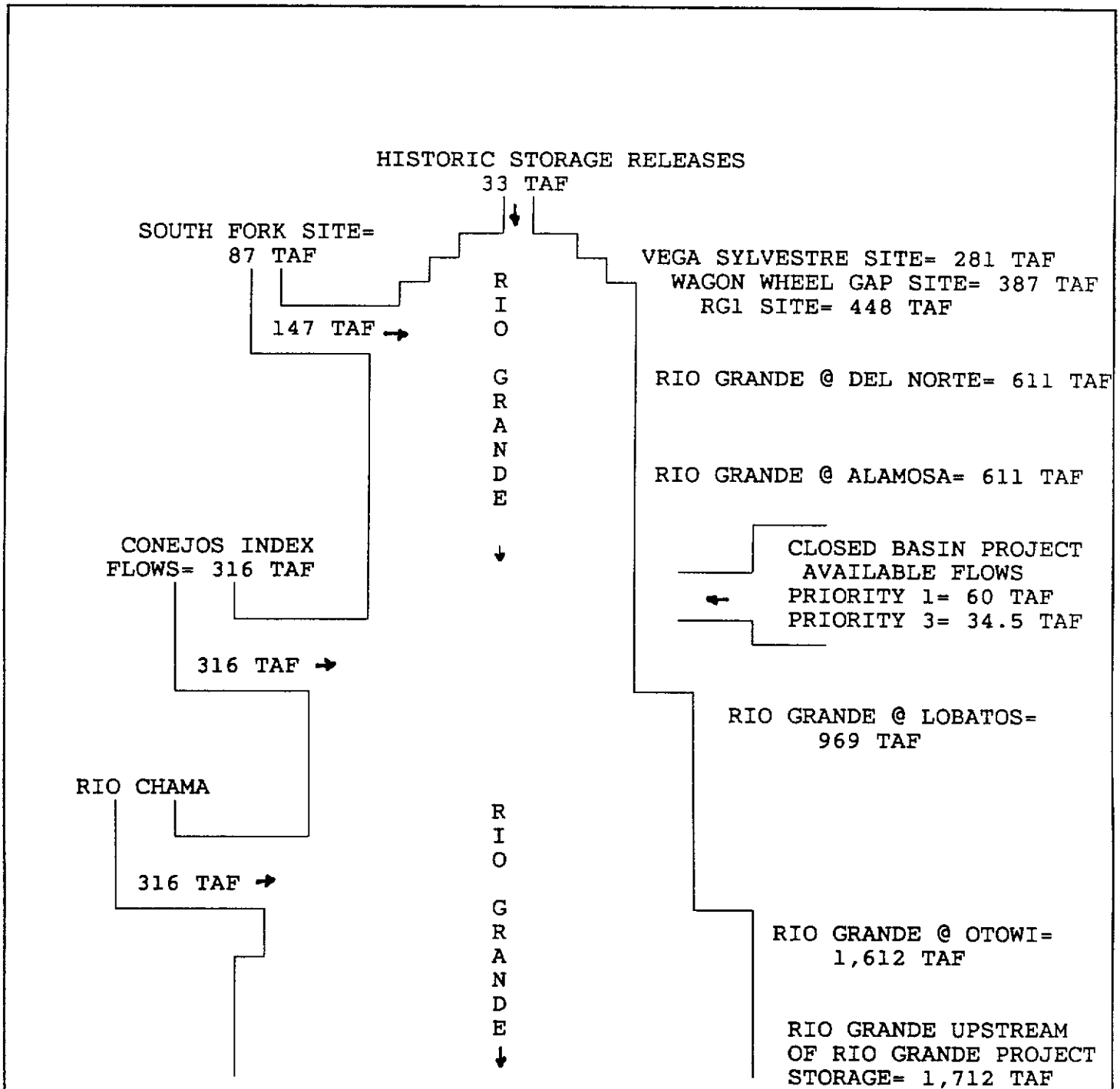
COLORADO WATER CONSERVATION BOARD
RIO GRANDE WATER SUPPLY STUDY - PHASE I

Figure VI-1

RIO GRANDE NEAR DEL NORTE, CO
ANNUAL FLOWS (1890-1985)

Leonard Rice Consulting Water Engineers, Inc.

AUG 1987	789SLV01



NOTE: TAF - THOUSAND ACRE FEET

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RIO GRANDE WATER SUPPLY STUDY

FIGURE VI-2
GENERATED BASE FLOWS FOR RIBSIM MODEL

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JUNE, 1989

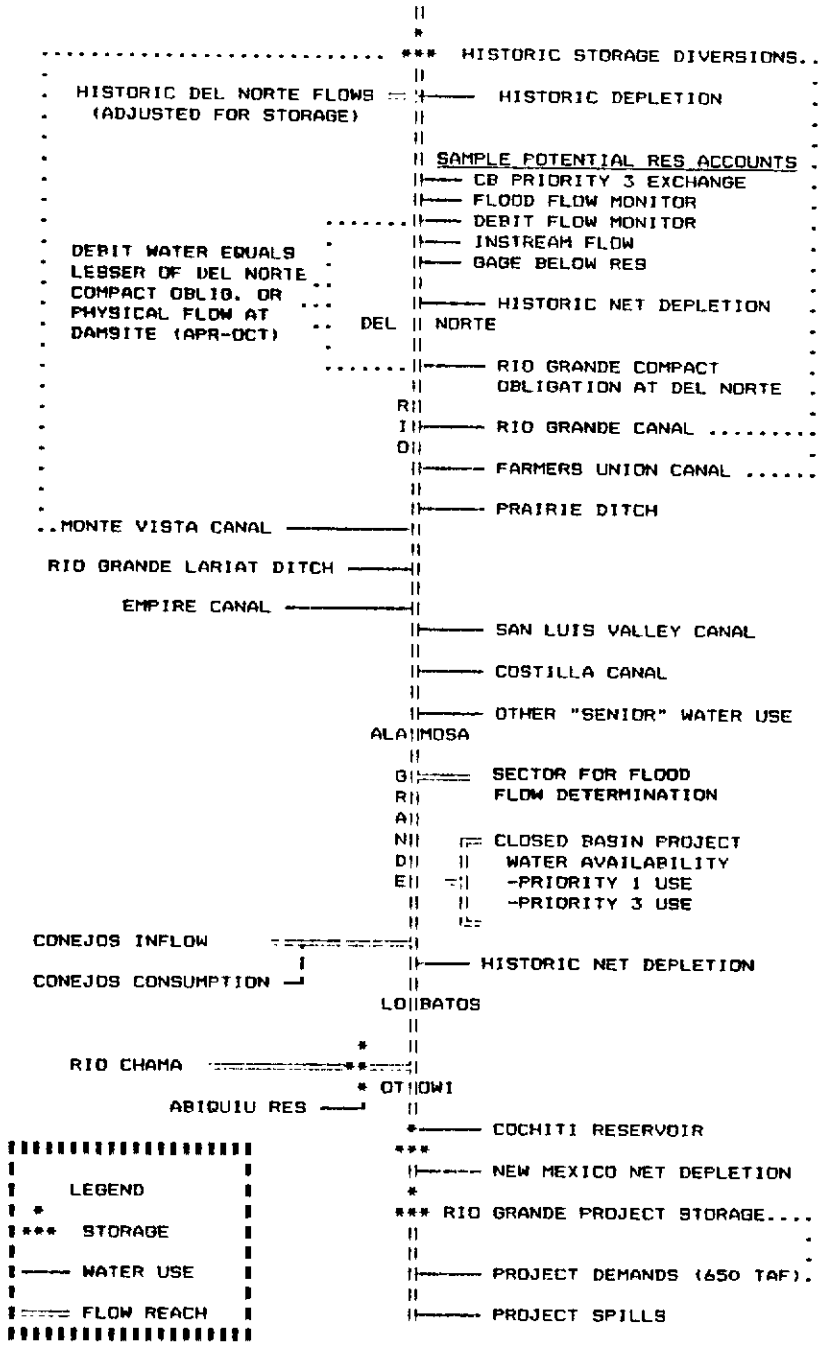

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FIGURE VI-3
SCHEMATIC OF
MODELED WATER USES

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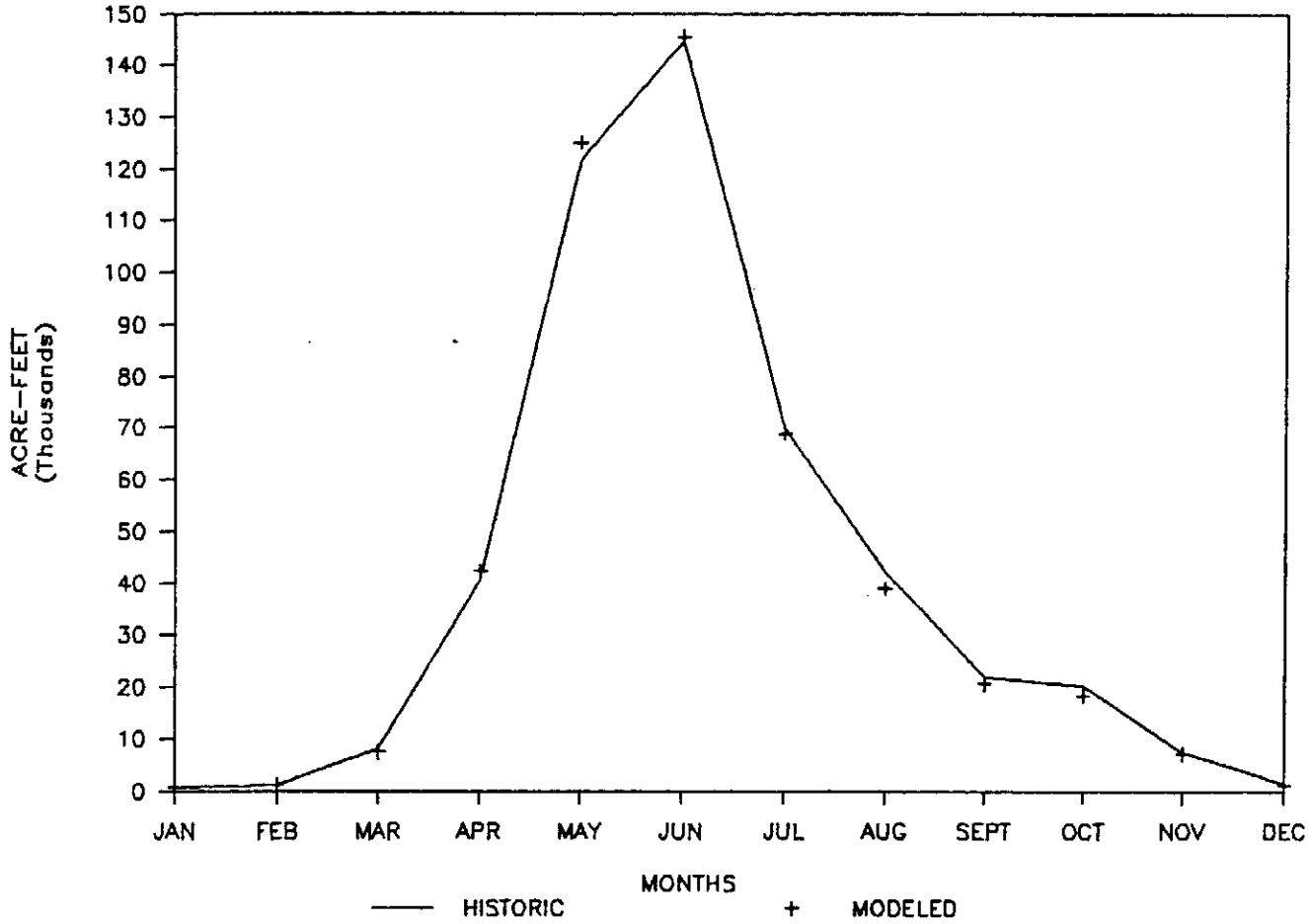

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FIGURE VI-4

MODELED VS. HISTORIC
DITCH DIVERSIONS
MEAN MONTHLY (1950-1967)

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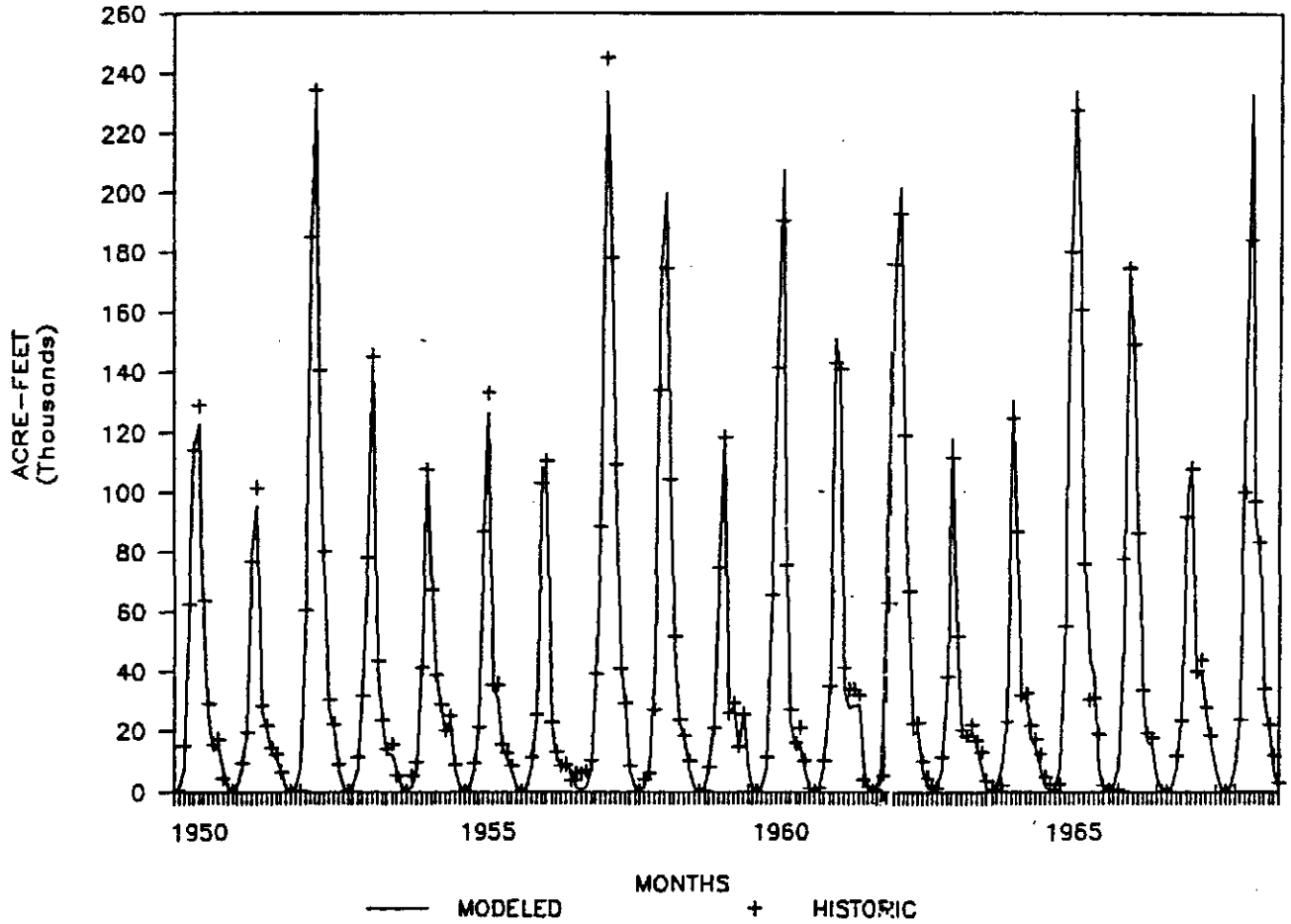

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FIGURE VI-5

MODELED VS. HISTORIC
DITCH DIVERSIONS
(MONTHLY)

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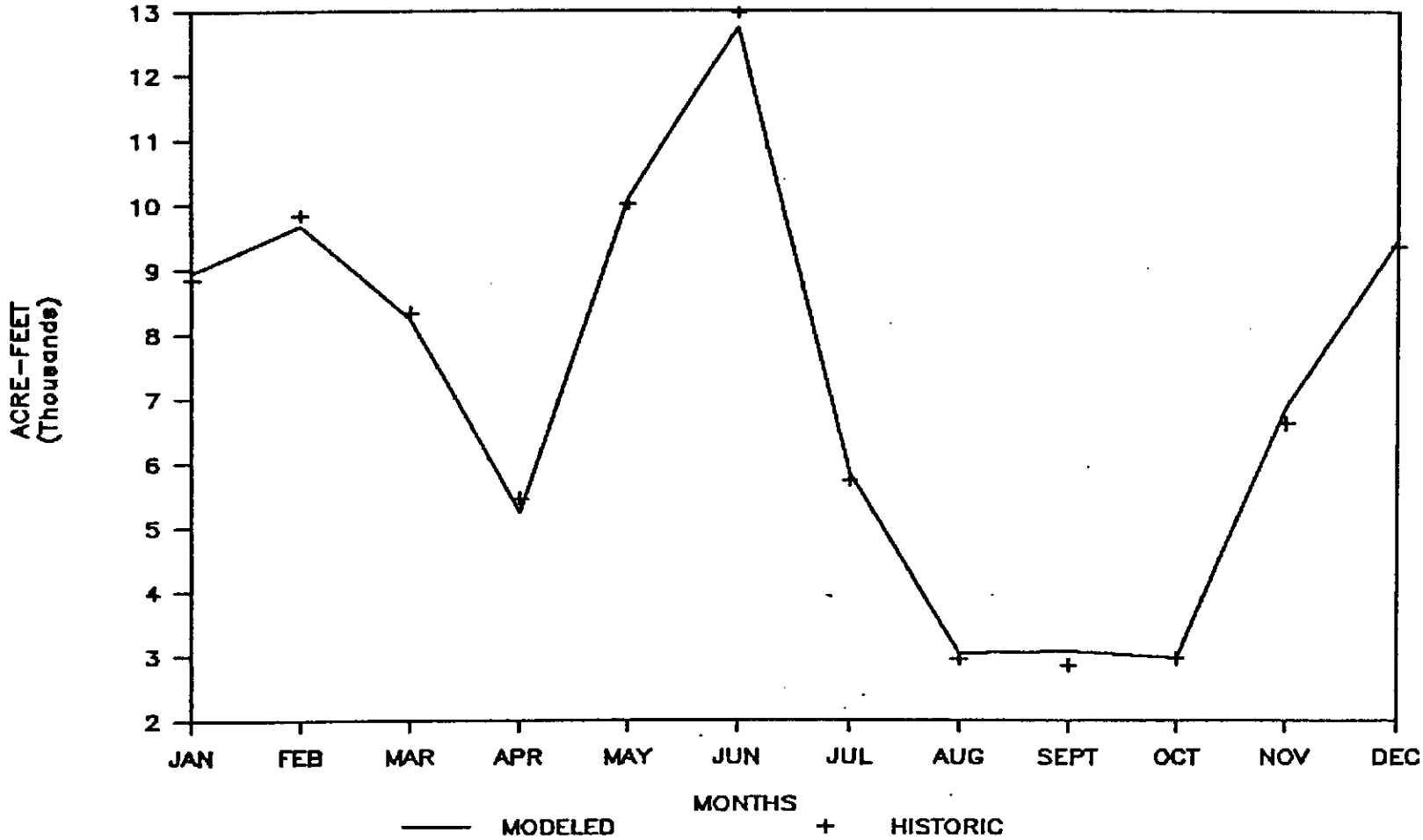

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FIGURE VI-6

MODELED VS. HISTORIC
ALAMOSA FLOW
MEAN MONTHLY (1950-1967)

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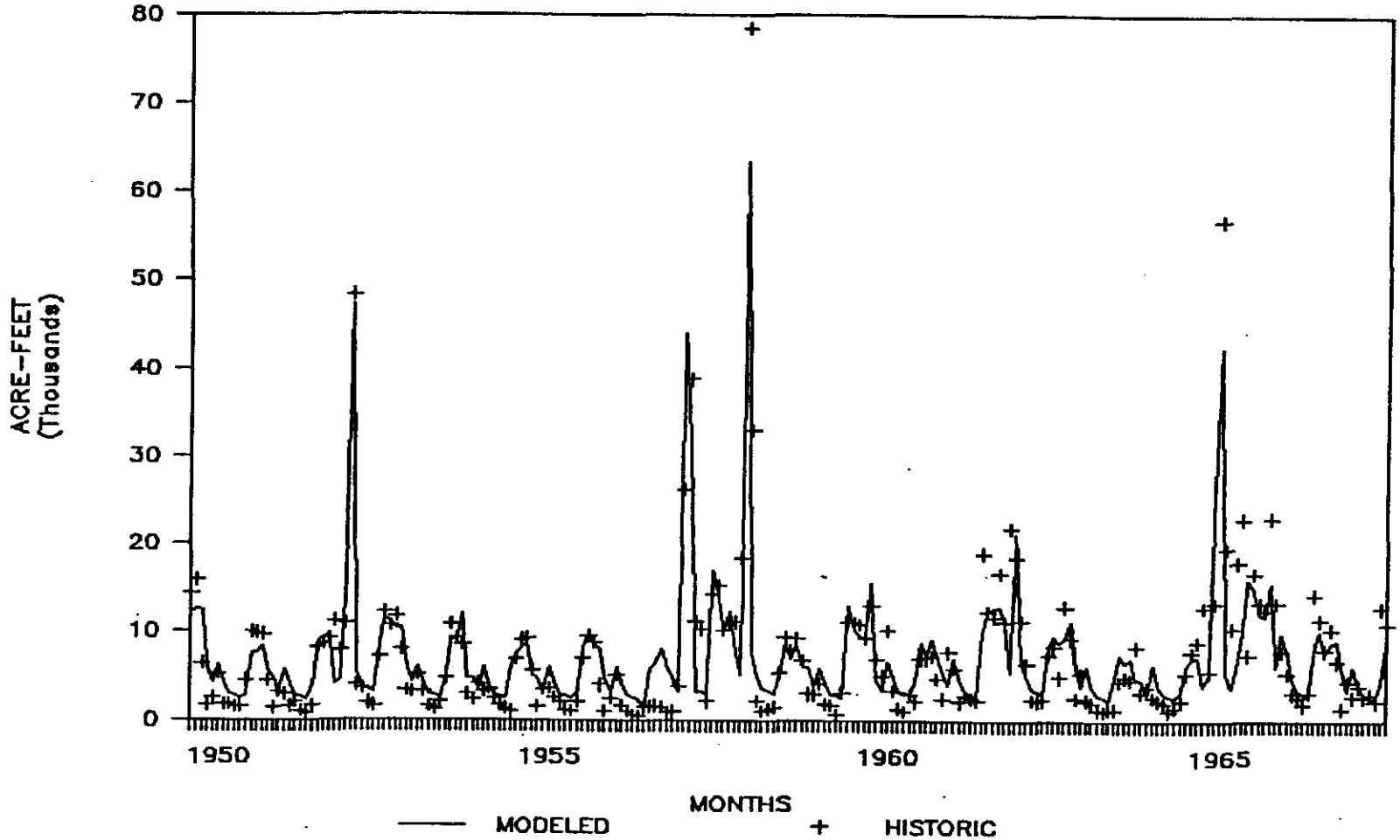

COLORADO WATER CONSERVATION BOARD
RIO GRANDE WATER SUPPLY STUDY - PHASE I

FIGURE VI-7

MODELED VS. HISTORIC
ALAMOSA FLOW
(MONTHLY)

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VII. MODEL OPERATION AND INTERPRETATION

Various water supply and use scenarios were utilized with the calibrated model and the results reviewed to analyze storable flows at four potential storage sites. Discussed below are the water supply scenarios for which the analyses were made, the methodology of determining storable flows, and the results of the analyses.

VII.1 WATER SUPPLY AND USE SCENARIOS

For each of the two mainstem diversion scenarios, five simulations were performed as indicated in the following table. A base simulation was performed for each of the mainstem diversion scenarios which estimated storable flow at Wagon Wheel Gap if no Closed Basin project deliveries were made. Subsequent simulations estimated storable flows at the four damsites with the estimated Closed Basin Project deliveries described in Section VI.3.4.

TABLE VII-1

TEN SIMULATIONS

	Without Closed Basin Project Deliveries	With Closed Basin Project Deliveries
Step One Mainstem Diversion Scenario	1. at WWG site	2. at VEGA site 3. at WWG site 4. at RG1 site 5. at SF1 site
Alternate Step Two Mainstem Diversions	6. at WWG site	7. at VEGA site 8. at WWG site 9. at RG1 site 10. at SF1 site

VII.2 TYPES OF STORABLE FLOWS

Four types of storable flow, as described in the following sections, were investigated at each potential reservoir site. Since the types of storable flow may all be competing for limited flow at the potential reservoir site, it was necessary to prioritize the allocation of limited flows to the types of storable flows. Water available at the potential reservoir site (in excess of the instream flow requirement) was first made available to a Closed Basin Project (Priority Three use) exchange, then as flood storable flows, as debit storable flows and finally as seasonal storable flows.

VII.2.1 Storable Closed Basin Exchange Water

Storable Closed Basin Exchange Water is the estimated amount of the Priority Three Closed Basin water availability (shown in Table VI-5) which could be exchanged upstream to a potential reservoir site. An exchange was modeled if 1) there was physical flow at the damsite exceeding the downstream requirements in Colorado, 2) there was Priority Three Closed Basin water available, and 3) a Compact obligation existed.

VII.2.2 Storable Flood Flow Determination

Storable Flood Flows are those flows occurring at a potential reservoir site which are excess to Compact obligations, to downstream irrigation uses and to an instream flow requirement at the potential damsite. These flows are not intended for determinations of flood storage in a potential reservoir.

In years of a spill of water from Rio Grande Project Storage, the Compact requirement can be neglected and the storable flood flows defined as flows at the potential reservoir site in excess of downstream irrigation uses and an instream flow requirement. However, in years with no Rio Grande Project Storage spill, caution was exercised in defining storable flood flows since water surplus to the system in one month may accrue as a credit against the Compact obligation in subsequent months and, therefore, not be truly surplus to the river basin within Colorado. It was assumed for this study that it would be desirable to limit the

accrual of Colorado's credits to some arbitrary number (150,000 af) and transfer any credits which would have exceeded that number into storable flood flows at a potential reservoir site. Such a transfer would be desirable to limit the loss of credit water by evaporation since evaporation losses at a reservoir site upstream of Del Norte may be 25 percent or less of the evaporation losses of Rio Grande Project Storage.

VII.2.3 Storable Debit Water Determination

Storable Debit Water is that part of Colorado's Compact obligation which could be captured and held at a potential reservoir site and which reverts to Colorado ownership with a spill of water at Rio Grande Project Storage. This account is a direct output of the RIBSIM model.

VII.2.4 Storable Seasonal Flow Determination

Storable Seasonal Flows are flows that could be stored at a potential reservoir site rather than diverted by direct flow diversion structures downstream. This water would then be released later in the irrigation season and perhaps used more efficiently on a pattern reflecting a theoretical river diversion scenario. The theoretical river diversions assumed no available storage downditch of the river headgate of the existing diversions.

Figure VII-1 graphically illustrates the definition of storable seasonal flow as the difference between two annual water diversion curves. The curve on the left represents historic average monthly diversions while the curve on the right represents theoretical monthly diversions based on irrigated crop demands and water delivery efficiencies.

The availability of Storable Seasonal Flows at a potential reservoir site may require the transfer of existing direct flow water rights to upstream storage (which has already been accomplished on a limited basis in the Basin). Investigation of the transfer of existing storage rights was outside the scope of the present study.

