WATERMASTER'S REPORT

RIO CHAMA MAINSTREAM

2004

Stermon M. Wells
Rio Chama Watermaster

STATE OF NEW MEXICO

OFFICE OF THE STATE ENGINEER

December 20, 2004

Mr. John R. D'Antonio, Jr., P.E.
New Mexico State Engineer
Bataan Memorial Building
Santa Fe, NM

Dear Mr. D'Antonio,

I am pleased to submit the following report of our activities on the Rio Chama during the 2004 irrigation season, which included water measurement, recording and accounting, as well as the study of various water right matters, and meetings with water users in the area.

Gauges on the Rio Chama were read and maintained as necessary, velocity measurements made, and rates of flow were calculated, resulting in the diversion data summarized in this report.

Thank you for your continued support, and please contact me with any questions that may occur to you after reading this report. I hope it meets with your approval.

Sincerely,

S M Wells

Stermon M. Wells
Rio Chama Watermaster

RIO CHAMA
HYDROGRAPHIC SURVEY
SECTIONS