The determination of Storable Seasonal Flows involved the following steps:

1) estimation of irrigated acreage served by Del Norte to Alamosa diversions
2) estimation of potential crop consumptive use of irrigation water
3) application of assumed ditch system efficiencies to potential crop consumptive use to derive theoretical river diversions
4) determination of storable seasonal flows at a potential reservoir site as the lessor of available flows at the reservoir site or the excess of modeled ditch diversions (between Del Norte and Alamosa) over theoretical river diversion levels.

Each of these steps is described in following sections.

Irrigated Acreage

Table VII-2 shows the estimated irrigated acreage served by diversions in the Del Norte to Alamosa reach as obtained from preliminary tabulations of the State Engineer's Office prepared in 1985. Since irrigated acreage varies from year to year depending on water supply, economic conditions, etc., the values in Table VII-2 should be recognized as the irrigated acreage at a single point in time and not interpreted as long term averages.

Table VII-2
Estimated Acreage Irrigated by Del Norte to Alamosa Diversions
(from preliminary State Engineer's tabulations of irrigated acreage in 1985)

	Acreage
Rio Grande Canal	102,620
Farmer's Union	43,680
Prairie Ditch	20,020
Monte Vista Ditch	24,500
Senior Ditch Right	33,040
Rio Grande Lariat	2,520
Empire Canal	48,440
San Luis Valley Canal	30,660
Costilla Ditch	8,680
Total	314,160

Potential Crop Consumptive Use

Based on additional information obtained from the State Engineer's Office, it was estimated that the average cropping pattern of the above acreage was 26 percent alfalfa, 19 percent pasture, 15 percent potatoes, and 40 percent spring grain. To obtain estimates of the potential requirements of these crops for irrigation water, the following procedure was followed:

- The modified Blaney-Criddle consumptive use methodology (USDA,1970) was applied to 1948 through 1985 monthly temperature and precipitation data collected for the Center, Colorado weather station to derive preliminary crop consumptive use of irrigation water estimates for each of the above crops.
- These estimates were further refined by adjusting by a percent factor to bring the values closer to average annual estimates of local agricultural consultants (Agro, -).

With this analysis, it was estimated that the average annual crop consumptive use of irrigation water approximates 1.43 feet for the above cropping pattern. Multiplying the 1.43 feet by the 314,160 acres indicates that the average annual crop requirement of irrigation water is approximately 430,000 af.

Theoretical River Diversions

Theoretical river diversions are those diversions which are estimated to be needed to provide a full water supply to irrigated crops. Three theoretical river diversion levels were derived by dividing the potential crop consumptive use by three assumed ditch system efficiencies (percent of river water which becomes available to the crop) of 30 percent, 50 percent and 70 percent. The average annual theoretical river diversion requirement approximated 1.4 million af with an assumed 30 percent ditch system efficiency, 900,000 af for an assumed 50 percent ditch system efficiency and 600,000 af for an assumed 70 percent ditch system efficiency.

Determination of Storable Seasonal Flows

The Storable Seasonal Flow at a potential reservoir site was the lessor of:

1) The excess of the modeled ditch diversions between Del Norte and Alamosa over the derived theoretical river diversions for those same ditches.

2) The physical flow at the potential reservoir site after reduction for instream flow, storable Priority 3 exchange flows, and storable flood flows.

VII.3 RESULTS

Summaries of selected simulation results for the Step One mainstem diversion and Alternate Step Two mainstem diversion scenarios are presented in Tables VII-3 and VII-4, respectively. Appendix E contains monthly storable flow results from the ten simulations. Monthly storable flows results have also been provided in computer form on a diskette included with the model documentation.

VII.3.1 Storable Closed Basin Project Exchange Water

The study indicated that there is little opportunity to exchange Priority Three water to a potential reservoir upstream of Del Norte. This resulted mainly because the availability of Priority Three exchange water often occurs in years of average or below average water supply when most of the flow at a potential reservoir site is appropriated by downstream users. The average (1948-1985) annual Priority Three exchange ranges from less than 1,000 af at the South Fork damsite for the Alternate Step Two mainstem diversion scenario to approximately 3,400 af at the RG1 site for the Step One mainstem diversion scenario. The annual exchange volumes ranged from 0 af to approximately 16,000 af. Approximately 45 percent of the years in the Step One mainstem diversion scenarios and 20 percent of the years in the Alternate Step Two mainstem diversion scenarios had exchanges of greater than 1,000 af. The annual distribution of a Priority Three exchange for the Wagon Wheel Gap site with the Step One mainstem diversion scenario is graphically shown in Figure VII-2(A).

At any given time, an exchange is dependant on the following three factors: 1) availability of an exchange source (i.e. Priority Three water), 2) existence of a Compact requirement, and 3) the minimum physical flow occurring between the potential reservoir site and the Closed Basin Project delivery point. Since the Compact requirement existed in all but two years of the study period, the existence of a Compact requirement does not usually limit the exchange ability. The most significant limiting factor for an exchange is the physical flow occurring between the potential reservoir site and the Closed Basin Project delivery point. The

TABLE VII-3

SELECTED SIMULATION RESULTS

Average Annual (1948-1985)
Thousand Acre-Feet unless noted otherwise

Step One Mainstem Diversion Scenario

	w/o CB Deliveries	w/ Closed Basin Project Deliveries			
	WWG Site	Vega Site	WWG Site	RG1 Site	S. Fork
Storable Flows					
1. Priority 3 CB Exchange	0	3.4	3.4	3.4	3.0
2. Flood Water	1.7	2.7	2.8	2.9	2.3
3. Debit Water	0	0	0	0	0
4. Seasonal Water					
a. at 70 % efficiency	69.6	64.4	75.3	76.8	29.6
b. at 50 % efficiency	41.4	39.5	45.0	47.1	19.1
c. at 30 % efficiency	15.1	13.1	16.1	17.8	5.5
Mainstem Use					
1. Diversions	496.2	524.4			
2. Diversion Curtailment	31.2	3.1			
Closed Basin Project Operation					
1. Priority 1 Delivery (mainstem and Conejos)	0	59.4			
Range (minimum-maximum)	0-0	10.0 - 94.5			
2. Priority 3 Delivery	0	3.4	3.4	3.4	3.0
Colorado Compact Operation					
1. Maximum Debit	-96.0	-44.6	-44.6	-44.6	-44.4
2. Maximum Credit	23.8	81.3	81.1	81.0	81.6
3. Ending Credit (minus=debit)	-37.3	67.8	67.8	67.8	67.9
4. Credit Evaporation Charges	1.1	6.1	6.1	6.1	6.1
5. Lobatos Gaged Flow	303.1	311.5	311.4	311.2	312.1
Rio Grande Project					
1. Inflow	708.1	716.5	716.4	716.2	717.2
2. Project Deliveries	592.7	594.1	594.3	594.4	593.7
3. Ending (1985) Storage	2,297.0	2297.0	2297.0	2297.0	2297.0
4. Evaporation	108.7	114.3	114.5	114.3	115.5
5. Spills (year- spill)	1948- 54.1 1985- 10.3	1948- 75.4 1985- 28.1	1948- 75.4 1985- 32.1	1948 - 75.5 1985 - 35.7	1948- 75.2 1985- 13.9

Table VII-4

Selected Simulation Results

Average Annual (1948-1985)
Thousand Acre-Feet unless noted otherwise

Alternative Step Two Mainstem Diversion Scenario

	w/o CB Deliveries	w/ Closed Basin Project Deliveries			
	WWG Site	Vega Site	WWG Site	RG1 Site	S. Fork
Storable Flows					
1. Priority 3 CB Exchange	0	1.0	1.1	1.1	.9
2. Flood Water	0	0	0	0	0
3. Debit Water	0	0	0	0	0
4. Seasonal Water					
a. at 70 % efficiency	76.3	69.5	84.3	90.3	30.5
b. at 50 % efficiency	46.2	48.2	55.3	57.8	22.4
c. at 30 % efficiency	16.2	16.3	19.2	21.0	8.1
Mainstem Use					
1. Diversions	497.2	534.3			
2. Diversion Curtailment	62.2	25.1			
Closed Basin Project Operation					
1. Priority 1 Delivery (mainstem and Conejos)	0	59.7			
Range (maximum - minimum)	0-0	10.0 - 94.5			
2. Priority 3 Delivery	0	1.0	1.1	1.1	.9
Colorado Compact Operation					
1. Maximum Debit	-84.8	-95.8	-95.8	-95.8	-95.8
2. Maximum Credit	18.7	24.3	24.3	24.3	24.3
3. Ending Credit (minus=debit)	-83.5	-95.8	-95.8	-95.8	-95.8
4. Credit Evaporation Charges	.7	.8	.8	.8	.8
5. Lobatos Gaged Flow	303.7	303.7	303.7	303.7	303.7
Rio Grande Project					
1. Inflow	709.0	708.7	708.8	708.8	708.8
2. Project Deliveries	595.8	594.5	594.6	595.0	594.6
3. Ending (1985) Storage	2,286.5	2195.6	2199.4	2203.2	2195.6
4. Evaporation	107.4	110.7	110.5	110.2	110.7
5. Spills (year- spill)	0	0	0	0	0

primary reason that the exchange ability significantly declines from the Step One mainstem diversion scenarios to the Alternate Step Two mainstem diversion scenarios is the greater utilization of flows by mainstem diversions in the Alternate Step Two scenarios and the resulting lack of unappropriated flows at the potential reservoir sites

VII.3.2 Storable Flood Flows

Flood waters available for storage upstream of Del Norte occurred in the first and last years of the study period for the Step One mainstem diversion scenarios. The modeling of the Alternate Step Two mainstem diversion scenarios (which has a higher mainstem use than the Step One scenario) indicated no storable flood flows.

Storable flood flows for the Step One mainstem diversion scenarios (with Closed Basin Project deliveries) and the potential mainstem reservoir sites approximated 75,000 af in 1948 and 30,000 af in 1985. These were years of modeled spills at Rio Grande Project Storage. Since Colorado accrued credits did not exceed 150,000 af, the assumption that accrued credits exceeding 150,000 af would be converted into Storable Flood Flows did not impact the determination of Storable Flood Flows. The annual storable flood flows are graphically shown in Figure VII-2(B) for the Wagon Wheel Gap site and the Step One mainstem diversion scenario.

VII.3.3 Storable Debit Water

No storable debit flows occurred in the simulations. Storable debit water would result if any of the Compact obligation water captured at a potential reservoir site could be held until a spill of water occurred at Rio Grande Project Storage. The modeling indicated that the generally low levels of Rio Grande Project storage during the study period required that the captured amounts of Colorado's Compact obligation be subsequently released to downstream states. Based on the assumptions used in the modeling, Rio Grande Project storage spilled in only two of the 38 years of the study period for Step One mainstem diversion scenarios and did not spill for the Alternate Step Two mainstem diversion scenarios. Figures VII-3(A), VII-3(B), VII-3(C) and VII-3(D) present annual inflows, releases, evaporation and contents

for the Rio Grande Project from the simulation of storable flows at the Wagon Wheel Gap site with Closed Basin Project operation and Step One mainstem diversions.

Factors which might appear to influence the frequency of modeled spill of Rio Grande Project Storage include the contents of Rio Grande Project Storage at the start of the modeling period, the level of Rio Grande Project demands, and the magnitude of inflows. The primary factor influencing the frequency of spills of Rio Grande Project Storage is the inflow hydrology such as a series of large (i.e. greater than 1,000,000 af) annual inflows such as occurred in 1982 through 1985.

In formulating an appropriate initial content level of Rio Grande Project Storage, several levels of initial Rio Grande Project contents were modeled. Initial contents ranging from 20 percent to 90 percent of capacity resulted in only two years of spill. Only when the initial contents exceeded 95 percent of capacity did the years of spill increase. Therefore, the frequency of spill of Rio Grande Project Storage was found to be not very sensitive to the assumed initial content level of Rio Grande Project Storage.

Though the simulated demand level of 650,000 af per year was assumed to be appropriate for this study, several lower demand levels were briefly investigated to determine impact on the spill frequency of Rio Grande Project Storage. This investigation indicated that if the simulated annual demand was reduced to a level of 550,000 af or 600,000 af, spills of the Rio Grande Project would still only occur in the first and last years of the study period. Therefore, the existence of storable debit flows does not appear to be sensitive to moderate changes in the Rio Grande Project demand level.

VII.3.4 Storable Seasonal Flows

Given the assumption that no storage for diversions exists downditch of the ditch river headgates, a new reservoir upstream of Del Norte may have considerable potential for regulating and making more efficient use of existing diversions. The seasonal storable flow ranges from approximately 5,500 af to approximately 90,000 af depending on the reservoir site, mainstem diversion scenario, and assumed irrigation system efficiency being investigated. Figure VII-2(C) shows annual

seasonal flows for the simulation at the Wagon Wheel Gap Site based on a 50 percent irrigation system efficiency and the Step One mainstem diversion scenario. Storable Seasonal Flows for this simulation occurred in 27 years out of the 38 year study period.

The storable seasonal flows are greater with the Alternate Step Two mainstem diversion scenario than with the Step One mainstem diversion scenario. This is because the theoretical irrigation diversions for the mainstem did not change between mainstem diversion scenarios. Since the Alternate Step Two mainstem diversion scenarios resulted in greater mainstem diversions than the Step One scenarios, there were more opportunities in the Alternate Step Two scenarios to store water.

Based on the return flow analysis for areas tributary to the Rio Grande upstream of Alamosa and large numbers of center pivot sprinklers associated with the lands served by existing diversions, it appears that a 70 percent use efficiency may be the most realistic of the three assumed use efficiencies. Much more study is required to define the use efficiency, including investigations of the efficiency of existing ground water systems used for storage, to better quantify the present reconnaissance level estimate of Storable Seasonal Flows.

VII.3.5 Total Storable Flow

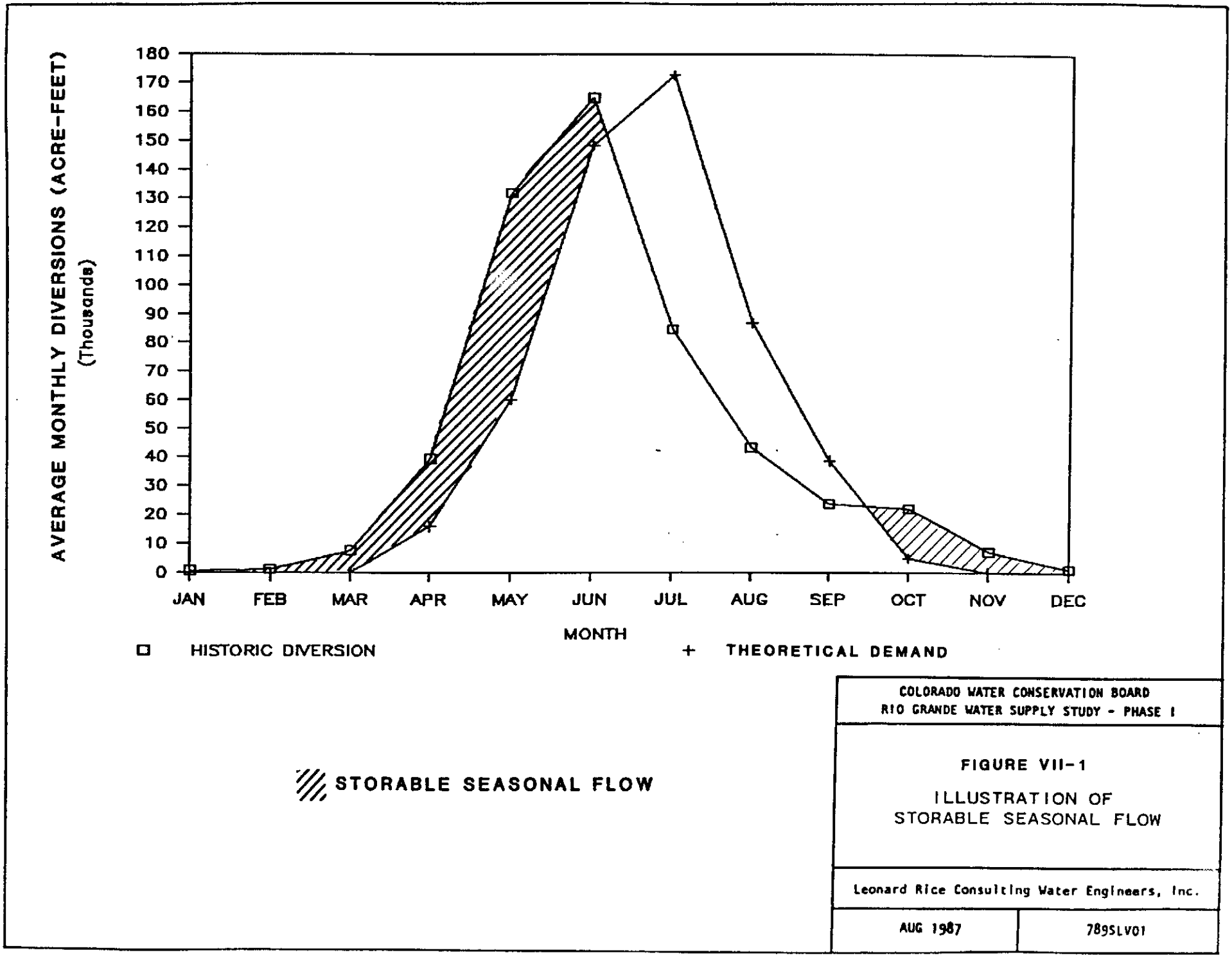
The Closed Basin Project Priority Three exchange, the storable flood flows, the storable debit flows and the storable seasonal flows (given assumed ditch system efficiencies) are additive and would sum to the total estimated storable flow at a potential reservoir site. A summary of the storable flows for the Wagon Wheel Gap site with Closed Basin Project deliveries, and an assumed 50 percent mainstem ditch system efficiency are shown in Table VII-5 for both diversion scenarios. The estimated total storable flows for the Wagon Wheel Gap site with Closed Basin Project deliveries, the Step One mainstem diversion scenario and an assumed 50 percent mainstem ditch system efficiency are shown graphically in Figure VII-2(D).

TABLE VII-5
STORABLE FLOW COMPARISON FOR WAGON WHEEL GAP SITE
(WITH CLOSED BASIN PROJECT DELIVERIES)
AVERAGE ANNUAL (1948-1985) ACRE-FEET

	Step One Mainstem Diversion Scenario	Alternate Step Two Mainstem Diversion Scenario
Closed Basin Project Priority 3 Exchange	3,400	1,100
Flood Water	2,800	0
Debit Water	0	0
Seasonal Storable Flow at 50 % System Efficiency	45,000	55,300
Total	51,200	56,400

VII.3.6 Potential Reservoir Sites

As might be suspected, the total storable flows are greatest at those potential reservoir sites with the greatest physical flow availability. The analyses conducted for this study indicate that the downstream reservoir sites, RG1 on the Rio Grande and SF1 on the South Fork, would have the greatest potential for capturing storable flows. The RG1 site displays the greatest potential of all sites investigated. It should be kept in mind, however, that a number of factors in addition to water availability must be considered in the selection of a potential reservoir site. These other factors such as geologic and geotechnical suitability, construction costs and environmental considerations were beyond the scope of this study.



COLORADO WATER CONSERVATION BOARD
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FIGURE VII-1

ILLUSTRATION OF
STORABLE SEASONAL FLOW

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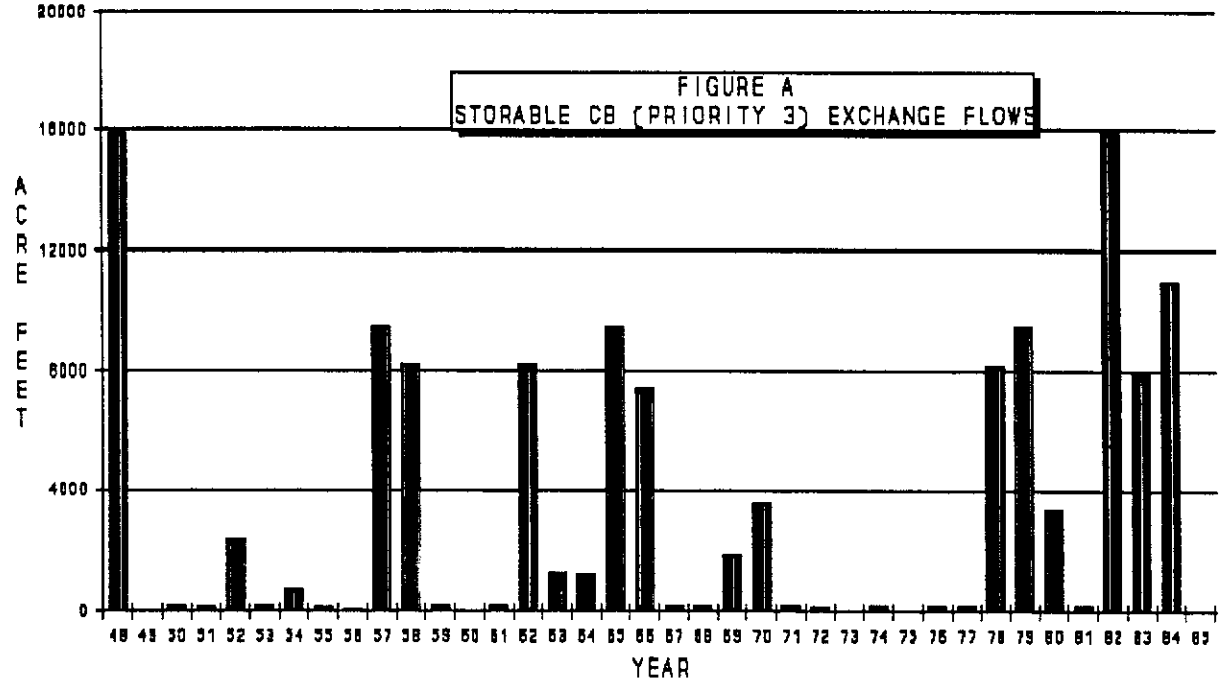

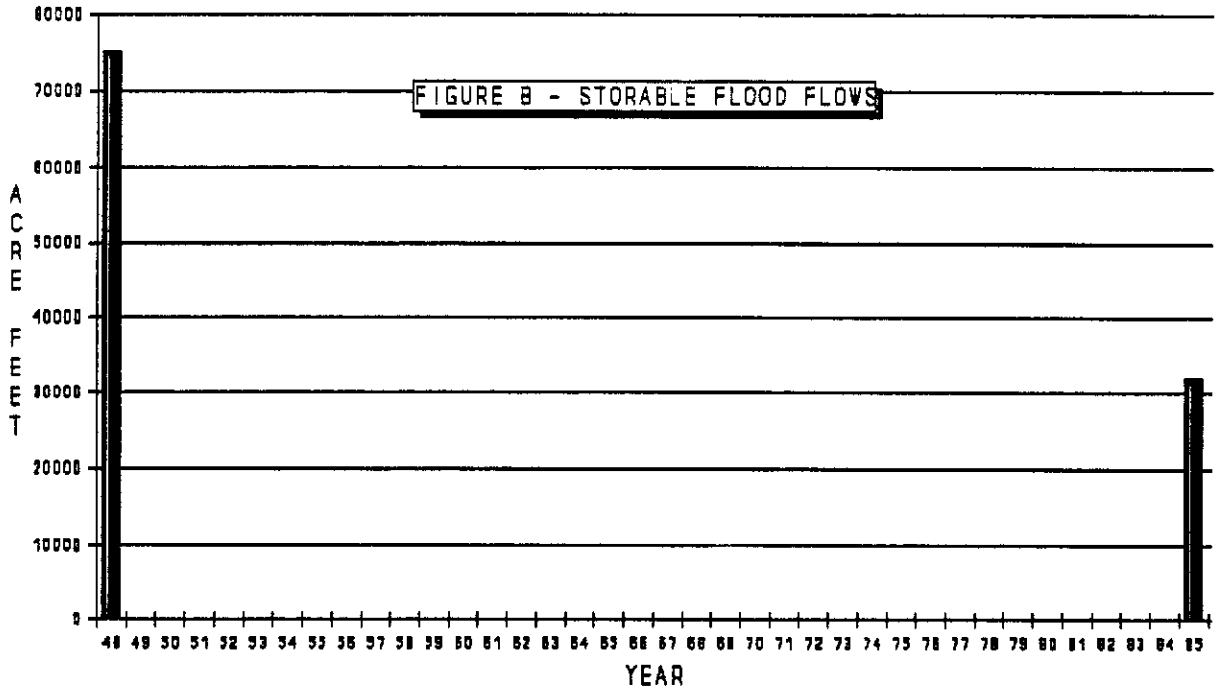

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FIGURE VII-2 A,B
SELECTED STORABLE FLOW RESULTS AT WWG W/CB, W/STEP 1 DIV.

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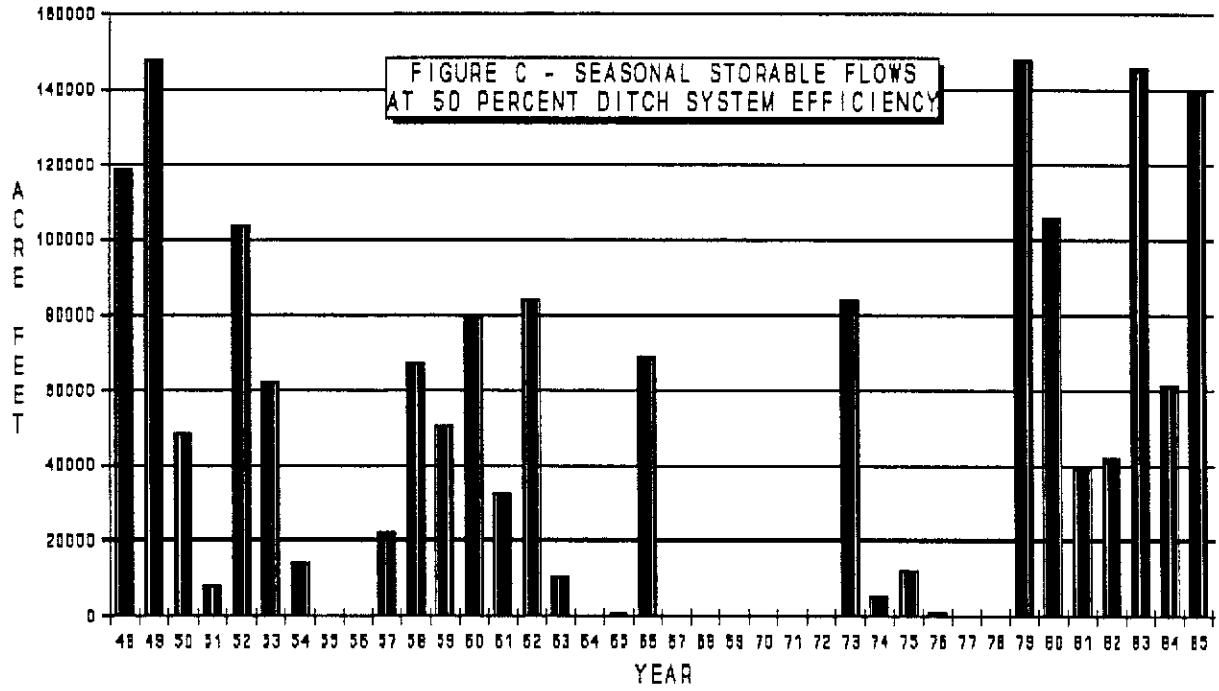

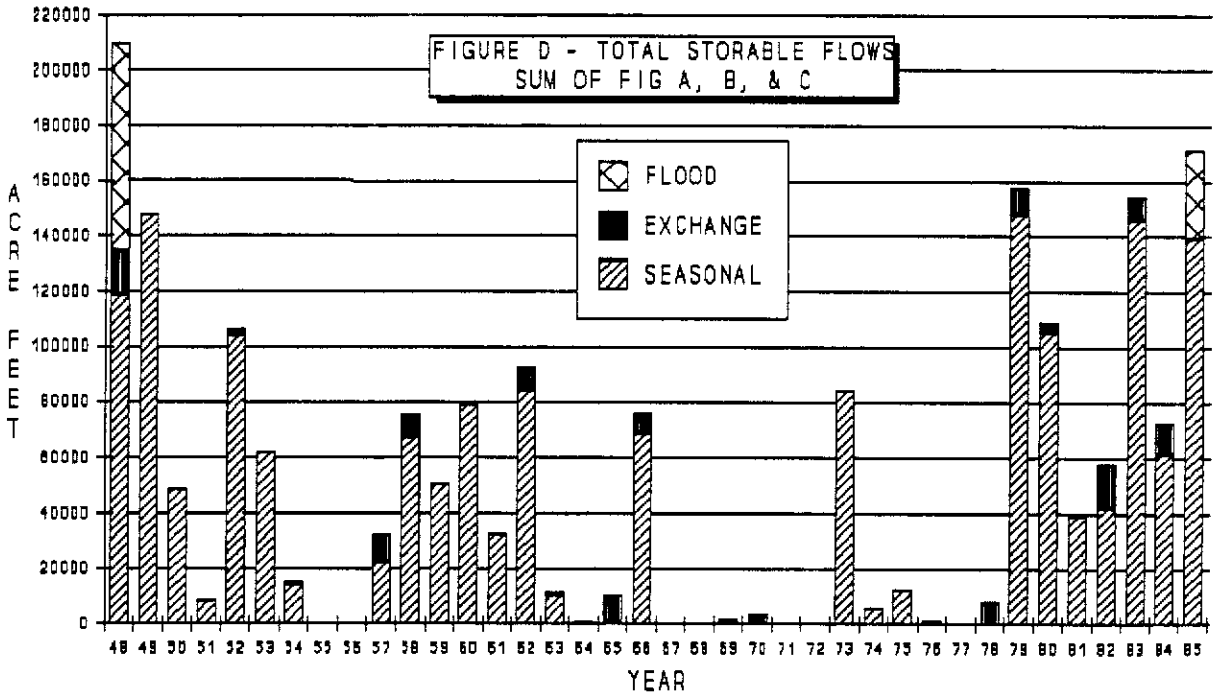

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FIGURE VII-2 C,D
SELECTED STORABLE FLOW
RESULTS AT WWG
W/CB, W/STEP 1 DIV.

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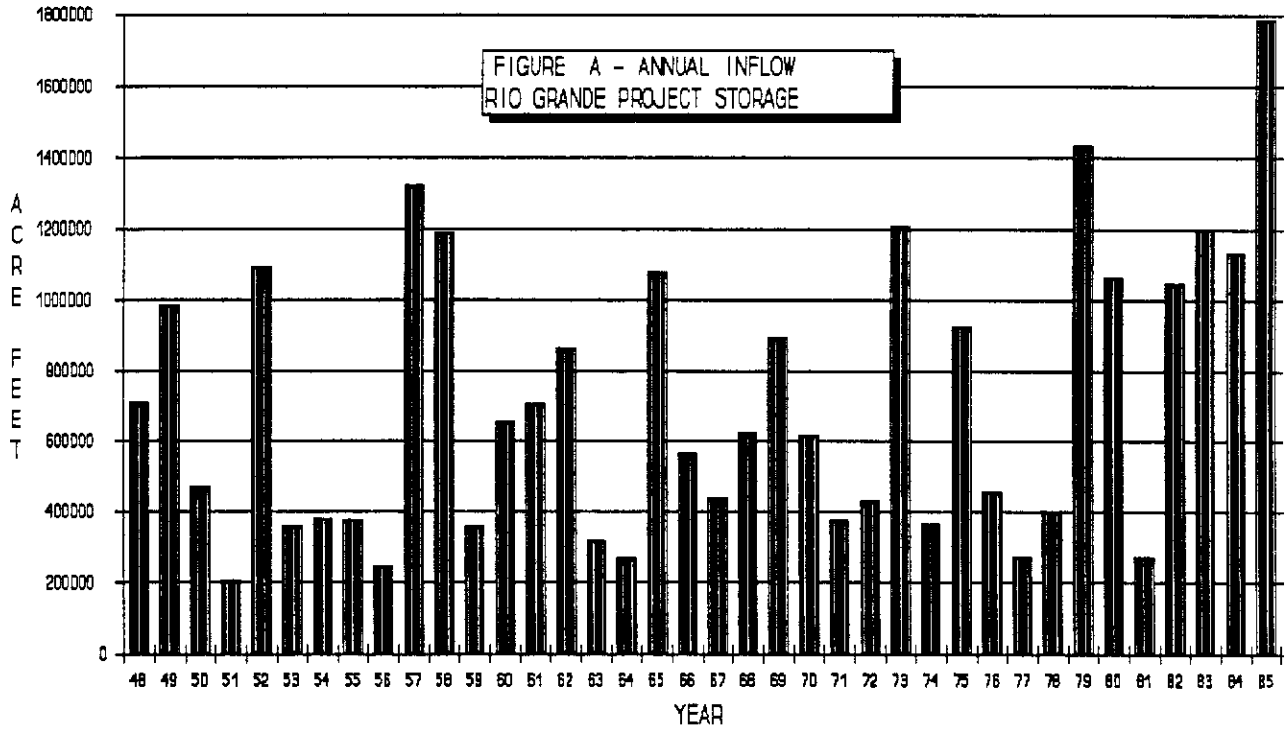

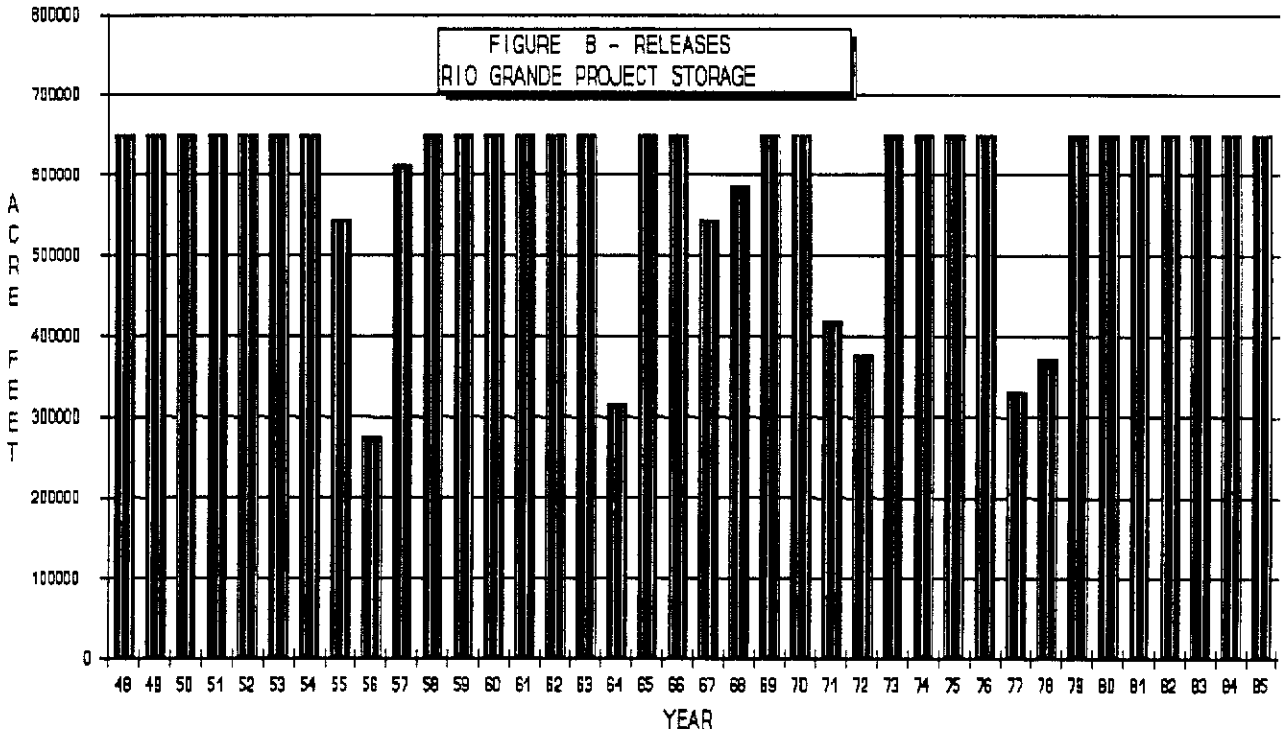

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FIGURE VII-3 A,B
RIO GRANDE PROJECT
MODELED OPERATIONS
W/CB, W/STEP 1 DIV., AT WWG

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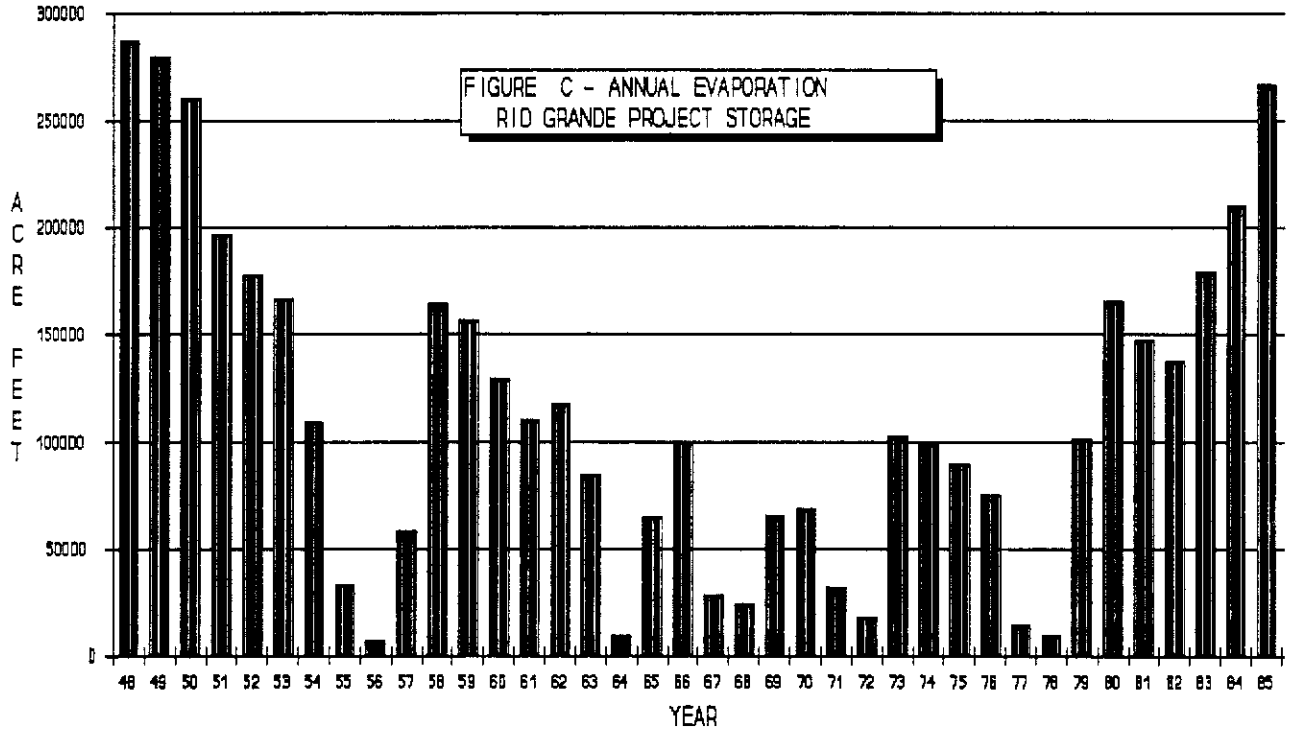

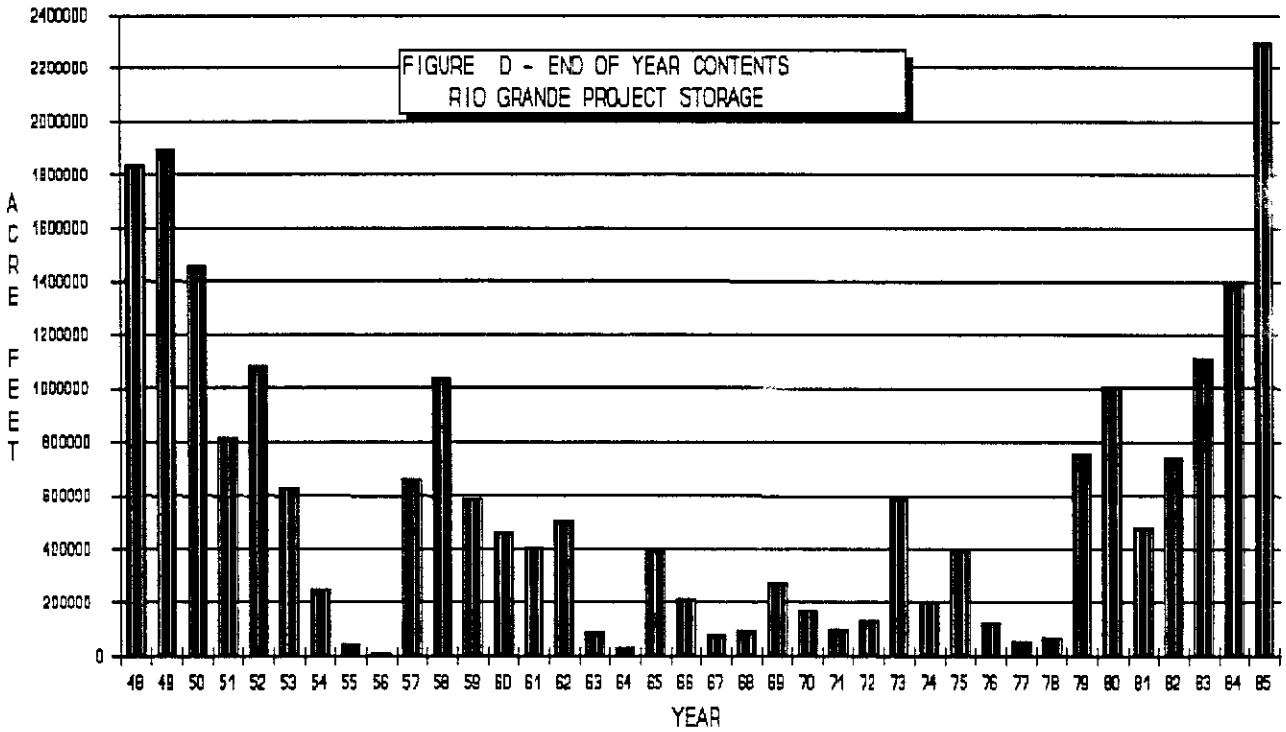

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RIO GRANDE WATER SUPPLY STUDY

FIGURE VII-3 C,D
RIO GRANDE PROJECT
MODELED OPERATIONS
W/CB, W/STEP 1 DIV., AT WWG

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JUNE, 1989

VIII. Summary - Major Findings

The purpose of the Rio Grande Water Supply Study - Phase I was to determine the physically and legally available flows (storable flows) at several potential reservoir sites in the Upper Rio Grande Basin. Three potential reservoir sites were identified on the mainstem of the Rio Grande upstream of Del Norte and one potential reservoir site was identified on the South Fork of the Rio Grande. The analyses were based on hydrologic records for the years 1948 through 1985.

Two mainstem diversion scenarios were included in the Rio Grande Water Supply Study. The Step One mainstem diversions are limited to maximum diversion levels experienced during the 1950-1967 period. The Alternate Step Two mainstem diversion scenarios are similar to the Step One mainstem diversion scenarios except that diversions by the primary ditches irrigating lands in the Closed Basin are limited by decreed rates rather than 1950-1967 usage.

Closed Basin Project delivery scenarios were developed for each of the two mainstem diversion scenarios based on projected Compact curtailments during 1948-1985. Closed Basin Project delivery capacity for combined Priority 1 and Priority 3 uses was assumed to be 94,500 af per year. Priority 1 deliveries approximated 60,000 af on an average annual basis. Priority 3 water availability was assumed to be the remaining delivery capacity after Priority 1 deliveries were made. A brief investigation indicated the Conejos portion of the Closed Basin Project delivery will be fully exchangeable to Conejos water users.

Various operating assumptions for the Rio Grande Compact were made for the study including: 1) Conejos water users will operate independently of Rio Grande mainstem water users, 2) Rio Grande Project demands are 650,000 af per year, and 3) Colorado is not to increase storage of post compact water rights when Rio Grande Project Storage has less than 400,000 af of usable water in storage. Many other assumptions and operating criteria have been made and are discussed in previous sections of this report. Major storable flow findings are presented below.

STORABLE CLOSED BASIN PROJECT EXCHANGE WATER

- Given the Closed Basin Project delivery schedules developed for the Rio Grande Water Supply Study, there is little opportunity to exchange Priority Three water to a new storage vessel upstream of Del Norte. For the Step One mainstem diversion scenario, it is estimated that the exchange ability approximates 3,000 af on an average (1948-1985) annual basis. For the Alternate Step Two mainstem diversion scenarios, the exchange ability approximates 1,000 af on an average (1948-1985) annual basis. The opportunity to exchange Closed Basin Project water to a potential reservoir site typically occurred in less than half of the years of the study period.

STORABLE FLOOD FLOWS

- Storable flood flows occurred in only two years of the 38 year study period for the Step One mainstem diversion scenario. Storable flood flows approximated 75,000 af in 1948 and 30,000 af in 1985. No storable flood flows, surplus to downstream irrigation diversions and the Rio Grande Compact, existed in 36 consecutive years of the study period.

- For the Alternate Step Two mainstem diversion scenarios, no storable flood flows existed.

STORABLE DEBIT WATER

- No debit storable flows occurred in the simulations. The modeling indicated that the generally low levels of Rio Grande Project storage during the study period required that the captured amounts of Colorado's Compact obligation be subsequently released to downstream states.

STORABLE SEASONAL FLOW

- There are potentially large volumes of storable seasonal flow. The average (1948-1985) annual storable seasonal flow ranged from approximately 5,500 af to over 90,000 af depending on the assumed efficiency of the direct flow irrigation systems, the potential reservoir site, and mainstem diversion

scenario. Storable Seasonal Flows were available in greater than 65 percent of the years studied.

POTENTIAL RESERVOIR SITES

- The RG1 site on the Rio Grande mainstem displays the greatest storable flow potential of all sites investigated. Other factors in addition to water availability must, however, be taken into consideration in selecting a potential reservoir site.

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GLOSSARY

acre-foot - The volume of water, equal to the quantity required to cover an acre of land to a dept of 1 foot, equivalent to about 326,000 gallons.

adjudication - A judicial proceeding in which a priority is assigned to an appropriation and a decree issued defining the water right.

appropriation - The volume or flow of water that is legally allocated to an individual, municipality, corporation, or government entity for an identified beneficial use.

aquifer - A geologic formation that contains sufficient saturated permeable material to yield water to wells and springs.

basin - The drainage or catchment area of a stream or lake.

calibration - A trial and error procedure of adjusting simulation model coefficients such that the results from the model provide a reflection of the actual system.

compact - A contract between states of the Union, entered into with the consent of the National Government, defining the relative rights of two or more states on an interstate stream to use the waters of that stream.

consumptive use - The amount of water consumed during use of the water and no longer available to the stream system. For irrigation, consumptive use is water used by crops in transpiration and building of plant tissues.

correlation - The process of establishing a relation between a variable and one or more related variables.

decree - An official document issued by the Court defining the priority, amount, use and location of a water rights. When issued, the decree serves as a mandate to the State Engineer to administer the water rights involved.

depletion - Net rate or quantity of water taken from a stream or ground water aquifer and consumed.

direct flow right - A right defined in terms of discharge and which must be put to use more or less promptly following diversions from the source.

diversion - (1) The act of taking water from a stream or other body of water into a canal, pipe or other conduit. (2) A man made structure for taking water from a stream or other body of water.

diversion records - Record of the daily flow in cubic feet per second for ditch or other diversion structure. Compiled by the District Water Commissioner and on file and available for review at the State Engineer's office.

drainage area - The drainage area of a stream at a specified location is that area, measured in a horizontal plane, which is enclosed by a drainage divide. Expressed in acres, square miles or other units of area.

drought - For the Rio Grande Study, defined as a year or series of consecutive years with below average runoff.

evaporation - The physical process by which a liquid or solid is transformed to the gaseous state.

exchange - A formal or informal agreement between owners of water rights to allow flexibility in the use of water.

gaging station - A particular site on a stream, canal, lake or reservoir when systematic observations of stream discharge are made.

ground water - For administrative purposes, ground water is usually defined as any water no visible on the surface of the ground under natural conditions.

headgate - A physical structure on a stream through which water is diverted into a ditch.

instream flows - A prescribed level of stream, usually described as a stipulation in a permit authorizing a dam or water diversion, which can be met with bypass flows.

pan evaporation - The depth of water evaporation for a pan of standard dimensions over a specified time period, normally expressed as inches per unit of time.

priority - The relative seniority of a water right as determined by its adjudication date and appropriation date. The priority of the water right determines its ability to divert in relation to other rights in periods of limited supply.

return flow - Unconsumed water which returns to its source or some other body of water after diversion as surface water or extraction from the ground.

storable flow - The portion of river inflow to a reservoir legally available for storage in the reservoir after considering senior water rights and diversions both upstream and downstream.

use efficiency - For the Rio Grande Study, defined as the percent of surface water diversions which are available for consumption by existing irrigation systems between the towns of Del Norte and Alamosa.

ABBREVIATIONS

af	acre-feet or acre-foot
amt	amount
av, avg	average
CB	Closed Basin Project
cfs	cubic feet per second
CWCB	Colorado Water Conservation Board
compact	Rio Grande Compact
eff	efficiency
el	elevation
ft	feet
LRCWE	Leonard Rice Consulting Water Engineers, Inc.
mainstem	Rio Grande mainstem
POS	Plan of Study
Project	Rio Grande Project
Project Storage	Rio Grande Project Storage
res	reservoir
RG1	Rio Grande 1 Potential Reservoir Site
RG2	Rio Grande 2 Potential Reservoir Site
RG3	Rio Grande 3 Potential Reservoir Site
RIBSIM	River Basin Simulation Model
SF1	South Fork 1 Potential Reservoir Site
SF2	South Fork 2 Potential Reservoir Site
SF3	South Fork 3 Potential Reservoir Site
SLVWCD	San Luis Valley Water Conservancy District
sq mi	square miles
USBR	United States Bureau of Reclamation
USGS	United Stated Geological Survey
yr	year

APPENDIX A
WATER DISTRICT 20 RIO GRANDE MAINSTEM WATER RIGHTS

DECREES OF THE RIO GRANDE
WATER DISTRICT 20

DISTRICT PRIORITY NUMBER		DITCH NAME	CUMULATIVE # OF DITCH RIGHTS	DECREED AMOUNT OF RIGHT	CUMULATIVE DECREED TO DITCH	CUMULATIVE DECREED TO STREAM
1		Silva	1	3.00	3.00	3.00
2		Atencio	1	0.74	0.74	3.74
3		San Jose or Lucero	1	0.90	0.90	4.64
7		Silva	2	11.00	14.00	15.64
8		Rio Grande No. 1	1	12.80	12.80	28.44
11		McDonald	1	13.40	13.40	41.84
11	T	Prairie	1	3.00	3.00	44.84
13		Cochran Pioneer	1	3.00	3.00	47.84
13	T	Rio Grande No. 4	1	1.20	1.20	49.04
14		Horner & Idren	1	2.20	2.20	51.24
15		Dyer	1	1.00	1.00	52.24
18		Pace	1	1.40	1.40	53.64
18	T	McDonald	2	1.00	14.40	54.64
28	T	Rio Grande Canal	1	2.00	2.00	56.64
30	T	Butler	1	1.00	1.00	57.64
31		Hubbard	1	1.00	1.00	58.64
31	T	Butler Irrigation	2	1.00	2.00	59.64
32		Centennial	1	47.40	47.40	107.04
34		Fish	1	1.50	1.50	108.54
34	T	Billings	1	1.50	1.50	110.04
36		Kane & Callen	1	1.60	1.60	111.64
38		Silva	3	2.80	16.80	114.44
43		Atencio	2	4.94	5.68	119.38
44		Horner & Idren	2	4.40	6.60	123.78
57		Andersen	1	3.20	3.20	126.98
68		Meadow Overflow	1	3.20	3.20	130.18
71		Empire Canal	1	1.80	1.80	131.98
73		Raber	1	1.40	1.40	133.38
73		Anna Raber	1	1.40	1.40	134.78
74	T	Excelsior	1	8.40	8.40	143.18
81		Off	1	5.00	5.00	148.18
81	T	Kane & Callen	2	2.00	3.60	150.18
83		McIntosh Arroya	1	2.80	2.80	152.98
83	T	Rio Grande No. 2	1	1.00	1.00	153.98
90		Andersen	2	12.00	13.20	166.98

DISTRICT PRIORITY NUMBER		DITCH NAME	CUMULATIVE # OF DITCH RIGHTS	DECREED AMOUNT OF RIGHT	CUMULATIVE DECREED TO DITCH	CUMULATIVE DECREED TO STREAM
97	T	Kane & Callen	3	1.40	5.00	167.38
105		Independent No. 2	1	17.43	17.43	184.81
105	T	Anaconda	1	3.33	3.33	188.14
105	T	Meadow Glen	1	3.33	3.33	191.47
109	T	Miner	1	1.51	1.51	192.98
116	T	South Fork Highline	1	1.60	1.60	194.58
126		Del Norte Town	1	5.00	5.00	199.58
126	T	Anaconda	2	3.00	6.33	202.58
127		Del Norte Town	2	1.20	6.20	203.78
130		James Patterson	1	3.60	3.60	207.38
141		Horner & Idren	3	5.00	11.60	212.38
143		Andersen	3	2.00	17.20	214.38
144		Atencio No. 2	1	4.00	4.00	218.38
144½	—	San Jose or Lucero	2	1.00	1.90	219.38
146		Rio Grande & Piedra	1	42.90	42.90	262.28
156	T	Rio Grande & San Luis	1	1.00	1.00	263.28
163		Excelsior	2	45.70	54.10	308.98
164		Pfeiffer	1	0.67	0.67	309.65
164	T	Anaconda	3	1.33	7.66	310.98
165		West Side	1	2.40	2.40	313.38
166		Independent	1	11.20	11.20	324.58
173		Centennial	2	35.00	82.40	359.58
174	T	Chicago	1	23.20	23.20	382.78
175		Ehrewits	1	1.60	1.60	384.38
176	T	Rio Grande Canal	2	2.80	4.80	387.18
178	T	Rio Grande Canal	3	11.20	16.00	398.38
179		Schuch & Schmidt	1	2.00	2.00	400.38
180	T	South Fork Highline	2	1.00	2.60	401.38
180	T	Miner	2	1.00	2.51	402.38
180	T	Park & Green	1	1.00	1.00	403.38
187		Bauer	1	3.73	3.73	407.13
187	T	Ehrewits	2	1.25	2.85	408.38
188	T	Rio Grande Canal	4	1.00	17.00	409.38
190		Miner	3	12.00	14.51	421.38
192		Nichol	1	8.00	8.00	429.38
193		John Andersen	1	3.20	3.20	432.58
195		Kane & Callen	4	1.20	6.20	433.78
196	T	Chicago	2	3.20	26.40	436.98
197	T	Rio Grande Canal	3	20.00	37.00	456.98
198	T	Rio Grande Canal	6	19.60	56.60	476.58
199		Park & Green	2	2.20	3.20	478.78
200		Rio Grande No. 2	2	3.20	4.20	481.98
202	T	Rio Grande Canal	7	2.00	58.60	483.98
203	T	Rio Grande Canal	8	2.90	61.50	486.88
206		Rio Grande & San Luis	2	14.60	15.60	501.48
209		Fish	2	7.80	9.50	509.28

DISTRICT PRIORITY NUMBER		DITCH NAME	CUMULATIVE # OF DITCH RIGHTS	DECREED AMOUNT OF RIGHT	CUMULATIVE DECREED TO DITCH	CUMULATIVE DECREED TO STREAM
209	T	Billings	2	7.80	9.30	517.08
211	T	Empire	2	4.28	6.08	521.36
215		McIntosh Arroya	2	1.70	4.00	525.56
216		Church	1	1.00	1.00	521.56
216-A		Rio Grande Canal	9	318.40	379.90	841.96
217		Rio Grande & Lariat	1	53.02	53.02	894.98
217	T	Rio Grande & San Luis	3	0.38	15.98	895.36
218		Butler Irrigation	3	4.80	6.80	900.16
219		Schuch & Schmidt	2	1.60	1.60	901.76
220	T	Rio Grande & San Luis	4	5.50	21.48	907.26
220	T	Horner & Idren	4	1.10	12.70	908.36
222		Atencio	3	0.50	6.18	908.86
224		Monte Vista Canal	1	132.20	132.20	1041.06
231		Maraje	1	0.70	0.70	1041.76
232	T	Anaconda	4	1.00	8.66	1042.76
234		West Side	2	8.40	10.80	1051.16
235	T	Rio Grande Canal	10	0.60	380.50	1051.76
236-A		Empire	3	312.30	318.38	1364.06
239		Silva	4	1.40	18.20	1365.46
241		Rio Grande & Piedra	2	32.60	75.70	1398.26
242		Maraje	2	1.20	1.90	1399.46
243		Corson	1	1.00	1.00	1400.46
244		Voss & Hall	1	1.00	1.00	1401.46
248	—	San Jose or Lucero	3	3.50	5.40	1404.96
249	T	Excelsior	4	6.20	60.30	1411.16
251		Silva	5	0.80	19.00	1411.96
253		Meadow Overflow	2	0.80	4.00	1412.76
258		Knoblauch	1	1.20	1.20	1413.96
259	T	West Side	3	12.80	21.60	1426.76
262		Excelsior	4	29.40	89.70	1456.16
263		Star	1	12.00	12.00	1468.16
270		San Luis Valley Canal	1	92.90	92.90	1561.06
274	T	West Side	4	1.20	24.50	1562.26
275		Voss & Hall	2	0.80	1.80	1563.06
276-A		Rio Grande Canal	11	22.80	403.30	1565.86
277		Cleghorn	1	1.00	1.00	1566.86
280	T	West Side	5	1.20	26.00	1568.06
285		Rio Grande No. 4	2	12.00	13.20	1600.06
286-A		Rio Grande Canal	12	22.70	426.00	1622.76
290		Kane Callen	5	2.00	8.20	1624.76
292		South Fork Highline	3	4.40	7.00	1629.16
293		Costilla	1	103.30	103.30	1732.46
297		Prairie	2	105.10	108.10	1837.56
298	T	Star	2	0.48	12.48	1838.04
298	T	Rio Grande & San Luis	5	9.52	31.00	1847.56
301		Pfeiffer	2	2.00	2.67	1849.56

DISTRICT PRIORITY NUMBER		DITCH NAME	CUMULATIVE # OF DITCH RIGHTS	DECREED AMOUNT OF RIGHT	CUMULATIVE DECREED TO DITCH	CUMULATIVE DECREED TO STREAM
304	T	West Side	6	1.20	27.20	1850.76
305		Billings	3	16.70	26.00	1867.46
307		South Fork Highline	4	1.60	8.60	1869.06
308	T	Farmers Union	1	0.25	0.25	1869.31
308	T	Prairie	3	0.75	108.85	1870.06
310-A		Empire Canal	4	6.00	324.38	1876.06
312-A		Rio Grande Canal	13	26.00	452.00	1902.06
313		Park & Green	3	2.00	5.20	1904.06
314		Farmers Union	2	138.80	139.05	2042.86
317		Schuch & Schmidt	3	0.80	4.40	2043.66
319		Anaconda	5	0.60	9.26	2044.26
322	T	West Side	7	1.20	28.40	2045.46
323		Meadow Glen	2	1.80	5.13	2047.26
324		Billings	4	4.44	30.44	2051.70
327	T	Anaconda	6	1.60	10.86	2053.30
328	T	Farmers Union	3	0.25	139.30	2053.55
328	T	Prairie	4	0.75	109.60	2054.30
329		Spring Ranch	1	1.00	1.00	2055.30
333		Bauer	2	1.50	5.25	2056.80
333	T	Ehrewits	3	0.50	3.35	2057.30
335-A		Empire	5	2.30	326.68	2059.60
3384-A		Rio Grande Canal	14	33.60	485.60	2093.20
341		Brey	1	1.00	1.00	2094.20
343	T	Anaconda	7	0.80	11.66	2095.00
344		Rio Grande Canal	15	24.40	510.00	2119.40
345		Maraje	3	3.10	5.00	2122.50
346	T	West Side	8	1.40	29.80	2123.90
348		Meadow Glen	3	1.20	6.33	2125.10
349		Billings	4	4.50	34.94	2129.60
350		Voss & Hall	3	0.15	1.95	2129.75
352		South Fork Highline	5	4.40	13.00	2134.15
353	T	Farmers Union	4	0.95	140.25	2135.10
353	T	Prairie	5	2.85	112.45	2137.95
357	T	San Luis Valley	2	0.70	93.60	2138.65
358		Monte Vista Canal	2	125.30	257.30	2263.95
358-A		Rio Grande Canal	16	16.60	526.60	2280.55
359		Independent No. 2	2	4.80	22.23	2285.35
360		Church	2	0.02	1.02	2285.37
361-A		Empire Canal	6	92.00	418.68	2377.37
361-B		Empire Canal	7	93.32	512.00	2470.69
362	T	San Luis Valley	3	3.40	97.00	2474.09
363	T	West Side	9	6.00	35.80	2480.09
363-A		Rio Grande Canal	17	43.40	470.00	2523.49
363-B		Rio Grande Canal	18	52.00	622.00	2575.49
365		Rio Grande Canal	19	293.70	915.70	2869.19
1903-1		Jessup	1	0.30	0.30	2869.49

DECREES OF THE RIO GRANDE
WATER DISTRICT 20

DISTRICT PRIORITY NUMBER	DITCH NAME	CUMULATIVE # OF DITCH RIGHTS	DECREED AMOUNT OF RIGHT	CUMULATIVE DECREED TO DITCH	CUMULATIVE DECREED TO STREAM
1903-2	Bray	2	3.80	4.80	2873.29
1903-12	Anna Raber	2	2.80	3.80	2875.69
1903-12	Raber	2	2.80	3.80	2878.09
1903-12-A	Rio Grande & Lariat	2	2.61	55.63	2880.70
1903-17	Rio Grande & Lariat	3	3.62	59.25	2884.32
1903-17-A	Prairie	6	11.07	123.32	2895.39
1903-17-B	Farmers Union	5	5.45	145.70	2900.84
1903-17-C	Haney	1	0.62	0.62	2901.46
1903-17-F	Riverside	1	1.60	1.60	2903.06
1903-19	Miner	4	1.60	16.11	2904.66
1903-21	Anaconda	8	12.10	23.76	2916.76
1903-21-A T	Meadow Glen	4	1.20	7.51	2917.96
1903-22	New	1	2.61	2.61	2920.57
1903-22-A	Rio Grande & Lariat	4	5.86	65.11	2926.43
1903-22-B	San Luis Valley	4	161.46	238.46	3087.89
1903-22-C	Prairie	7	36.84	160.36	3124.73
1903-22-D T	Star	1	0.96	13.44	3125.69
1903-22-D T	Rio Grande San Luis	6	19.06	50.06	3144.75
1903-22-E	Farmers Union	6	105.41	251.11	3250.16
1903-22-F	San Luis Valley	5	5.21	263.67	3255.37
1903-24	Rio Grande & Piedra	3	0.38	76.08	3255.75
1903-24-A	Monte Vista Canal	3	13.35	270.85	3269.10
1903-24-B	Rio Grande & Lariat	5	15.87	80.98	3284.97
1903-24-C	Rio Grande Canal	20	45.00	960.70	3329.97
1903-24-D	San Luis Valley	6	44.27	307.94	3374.24
1903-24-E	Prairie	8	59.90	220.26	3434.14
1903-24-F	Farmers Union	7	280.47	531.58	3714.61
1903-24-G	San Luis Canal	7	11.07	319.01	3725.68
1903-24-H	Jersey	2	0.80	1.10	3726.48
1903-27	Helen & Julia	1	1.00	1.00	3727.48
1903-30	Rio Grande & Piedra	4	0.85	76.93	3728.33
1903-30-A	Monte Vista Canal	4	20.58	291.43	3748.91
1903-30-B	Rio Grande & Lariat	6	2.28	83.26	3751.19
1903-30-C	Rio Grande Canal	21	84.96	1045.66	3836.15
1903-30-D	Prairie	9	20.18	240.44	3856.33
1903-30-E T	Star	4	0.03	13.47	3856.36
1903-30-E T	Rio Grande & San Luis	7	0.54	50.60	3856.90
1903-30-F	Farmers Union	8	159.69	691.27	4016.59
1903-34	Rio Grande & Piedra	5	1.14	78.07	4017.73
1903-34-A	Monte Vista Canal	5	9.44	300.87	4027.17
1903-34-B	Rio Grande & Lariat	7	10.42	93.68	4037.59
1903-34-C	Rio Grande Canal	22	48.99	1094.65	4086.58
1903-34-D	San Luis Valley	8	31.25	351.26	4117.83
1903-34-E	Prairie	10	22.79	263.79	4140.62
1903-34-F T	Star	3	0.13	13.60	4140.75
1903-34-F T	Rio Grande & San Luis	8	2.48	53.08	4143.23

DISTRICT PRIORITY NUMBER	DITCH NAME	CUMULATIVE # OF DITCH RIGHTS	DECREED AMOUNT OF RIGHT	CUMULATIVE DECREED TO DITCH	CUMULATIVE DECREED TO STREAM
1903-34-G	Farmers Union	9	149.69	840.96	4292.92
1903-34-H	San Luis Valley	9	15.63	365.89	4308.55
1903-34-I	Miner	5	0.70	16.81	4309.25
1903-37	Monte Vista Canal	6	3.75	304.62	4313.00
1903-37-A	Rio Grande & Lariat	8	3.91	97.59	4316.91
1903-37-B	Rio Grande Canal	23	38.74	1133.19	4355.65
1903-37-C	San Luis Valley	10	10.42	376.31	4366.07
1903-37-D	Prairie	11	20.84	284.07	4386.91
1903-37-E	San Luis Valley	11	13.02	389.33	4399.93
1903-41	Monte Vista Canal	7	1.63	306.25	4401.56
1903-41-A	Rio Grande & Lariat	9	2.04	99.63	4403.60
1903-41-B	Rio Grande Canal	24	41.34	1174.73	4444.94
1903-41-C	San Luis Valley	12	7.81	397.14	4452.75
1903-41-D	Prairie	12	24.74	308.81	4477.49
1903-41-I	Rio Grande No. 4	3	1.20	14.40	4478.69
1903-44	Weiss	1	1.34	1.34	4480.03
1903-45	Rio Grande & Piedra	6	1.91	79.98	4481.94
1903-45-A	Monte Vista Canal	8	10.42	316.67	4492.36
1903-45-B	Rio Grande & Lariat	10	3.26	102.89	4495.62
1903-45-C	Rio Grande Canal	25	88.14	1262.87	4583.76
1903-45-D	San Luis Valley	13	18.25	415.39	4602.01
1903-45-E	Prairie	13	16.20	325.01	4618.21
1903-45-G	San Luis Valley	14	14.33	429.72	4632.54
1903-45-H	Miner	6	1.20	18.01	4633.74
1903-46	Rio Grande Piedra	7	0.57	80.55	4634.31
1903-46-A	Monte Vista Canal	9	5.21	321.88	4639.52
1903-46-B	Rio Grande & Lariat	11	0.65	103.54	4640.17
1903-46-C	Rio Grande Canal	26	81.71	1344.58	4721.88
1903-46-D	San Luis Valley	15	20.84	450.56	4742.72
1903-46-E	Prairie	14	15.63	340.64	4758.35
1903-49	Rio Grande & Piedra	8	3.00	83.55	4761.35
1903-49-A	New	2	2.61	5.22	4763.96
1903-49-B	Monte Vista Canal	10	14.33	336.21	4778.29
1903-49-C	Rio Grande & Lariat	12	2.61	106.15	4780.90
1903-49-D	Rio Grande Canal	27	183.60	1528.18	4964.50
1903-49-E	San Luis Valley	16	26.04	476.60	4990.54
1903-49-F	Prairie	15	10.42	351.06	5000.96
1903-49-H	San Luis Valley	17	10.42	487.02	5011.38
1903-49-K	San Juan	1	10.00	10.00	5021.38
1903-51	Antler Park	1	1.06	1.06	5022.44
1903-52	Rio Grande & Piedra	9	3.05	86.60	5025.49
1903-52-A	Monte Vista Canal	11	4.56	300.77	5030.05
1903-52-B	Rio Grande & Lariat	13	0.65	106.80	5030.70
1903-52-C	Rio Grande Canal	28	82.68	1610.86	5113.38
1903-52-D	San Luis Valley	18	10.42	497.44	5123.80
1903-52-E	Prairie	16	6.51	357.57	5130.31

DISTRICT PRIORITY NUMBER	DITCH NAME	CUMULATIVE # OF DITCH RIGHTS	DECREED AMOUNT OF RIGHT	CUMULATIVE DECREED TO DITCH	CUMULATIVE DECREED TO STREAM
1903-57	Rio Grande & Piedra	10	4.46	91.06	5134.77
1903-57-A	Rio Grande Canal	29	44.92	1655.78	5179.69
1903-57-B	San Luis Valley	19	27.34	524.78	5207.03
1903-57-C	Meadow Glen	5	14.00	21.53	5221.03
1903-57-D	Prairie	17	6.84	364.41	5227.87
1903-57-E T	Star	6	0.01	13.61	5227.88
1903-57-E T	Rio Grande & San Luis	9	0.16	53.24	5228.04
1903-61	Rio Grande & Piedra	11	3.42	94.48	5231.46
1903-61-A	Rio Grande Canal	30	43.62	1699.40	5275.08
1903-61-B	Prairie	18	2.61	367.02	5277.69
1903-62 T	New	3	5.21	10.43	5282.90
1916-11	Church	3	2.00	3.02	5284.90
1916-14	Anaconda	9	1.00	24.76	5285.90
1916-14 T	Anaconda	10	1.00	25.76	5286.90
1916-16	Rio Grande No. 4	7	10.00	24.40	5296.90
1916-18	Midland	1	10.00	10.00	5306.90
1916-23	Nosselrus	1	2.67	2.67	5309.57
1916-23 T	Meadow Glen	6	5.33	26.86	5314.90
1916-25	Pfeiffer	3	8.00	10.67	5322.90
1916-27	Bauer	2	10.00	15.25	5332.90
1916-30 T	San Luis Valley	20	50.00	574.78	Blackpore Slough
1916-30-A	Dyer	2	3.00	4.00	5335.90
1916-30-B	Meadow Glen	7	20.00	46.86	5355.90
1916-36	Anaconda	11	13.00	38.76	5368.90
1916-40	Minor	7	2.00	20.01	5370.90
1916-43	Ehrowitz	4	2.00	5.35	5372.90
1916-57	Ehrowitz	5	4.00	9.35	5376.90
1916-58	South Fork Highline	6	7.00	20.00	5383.90
1916-61	Rio Grande No. 4	4	2.00	26.40	5385.90
1916-69	Ehrowitz	6	3.00	12.35	5388.90
1916-71	Minor	8	2.00	22.01	5390.90
1916-78	Wesson	1	25.00	25.00	5415.90
1916-89	Midland	2	50.00	60.00	5465.90
1916-100	Chicago	3	40.00	66.40	5505.90
1934-2	Independent No. 2	3	45.00	67.23	5550.90
1934-9	Kane & Callen	6	15.00	24.00	5565.90
1934-10	Minor Ditch Enlg.	9	9.48	31.49	5575.18
1934-13	Minor Ditch No. 2 Enlg.	10	7.99	39.48	5584.17
1934-14	Chicago	4	40.00	106.40	5624.17
1959-19	Meadow Overflow Enlg.	2	63.00	67.00	5687.17
1959-23	New Enlargement	4	20.00	38.43	5707.17
1959-34	Stewart	1	20.00	20.00	5727.17
1959-35	Stanley Knapp Pump	1	6.00	6.00	5733.17

NOTES:

1. BODY OF TABLE EXTRACTED FROM "DECREES OF THE RIO GRANDE RIVER" PREPARED BY OFFICE OF WATER DIVISION 3.
2. DECREED AMOUNTS IN CUBIC FEET PER SECOND (CFS)
3. COLUMN HEADINGS HAVE BEEN ALTERED TO BE MORE DESCRIPTIVE. SECOND TO THE LAST COLUMN REFLECTS THE CUMULATIVE CFS TOTAL OF PREVIOUSLY LISTED DECREES AND CURRENT DECREE ASSOCIATED WITH NAMED DITCH. LAST COLUMN INDICATES THE CUMULATIVE CFS TOTAL OF ALL PREVIOUSLY LISTED DECREES AND CURRENT DECREE.

APPENDIX B
RIO GRANDE COMPACT

RIO GRANDE COMPACT

The State of Colorado, the State of New Mexico, and the State of Texas, desiring to remove all causes of present and future controversy among these States and between citizens of one of these States and citizens of another State with respect to the use of the waters of the Rio Grande above Fort Quitman, Texas, and being moved by considerations of interstate comity, and for the purpose of effecting an equitable apportionment of such waters, have resolved to conclude a Compact for the attainment of these purposes, and to that end, through their respective Governors, have named as their respective Commissioners:

For the State of Colorado—M. C. Hinderlider

For the State of New Mexico—Thomas M. McClure

For the State of Texas—Frank B. Clayton

who, after negotiations participated in by S. O. Harper, appointed by the President as the representative of the United States of America, have agreed upon the following articles, to-wit:

ARTICLE I.

(a) The State of Colorado, the State of New Mexico, the State of Texas, and the United States of America, are hereinafter designated "Colorado," "New Mexico," "Texas," and the "United States," respectively.

(b) "The Commission" means the agency created by this Compact for the administration thereof.

(c) The term "Rio Grande Basin" means all of the territory drained by the Rio Grande and its tributaries in Colorado, in New Mexico, and in Texas above Fort Quitman, including the Closed Basin in Colorado.

(d) The "Closed Basin" means that part of the Rio Grande Basin in Colorado where the streams drain into the San Luis Lakes and adjacent territory, and do not normally contribute to the flow of the Rio Grande.

(e) The term "tributary" means any stream which naturally contributes to the flow of the Rio Grande.

(f) "Transmountain Diversion" is water imported into the drainage basin of the Rio Grande from any stream system outside of the Rio Grande Basin, exclusive of the Closed Basin.

(g) "Annual Debits" are the amounts by which actual deliveries in any calendar year fall below scheduled deliveries.

(h) "Annual Credits" are the amounts by which actual deliveries in any calendar year exceed scheduled deliveries.

(i) "Accrued Debits" are the amounts by which the sum of all annual debits exceeds the sum of all annual credits over any common period of time.

(j) "Accrued Credits" are the amounts by which the sum of all annual credits exceeds the sum of all annual debits over any common period of time.

(k) "Project Storage" is the combined capacity of Elephant Butte Reservoir and all other reservoirs actually available for the storage of usable water below Elephant Butte and above the first diversion to lands of the Rio Grande Project, but not more than a total of 2,638,860 acre feet.

(l) "Usable Water" is all water, exclusive of credit water, which is in project storage and which is available for release in accordance with irrigation demands, including deliveries to Mexico.

(m) "Credit Water" is that amount of water in project storage which is equal to the accrued credit of Colorado, or New Mexico, or both.

(n) "Unfilled Capacity" is the difference between the total physical capacity of project storage and the amount of usable water then in storage.

(o) "Actual Release" is the amount of usable water released in any calendar year from the lowest reservoir comprising project storage.

(p) "Actual Spill" is all water which is actually spilled from Elephant Butte Reservoir, or is released therefrom for flood control, in excess of the current demand on project storage and which does not become usable water by storage in another reservoir; provided, that actual spill of usable water cannot occur until all credit water shall have been spilled.

(q) "Hypothetical Spill" is the time in any year at which usable water would have spilled from project storage if 790,000 acre feet had been released therefrom at rates proportional to the actual release in every year from the starting date to the end of the year in which hypothetical spill occurs; in computing hypothetical spill the initial condition shall be the amount of usable water in project storage at the beginning of the calendar year following the effective date of this Compact, and thereafter the initial condition shall be the amount of usable water in project storage at the beginning of the calendar year following each actual spill.

ARTICLE II.

The Commission shall cause to be maintained and operated a stream gaging station equipped with an automatic water stage recorder at each of the following points, to-wit:

(a) On the Rio Grande near Del Norte above the principal points of diversion to the San Luis Valley;

(b) On the Conejos River near Mogote;

(c) On the Los Pinos River near Ortiz;

(d) On the San Antonio River at Ortiz;

(e) On the Conejos River at its mouth near Los Sauces;

(f) On the Rio Grande near Lobatos;

(g) On the Rio Chama below El Vado Reservoir;

(h) On the Rio Grande at Otowi Bridge near San Ildefonso;

(i) On the Rio Grande near San Acacia;

(j) On the Rio Grande at San Marcial;

(k) On the Rio Grande below Elephant Butte Reservoir;

(l) On the Rio Grande below Caballo Reservoir.

Similar gaging stations shall be maintained and operated below any other reservoir constructed after 1929, and at such other points as may be necessary for the securing of records required for the carrying out of the Compact; and automatic water stage recorders shall be maintained and operated on each of the reservoirs mentioned, and on all others constructed after 1929.

Such gaging stations shall be equipped, maintained and operated by the Commission directly or in cooperation with an appropriate Federal or State agency, and the equipment, method and frequency of measurement at such stations shall be such as to produce reliable records at all times.

ARTICLE III.

The obligation of Colorado to deliver water in the Rio Grande at the Colorado-New Mexico State Line, measured at or near Lobatos, in each calendar year, shall be ten thousand acre feet less than the sum of those quantities set forth in the two following tabulations of relationship, which correspond to the quantities at the upper index stations:

DISCHARGE OF CONEJOS RIVER

Quantities in thousands of acre feet

Conejos Index Supply (1)	Conejos River at Mouths (2)
100	0
150	20
200	45
250	75
300	109
350	147
400	188
450	232
500	278
550	326
600	376
650	426
700	476

Intermediate quantities shall be computed by proportional parts.

(1) Conejos Index Supply is the natural flow of Conejos River at the U.S.G.S. gaging station near Mogote during the calendar year, plus the natural flow of Los Pinos River at the U.S.G.S. gaging station near Ortiz and the natural flow of San Antonio River at the U.S.G.S. gaging station at Ortiz, both during the months of April to October, inclusive.

(2) Conejos River at Mouths is the combined discharge of branches of this river at the U.S.G.S. gaging stations near Los Sauces during the calendar year.

DISCHARGE OF RIO GRANDE EXCLUSIVE OF CONEJOS RIVER

Quantities in thousands of acre feet

Rio Grande at Del Norte (3)	Rio Grande at Lobatos less Conejos at Mouths (4)
200	60
250	65
300	75
350	86
400	98
450	112
500	127
550	144
600	162
650	182
700	204
750	229
800	257
850	292
900	335
950	380
1,000	430
1,100	540
1,200	640
1,300	740
1,400	840

Intermediate quantities shall be computed by proportional parts.

(3) Rio Grande at Del Norte is the recorded flow of the Rio Grande at the U.S.G.S. gaging station near Del Norte during the calendar year (measured above all principal points of diversion to San Luis Valley) corrected for the operation of reservoirs constructed after 1937.

(4) Rio Grande at Lobatos less Conejos at Mouths is the total flow of the Rio Grande at the U.S.G.S. gaging station near Lobatos, less the discharge of Conejos River at its Mouths, during the calendar year.

The application of these schedules shall be subject to the provisions hereinafter set forth and appropriate adjustments shall be made for (a) any change in location of gaging stations; (b) any new or increased depletion of the runoff above inflow index gaging stations; and (c) any transmountain diversions into the drainage basin of the Rio Grande above Lobatos.

In event any works are constructed after 1937 for the purpose of delivering water into the Rio Grande from the Closed Basin, Colorado shall not be credited with the amount of such water delivered, unless the proportion of sodium ions shall be less than forty-five percent of the total positive ions in that water when the total dissolved solids in such water exceeds three hundred fifty parts per million.

ARTICLE IV.

The obligation of New Mexico to deliver water in the Rio Grande at San Marcial, during each calendar year, exclusive of the months of July, August and September, shall be that quantity set forth in the following tabulation of relationship, which corresponds to the quantity at the upper index station:

DISCHARGE OF RIO GRANDE AT OTOWI BRIDGE AND AT SAN MARCIAL EXCLUSIVE OF JULY, AUGUST AND SEPTEMBER

Quantities in thousands of acre feet

Otowi Index Supply (5)	San Marcial Index Supply (6)
100	0
200	65
300	141
400	219
500	300
600	383
700	469
800	557
900	648
1000	742
1100	839
1200	939
1300	1042
1400	1148
1500	1257
1600	1370
1700	1489
1800	1608
1900	1730
2000	1856
2100	1985
2200	2117
2300	2253

Intermediate quantities shall be computed by proportional parts.

(5) The Otowi Index Supply is the recorded flow of the Rio Grande at the U.S.G.S. gaging station at Otowi Bridge near San Ildefonso (formerly station near Buckman) during the calendar year, exclusive of the flow during the months of July, August and September, corrected for the operation of reservoirs constructed after 1929 in the drainage basin of the Rio Grande between Lobatos and Otowi Bridge.

(6) San Marcial Index Supply is the recorded flow of the Rio Grande at the gaging station at San Marcial during the calendar year exclusive of the flow during the months of July, August and September.

The application of this schedule shall be subject to the provisions hereinafter set forth and appropriate adjustments shall be made for (a) any change in location of gaging stations; (b) depletion after 1929 in New Mexico at any time of the year of the natural runoff at Otowi Bridge; (c) depletion of the runoff during July, August and September of tributaries between Otowi Bridge and San Marcial, by works constructed after 1937; and (d) any transmountain diversions into the Rio Grande between Lobatos and San Marcial.

Concurrent records shall be kept of the flow of the Rio Grande at San Marcial, near San Acacia, and of the release from Elephant Butte Reservoir, to the end that the records at these three stations may be correlated.

ARTICLE V.

If at any time it should be the unanimous finding and determination of the Commission that because of changed physical conditions, or for any other reason, reliable records are not obtainable, or cannot be obtained, at any of the stream gaging stations herein referred to, such stations may, with the unanimous approval of the Commission, be abandoned, and with such approval another station, or other stations, shall be established and new measurements shall be substituted which, in the unanimous opinion of the Commission, will result in substantially the same results, so far as the rights and obligations to deliver water are concerned, as would have existed if such substitution of stations and measurements had not been so made.

ARTICLE VI.

Commencing with the year following the effective date of this Compact, all credits and debits of Colorado and New Mexico shall be computed for each calendar year; provided, that in a year of actual spill no annual credits nor annual debits shall be computed for that year.

In the case of Colorado, no annual debit nor accrued debit shall exceed 100,000 acre feet, except as either or both may be caused by holdover storage of water in reservoirs constructed after 1937 in the drainage basin of the Rio Grande above Lobatos.

Within the physical limitations of storage capacity in such reservoirs, Colorado shall retain water in storage at all times to the extent of its accrued debit.

In the case of New Mexico, the accrued debit shall not exceed 200,000 acre feet at any time, except as such debit may be caused by holdover storage of water in reservoirs constructed after 1929 in the drainage basin of the Rio Grande between Lobatos and San Marcial. Within the physical limitations of storage capacity in such reservoirs, New Mexico shall retain water in storage at all times to the extent of its accrued debit. In computing the magnitude of accrued credits or debits, New Mexico shall not be charged with any greater debit in any one year than the sum of 150,000 acre feet and all gains in the quantity of water in storage in such year.

The Commission by unanimous action may authorize the release from storage of any amount of water which is then being held in storage by reason of accrued debits of Colorado or New Mexico; provided, that such water shall be replaced at the first opportunity thereafter.

In computing the amount of accrued credits and accrued debits of Colorado or New Mexico, any annual credits in excess of 150,000 acre feet shall be taken as equal to that amount.

In any year in which actual spill occurs, the accrued credits of Colorado, or New Mexico, or both, at the beginning of the year shall be reduced in proportion to their respective credits by the amount of such actual spill; provided, that the amount of actual spill shall be deemed to be increased by the aggregate gain in the amount of water in storage, prior to the time of spill, in reservoirs above San Marcial constructed after 1929; provided, further, that if the Commissioners for the States having accrued credits authorize the release of part, or all, of such credits in advance of spill, the amount so released shall be deemed to constitute actual spill.

In any year in which there is actual spill of usable water, or at the time of hypothetical spill thereof, all accrued debits of Colorado, or New Mexico, or both, at the beginning of the year shall be cancelled.

In any year in which the aggregate of accrued debits of Colorado and New Mexico exceeds the minimum unfilled capacity of project storage, such debits shall be reduced proportionally to an aggregate amount equal to such minimum unfilled capacity.

To the extent that accrued credits are impounded in reservoirs between San Marcial and Courchesne, and to the extent that accrued debits are impounded in reservoirs above San Marcial, such credits and debits shall be reduced annually to compensate for evaporation losses in the proportion that such credits or debits bore to the total amount of water in such reservoirs during the year.

ARTICLE VII.

Neither Colorado nor New Mexico shall increase the amount of water in storage in reservoirs constructed after 1929 whenever there is less than 400,000 acre feet of usable water in project storage; provided, that if the actual releases of usable water from the beginning of the calendar year following the effective date of this Compact, or from the beginning of the calendar year following actual spill, have aggregated more than an average of 790,000 acre feet per annum, the time at which such minimum stage is reached shall be adjusted to compensate for the difference between the total actual release and releases at such average rate; provided, further, that Colorado or New Mexico, or both, may relinquish accrued credits at any time, and Texas may accept such relinquished water, and in such event the state, or states, so relinquishing shall be entitled to store water in the amount of the water so relinquished.

ARTICLE VIII.

During the month of January of any year the Commissioner for Texas may demand of Colorado and New Mexico, and the Commissioner for New Mexico may demand of Colorado, the release of water from storage reservoirs constructed after 1929 to the amount of the accrued debits of Colorado and New Mexico, respectively, and such releases shall be made by each at the greatest rate practicable under the conditions then prevailing, and in proportion to the total debit of each, and in amounts, limited by their accrued debits, sufficient to bring the quantity of usable water in project storage to 600,000 acre feet by March first and to maintain this quantity in storage until April thirtieth, to the end that a normal release of 790,000 acre feet may be made from project storage in that year.

ARTICLE IX.

Colorado agrees with New Mexico that in event the United States or the State of New Mexico decides to construct the necessary works for diverting the waters of the San Juan River, or any of its tributaries, into the Rio Grande, Colorado hereby consents to the construction of said works and the diversion of waters from the San Juan River, or the tributaries thereof, into the Rio Grande in New Mexico, provided the present and prospective uses of water in Colorado by other diversions from the San Juan River, or its tributaries, are protected.

ARTICLE X.

In the event water from another drainage basin shall be imported into the Rio Grande Basin by the United States or Colorado or New Mexico, or any of them jointly, the State having the right to the use of such water shall be given proper credit therefor in the application of the schedules.

ARTICLE XI.

New Mexico and Texas agree that upon the effective date of this Compact all controversies between said States relative to the quantity or quality of the water of the Rio Grande are composed and settled; however, nothing herein shall be interpreted to prevent recourse by a signatory state to the Supreme Court of the United States for redress should the character or quality of the water, at the point of delivery, be changed hereafter by one signatory State to the injury of another. Nothing herein shall be construed as an admission by any signatory state that the use of water for irrigation causes increase of salinity for which the user is responsible in law.

ARTICLE XII.

To administer the provisions of this Compact there shall be constituted a Commission composed of one representative from each State, to be known as the Rio Grande Compact Commission. The State Engineer of Colorado shall be ex-officio the Rio Grande Compact Commissioner for Colorado. The State Engineer of New Mexico shall be ex-officio the Rio Grande Compact Commissioner for New Mexico. The Rio Grande Compact Commissioner for Texas shall be appointed by the Governor of Texas. The President of the United States shall be requested to designate a representative of the United States to sit with such Commission, and such representative of the United States, if so designated by the President, shall act as Chairman of the Commission without vote.

The salaries and personal expenses of the Rio Grande Compact Commissioners for the three States shall be paid by their respective States, and all other expenses incident to the administration of this Compact. not borne by the United States, shall be borne equally by the three States.

In addition to the powers and duties hereinbefore specifically conferred upon such Commission, and the members thereof, the jurisdiction of such Commission shall extend only to the collection, correlation and presentation of factual data and the maintenance of records having a bearing upon the administration of this Compact, and, by unanimous action, to the making of recommendations to the respective States upon matters connected with the administration of this Compact. In connection therewith, the Commission may employ such engineering and clerical aid as may be reasonably necessary within the limit of funds provided for that purpose by the respective States. Annual reports compiled for each calendar year shall be made by the Commission and transmitted to the Governors of the signatory States on or before March first following the year covered by the report. The Commission may, by unanimous action, adopt rules and regulations consistent with the provisions of this Compact to govern their proceedings.

The findings of the Commission shall not be conclusive in any court or tribunal which may be called upon to interpret or enforce this Compact.

ARTICLE XIII.

At the expiration of every five year period after the effective date of this Compact, the Commission may, by unanimous consent, review any provisions hereof which are not substantive in character and which do not affect the basic principles upon which the Compact is founded, and shall meet for the consideration of such questions on the request of any member of the Commission; provided, however, that the provisions hereof shall remain in full force and effect until changed and amended within the intent of the Compact by unanimous action of the Commissioners, and until any changes in this Compact are ratified by the legislatures of the respective states and consented to by the Congress, in the same manner as this Compact is required to be ratified to become effective.

ARTICLE XIV.

The schedules herein contained and the quantities of water herein allocated shall never be increased nor diminished by reason of any increase or diminution in the delivery or loss of water to Mexico.

ARTICLE XV.

The physical and other conditions characteristic of the Rio Grande and peculiar to the territory drained and served thereby, and to the development thereof, have actuated this Compact and none of the signatory states admits that any provisions herein contained establishes any general principle or precedent applicable to other interstate streams.

ARTICLE XVI.

Nothing in this Compact shall be construed as affecting the obligations of the United States of America to Mexico under existing treaties, or to the Indian Tribes, or as impairing the rights of the Indian Tribes.

ARTICLE XVII.

This Compact shall become effective when ratified by the legislatures of each of the signatory states and consented to by the Congress of the United States. Notice of ratification shall be given by the Governor of each state to the Governors of the other states and to the President of the United States, and the President of the United States is requested to give notice to the Governors of each of the signatory states of the consent of the Congress of the United States.

IN WITNESS WHEREOF, the Commissioners have signed this Compact in quadruplicate original, one of which shall be

deposited in the archives of the Department of State of the United States of America and shall be deemed the authoritative original, and of which a duly certified copy shall be forwarded to the Governor of each of the signatory States.

Done at the City of Santa Fe, in the State of New Mexico, on the 18th day of March, in the year of our Lord, One Thousand Nine Hundred and Thirty-eight.

(Sgd.) M. C. HINDERLIDER.
(Sgd.) THOMAS M. McCLURE.
(Sgd.) FRANK B. CLAYTON.

APPROVED:

(Sgd.) S. O. HARPER.

APPENDIX C
RESOLUTION REGARDING CLOSED BASIN PROJECT

RESOLUTION
REGARDING THE ALLOCATION OF THE
YIELD OF THE CLOSED BASIN PROJECT

WHEREAS, §104(b)(1) of the Reclamation Project Authorization Act of 1972, Public Law 92-514, 86 Stat. 964, provides:

> "(b) After the construction of any phase thereof has been constructed and is operational, the secretary shall make water available in the following listed order of priority:
>
> (1) to assist in making the annual delivery of water at the gauging station on the Rio Grande near Labatos, Colorado, as required by Article III of the Rio Grande Compact: provided, that the total amount of water delivered for this purpose shall not exceed an aggregate of 600,000 acre-feet for any period of ten consecutive years reckoned in continuing progressive series beginning with the first day of January, next succeeding the year in which the secretary determined that the project authorized by this act is operational; ..."

and

WHEREAS, the Rio Grande Water Conservation District, as owner of the conditional decree for the Closed Basin Project (Case No. W-3038, District Court, Water Division No. 3), and pursuant to Article 48, Title 37, C.R.S., is empowered to allocate that portion of the yield of the Closed Basin Project that is subject to §104(b)(1) of the Reclamation Project Authorization Act of 1972, in a manner that it determines will best benefit the lands and people within the District; and

WHEREAS, the Colorado Supreme Court in Alamosa-La Jara Water Users Protection Association v. Gould, 674 P.2d 1914 (Colo. 1983), held that the Rio Grande Compact, C.R.S.

§37-66-101, imposes separate delivery obligations on the Conejos River and on the Rio Grande, exclusive of the Conejos River; and

WHEREAS, surface diversions on both the Rio Grande and the Conejos River have been curtailed so that Colorado would meet its obligations under the Rio Grande Compact; and

WHEREAS, the continued curtailment of surface diversions threatens the economic stability of the San Luis Valley by reducing the total agricultural production within the Rio Grande Water Conservation District; and

WHEREAS, the danger of curtailment of well pumping further threatens the economic stability of the San Luis Valley by raising the risk of a reduction of total irrigated acreage within the Rio Grande Water Conservation District; and

WHEREAS, the Closed Basin Project adds a new water supply to the Rio Grande and, with this new water supply, presents an opportunity to reduce the curtailment of surface diversions that would otherwise be required by the Rio Grande Compact, while at the same time reducing claims of stream depletion from well pumping; and

WHEREAS, by reducing claims of stream depletion from well pumping, the new water supply provided by the Closed Basin Project will create a common benefit for municipal, agricultural and industrial well owners; and

WHEREAS, it is in the interests of all water users within the Rio Grande Water Conservation District to reduce the burdens of curtailment of surface diversions which are currently required to meet the delivery obligations of the Rio Grande Compact, to restore higher levels of surface diversions within the District, and to relieve well users within the District from claims that the operation of wells has reduced the discharges of the Rio Grande and Conejos River, by making a permanent allocation between the two river systems of that portion of the yield of the Closed Basin Project that is subject to §104(b)(1) of the Reclamation Project Authorization Act of 1972; and

WHEREAS, maximum utilization of the San Luis Valley's water resources will be furthered if substantial amounts of well pumping are not curtailed merely to increase by a much smaller amount the discharges of the Rio Grande and the Conejos River; and

WHEREAS, it is in the interests of all of the water users within the Rio Grande Water Conservation District to reach an agreement concerning the allocation of that portion of the yield of the Closed Basin Project that is subject to §104(b)(1) of the Reclamation Project Authorization Act of 1972, in a manner that is satisfactory to the Conejos Water Conservancy District; the San Luis Valley Water Conservancy District; the Alamosa-La Jara Water Conservancy District; and the Rio Grande Water Users Association; and

WHEREAS, the Board of Directors of the Rio Grande Water Conservation District, having considered the terms of settlement herein contained and contained in the prior resolutions of the Conejos Water Conservancy District; the San Luis Valley Water Conservancy District; the Alamosa-La Jara Water Conservancy District; and the Rio Grande Water Users Association and found the same to be in best interests of the District;

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Rio Grande Water Conservation District, that the portion of the yield of the Closed Basin Project that is subject to §104(b)(1) of the Reclamation Project Authorization Act of 1972 (measured at the stream gauging station on the Rio Grande near Labatos, Colorado) should be allocated as follows:

1. Allocation of Project Yield:

A. As used in this agreement, the term "usable yield" shall mean that quantity of water which, in any year, can be made physically available to water users on the Rio Grande or on the Conejos by exchange. "Usable yield," for purposes of this agreement, shall not include deliveries pursuant to the terms of the Rio Grande Compact which are in excess of the obligations for the Rio Grande and for the Conejos River as set forth in Article III thereof and, for its term, the stipulation in Texas and New Mexico v. Colorado.

B. The usable yield from the Closed Basin Project will be divided, as nearly as possible, on a 60/40 basis with the Rio Grande being entitled to 60% of the usable yield from the project and the Conejos River being entitled to 40% of the usable yield from the project. The 60/40 percentage division between the two rivers will be determined utilizing usable yield for any period of 15 consecutive years reckoned in continuing progressive series beginning with the first day of January next succeeding the first delivery of water from the Closed Basin Project.

C. The Rio Grande shall be entitled to claim up to and including 80% of the project production in any year when it may exchange and beneficially use said production, so as to assist it in achieving its 60% share over any 15-year period. The Conejos shall be entitled to at least 20% of the project production in every year that said quantity of water is usable by the Conejos.

D. Any project water not usable by one river system in a particular year may be used by the other river system so as to maximize the beneficial use of the project production within the State of Colorado, as long as the long-term 60/40 allocation between the rivers is maintained. The allocation of usable yield on a 60/40 basis shall be the guiding principle of this agreement.

E. The management and allocation of usable yield within each river system shall be the responsibility of the Conejos Water Conservancy District, and the Rio Grande Water

Users Association in consultation with the San Luis Valley Water Conservancy District, respectively. These organizations may seek the assistance and cooperation of the Division Engineer as appropriate in order to achieve the principles set forth herein.

F. The project shall be operated to maximize the usable yield to the water users subject to the foregoing principles. However, if at anytime after fifteen (15) years from the date of first delivery of water from the Closed Basin Project, the principles set forth in this paragraph fail to achieve the 60/40 allocation between the rivers, the Rio Grande Water Conservation District, upon written request of the Conejos Water Conservancy District, the Rio Grande Water Users Association, or the San Luis Valley Water Conservancy District, will modify these operating principles to insure that the 60/40 allocation is met.

2. In any legal or administrative proceedings, to curtail the pumping of wells within the boundaries of the Rio Grande Water Conservation District (or otherwise assess damages or other legal remedies based on the pumping of such wells) because of their alleged effects on the discharges of the Conejos River and the Rio Grande and their tributaries, the following agreements shall be incorporated:

A. The Conejos Water Conservancy District waives all claims against existing wells located within the boundaries of the Rio Grande Water Conservation District for

such alleged effects on the discharge of the Conejos River resulting from the existing levels of attained production and beneficial use of said wells.

B. The Rio Grande Water Users Association and the San Luis Valley Water Conservancy District waive all claims against existing wells located within the boundaries of the Rio Grande Water Conservation District for such alleged effects on the discharge of the Rio Grande resulting from the existing levels of attained production and beneficial use of said wells.

C. The Alamosa-La Jara Water Conservancy District waives all claims against existing wells located within the boundaries of the Rio Grande Water Conservation District for such alleged effects on the surface flows of Alamosa Creek and La Jara Creek resulting from the existing levels of attained production and beneficial use of said wells.

D. As used in this agreement, the term "existing level of production and use" shall generally refer to the levels of diversion and beneficial use of well water attained during the period 1981 to 1985, inclusive, except that when referring to wells currently owned and operated by municipal or quasi-municipal entities within the Rio Grande Water Conservation District, it shall refer to the currently permitted and/or decreed capacity of such wells without regard to the level of use during said period.

E. The water delivered pursuant to the terms of this agreement shall be considered to fully satisfy the parties for any injury alleged to be or have been caused by the existing level of production and use of wells within the Rio Grande Water Conservation District.

3. If the Closed Basin Project fails to yield at least 250,000 acre-feet in any ten-year period, pursuant to the terms of this agreement, then the provisions of this Resolution are void, subject to the following:

A. The calculation of the 250,000 acre-feet over ten years shall not commence until after Stage 4 of the Closed Basin Project has been placed in full operation.

B. Each conservancy district, water user organization, ditch company, or individual water user affected by this Resolution shall retain whatever legal rights they hold as of the date hereof in the event the provisions of this paragraph 3 are ever found to be applicable. All statements of fact and/or law herein contained shall only remain binding so long as this agreement is in force. The provisions of this agreement shall have no effect in any future proceeding if the terms hereof are considered void by the action of this paragraph.

4. If, despite this agreement, administrative or legal proceedings are initiated and prosecuted to completion which require well users in the Rio Grande Water Conservation District to provide augmentation or replacement water to surface streams in addition to that provided herein for

well depletions caused by existing levels of attained production and beneficial use as herein defined, then the terms hereof may be declared to be null and void and of no further effect at the election of the Conejos Water Conservancy District, the San Luis Valley Water Conservancy District, or the Rio Grande Water Users Association. Notice of the exercise of said election must be given in writing to the Rio Grande Water Conservation District.

5. Operation of the Project to insure that these agreements are met and accounting for the allocations herein made will require decisions to be made on a regular basis. The Rio Grande Water Conservation District Board of Directors hereby establishes an operating committee consisting of three sets of representatives. One set of representatives shall be selected jointly by the Rio Grande Water Users Association and the San Luis Valley Water Conservancy District for the Rio Grande Basin; one set of representatives shall be selected by the Conejos Water Conservancy District for the Conejos Basin; and a third set of representatives shall be selected by the Rio Grande Water Conservation District. The names of the representatives shall be submitted to the Rio Grande Water Conservation District in writing. Each set of representatives shall have one vote, and two affirmative votes on any proposal shall be required for the committee to act. The operating committee shall be responsible for making decisions relative to the issues of allocating project deliveries between the Conejos

River and the Rio Grande as to both quantity and timing. The operating committee will function as a committee of the Board and will report to it at least quarterly and will be governed by its instructions and guidance. Decisions of the operating committee and instructions and guidance by the Board shall not be in derogation of the provisions of this agreement. The operating committee will include the Division Engineer as an ex officio member.

6. The Conejos Water Conservancy District, the San Luis Valley Water Conservancy District, the Rio Grande Water Users Association, and the Alamosa-La Jara Water Conservancy District having adopted the resolutions herein contemplated which contain these same terms, conditions, and agreements, this resolution is therefore effective and constitutes a binding and enforceable agreement among the parties hereto.

WHEREFORE, the Rio Grande Water Conservation District adopts this Resolution by unanimous vote and directs its attorney to obtain the approval of the District Court in and for the County of Alamosa, State of Colorado, pursuant to C.R.S. §37-48-113.

DONE, this 19 day of Feb, 1985.

RIO GRANDE WATER CONSERVATION DISTRICT

By: Harold L. Ziegler
Harold L. Ziegler
President

ATTEST:

Jon Brownell
Secretary

APPENDIX D
DESCRIPTION OF FLOW BASE GENERATION

Appendix D
Description of Flow Base Generation

The following describes the basic methodology used in generating the incremental flow originating in each modeled flow sector.

1. "Historic Storage Release" flow was obtained from Colorado State Engineer's records of historically diverted quantities of released water by reservoirs upstream of Del Norte to the Rio Grande Canal, Monte Vista Canal and Farmers Union Canal.
2. Vega Sylvestre Damsite incremental sector flows were estimated as 73 percent of the Wagon Wheel Gap Damsite flows. The 73 percent number was derived from inflow data for the Vega Sylvestre Reservoir and Wagon Wheel Gap Reservoir sites contained in the 1938 National Resources Study on the Upper Rio Grande. Based on information reviewed in this study, there have been no significant changes upstream of the reservoirs which would affect this relationship.
3. Wagon Wheel Gap Damsite sector incremental flows consist of gaged flows of the Rio Grande at Wagonwheel Gap, Colo. minus the flows placed in the Vega Sylvestre and historic storage release sectors. Values were generated for months of missing data prior to 1954 though monthly relationships developed with flows at the Rio Grande at Wason, below Creede, Co. gage.
4. RG1 sector incremental flows were estimated as the sum of Goose Creek historic flows and incremental inflow below Goose Creek (based on an assumed 300 af per square mile of incremental drainage area). The incremental inflow below Goose Creek was assumed to have a similar monthly distribution pattern as the Goose Creek flows. Missing data for Goose Creek were generated based on monthly relationships developed with the Wagon Wheel Gap damsite flows.
5. SF1 incremental sector flows were estimated by multiplying the gaged flows of the South Fork of the Rio Grande at South Fork, Colorado by the ratio of the drainage area upstream of SF1 to the drainage area upstream of the gage (a factor of 60 percent).
6. "South Fork of Rio Grande near South Fork" sector contains gage records of the South Fork of the Rio Grande at South Fork, Colorado minus the flows placed in the SF1 sector.
7. "Rio Grande near Del Norte" flow sector contains historic gage records for the gage at Rio Grande near Del Norte, Colorado minus flows placed in upstream flow sectors.
8. The "Rio Grande at Alamosa" flow sector contains no incremental flow except for approximately 7,000 acre-feet of return flows placed in the first year of the study period to simulate return flows originating from years prior to the study period.
9. The "Flood Replacement" sector is an empty flow sector used in the calculation of flows (flows not needed by Del Norte to Alamosa mainstem water users).
10. The "Priority Three" sector contains estimated available Closed Basin Project Priority Three water.

11. The "Rio Grande Closed Basin" sector contains estimated Closed Basin Project Priority One deliveries allocated to the Rio Grande mainstem users.

12. The "Conejos Closed Basin" sector contains estimated Closed Basin Project Priority One deliveries allocated to the Conejos water users.

13. The "Closed Basin Project" sector is an empty sector used in the model to constrain Priority One and Priority Three Closed Basin Project deliveries to Closed Basin Project delivery capacity.

14. The "Conejos Inflow" sector contains the historic index flow values for the Conejos Basin as derived from annual reports of the Rio Grande Compact Commission.

15. The "Conejos Compact Station" is an empty sector not used in the latest Rio Grande Water Supply Study simulations.

16. The "Rio Grande near Lobatos" sector's incremental flow consists of historic inflows downstream of Alamosa and upstream of Lobatos excluding the Conejos River inflow at La Sauses.

17. The "Abiquiu Flow Sector" contains estimated native Rio Chama (the largest tributary to the Rio Grande in New Mexico) inflow to Abiquiu Reservoir. Eight years of estimated native inflow to Abiquiu were correlated with estimated 1948-1985 native flows originating below Lobatos and upstream of Cochiti Reservoir to generate native inflow to Abiquiu through the study period. The primary steps to extend the records included:

    1) compute Rio Chama native inflow to Abiquiu by adjusting the 1963 through 1970 Rio Chama flows below Abiquiu Dam, by historic changes in contents of Abiquiu Reservoir.
    2) compute the native inflows downstream of Lobatos and upstream of Cochiti by making the following adjustments to the Otowi gaged flow:
        a) subtract Rio Grande gage flows near Lobatos,
        b) remove transmountain flows contained in the historic Otowi flows,
        c) remove the affect of Abiquiu reservoir storage.
    3) Correlate the estimated monthly 1963-1970 native Abiquiu inflows with the 1948-1985 estimated monthly native flows originating downstream of Lobatos and upstream of Cochiti.
    4) Use the correlated relationship to extend the estimated native inflow to Abiquiu.

18. The "Cochiti Inflow" sector contains the native flows originating downstream of Lobatos and upstream of Cochiti Reservoir excluding the native flow placed in the Abiquiu flow sector. To obtain these flows the estimated native inflow to Abiquiu calculated in 14.4 was subtracted from the estimated native flow originating below Lobatos and upstream of Cochiti generated in 14.2.

19. The following steps were performed to estimate the incremental flow occurring in the Rio Grande Project flow sector, downstream of Cochiti Reservoir and upstream of the Rio Grande Project.

1) compute total net historic inflow to Elephant Butte Reservoir by adjusting the "effective supply" downstream of Elephant Butte Reservoir reported in annual Compact reports for estimated historic Elephant Butte Reservoir evaporation and historic changes in storage in Abiquiu and Cochiti reservoirs.
2) compute the net historic inflow to Elephant Butte Reservoir attributed to New Mexico by subtracting the historic flow at Lobatos from the total net historic inflow to Elephant Butte Reservoir derived in 16.1.
3) compute the net historic inflow to Elephant Butte Reservoir originating below Cochiti Reservoir by subtracting the flows placed in the Abiquiu and Cochiti flow sectors from the net historic inflow to Elephant Butte Reservoir attributed to New Mexico (16.2 - 15. - 14.4).

APPENDIX E
MONTHLY STORABLE FLOW RESULTS

APPENDIX E
LIST OF TABLES

APPENDIX E
LIST OF TABLES (CONT.)

WAGON WHEEL GAP SITE
CB PRIORITY 3 EXCHANGE STORABLE FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	8024	7765	0	0	0	0	92	4	15886
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	4	18	133	0	0	0	0	0	0	0	70	3	227
1951	2	10	110	0	0	0	0	0	0	0	67	1	190
1952	1	7	102	0	2290	0	0	0	0	0	0	0	2400
1953	4	20	135	0	0	0	0	0	0	0	70	2	231
1954	2	7	106	0	0	0	0	0	0	0	65	576	757
1955	3	9	104	0	0	0	0	0	0	0	68	2	187
1956	2	8	105	0	0	0	0	0	0	0	0	0	115
1957	0	8	105	0	0	7765	1621	0	0	0	0	0	9500
1958	5	9	118	0	8024	0	0	0	0	0	81	4	8242
1959	3	19	128	0	0	0	0	0	0	0	71	2	223
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	2	15	125	0	0	0	0	0	0	0	74	3	218
1962	3	17	119	0	8024	0	0	0	0	0	83	4	8250
1963	4	20	133	0	0	0	0	0	0	0	80	1060	1276
1964	2	9	102	0	0	0	0	0	0	0	68	1060	1240
1965	2	13	109	0	8024	1351	0	0	0	0	0	0	9500
1966	5	20	136	0	4787	0	0	0	0	0	2500	2	7450
1967	0	19	123	0	0	0	0	0	0	0	69	3	215
1968	3	9	105	0	0	0	0	0	0	0	88	4	210
1969	4	15	125	0	535	0	0	0	0	1129	78	5	1891
1970	4	20	125	0	3451	0	0	0	0	0	0	0	3600
1971	4	20	122	0	0	0	0	0	0	0	73	3	222
1972	2	8	107	0	0	0	0	0	0	0	70	2	188
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	4	19	132	0	0	0	0	0	0	0	62	1	218
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	3	17	129	0	0	0	0	0	0	0	80	4	233
1977	0	17	125	0	0	0	0	0	0	0	57	1	200
1978	2	6	89	0	0	0	0	0	0	8024	75	2	8198
1979	1	7	109	0	8024	1358	0	0	0	0	0	0	9500
1980	3	19	134	0	0	3244	0	0	0	0	0	0	3400
1981	2	16	127	0	0	0	0	0	0	0	72	3	220
1982	3	10	105	0	0	0	0	0	7765	8024	85	5	15997
1983	4	10	115	0	0	7765	0	0	0	0	90	4	7989
1984	4	10	119	0	8024	0	0	0	1123	1627	85	5	10996
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	2	11	99	0	1558	770	43	0	234	495	114	73	3399

WAGON WHEEL GAP SITE
STORABLE FLOOD FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	40703	34742	0	0	0	0	0	0	75445
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	10429	21646	0	0	0	0	0	0	32075
AVG.	0	0	0	0	1346	1484	0	0	0	0	0	0	2830

WAGON WHEEL GAP SITE
STORABLE [illegible] FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	0	0	0	0	0	0	0	0	0	0	0	0	0

WAGON WHEEL GAP SITE
STORABLE SEASONAL FLOWS ASSUMING 70 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	520	1020	4138	24307	103811	56619	0	0	0	8955	3286	1060	203716
1949	520	1020	3492	23432	69298	91654	0	0	0	10053	4378	1060	204905
1950	520	1020	5167	34415	34919	0	0	0	0	5541	2581	1060	85203
1951	520	1020	1846	0	0	0	0	0	0	3997	2731	1060	11174
1952	520	1020	2044	28451	94875	4371	0	0	0	8582	4464	1060	145187
1953	520	1020	4169	14342	38922	0	0	0	0	4734	2490	1060	67257
1954	520	1020	1671	21116	13950	0	0	0	0	0	0	0	38277
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	14257	7130	1060	22447
1958	520	1020	3510	19731	77043	0	0	0	0	7870	3550	1060	114304
1959	520	1020	1415	9343	39953	0	0	0	0	9100	5404	1060	67815
1960	520	1020	7530	31475	62618	1309	0	0	0	6702	2560	270	114004
1961	139	579	2888	13687	57186	0	0	0	0	0	0	1060	75539
1962	520	1020	2648	31062	80651	40683	0	0	0	0	4857	1060	162501
1963	520	735	3986	15234	32646	0	0	0	0	0	0	0	53121
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1060	1060
1966	520	1020	6505	22613	80453	0	0	0	0	0	0	0	111111
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	84925	47843	0	0	0	8793	3155	1060	145776
1974	520	1020	4172	1067	11623	0	0	0	0	0	0	0	18402
1975	0	0	0	0	0	75467	0	0	0	0	0	0	75467
1976	520	1020	0	0	0	0	0	0	0	0	0	0	1540
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	105921	109798	0	0	0	6518	3928	1060	227223
1980	520	1020	2817	12556	75361	35945	0	0	7942	7686	3571	1060	148478
1981	520	1020	2271	5837	33617	0	0	0	0	17524	4868	1060	86717
1982	520	1020	2600	13749	19475	43730	0	0	14299	21183	7130	1060	124768
1983	520	1020	3697	6460	57431	121408	0	0	0	19553	4076	1060	215223
1984	520	1020	3447	7189	68389	19591	0	0	0	22661	7130	1060	131007
1985	520	1020	4427	27909	99012	51831	0	0	9338	28617	7130	1060	230864
AVG	291	571	1959	9578	35313	18428	0	0	831	5588	2221	565	75344

WAGON WHEEL GAP SITE
STORABLE SEASONAL FLOWS ASSUMING 50 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	520	1020	4138	24307	75532	0	0	0	0	8955	3286	1060	118818
1949	520	1020	3492	23432	69296	34863	0	0	0	10053	4378	1060	148114
1950	520	1020	5167	33419	3341	0	0	0	0	1900	2561	1060	48988
1951	520	1020	1846	0	0	0	0	0	0	1372	2731	1060	8549
1952	520	1020	2044	28451	62741	0	0	0	0	3735	4464	1060	104035
1953	520	1020	4169	14342	35701	0	0	0	0	3053	2490	1060	62355
1954	520	1020	1671	11203	0	0	0	0	0	0	0	0	14414
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	14257	7130	1060	22447
1958	520	1020	3510	12023	38056	0	0	0	0	7870	3550	1060	67609
1959	520	1020	1415	7579	24911	0	0	0	0	9100	5404	1060	51009
1960	520	1020	7530	31475	29251	0	0	0	0	6702	2560	270	79328
1961	139	579	2888	8351	19867	0	0	0	0	0	0	1060	32684
1962	520	1020	2848	31062	43108	0	0	0	0	0	4857	1060	84275
1963	520	735	3986	5251	0	0	0	0	0	0	0	0	10492
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1060	1060
1966	520	1020	6505	18103	42830	0	0	0	0	0	0	0	68978
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	71187	0	0	0	0	8793	3155	1060	84195
1974	520	1020	4172	0	0	0	0	0	0	0	0	0	5712
1975	0	0	0	0	0	12202	0	0	0	0	0	0	12202
1976	520	1020	0	0	0	0	0	0	0	0	0	0	1540
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	78486	60262	0	0	0	4449	3928	1060	148185
1980	520	1020	2817	12556	75361	0	0	0	991	7686	3571	1060	105582
1981	520	1020	2271	0	12223	0	0	0	0	17524	4868	1060	39486
1982	520	1020	2600	6489	0	0	0	0	2275	21183	7130	1060	42277
1983	520	1020	3697	0	39768	76517	0	0	0	19553	4076	1060	146211
1984	520	1020	3447	0	25940	0	0	0	0	22661	7130	1060	61778
1985	520	1020	4427	27909	68813	0	0	0	0	28617	7130	1060	139498
AVG	291	571	1959	7788	21479	4838	0	0	88	5196	2221	565	44995

WAGON WHEEL GAP SITE
STORABLE SEASONAL FLOWS ASSUMING 30 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	520	1020	4138	2301	9548	0	0	0	0	8853	3286	1060	30726
1949	520	1020	3492	4871	6590	0	0	0	0	10053	4378	1060	31984
1950	520	1020	5167	10892	0	0	0	0	0	0	2561	1060	21220
1951	520	1020	1846	0	0	0	0	0	0	0	2731	1060	7177
1952	520	1020	2044	28451	0	0	0	0	0	0	4464	1060	37559
1953	520	1020	4169	3339	7210	0	0	0	0	0	2490	1060	19808
1954	520	1020	1671	0	0	0	0	0	0	0	0	0	3211
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	14257	7130	1060	22447
1958	520	1020	3510	0	0	0	0	0	0	5239	3550	1060	14899
1959	520	1020	1415	0	0	0	0	0	0	9100	5404	1060	18519
1960	520	1020	7530	9421	0	0	0	0	0	6702	2560	270	28023
1961	139	579	2888	0	0	0	0	0	0	0	0	1060	4666
1962	520	1020	2848	17954	0	0	0	0	0	0	4857	1060	28059
1963	520	735	3986	0	0	0	0	0	0	0	0	0	5241
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1060	1060
1966	520	1020	6505	0	0	0	0	0	0	0	0	0	8045
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	2304	0	0	0	0	8793	3155	1060	15312
1974	520	1020	4172	0	0	0	0	0	0	0	0	0	5712
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	520	1020	0	0	0	0	0	0	0	0	0	0	1540
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	14468	0	0	0	0	0	3928	1060	19456
1980	520	1020	2817	3711	75361	0	0	0	0	7686	3571	1060	95746
1981	520	1020	2271	0	0	0	0	0	0	17524	4868	1060	27263
1982	520	1020	2600	0	0	0	0	0	0	21183	7130	1060	33513
1983	520	1020	3697	0	0	0	0	0	0	13635	4076	1060	24008
1984	520	1020	3447	0	0	0	0	0	0	22661	7130	1060	35838
1985	520	1020	4427	27909	0	0	0	0	0	28294	7130	1060	70360
AVG	291	571	1959	2864	3039	0	0	0	0	4578	2221	565	16089

VEGA SYLVESTRE SITE
CB PRIORITY 3 EXCHANGE STORABLE FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	8024	7765	0	0	0	0	92	4	15886
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	4	18	133	0	0	0	0	0	0	0	70	3	227
1951	2	10	110	0	0	0	0	0	0	0	67	1	190
1952	1	7	102	0	2290	0	0	0	0	0	0	0	2400
1953	4	20	135	0	0	0	0	0	0	0	70	2	231
1954	2	7	106	0	0	0	0	0	0	0	65	576	757
1955	3	9	104	0	0	0	0	0	0	0	68	2	187
1956	2	8	105	0	0	0	0	0	0	0	0	0	115
1957	0	8	105	0	0	7765	1621	0	0	0	0	0	9500
1958	5	9	118	0	8024	0	0	0	0	0	81	4	8242
1959	3	19	128	0	0	0	0	0	0	0	71	2	223
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	2	15	125	0	0	0	0	0	0	0	74	3	218
1962	3	17	119	0	8024	0	0	0	0	0	83	4	8250
1963	4	20	133	0	0	0	0	0	0	0	60	1060	1276
1964	2	9	102	0	0	0	0	0	0	0	66	1060	1240
1965	2	13	109	0	8024	1351	0	0	0	0	0	0	9500
1966	5	20	136	0	4807	0	0	0	0	0	1953	2	6923
1967	2	19	123	0	0	0	0	0	0	0	69	3	217
1968	3	9	105	0	0	0	0	0	0	0	88	4	210
1969	4	15	125	0	535	0	0	0	0	1129	78	5	1891
1970	4	20	125	0	3451	0	0	0	0	0	0	0	3600
1971	4	20	122	0	0	0	0	0	0	0	73	3	222
1972	2	8	107	0	0	0	0	0	0	0	70	2	188
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	4	19	132	0	0	0	0	0	0	0	62	1	218
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	3	17	129	0	0	0	0	0	0	0	80	4	233
1977	3	17	125	0	0	0	0	0	0	0	57	1	203
1978	2	6	89	0	0	0	0	0	0	8024	75	2	8198
1979	1	7	109	0	8024	1358	0	0	0	0	0	0	9500
1980	3	19	134	0	0	3244	0	0	0	0	0	0	3400
1981	2	16	127	0	0	0	0	0	0	0	72	3	220
1982	3	10	105	0	0	0	0	0	7765	8024	85	5	15997
1983	4	10	115	0	0	7765	0	0	0	0	90	4	7989
1984	4	10	119	0	8024	0	0	0	1123	1627	85	5	10996
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	2	11	99	0	1559	770	43	0	234	495	100	73	3385

VEGA SYLVESTRE SITE
STORABLE FLOOD FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	40661	34706	0	0	0	0	0	0	75367
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	9133	18956	0	0	0	0	0	0	28089
AVG.	0	0	0	0	1310	1412	0	0	0	0	0	0	2722

VEGA SYLVESTRE SITE
STORABLE DEBIT FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	0	0	0	0	0	0	0	0	0	0	0	0	0

VEGA SYLVESTRE SITE
STORABLE SEASONAL FLOWS ASSUMING 70 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	520	1020	3149	17334	56207	56619	0	0	0	6628	2498	1060	145034
1949	520	1020	2880	16897	50939	91654	0	0	0	7427	3318	1060	175315
1950	520	1020	3861	22551	34919	0	0	0	0	5357	1978	1060	71266
1951	520	1020	1452	0	0	0	0	0	0	3047	2102	1051	9192
1952	520	912	1599	19594	69476	4371	0	0	0	6771	3381	1060	107684
1953	520	1020	3135	10565	29481	0	0	0	0	3583	1926	996	51226
1954	520	1020	1326	19823	13950	0	0	0	0	0	0	0	36639
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	10020	5998	1060	17078
1958	520	1020	2660	13747	77043	0	0	0	0	5864	2694	1060	104608
1959	520	911	1134	6929	35456	0	0	0	0	6758	4045	1060	56813
1960	520	1020	5640	21839	58355	1309	0	0	0	5014	1996	336	96029
1961	240	543	2208	10089	57188	0	0	0	0	0	0	1060	71324
1962	520	1020	2033	22725	63473	40683	0	0	0	0	3844	1060	135158
1963	520	656	3003	14849	32646	0	0	0	0	0	0	0	51674
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1060	1060
1966	520	1020	4834	16580	72842	0	0	0	0	0	0	0	95796
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	62772	47843	0	0	0	6535	2429	1060	120639
1974	520	1020	3138	1067	11623	0	0	0	0	0	0	0	17368
1975	0	0	0	0	0	75467	0	0	0	0	0	0	75467
1976	520	1020	0	0	0	0	0	0	0	0	0	0	1540
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	79920	109796	0	0	0	4880	2991	1060	198647
1980	520	1020	2152	9268	55690	35945	0	0	7942	5?30	2731	1060	122056
1981	520	1020	1757	5838	26853	0	0	0	0	12885	3655	1060	53588
1982	520	1020	2002	10781	19477	43732	0	0	14299	13357	6022	1060	112270
1983	520	1020	2797	5414	42942	90240	0	0	0	14360	3074	1060	161427
1984	520	1020	2614	6886	66399	19591	0	0	0	16177	5502	1060	119769
1985	520	1020	3338	20432	72004	51831	0	0	9338	19270	7130	1060	185942
AVG	294	563	1487	7184	28675	17607	0	0	831	4044	1766	565	63016

VEGA SYLVESTRE SITE
STORABLE SEASONAL FLOWS ASSUMING 50 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	520	1020	3149	17334	58207	0	0	0	0	6628	2498	1060	88416
1949	520	1020	2680	16697	50939	34863	0	0	0	7427	3318	1060	118524
1950	520	1020	3861	22551	3341	0	0	0	0	1900	1978	1060	36231
1951	520	1020	1452	0	0	0	0	0	0	1372	2102	1051	7517
1952	520	912	1599	19594	62741	0	0	0	0	3735	3381	1060	93542
1953	520	1020	3135	10565	29481	0	0	0	0	3053	1928	998	50698
1954	520	1020	1328	11203	0	0	0	0	0	0	0	0	14069
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	10020	5998	1060	17078
1958	520	1020	2660	12033	38056	0	0	0	0	5864	2694	1060	63907
1959	520	911	1134	6929	24911	0	0	0	0	6758	4045	1060	46268
1960	520	1020	5640	21839	29251	0	0	0	0	5014	1998	336	65616
1961	240	543	2206	8351	19667	0	0	0	0	0	0	1060	32067
1962	520	1020	2033	22725	43108	0	0	0	0	0	3644	1060	74110
1963	520	656	3003	5251	0	0	0	0	0	0	0	0	9430
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1060	1060
1966	520	1020	4834	16580	42830	0	0	0	0	0	0	0	65784
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	62772	0	0	0	0	6535	2429	1060	72796
1974	520	1020	3138	0	0	0	0	0	0	0	0	0	4678
1975	0	0	0	0	0	12202	0	0	0	0	0	0	12202
1976	520	1020	0	0	0	0	0	0	0	0	0	0	1540
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	78486	60262	0	0	0	4449	2991	1060	147248
1980	520	1020	2152	9268	55690	0	0	0	991	5730	2731	1060	79160
1981	520	1020	1757	0	12224	0	0	0	0	12885	3655	1060	33121
1982	520	1020	2002	6490	0	0	0	0	2275	13357	6022	1060	32746
1983	520	1020	2797	0	39768	76517	0	0	0	14360	3074	1060	139116
1984	520	1020	2614	0	25940	0	0	0	0	16177	5502	1060	52833
1985	520	1020	3338	20432	68813	0	0	0	0	19270	7130	1060	121582
AVG	294	563	1487	5998	19585	4838	0	0	88	3804	1768	565	38983

VEGA SYLVESTRE SITE
STORABLE SEASONAL FLOWS ASSUMING 30 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	520	1020	3149	2301	9548	0	0	0	0	6628	2498	1060	26724
1949	520	1020	2680	4871	6590	0	0	0	0	7427	3318	1060	27486
1950	520	1020	3861	10892	0	0	0	0	0	0	1978	1060	19331
1951	520	1020	1452	0	0	0	0	0	0	0	2102	1051	6145
1952	520	912	1599	19594	0	0	0	0	0	0	3381	1060	27066
1953	520	1020	3135	3339	7210	0	0	0	0	0	1928	998	18146
1954	520	1020	1328	0	0	0	0	0	0	0	0	0	2866
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	10020	5998	1060	17078
1958	520	1020	2660	0	0	0	0	0	0	5244	2694	1060	13198
1959	520	911	1134	0	0	0	0	0	0	6758	4045	1060	14428
1960	520	1020	5640	9421	0	0	0	0	0	5014	1998	336	23947
1961	240	543	2206	0	0	0	0	0	0	0	0	1060	4049
1962	520	1020	2033	17954	0	0	0	0	0	0	3644	1060	26231
1963	520	656	3003	0	0	0	0	0	0	0	0	0	4179
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1060	1060
1966	520	1020	4834	0	0	0	0	0	0	0	0	0	6374
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	2304	0	0	0	0	6535	2429	1060	12328
1974	520	1020	3138	0	0	0	0	0	0	0	0	0	4678
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	520	1020	0	0	0	0	0	0	0	0	0	0	1540
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	14468	0	0	0	0	0	2991	1060	18519
1980	520	1020	2152	3711	55690	0	0	0	0	5730	2731	1060	72614
1981	520	1020	1757	0	0	0	0	0	0	12885	3655	1060	20897
1982	520	[illegible]	2002	0	0	0	0	0	0	13357	6022	1060	23981
1983	520	1020	2797	0	0	0	0	0	0	13635	3074	1060	22106
1984	520	1020	2614	0	0	0	0	0	0	16177	5502	1060	26893
1985	520	1020	3338	20432	0	0	0	0	0	19270	7130	1060	52769
AVG	294	563	1487	2435	2521	0	0	0	0	3386	1768	565	13017

RG1 SITE
CB PRIORITY 3 EXCHANGE STORABLE FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	8024	7765	0	0	0	0	92	4	15886
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	4	18	133	0	0	0	0	0	0	0	70	3	227
1951	2	10	110	0	0	0	0	0	0	0	67	1	190
1952	1	7	102	0	2290	0	0	0	0	0	0	0	2400
1953	4	20	135	0	0	0	0	0	0	0	70	2	231
1954	2	7	106	0	0	0	0	0	0	0	65	576	757
1955	3	9	104	0	0	0	0	0	0	0	68	2	187
1956	2	8	105	0	0	0	0	0	0	0	0	0	115
1957	0	8	105	0	0	7765	1621	0	0	0	0	0	9500
1958	5	9	118	0	8024	0	0	0	0	0	81	4	8242
1959	3	19	128	0	0	0	0	0	0	0	71	2	223
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	2	15	125	0	0	0	0	0	0	0	74	3	218
1962	3	17	119	0	8024	0	0	0	0	0	83	4	8250
1963	4	20	133	0	0	0	0	0	0	0	60	1060	1276
1964	2	9	102	0	0	0	0	0	0	0	68	1060	1240
1965	2	13	109	0	8024	1351	0	0	0	0	0	0	9500
1966	5	20	136	0	4773	0	0	0	0	0	3068	2	8002
1967	2	19	123	0	0	0	0	0	0	0	69	3	217
1968	3	9	105	0	0	0	0	0	0	0	88	4	210
1969	4	15	125	0	535	0	0	0	0	1129	78	5	1891
1970	4	20	125	0	3451	0	0	0	0	0	0	0	3600
1971	4	20	122	0	0	0	0	0	0	0	73	3	222
1972	2	8	107	0	0	0	0	0	0	0	70	2	188
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	4	19	132	0	0	0	0	0	0	0	62	1	218
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	3	17	129	0	0	0	0	0	0	0	80	0	229
1977	0	17	125	0	0	0	0	0	0	0	57	1	200
1978	2	6	89	0	0	0	0	0	0	8024	75	2	8198
1979	1	7	109	0	8024	1358	0	0	0	0	0	0	9500
1980	3	19	134	0	0	3244	0	0	0	0	0	0	3400
1981	2	16	127	0	0	0	0	0	0	0	72	3	220
1982	3	10	105	0	0	0	0	0	7765	8024	85	5	15997
1983	4	10	115	0	0	7765	0	0	0	0	90	4	7989
1984	4	10	119	0	8024	0	0	0	1123	1627	85	5	10998
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	2	11	99	0	1558	770	43	0	234	495	129	73	3414

RG1 SITE
STORABLE FLOOD FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	40749	34781	0	0	0	0	0	0	75530
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	11620	24119	0	0	0	0	0	0	35739
AVG.	0	0	0	0	1378	1550	0	0	0	0	0	0	2928

RG1 SITE
STORABLE DEBIT FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	0	0	0	0	0	0	0	0	0	0	0	0	0

RG1 SITE
STORABLE SEASONAL FLOWS ASSUMING 70 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	520	1020	5149	29881	103811	56619	0	0	0	10168	3880	1060	211888
1949	520	1020	4350	28803	81368	91654	0	0	0	11445	5177	1060	225195
1950	520	1020	6454	43073	34919	0	0	0	0	5541	3001	1080	95588
1951	520	1020	2339	0	0	0	0	0	0	4021	3205	1060	12165
1952	520	1020	2582	35246	94875	4371	0	0	0	8582	5280	1060	153336
1953	520	1020	5220	17249	45862	0	0	0	0	5241	2915	1080	79087
1954	520	1020	2121	21116	13950	0	0	0	0	0	0	0	38727
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	14986	7130	1060	23176
1958	520	1020	4129	20345	77043	0	0	0	0	8835	4255	1060	117207
1959	520	1020	1925	11166	39953	0	0	0	0	11549	6794	1060	73987
1960	520	1020	7530	37863	62818	1309	0	0	0	7516	3054	637	122067
1961	447	911	3516	16523	57186	0	0	0	0	0	0	1060	79643
1962	520	1020	3385	40849	80651	40683	0	0	0	0	5366	1060	173534
1963	520	1020	5389	15234	32646	0	0	0	0	0	0	0	54809
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1060	1060
1966	520	1020	7530	26991	80453	0	0	0	0	0	0	0	116514
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	100708	47843	0	0	0	[illegible]	3762	1080	183378
1974	520	1020	5289	1067	11623	0	0	0	0	[illegible]	0	0	19519
1975	0	0	0	0	0	75467	0	0	0	0	0	0	75467
1976	520	1020	0	0	0	0	0	0	0	0	0	0	1540
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	105921	109798	0	0	0	7207	4502	1060	228486
1980	520	1020	3420	15642	88394	35945	0	0	7942	8230	4341	1080	166514
1981	520	1020	2705	5837	33617	0	0	0	0	19963	6014	1060	70736
1982	520	1020	3304	13749	19474	43728	0	0	14299	26849	7130	1060	131133
1983	520	1020	5159	6460	59894	121408	0	0	0	22085	5115	1060	222719
1984	520	1020	4588	7189	68389	19591	0	0	0	24941	7130	1060	134428
1985	520	1020	5194.42	34687	99012	51831	0	0	9338	30485.4	7130	1060	240277.
AVG	299	588	2402	11278	36636	18427	0	0	831	6254	2505	575	79794

RG1 SITE
STORABLE SEASONAL FLOWS ASSUMING 50 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	520	1020	5149	27687	75532	0	0	0	0	10169	3880	1060	125016
1949	520	1020	4350	24525	70724	34883	0	0	0	11445	5177	1060	153684
1950	520	1020	6454	33419	3341	0	0	0	0	1900	3001	1060	50715
1951	520	1020	2339	0	0	0	0	0	0	1372	3205	1060	9516
1952	520	1020	2582	35246	62741	0	0	0	0	3735	5280	1060	112184
1953	520	1020	5220	15274	35701	0	0	0	0	3053	2915	1060	64763
1954	520	1020	2121	11203	0	0	0	0	0	0	0	0	14864
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	14986	7130	1060	23176
1958	520	1020	4129	12013	38056	0	0	0	0	8835	4255	1060	69888
1959	520	1020	1925	7579	24911	0	0	0	0	11549	6794	1060	55358
1960	520	1020	7530	33128	29251	0	0	0	0	7518	3054	637	82658
1961	447	911	3518	8351	19867	0	0	0	0	0	0	1060	33952
1962	520	1020	3385	40849	43108	0	0	0	0	0	5366	1060	95308
1963	520	1020	5389	5251	0	0	0	0	0	0	0	0	12180
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1060	1060
1966	520	1020	7530	18099	42830	0	0	0	0	0	0	0	[illegible]
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	71187	0	0	0	0	10003	3762	1060	86012
1974	520	1020	5289	0	0	0	0	0	0	0	0	0	6829
1975	0	0	0	0	0	12202	0	0	0	0	0	0	12202
1976	520	1020	0	0	0	0	0	0	0	0	0	0	1540
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	78486	60262	0	0	0	4449	4502	1060	148759
1980	520	1020	3420	14737	88394	0	0	0	991	8230	4341	1060	122713
1981	520	1020	2705	0	12223	0	0	0	0	19963	6014	1060	43505
1982	520	1020	3304	6489	0	0	0	0	2275	26849	7130	1060	48647
1983	520	1020	5159	0	39768	76517	0	0	0	20415	5115	1060	149574
1984	520	1020	4588	0	25940	0	0	0	0	24941	7130	1060	65199
1985	520	1020	5194	34887	68813	0	0	0	0	30485	7130	1060	148909
AVG	299	588	2402	8646	21860	4838	0	0	86	5787	2505	575	47584

RG1 SITE
STORABLE SEASONAL FLOWS ASSUMING 30 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	520	1020	5149	2301	9548	0	0	0	0	8853	3880	1060	32331
1949	520	1020	4350	4871	6590	0	0	0	0	11287	5177	1060	34875
1950	520	1020	6454	10892	0	0	0	0	0	0	3001	1060	22947
1951	520	1020	2339	0	0	0	0	0	0	0	3205	1060	8144
1952	520	1020	2582	35246	0	0	0	0	0	0	5280	1060	45708
1953	520	1020	5220	3339	7210	0	0	0	0	0	2915	1060	21284
1954	520	1020	2121	0	0	0	0	0	0	0	0	0	3661
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	14986	7130	1060	23176
1958	520	1020	4129	0	0	0	0	0	0	5235	4255	1060	16219
1959	520	1020	1925	0	0	0	0	0	0	11549	6794	1060	22868
1960	520	1020	7530	9421	0	0	0	0	0	7516	3054	637	29698
1961	447	911	3518	0	0	0	0	0	0	0	0	1060	5934
1962	520	1020	3385	17954	0	0	0	0	0	0	5366	1060	29305
1963	520	1020	5389	0	0	0	0	0	0	0	0	0	6929
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1060	1060
1966	520	1020	7530	0	0	0	0	0	0	0	0	0	9070
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	2304	0	0	0	0	10003	3762	1060	17129
1974	520	1020	5289	0	0	0	0	0	0	0	0	0	6829
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	520	1020	0	0	0	0	0	0	0	0	0	0	1540
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	14468	0	0	0	0	0	4502	1060	20030
1980	520	1020	3420	3711	88394	0	0	0	0	8230	4341	1060	110698
1981	520	1020	2705	0	0	0	0	0	0	19963	6014	1060	31282
1982	520	1020	3304	0	0	0	0	0	0	26849	7130	1060	39883
1983	520	1020	5159	0	0	0	0	0	0	13635	5115	1060	26509
1984	520	1020	4588	0	0	0	0	0	0	24941	7130	1060	39259
1985	520	1020	5194.42	32424	0	0	0	0	0	28294	7130	1060	75842.4
AVG	299	588	2402	3162	3382	0	0	0	0	5035	2505	575	17948

SOUTH FORK SITE
CB PRIORITY 3 EXCHANGE STORABLE FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	8024	7765	0	0	0	0	40	4	15834
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	4	18	133	0	0	0	0	0	0	0	70	0	224
1951	0	0	8	0	0	0	0	0	0	0	67	1	76
1952	1	7	102	0	2290	0	0	0	0	0	0	0	2400
1953	1	10	135	0	0	0	0	0	0	0	0	0	146
1954	0	7	37	0	0	0	0	0	0	0	0	0	44
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	105	0	0	0	0	0	0	0	0	0	105
1957	0	0	105	0	0	7765	1629	0	0	0	0	0	9500
1958	5	9	118	0	8024	0	0	0	0	0	0	0	8157
1959	0	0	128	0	0	0	0	0	0	0	71	2	201
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	125	0	0	0	0	0	0	0	74	3	201
1962	3	17	119	0	8024	0	0	0	0	0	83	0	8247
1963	0	20	133	0	0	0	0	0	0	0	0	0	153
1964	0	0	1	0	0	0	0	0	0	0	66	308	375
1965	2	13	109	0	8024	1351	0	0	0	0	0	0	9500
1966	5	20	136	0	4856	0	0	0	0	0	767	2	5786
1967	0	19	123	0	0	0	0	0	0	0	69	0	211
1968	0	0	105	0	0	0	0	0	0	0	88	4	198
1969	4	0	125	0	535	0	0	0	0	1129	78	5	1876
1970	4	20	125	0	3451	0	0	0	0	0	0	0	3600
1971	4	20	122	0	0	0	0	0	0	0	73	3	222
1972	2	8	107	0	0	0	0	0	0	0	70	2	188
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	4	19	132	0	0	0	0	0	0	0	58	0	213
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	3	17	129	0	0	0	0	0	0	0	1	0	150
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	89	0	0	0	0	0	0	334	75	2	500
1979	0	7	109	0	8024	1359	0	0	0	0	0	0	9500
1980	3	19	134	0	0	3244	0	0	0	0	0	0	3400
1981	0	0	127	0	0	0	0	0	0	0	72	3	201
1982	3	10	105	0	0	0	0	0	7494	5912	85	5	13613
1983	4	10	115	0	0	7765	0	0	0	0	90	4	7989
1984	4	10	119	0	8024	0	0	0	1123	1627	85	5	10998
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	1	7	86	0	1560	770	43	0	227	237	55	9	2995

SOUTH FORK SITE
STORABLE FLOOD FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	114	239	891	822	30779	33508	0	0	0	0	0	0	68153
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	5904	7968	0	0	0	0	0	0	13872
AVG.	3	6	23	18	965	1091	0	0	0	0	0	0	2106

SOUTH FORK SITE
STORABLE DEBIT FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	0	0	0	0	0	0	0	0	0	0	0	0	0

SOUTH FORK SITE
STORABLE SEASONAL FLOWS ASSUMING 70 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	114	239	891	11038	0	0	0	0	0	484	0	55	12821
1949	169	371	1015	7742	24629	52898	0	0	0	1217	579	0	88620
1950	345	446	1171	9408	14850	0	0	0	0	843	66	0	27129
1951	0	0	0	0	0	0	0	0	0	451	529	274	1254
1952	252	201	404	10365	26075	4371	0	0	0	825	922	0	43415
1953	0	0	979	5190	10968	0	0	0	0	806	0	0	17943
1954	0	46	0	6430	12103	0	0	0	0	0	0	0	18579
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	2411	2673	235	5319
1958	47	104	491	4339	19828	0	0	0	0	363	0	0	25172
1959	0	0	158	3028	9722	0	0	0	0	3678	1993	233	18812
1960	52	0	2048	10648	17743	1309	0	0	0	436	0	0	32236
1961	0	0	330	6808	20563	0	0	0	0	0	0	0	27501
1962	415	725	482	15788	23600	28761	0	0	0	0	279	0	70050
1963	0	27	721	5048	13275	0	0	0	0	0	0	0	19071
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1060	1060
1966	520	424	1872	8557	22154	0	0	0	0	0	0	0	33527
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	33602	45030	0	0	0	894	0	0	79526
1974	22	74	1235	1067	11623	0	0	0	0	0	0	0	14021
1975	0	0	0	0	0	45101	0	0	0	0	0	0	45101
1976	162	424	0	0	0	0	0	0	0	0	0	0	586
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	26933	57848	0	0	0	480	192	213	85666
1980	217	330	273	4800	23164	35945	0	0	140	546	129	12	65556
1981	0	0	145	4623	11151	0	0	0	0	4374	1201	525	22019
1982	243	192	844	5473	19484	31207	0	0	0	0	1748	1060	60251
1983	520	598	1457	3524	16681	33437	0	0	0	2246	389	429	59279
1984	41	239	1240	4800	36183	19591	0	0	0	2014	1397	1060	66545
1985	520	229	1378	15681	34121	46052	0	0	2674	4166	2554	1060	108435
AVG	98	123	451	3794	11275	10567	0	0	74	690	386	164	27618

SOUTH FORK SITE
STORABLE SEASONAL FLOWS ASSUMING 50 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	114	239	891	11038	0	0	0	0	0	484	0	55	12821
1949	169	371	1015	7742	24629	34863	0	0	0	1217	579	0	70585
1950	345	446	1171	9408	3341	0	0	0	0	843	66	0	15620
1951	0	0	0	0	0	0	0	0	0	451	529	274	1254
1952	252	201	404	10365	26075	0	0	0	0	825	922	0	39044
1953	0	0	979	5190	10968	0	0	0	0	808	0	0	17943
1954	0	46	0	6430	0	0	0	0	0	0	0	0	6476
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	2411	2673	235	5319
1958	47	104	491	4339	19828	0	0	0	0	363	0	0	25172
1959	0	0	158	3028	9722	0	0	0	0	3678	1993	233	18812
1960	52	0	2048	10648	17743	0	0	0	0	436	0	0	30927
1961	0	0	330	6608	19667	0	0	0	0	0	0	0	26605
1962	415	725	482	15788	23600	0	0	0	0	0	279	0	41289
1963	0	27	721	5048	0	0	0	0	0	0	0	0	5796
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1060	1060
1966	520	424	1872	8557	22154	0	0	0	0	0	0	0	33527
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	33602	0	0	0	0	894	0	0	34496
1974	22	74	1235	0	0	0	0	0	0	0	0	0	1331
1975	0	0	0	0	0	12202	0	0	0	0	0	0	12202
1976	162	424	0	0	0	0	0	0	0	0	0	0	586
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	26933	57848	0	0	0	480	192	213	85666
1980	217	330	273	4800	23164	0	0	0	140	548	129	12	29811
1981	0	0	145	0	11151	0	0	0	0	4374	1201	525	17396
1982	243	192	844	5473	0	0	0	0	0	0	1748	1060	9560
1983	520	596	1457	0	18681	33437	0	0	0	2246	389	429	55755
1984	41	239	1240	0	25940	0	0	0	0	2014	1397	1060	31931
1985	520	229	1378	15681	34121	0	0	0	0	4166	2554	1060	59710
AVG	96	123	451	3425	9193	3641	0	0	4	690	386	164	18171

SOUTH FORK SITE
STORABLE SEASONAL FLOWS ASSUMING 30 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	114	239	891	2301	0	0	0	0	0	484	0	55	4084
1949	169	371	1015	4871	6590	0	0	0	0	1217	579	0	14812
1950	345	446	1171	9408	0	0	0	0	0	0	66	0	11436
1951	0	0	0	0	0	0	0	0	0	0	529	274	803
1952	252	201	404	10365	0	0	0	0	0	0	922	0	12144
1953	0	0	979	3339	7210	0	0	0	0	0	0	0	11528
1954	0	46	0	0	0	0	0	0	0	0	0	0	46
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	2411	2673	235	5319
1958	47	104	491	0	0	0	0	0	0	363	0	0	1005
1959	0	0	158	0	0	0	0	0	0	3678	1993	233	6062
1960	52	0	2048	9421	0	0	0	0	0	436	0	0	11957
1961	0	0	330	0	0	0	0	0	0	0	0	0	330
1962	415	725	482	15788	0	0	0	0	0	0	279	0	17689
1963	0	27	721	0	0	0	0	0	0	0	0	0	748
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1060	1060
1966	520	424	1872	0	0	0	0	0	0	0	0	0	2816
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	2304	0	0	0	0	894	0	0	3198
1974	22	74	1235	0	0	0	0	0	0	0	0	0	1331
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	162	424	0	0	0	0	0	0	0	0	0	0	586
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	14468	0	0	0	0	0	192	213	14873
1980	217	330	273	3711	23164	0	0	0	0	548	129	12	28382
1981	0	0	145	0	0	0	0	0	0	4374	1201	525	6245
1982	243	192	844	0	0	0	0	0	0	0	1748	1060	4087
1983	520	596	1457	0	0	0	0	0	0	2246	389	429	5637
1984	41	239	1240	0	0	0	0	0	0	2014	1397	1060	5991
1985	520	229	1378	15681	0	0	0	0	0	4166	2554	1060	25589
AVG	96	123	451	1971	1414	0	0	0	0	601	386	164	5204

WAGON WHEEL GAP SITE
CB PRIORITY 3 EXCHANGE STORABLE FLOWS

WITHOUT CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	0	0	0	0	0	0	0	0	0	0	0	0	0

WAGON WHEEL GAP SITE
STORABLE FLOOD FLOWS

WITHOUT CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	30868	25511	0	0	0	0	0	0	56377
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	3915	8197	0	0	0	0	0	0	12112
AVG.	0	0	0	0	915	887	0	0	0	0	0	0	1802

WAGON WHEEL GAP SITE
STORABLE DEBIT FLOWS

WITHOUT CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	0	0	0	0	0	0	0	0	0	0	0	0	0

WAGON WHEEL GAP SITE
STORABLE SEASONAL FLOWS ASSUMING 70 PERCENT DITCH SYSTEM EFFICIENCY

WITHOUT CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	520	1020	4138	24307	103811	56819	0	0	0	8955	3337	1080	203767
1949	520	1020	3492	23432	69296	91654	0	0	0	10053	4378	1080	204905
1950	520	1020	5300	34415	24231	0	0	0	0	3981	2631	1080	73158
1951	520	1020	1956	0	0	0	0	0	0	3997	2798	1060	11351
1952	520	1020	2148	28451	94675	4371	0	0	0	7323	4464	1060	144030
1953	520	1020	4304	14342	38485	0	0	0	0	3955	2560	1060	86228
1954	520	1020	1777	18931	9095	0	0	0	0	0	0	0	31343
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	14257	7130	1060	22447
1958	520	1020	3628	15175	77043	0	0	0	0	7870	3631	1060	109947
1959	520	1020	1543	9343	36563	0	0	0	0	9100	5475	1060	64624
1960	520	1020	7530	31475	56881	0	0	0	0	6702	2560	270	106958
1961	141	584	3013	12207	39452	0	0	0	0	0	0	1060	56467
1962	520	1020	2767	31062	80651	23958	0	0	0	0	4940	1060	145978
1963	520	755	4119	10672	20298	0	0	0	0	0	0	0	36364
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	520	1020	6641	14312	38404	0	0	0	0	0	0	0	60897
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	84925	47843	0	0	0	8793	3155	1080	145776
1974	520	1020	4304	0	0	0	0	0	0	0	0	0	5844
1975	0	0	0	0	0	75467	0	0	0	0	0	0	75467
1976	520	1020	0	0	0	0	0	0	0	0	0	0	1540
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	105921	109796	0	0	0	5524	3928	805	225774
1980	520	1020	2951	12556	75361	20481	0	0	2132	7686	3571	1060	127338
1981	520	1020	2398	2739	26725	0	0	0	0	17524	4940	1060	56926
1982	520	1020	2705	11559	12194	31283	0	0	14299	29207	7130	1060	110977
1983	520	1020	3812	6104	57431	121406	0	0	0	19553	4168	1060	215072
1984	520	1020	3566	3610	68389	0	0	0	0	24288	7130	1060	109583
1985	520	1020	4419	27909	99012	51831	0	0	9039	28079	7130	1060	230018
AVG	291	572	2013	8753	32074	16703	0	0	670	5707	2238	525	69547

WAGON WHEEL GAP SITE
STORABLE SEASONAL FLOWS ASSUMING 50 PERCENT DITCH SYSTEM EFFICIENCY

WITHOUT CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	520	1020	4138	24307	75532	0	0	0	0	8955	3337	1060	118869
1949	520	1020	3492	23359	67032	34863	0	0	0	10053	4378	1060	145777
1950	520	1020	5300	27172	0	0	0	0	0	340	2631	1060	38043
1951	520	1020	1956	0	0	0	0	0	0	1372	2798	1060	8728
1952	520	1020	2146	28451	62741	0	0	0	0	2476	4464	1060	102878
1953	520	1020	4304	11334	26254	0	0	0	0	1417	2560	1060	48469
1954	520	1020	1777	9018	0	0	0	0	0	0	0	0	12335
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	14257	7130	1060	22447
1958	520	1020	3628	6843	38056	0	0	0	0	7554	3631	1060	62312
1959	520	1020	1543	6859	21521	0	0	0	0	9100	5475	1060	46898
1960	520	1020	7530	30469	23514	0	0	0	0	6702	2560	270	72585
1961	141	594	3013	4035	1933	0	0	0	0	0	0	1060	10778
1962	520	1020	2767	31062	43108	0	0	0	0	0	4940	1060	84477
1963	520	755	4119	689	0	0	0	0	0	0	0	0	6083
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	520	1020	6641	5420	781	0	0	0	0	0	0	0	14382
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	71187	0	0	0	0	8793	3155	1060	84195
1974	520	1020	4304	0	0	0	0	0	0	0	0	0	5844
1975	0	0	0	0	0	12202	0	0	0	0	0	0	12202
1976	520	1020	0	0	0	0	0	0	0	0	0	0	1540
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	78486	60262	0	0	0	2786	3928	605	146047
1980	520	1020	2951	8213	75361	0	0	0	0	7686	3571	1060	100382
1981	520	1020	2398	0	5331	0	0	0	0	17524	4940	1060	32793
1982	520	1020	2705	4299	0	0	0	0	2275	29207	7130	1060	48216
1983	520	1020	3812	0	38030	76517	0	0	0	15553	4168	1060	144678
1984	520	1020	3568	0	25840	0	0	0	0	24288	7130	1060	63524
1985	520	1020	4419	27909	68813	0	0	0	0	28079	7130	1060	138949
AVG	291	572	2013	6559	19043	4838	0	0	60	5268	2238	525	41408

WAGON WHEEL GAP SITE
STORABLE SEASONAL FLOWS ASSUMING 30 PERCENT DITCH SYSTEM EFFICIENCY

WITHOUT CLOSED BASIN PROJECT DELIVERIES
WITH STEP ONE MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	520	1020	4138	618	9548	0	0	0	0	8853	3337	1060	29094
1949	520	1020	3492	3705	2898	0	0	0	0	10053	4378	1060	27126
1950	520	1020	5300	4645	0	0	0	0	0	0	2631	1060	15176
1951	520	1020	1956	0	0	0	0	0	0	0	2798	1060	7354
1952	520	1020	2146	28451	0	0	0	0	0	0	4464	1060	37661
1953	520	1020	4304	0	0	0	0	0	0	0	2560	1060	9464
1954	520	1020	1777	0	0	0	0	0	0	0	0	0	3317
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	14257	7130	1060	22447
1958	520	1020	3628	0	0	0	0	0	0	3008	3631	1060	12867
1959	520	1020	1543	0	0	0	0	0	0	9100	5475	1060	18718
1960	520	1020	7530	6762	0	0	0	0	0	6702	2560	270	25364
1961	141	594	3013	0	0	0	0	0	0	0	0	1060	4808
1962	520	1020	2767	10993	0	0	0	0	0	0	4940	1060	21300
1963	520	755	4119	0	0	0	0	0	0	0	0	0	5394
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	520	1020	6641	0	0	0	0	0	0	0	0	0	8181
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	2304	0	0	0	0	8750	3155	1060	15269
1974	520	1020	4304	0	0	0	0	0	0	0	0	0	5844
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	520	1020	0	0	0	0	0	0	0	0	0	0	1540
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	14468	0	0	0	0	0	3928	605	19001
1980	520	1020	2951	0	68047	0	0	0	0	6420	3571	1060	81589
1981	520	1020	2398	0	0	0	0	0	0	17524	4940	1060	27462
1982	520	1020	2705	0	0	0	0	0	0	29207	7130	1060	41642
1983	520	1020	3812	0	0	0	0	0	0	13117	4168	1060	23895
1984	520	1020	3568	0	0	0	0	0	0	24288	7130	1060	37584
1985	520	1020	4419	27909	0	0	0	0	0	28079	7130	1060	70136
AVG	291	572	2013	2188	2507	0	0	0	0	4720	2238	525	15054

WAGON WHEEL GAP SITE
CB PRIORITY 3 EXCHANGE STORABLE FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	7765	0	0	0	0	0	0	7765
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	443	443
1955	306	0	0	0	0	0	0	0	0	0	0	0	306
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	1060	1060
1964	0	0	0	0	0	0	0	0	0	0	0	1060	1060
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	2500	0	2500
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	7765	0	0	0	7765
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	8024	0	0	8025
1979	0	0	0	0	0	7765	0	0	0	0	0	602	8368
1980	0	0	0	0	0	0	0	0	0	2317	0	0	2317
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	897	0	0	0	897
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	8	0	0	0	0	409	0	0	228	272	68	83	1068

WAGON WHEEL GAP SITE
STORABLE FLOOD FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	0	0	0	0	0	0	0	0	0	0	0	0	0

WAGON WHEEL GAP SITE
STORABLE DEBIT FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	0	0	0	0	0	0	0	0	0	0	0	0	0

WAGON WHEEL GAP SITE
STORABLE SEASONAL FLOWS ASSUMING 70 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	600	1300	4138	24307	143481	95177	0	0	0	8955	3378	1082	282418
1949	536	1094	3492	23432	69296	139802	0	0	0	10053	4378	1084	253167
1950	537	1090	5300	34415	34249	0	0	0	0	5441	2631	1080	84743
1951	535	1082	1956	0	0	0	0	0	0	3997	2798	1079	11447
1952	534	1079	2148	28451	97139	35126	0	0	0	7904	4464	1083	177928
1953	537	1091	4304	14342	38922	0	0	0	0	4734	2560	1079	67569
1954	535	1080	1777	21116	13950	0	0	0	0	0	0	0	38458
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	14257	7332	1085	22674
1958	537	1081	3628	19731	124123	0	0	0	0	7870	3631	1082	161683
1959	536	1093	1543	9343	39098	0	0	0	0	9100	5475	1079	67267
1960	536	1080	7563	31475	60940	0	0	0	0	6702	2560	270	111126
1961	141	594	3013	13687	56061	0	0	0	0	0	0	0	73496
1962	536	1089	2767	31062	96719	39681	0	0	0	0	0	1082	172936
1963	537	755	4119	13880	0	0	0	0	0	0	0	0	19291
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1085	1085
1966	539	1092	6641	22613	79353	0	0	0	0	0	0	0	110238
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	84925	89548	0	0	0	8793	3155	1084	187505
1974	537	1090	4304	330	8048	0	0	0	0	0	0	0	14309
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	536	1088	0	0	0	0	0	0	0	0	0	0	1624
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	120980	157905	0	0	0	4094	3928	481	288388
1980	536	1091	2951	12556	75361	61298	0	0	6292	5369	3571	1082	170105
1981	535	1087	2398	4888	31502	0	0	0	0	17524	4940	1080	63954
1982	536	1081	2705	13488	18611	42253	0	0	33680	29207	7217	1083	149861
1983	538	1083	3812	6461	57431	129948	0	0	0	19553	4168	1082	224072
1984	537	1082	3568	7030	98089	18554	0	0	0	24288	7217	1083	161426
1985	538	1093	4427	27909	109265	99940	0	0	7115	28617	7227	1083	287214
AVG	302	613	2014	9487	38356	23927	0	0	1239	5723	2122	532	84315

WAGON WHEEL GAP SITE
STORABLE SEASONAL FLOWS ASSUMING 50 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	600	1300	4138	22676	129081	24373	0	0	0	8955	3378	1082	195583
1949	538	1094	3492	21273	80360	83011	0	0	0	10053	4378	1084	185281
1950	537	1090	5300	33025	2671	0	0	0	0	1800	2631	1080	48134
1951	535	1082	1956	0	0	0	0	0	0	1372	2798	1079	8822
1952	534	1079	2146	28451	68994	0	0	0	0	3057	4464	1083	109808
1953	537	1091	4304	14342	35705	0	0	0	0	3053	2560	1079	62671
1954	535	1080	1777	11203	0	0	0	0	0	0	0	0	14595
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	14257	7332	1085	22674
1958	537	1081	3628	12191	90287	0	0	0	0	7870	3631	1082	120307
1959	536	1093	1543	7368	24056	0	0	0	0	9100	5475	1079	50250
1960	538	1080	7563	31475	27573	0	0	0	0	6702	2560	270	77759
1961	141	594	3013	8077	18542	0	0	0	0	0	0	0	30367
1962	538	1089	2767	31062	59781	0	0	0	0	0	0	1082	96317
1963	537	755	4119	3897	0	0	0	0	0	0	0	0	9308
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1085	1085
1966	539	1092	6841	16510	41730	0	0	0	0	0	0	0	66512
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	84925	15233	0	0	0	8793	3155	1084	113190
1974	537	1090	4304	0	0	0	0	0	0	0	0	0	5931
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	536	1088	0	0	0	0	0	0	0	0	0	0	1624
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	100219	108371	0	0	0	2338	3928	481	215335
1980	536	1091	2951	12556	75361	0	0	0	0	5369	3571	1082	102517
1981	535	1087	2398	0	10108	0	0	0	0	17524	4940	1080	37672
1982	538	1081	2705	6228	0	0	0	0	24380	29207	7217	1083	72437
1983	538	1083	3812	0	39788	85057	0	0	0	19553	4166	1082	155059
1984	537	1082	3568	0	55620	0	0	0	0	24288	7217	1083	93393
1985	538	1093	4427	27909	106617	27220	0	0	0	28617	7227	1083	204731
AVG	302	613	2014	7585	27142	9033	0	0	642	5313	2122	532	55299

WAGON WHEEL GAP SITE
STORABLE SEASONAL FLOWS ASSUMING 30 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	600	1300	4138	0	63097	0	0	0	0	7174	3378	1082	80769
1949	538	1094	3492	1819	0	0	0	0	0	9939	4378	1084	22142
1950	537	1090	5300	10498	0	0	0	0	0	0	2631	1080	21136
1951	535	1082	1958	0	0	0	0	0	0	0	2798	1079	7450
1952	534	1079	2148	28451	0	0	0	0	0	0	4464	1083	37757
1953	537	1091	4304	3342	7214	0	0	0	0	0	2560	1079	20127
1954	535	1080	1777	0	0	0	0	0	0	0	0	0	3392
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	14257	7332	1085	22674
1958	537	1081	3628	0	0	0	0	0	0	5321	3631	1082	15280
1959	536	1093	1543	0	0	0	0	0	0	9100	5475	1079	18826
1960	538	1080	7563	8643	0	0	0	0	0	6702	2560	270	27354
1961	141	594	3013	0	0	0	0	0	0	0	0	0	3748
1962	536	1089	2767	17538	0	0	0	0	0	0	0	1082	23012
1963	537	755	4119	0	0	0	0	0	0	0	0	0	5411
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1085	1085
1966	539	1092	6841	0	0	0	0	0	0	0	0	0	8272
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	20315	0	0	0	0	8793	3155	1084	33347
1974	537	1090	4304	0	0	0	0	0	0	0	0	0	5931
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	536	1088	0	0	0	0	0	0	0	0	0	0	1624
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	36201	0	0	0	0	0	3928	481	40610
1980	536	1091	2951	1864	75361	0	0	0	0	5369	3571	1082	91825
1981	535	1087	2398	0	0	0	0	0	0	17524	4940	1080	27564
1982	538	1081	2705	0	0	0	0	0	0	29207	7217	1083	41829
1983	538	1083	3812	0	0	0	0	0	0	13634	4166	1082	24315
1984	537	1082	3568	0	0	0	0	0	0	24288	7217	1083	37773
1985	538	1093	4427	27909	36153	0	0	0	0	28617	7227	1083	107047
AVG	302	613	2014	2628	6272	0	0	0	0	4735	2122	532	19218

VEGA SYLVESTRE SITE
CB PRIORITY 3 EXCHANGE STORABLE FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	7765	0	0	0	0	0	0	7766
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	443	443
1955	306	0	0	0	0	0	0	0	0	0	0	0	306
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	1060	1060
1964	0	0	0	0	0	0	0	0	0	0	0	1060	1060
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	1953	0	1953
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	7765	0	0	0	7765
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	8024	0	0	8025
1979	0	0	0	0	0	7765	0	0	0	0	0	602	8368
1980	0	0	0	0	0	0	0	0	0	2317	0	0	2317
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	897	0	0	0	897
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	8	0	0	0	0	409	0	0	228	272	51	83	1052

VEGA SYLVESTRE SITE
STORABLE FLOOD FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	0	0	0	0	0	0	0	0	0	0	0	0	0

VEGA SYLVESTRE SITE
STORABLE DEBIT FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	0	0	0	0	0	0	0	0	0	0	0	0	0

VEGA SYLVESTRE SITE
STORABLE SEASONAL FLOWS ASSUMING 70 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	600	1300	3149	17334	104892	95177	0	0	0	6628	2590	1082	232752
1949	536	1094	2680	16897	50939	133510	0	0	0	7427	3318	1084	217285
1950	537	1090	3994	22551	34249	0	0	0	0	5357	2048	1080	70906
1951	535	1082	1562	0	0	0	0	0	0	3047	2169	1052	9447
1952	534	919	1701	19594	71768	35126	0	0	0	6771	3381	1083	140875
1953	537	1091	3270	10565	29481	0	0	0	0	3583	1996	998	51521
1954	535	1080	1432	19823	13950	0	0	0	0	0	0	0	36820
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	10020	5998	1085	17103
1958	537	1081	2778	13747	90919	0	0	0	0	5864	2775	1082	118783
1959	536	930	1262	6929	35456	0	0	0	0	6758	4116	1079	57066
1960	536	1080	5640	21839	58355	0	0	0	0	5014	1998	336	94798
1961	242	558	2331	10089	56061	0	0	0	0	0	0	0	69281
1962	536	1089	2152	22725	71497	39681	0	0	0	0	0	1082	138762
1963	537	676	3136	13880	0	0	0	0	0	0	0	0	18229
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1085	1085
1966	539	1092	4970	16580	77649	0	0	0	0	0	0	0	100830
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	62772	89549	0	0	0	6535	2429	1084	162369
1974	537	1090	3270	330	8048	0	0	0	0	0	0	0	13275
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	538	1088	0	0	0	0	0	0	0	0	0	0	1624
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	87944	123552	0	0	0	4880	2991	915	220282
1980	536	1091	2288	9266	55690	61114	0	0	6273	3412	2731	1082	143481
1981	535	1087	1884	4884	26853	0	0	0	0	12885	3727	1080	52935
1982	536	1081	2107	10781	18611	42253	0	0	25631	21381	6107	1083	129571
1983	538	1083	2912	5414	42942	98005	0	0	0	14360	3164	1082	169500
1984	537	1082	2733	6886	74423	18552	0	0	0	17804	5587	1083	128687
1985	538	1093	3360	20432	80639	99940	0	0	7115	20758	7227	1083	242185
AVG	304	602	1542	7114	30346	22012	0	0	1027	4276	1693	543	69459

VEGA SYLVESTRE SITE
STORABLE SEASONAL FLOWS ASSUMING 50 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	600	1300	3149	17334	104892	24373	0	0	0	6628	2590	1082	161948
1949	536	1094	2680	16897	50939	83011	0	0	0	7427	3318	1084	166786
1950	537	1090	3994	22551	2671	0	0	0	0	1800	2048	1080	35771
1951	535	1082	1562	0	0	0	0	0	0	1372	2169	1052	7772
1952	534	919	1701	19594	68994	0	0	0	0	3057	3381	1083	99263
1953	537	1091	3270	10565	29481	0	0	0	0	3053	1996	998	50991
1954	535	1080	1432	11203	0	0	0	0	0	0	0	0	14250
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	10020	5998	1085	17103
1958	537	1081	2778	12191	90287	0	0	0	0	5864	2775	1082	116595
1959	536	930	1262	6929	24056	0	0	0	0	6758	4116	1079	45666
1960	536	1080	5640	21839	27573	0	0	0	0	5014	1996	336	64014
1961	242	558	2331	8077	18542	0	0	0	0	0	0	0	29750
1962	536	1089	2152	22725	59781	0	0	0	0	0	0	1082	87365
1963	537	678	3136	3897	0	0	0	0	0	0	0	0	8248
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1085	1085
1966	539	1092	4970	16510	41731	0	0	0	0	0	0	0	64842
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	62772	15234	0	0	0	6535	2429	1084	88054
1974	537	1090	3270	0	0	0	0	0	0	0	0	0	4897
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	536	1088	0	0	0	0	0	0	0	0	0	0	1624
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	87944	108371	0	0	0	2336	2991	915	202557
1980	536	1091	2286	9266	55690	0	0	0	0	3412	2731	1082	76094
1981	535	1087	1884	0	10101	0	0	0	0	12885	3727	1080	31299
1982	536	1081	2107	6228	0	0	0	0	24380	21381	6107	1083	62903
1983	538	1083	2912	0	39768	85057	0	0	0	14360	3164	1087	[illegible]
1984	537	1082	2733	0	55618	0	0	0	0	17804	5587	1083	[illegible]
1985	538	1093	3360	20432	80639	27220	0	0	0	20758	7227	1083	162350
AVG	304	602	1542	5948	23988	9033	0	0	642	3960	1693	543	48254

VEGA SYLVESTRE SITE
STORABLE SEASONAL FLOWS ASSUMING 30 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	600	1300	3149	0	63097	0	0	0	0	6628	2590	1082	78446
1949	536	1094	2680	1619	0	0	0	0	0	7427	3318	1084	17758
1950	537	1090	3994	10498	0	0	0	0	0	0	2048	1080	19247
1951	535	1082	1562	0	0	0	0	0	0	0	2169	1052	6400
1952	534	919	1701	19594	0	0	0	0	0	0	3381	1083	27212
1953	537	1091	3270	3342	7214	0	0	0	0	0	1996	998	18448
1954	535	1080	1432	0	0	0	0	0	0	0	0	0	3047
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	10020	5998	1085	17103
1958	537	1081	2778	0	0	0	0	0	0	5321	2775	1082	13574
1959	536	930	1262	0	0	0	0	0	0	6758	4116	1079	14681
1960	536	1080	5640	8643	0	0	0	0	0	5014	1996	336	23245
1961	242	558	2331	0	0	0	0	0	0	0	0	0	3131
1962	536	1089	2152	17538	0	0	0	0	0	0	0	1082	22397
1963	537	678	3136	0	0	0	0	0	0	0	0	0	4349
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1085	1085
1966	539	1092	4970	0	0	0	0	0	0	0	0	0	6601
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	20315	0	0	0	0	6535	2429	1084	30363
1974	537	1090	3270	0	0	0	0	0	0	0	0	0	4897
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	536	1088	0	0	0	0	0	0	0	0	0	0	1624
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	36202	0	0	0	0	0	2991	915	40108
1980	536	1091	2288	1843	55690	0	0	0	0	3412	2731	1082	68671
1981	535	1087	1884	0	0	0	0	0	0	12885	3727	1080	21198
1982	536	1081	2107	0	0	0	0	0	0	21381	6107	1083	32295
1983	538	1083	2912	0	0	0	0	0	0	13634	3164	1082	22413
1984	537	1082	2733	0	0	0	0	0	0	17804	5587	1083	28826
1985	538	1093	3360	20432	36153	0	0	0	0	20758	7227	1083	90644
AVG	304	602	1542	2198	5755	0	0	0	0	[illegible]	1693	543	16257

RG1 SITE
CB PRIORITY 3 EXCHANGE STORABLE FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	7765	0	0	0	0	0	0	7768
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	443	443
1955	306	0	0	0	0	0	0	0	0	0	0	0	306
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	1060	1060
1964	0	0	0	0	0	0	0	0	0	0	0	1060	1060
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	3066	0	3066
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	7765	0	0	0	7765
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	8024	0	0	8025
1979	0	0	0	0	0	7765	0	0	0	0	0	602	8368
1980	0	0	0	0	0	0	0	0	0	2317	0	0	2317
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	897	0	0	0	897
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	8	0	0	0	0	409	0	0	228	272	81	83	1081

RG1 SITE
STORABLE FLOOD FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	0	0	0	0	0	0	0	0	0	0	0	0	0

RGI SITE
STORABLE DEBIT FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	0	0	0	0	0	0	0	0	0	0	0	0	0

RGI SITE
STORABLE SEASONAL FLOWS ASSUMING 70 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	600	1300	5149	29661	157360	95177	0	0	0	10168	3972	1082	304469
1949	536	1094	4350	28803	81368	139802	0	0	0	11445	5177	1084	273457
1950	537	1090	6587	42679	34249	0	0	0	0	5441	3071	1080	94734
1951	535	1082	2449	0	0	0	0	0	0	4021	3272	1079	12438
1952	534	1079	2684	35248	100928	35126	0	0	0	7904	5280	1083	189864
1953	537	1091	5355	17249	45862	0	0	0	0	5241	2985	1079	79399
1954	535	1080	2227	21118	13950	0	0	0	0	0	0	0	38908
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	14986	7332	1085	23403
1958	537	1081	4247	20523	129274	0	0	0	0	8835	4336	1082	169915
1959	536	1093	2053	11166	39098	0	0	0	0	11549	6865	1079	73439
1960	536	1080	7633	37863	60940	0	0	0	0	7516	3054	637	119259
1961	449	926	3641	16249	56061	0	0	0	0	0	0	0	77326
1962	536	1089	3504	40849	97324	39681	0	0	0	0	0	1082	184065
1963	537	1091	5522	13880	0	0	0	0	0	0	0	0	21030
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1085	1085
1966	539	1092	7865	25402	79351	0	0	0	0	0	0	0	114049
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	104783	89548	0	0	0	10003	3762	1084	209180
1974	537	1090	5421	330	8048	0	0	0	0	0	0	0	15426
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	536	1088	0	0	0	0	0	0	0	0	0	0	1624
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	127653	157905	0	0	0	5094	4502	913	296067
1980	536	1091	3554	15642	88394	61114	0	0	6273	5912	4341	1082	187939
1981	535	1087	2832	4884	31495	0	0	0	0	19963	6086	1080	67962
1982	536	1081	3409	13488	18611	42253	0	0	36404	34873	7217	1083	158955
1983	538	1083	5274	6461	59894	129946	0	0	0	22085	5205	1082	231568
1984	537	1082	4707	7030	98067	18552	0	0	0	26568	7217	1083	164843
1985	538	1093	5223	34687	131903	99940	0	0	7115	32379	7227	1083	321188
AVG	310	631	2460	11132	41174	23922	0	0	1310	8421	2392	553	90305

RG1 SITE
STORABLE SEASONAL FLOWS ASSUMING 50 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	600	1300	5149	22676	129081	24373	0	0	0	10168	3972	1082	198401
1949	538	1094	4350	21273	60360	83011	0	0	0	11445	5177	1084	188330
1950	537	1090	6587	33025	2671	0	0	0	0	1800	3071	1080	49881
1951	535	1082	2449	0	0	0	0	0	0	1372	3272	1079	9789
1952	534	1079	2684	35246	68994	0	0	0	0	3057	5280	1083	117957
1953	537	1091	5355	15277	35705	0	0	0	0	3053	2985	1079	65082
1954	535	1080	2227	11203	0	0	0	0	0	0	0	0	15045
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	14986	7332	1085	23403
1958	537	1081	4247	12191	90287	0	0	0	0	8835	4336	1082	122598
1959	536	1093	2053	7368	24056	0	0	0	0	11549	6865	1079	54599
1960	536	1080	7633	32350	27573	0	0	0	0	7516	3054	637	80379
1961	449	926	3641	8077	18542	0	0	0	0	0	0	0	31635
1962	536	1089	3504	40849	59781	0	0	0	0	0	0	1082	106841
1963	537	1091	5522	3897	0	0	0	0	0	0	0	0	11047
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1085	1085
1966	539	1092	7665	16510	41728	0	0	0	0	0	0	0	67534
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	89198	15233	0	0	0	10003	3762	1084	119280
1974	537	1090	5421	0	0	0	0	0	0	0	0	0	7048
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	536	1088	0	0	0	0	0	0	0	0	0	0	1624
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	100218	108371	0	0	0	2338	4502	913	216340
1980	536	1091	3554	12869	88394	0	0	0	0	5912	4341	1082	117779
1981	535	1087	2832	0	10101	0	0	0	0	19963	6086	1080	41684
1982	536	1081	3409	6228	0	0	0	0	24380	34873	7217	1083	78807
1983	538	1083	5274	0	39768	85057	0	0	0	20414	5205	1082	158421
1984	537	1082	4707	0	55618	0	0	0	0	26568	7217	1083	96812
1985	538	1093	5223	34687	106617	27220	0	0	0	32379	7227	1083	216067
AVG	310	631	2460	8256	27597	9033	0	0	642	5953	2392	553	57828

RG1 SITE
STORABLE SEASONAL FLOWS ASSUMING 30 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	600	1300	5149	0	63087	0	0	0	0	7174	3972	1082	82374
1949	538	1094	4350	1619	0	0	0	0	0	9939	5177	1084	23799
1950	537	1090	6587	10498	0	0	0	0	0	0	3071	1080	22863
1951	535	1082	2449	0	0	0	0	0	0	0	3272	1079	8417
1952	534	1079	2684	35246	0	0	0	0	0	0	5280	1083	45906
1953	537	1091	5355	3342	7214	0	0	0	0	0	2985	1079	21603
1954	535	1080	2227	0	0	0	0	0	0	0	0	0	3842
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	14986	7332	1085	23403
1958	537	1081	4247	0	0	0	0	0	0	5321	4336	1082	16604
1959	536	1093	2053	0	0	0	0	0	0	11549	6865	1079	23175
1960	536	1080	7633	8643	0	0	0	0	0	7431	3054	637	29014
1961	449	926	3641	0	0	0	0	0	0	0	0	0	5018
1962	536	1089	3504	17538	0	0	0	0	0	0	0	1082	23749
1963	537	1091	5522	0	0	0	0	0	0	0	0	0	7150
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1085	1085
1966	539	1092	7665	0	0	0	0	0	0	0	0	0	9296
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	20315	0	0	0	0	10003	3762	1084	35164
1974	537	1090	5421	0	0	0	0	0	0	0	0	0	7048
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	536	1088	0	0	0	0	0	0	0	0	0	0	1624
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	36200	0	0	0	0	0	4502	913	41615
1980	536	1091	3554	1843	87527	0	0	0	0	5912	4341	1082	105886
1981	535	1087	2832	0	0	0	0	0	0	19963	6086	1080	31583
1982	536	1081	3409	0	0	0	0	0	0	34873	7217	1083	48199
1983	538	1083	5274	0	0	0	0	0	0	13634	5205	1082	26816
1984	537	1082	4707	0	0	0	0	0	0	26568	7217	1083	41194
1985	538	1093	5223	28970	36153	0	0	0	0	32379	7227	1083	112666
AVG	310	631	2460	2834	6592	0	0	0	0	5256	2392	553	21029

SOUTH FORK SITE
CB PRIORITY 3 EXCHANGE STORABLE FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	7765	0	0	0	0	0	0	7768
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	308	308
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	767	0	767
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	7765	0	0	0	7765
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	334	0	0	334
1979	0	0	0	0	0	7765	0	0	0	0	0	165	7930
1980	0	0	0	0	0	0	0	0	0	546	0	0	546
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	897	0	0	0	897
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	0	0	0	0	0	409	0	0	228	23	20	12	692

SOUTH FORK SITE
STORABLE FLOOD FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	0	0	0	0	0	0	0	0	0	0	0	0	0

SOUTH FORK SITE
STORABLE DEBIT FLOWS

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	0	0	0	0	0	0	0	0	0	0	0	0	0

SOUTH FORK SITE
STORABLE SEASONAL FLOWS ASSUMING 70 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	114	239	891	11038	38803	41273	0	0	0	484	40	59	92941
1949	169	371	1015	7742	24629	38698	0	0	0	1217	579	0	74420
1950	349	464	1304	9408	14850	0	0	0	0	843	136	0	27354
1951	0	0	8	0	0	0	0	0	0	451	596	275	1330
1952	253	208	508	10385	28385	35126	0	0	0	825	922	0	76570
1953	1	10	1114	5190	10968	0	0	0	0	806	0	0	18089
1954	0	53	37	6430	12103	0	0	0	0	0	0	0	18623
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	2411	2673	235	5319
1958	52	113	609	4339	27852	0	0	0	0	363	0	0	33328
1959	0	0	286	3028	9722	0	0	0	0	3678	2064	235	19013
1960	52	0	2048	10648	17743	0	0	0	0	436	0	0	30927
1961	0	0	455	6608	20563	0	0	0	0	0	0	0	27626
1962	418	742	601	15788	31624	28781	0	0	0	0	0	0	77934
1963	0	47	854	5048	0	0	0	0	0	0	0	0	5949
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1085	1085
1966	539	444	2008	8557	27010	0	0	0	0	0	0	0	38558
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	33602	45030	0	0	0	894	0	0	79526
1974	26	93	1367	330	8048	0	0	0	0	0	0	0	9864
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	165	441	0	0	0	0	0	0	0	0	0	0	606
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	34957	47073	0	0	0	480	192	48	82750
1980	220	349	407	4800	23164	48397	0	0	140	0	129	12	77618
1981	0	0	272	4623	11151	0	0	0	0	4374	1273	528	22221
1982	246	202	949	5473	18611	31207	0	0	7494	5912	1833	1083	73010
1983	538	606	1572	3524	16681	41202	0	0	0	2246	479	433	67281
1984	45	249	1359	4800	44187	18539	0	0	0	3641	1482	1077	75379
1985	538	232	1396	15681	39719	53607	0	0	2674	4850	2567	1083	122347
AVG	98	128	502	3774	13009	11287	0	0	271	892	394	162	30518

SOUTH FORK SITE
STORABLE SEASONAL FLOWS ASSUMING 50 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	114	239	891	11038	38803	24373	0	0	0	484	40	59	76041
1949	169	371	1015	7742	24629	38698	0	0	0	1217	579	0	74420
1950	349	464	1304	9408	2671	0	0	0	0	843	136	0	15175
1951	0	0	8	0	0	0	0	0	0	451	598	275	1330
1952	253	208	506	10365	28365	0	0	0	0	825	922	0	41444
1953	1	10	1114	5190	10968	0	0	0	0	806	0	0	18089
1954	0	53	37	6430	0	0	0	0	0	0	0	0	6520
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	2411	2673	235	5319
1958	52	113	609	4339	27852	0	0	0	0	363	0	0	33328
1959	0	0	286	3028	9722	0	0	0	0	3678	2064	235	19013
1960	52	0	2048	10648	17743	0	0	0	0	436	0	0	30927
1961	0	0	455	6608	18542	0	0	0	0	0	0	0	25605
1962	418	742	601	15788	31624	0	0	0	0	0	0	0	49173
1963	0	47	854	3897	0	0	0	0	0	0	0	0	4798
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1085	1085
1966	539	444	2008	8557	27010	0	0	0	0	0	0	0	38558
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	33602	15235	0	0	0	894	0	0	49731
1974	26	93	1367	0	0	0	0	0	0	0	0	0	1486
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	165	441	0	0	0	0	0	0	0	0	0	0	606
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	34957	47073	0	0	0	480	192	48	82750
1980	220	349	407	4800	23164	0	0	0	0	0	129	12	29081
1981	0	0	272	0	9698	0	0	0	0	4374	1273	528	16145
1982	246	202	949	5473	0	0	0	0	7494	5912	1833	1083	23192
1983	538	606	1572	0	18681	41202	0	0	0	2246	479	433	65757
1984	45	249	1359	0	44187	0	0	0	0	3641	1482	1077	52040
1985	538	232	1398	15681	39719	27220	0	0	0	4850	2567	1083	93286
AVG	98	128	502	3394	11577	5100	0	0	197	892	394	162	22445

SOUTH FORK SITE
STORABLE SEASONAL FLOWS ASSUMING 30 PERCENT DITCH SYSTEM EFFICIENCY

WITH CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	114	239	891	0	38803	0	0	0	0	484	40	59	40630
1949	169	371	1015	1619	0	0	0	0	0	1217	579	0	4970
1950	349	464	1304	9408	0	0	0	0	0	0	136	0	11661
1951	0	0	8	0	0	0	0	0	0	0	598	275	879
1952	253	208	506	3365	0	0	0	0	0	0	922	0	12254
1953	1	10	1114	3342	7214	0	0	0	0	0	0	0	11681
1954	0	53	37	0	0	0	0	0	0	0	0	0	90
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	2411	2673	235	5319
1958	52	113	609	0	0	0	0	0	0	363	0	0	1137
1959	0	0	286	0	0	0	0	0	0	3678	2064	235	6263
1960	52	0	2048	8643	0	0	0	0	0	436	0	0	11179
1961	0	0	455	0	0	0	0	0	0	0	0	0	455
1962	418	742	601	15788	0	0	0	0	0	0	0	0	17549
1963	0	47	854	0	0	0	0	0	0	0	0	0	901
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1085	1085
1966	539	444	2008	0	0	0	0	0	0	0	0	0	2991
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	20316	0	0	0	0	894	0	0	21210
1974	26	93	1367	0	0	0	0	0	0	0	0	0	1486
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	165	441	0	0	0	0	0	0	0	0	0	0	606
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	34957	0	0	0	0	0	192	48	35197
1980	220	349	407	1843	23164	0	0	0	0	0	129	12	26124
1981	0	0	272	0	0	0	0	0	0	4374	1273	528	6447
1982	246	202	949	0	0	0	0	0	0	5912	1833	1083	10225
1983	538	606	1572	0	0	0	0	0	0	2246	479	433	5874
1984	45	249	1359	0	0	0	0	0	0	3641	1482	1077	7853
1985	538	232	1398	15681	36152	0	0	0	0	4850	2567	1083	62499
AVG	98	128	502	1755	4226	0	0	0	0	803	394	162	8068

WAGON WHEEL GAP SITE
CB PRIORITY 3 EXCHANGE STORABLE FLOWS

WITHOUT CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	0	0	0	0	0	0	0	0	0	0	0	0	0

WAGON WHEEL GAP SITE
STORABLE FLOOD FLOWS

WITHOUT CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	0	0	0	0	0	0	0	0	0	0	0	0	0

WAGON WHEEL GAP SITE
STORABLE DEBIT FLOWS

WITHOUT CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG.	0	0	0	0	0	0	0	0	0	0	0	0	0

WAGON WHEEL GAP SITE
STORABLE SEASONAL FLOWS ASSUMING 70 PERCENT DITCH SYSTEM EFFICIENCY

WITHOUT CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	600	1300	4138	24307	141236	74782	0	0	0	8955	3378	1082	259778
1949	536	1092	3492	23432	68483	139802	0	0	0	10053	4378	1083	252351
1950	536	1088	5300	34415	22625	0	0	0	0	3744	2631	1079	71418
1951	534	1081	1956	0	0	0	0	0	0	3997	2798	1079	11445
1952	534	1079	2148	28451	84890	11937	0	0	0	6197	4464	1082	140780
1953	537	1090	4304	14342	38922	0	0	0	0	4585	2560	1078	67398
1954	534	1079	1777	18987	9210	0	0	0	0	0	0	0	31587
1955	0	1081	0	0	0	0	0	0	0	0	0	0	1081
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	14257	7327	1085	22869
1958	537	1080	3628	16321	104738	0	0	0	0	7870	3631	1081	138886
1959	536	1090	1543	9343	31287	0	0	0	0	9100	5475	1078	59452
1960	535	1078	7563	31475	57381	0	0	0	0	6702	2560	270	107564
1961	141	594	3013	12079	38922	0	0	0	0	0	0	1080	55829
1962	536	1087	2787	31082	87885	23767	0	0	0	0	4940	1082	147126
1963	536	755	4119	10508	19847	0	0	0	0	0	0	0	35765
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1085	1085
1966	538	1091	6641	20079	59710	0	0	0	0	[illegible]	0	0	88059
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	84925	55053	0	0	0	8793	3155	1083	153009
1974	536	1089	4304	0	2172	0	0	0	0	0	0	0	8101
1975	0	0	0	0	0	75849	0	0	0	0	0	1083	76932
1976	536	1087	0	0	0	0	0	0	0	0	0	0	1623
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	108745	141062	0	0	0	3833	3928	589	258157
1980	536	1090	2951	12556	75361	19491	0	0	2027	7686	3571	1081	126350
1981	535	1081	2398	2660	26545	0	0	0	0	17524	4940	1080	56763
1982	536	1080	2705	11499	11994	30941	0	0	32211	29207	7215	1083	128471
1983	538	1083	3812	4756	51585	111792	0	0	0	19553	4168	1082	198367
1984	537	1081	3566	3765	73947	0	0	0	0	24288	7213	1083	115480
1985	538	1090	4427	27909	109265	99940	0	0	4017	28617	7227	1083	284113
AVG	302	841	2014	8893	34307	20643	0	0	1007	5656	2252	592	76306

WAGON WHEEL GAP SITE
STORABLE SEASONAL FLOWS ASSUMING 50 PERCENT DITCH SYSTEM EFFICIENCY

WITHOUT CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	600	1300	4138	18578	112957	3978	0	0	0	8955	3378	1082	154964
1949	536	1092	3492	15150	40996	83011	0	0	0	10053	4378	1083	159791
1950	536	1088	5300	26215	0	0	0	0	0	103	2631	1079	36952
1951	534	1081	1956	0	0	0	0	0	0	1372	2798	1079	8820
1952	534	1079	2146	28451	52956	0	0	0	0	1350	4464	1082	92062
1953	537	1090	4304	12801	29771	0	0	0	0	2027	2560	1078	54168
1954	534	1079	1777	9074	0	0	0	0	0	0	0	0	12464
1955	0	1081	0	0	0	0	0	0	0	0	0	0	1081
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	14257	7327	1085	22669
1958	537	1080	3628	7989	65751	0	0	0	0	7870	3631	1081	91567
1959	536	1090	1543	5235	16245	0	0	0	0	9100	5475	1078	40302
1960	535	1078	7563	30696	24014	0	0	0	0	6702	2560	270	73418
1961	141	594	3013	3907	1403	0	0	0	0	0	0	1080	10138
1962	536	1087	2767	31062	44342	0	0	0	0	0	4940	1082	85816
1963	536	755	4119	525	0	0	0	0	0	0	0	0	5935
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1085	1085
1966	538	1091	6641	11187	22087	0	0	0	0	0	0	0	41544
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	65141	0	0	0	0	8793	3155	1083	78172
1974	536	1089	4304	0	0	0	0	0	0	0	0	0	5929
1975	0	0	0	0	0	12584	0	0	0	0	0	1083	13667
1976	538	1087	0	0	0	0	0	0	0	0	0	0	1623
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	81310	91528	0	0	0	1075	3928	589	178430
1980	538	1090	2951	8102	75361	0	0	0	0	7610	3571	1081	100302
1981	535	1081	2398	0	5151	0	0	0	0	17524	4940	1080	32709
1982	536	1080	2705	4239	0	0	0	0	20187	29207	7215	1083	66252
1983	538	1083	3812	0	31459	68903	0	0	0	17932	4166	1082	126975
1984	537	1081	3566	0	31498	0	0	0	0	24288	7213	1083	69266
1985	538	1090	4427	27909	90789	27220	0	0	0	28617	7227	1083	188900
AVG	302	641	2014	6345	20822	7508	0	0	531	5180	2252	592	46184

WAGON WHEEL GAP SITE
STORABLE SEASONAL FLOWS ASSUMING 30 PERCENT DITCH SYSTEM EFFICIENCY

WITHOUT CLOSED BASIN PROJECT DELIVERIES
WITH ALT STEP TWO MAINSTEM DIVERSION SCENARIO

IN ACRE-FEET

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1948	600	1300	4138	0	46973	0	0	0	0	5923	3378	1082	63394
1949	536	1092	3492	0	0	0	0	0	0	7373	4378	1083	17954
1950	536	1088	5300	3688	0	0	0	0	0	0	2631	1079	14322
1951	534	1081	1956	0	0	0	0	0	0	0	2798	1079	7448
1952	534	1079	2146	28451	0	0	0	0	0	0	4464	1082	37756
1953	537	1090	4304	866	1280	0	0	0	0	0	2560	1078	11715
1954	534	1079	1777	0	0	0	0	0	0	0	0	0	3390
1955	0	1081	0	0	0	0	0	0	0	0	0	0	1081
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	12855	7327	1085	21267
1958	537	1080	3628	0	0	0	0	0	0	3509	3631	1081	13466
1959	536	1090	1543	0	0	0	0	0	0	9100	5475	1078	18822
1960	535	1078	7563	6989	0	0	0	0	0	6702	2560	270	25697
1961	141	594	3013	0	0	0	0	0	0	0	0	1080	4828
1962	536	1087	2767	10912	0	0	0	0	0	0	4940	1082	21324
1963	536	755	4119	0	0	0	0	0	0	0	0	0	5410
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	1085	1085
1966	538	1091	6641	0	0	0	0	0	0	0	0	0	8270
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	6824	3155	1083	11062
1974	536	1089	4304	0	0	0	0	0	0	0	0	0	5929
1975	0	0	0	0	0	0	0	0	0	0	0	1083	1083
1976	536	1087	0	0	0	0	0	0	0	0	0	0	1623
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	17292	0	0	0	0	0	3928	589	21809
1980	536	1090	2951	0	65528	0	0	0	0	8323	3571	1081	81080
1981	535	1081	2398	0	0	0	0	0	0	17524	4940	1080	27558
1982	536	1080	2705	0	0	0	0	0	0	29207	7215	1083	41826
1983	538	1083	3812	0	0	0	0	0	0	11152	4166	1082	21833
1984	537	1081	3566	0	0	0	0	0	0	24288	7213	1083	37768
1985	538	1090	4427	24167	20325	0	0	0	0	28617	7227	1083	87474
AVG	302	641	2014	1976	3984	0	0	0	0	4458	2252	592	16218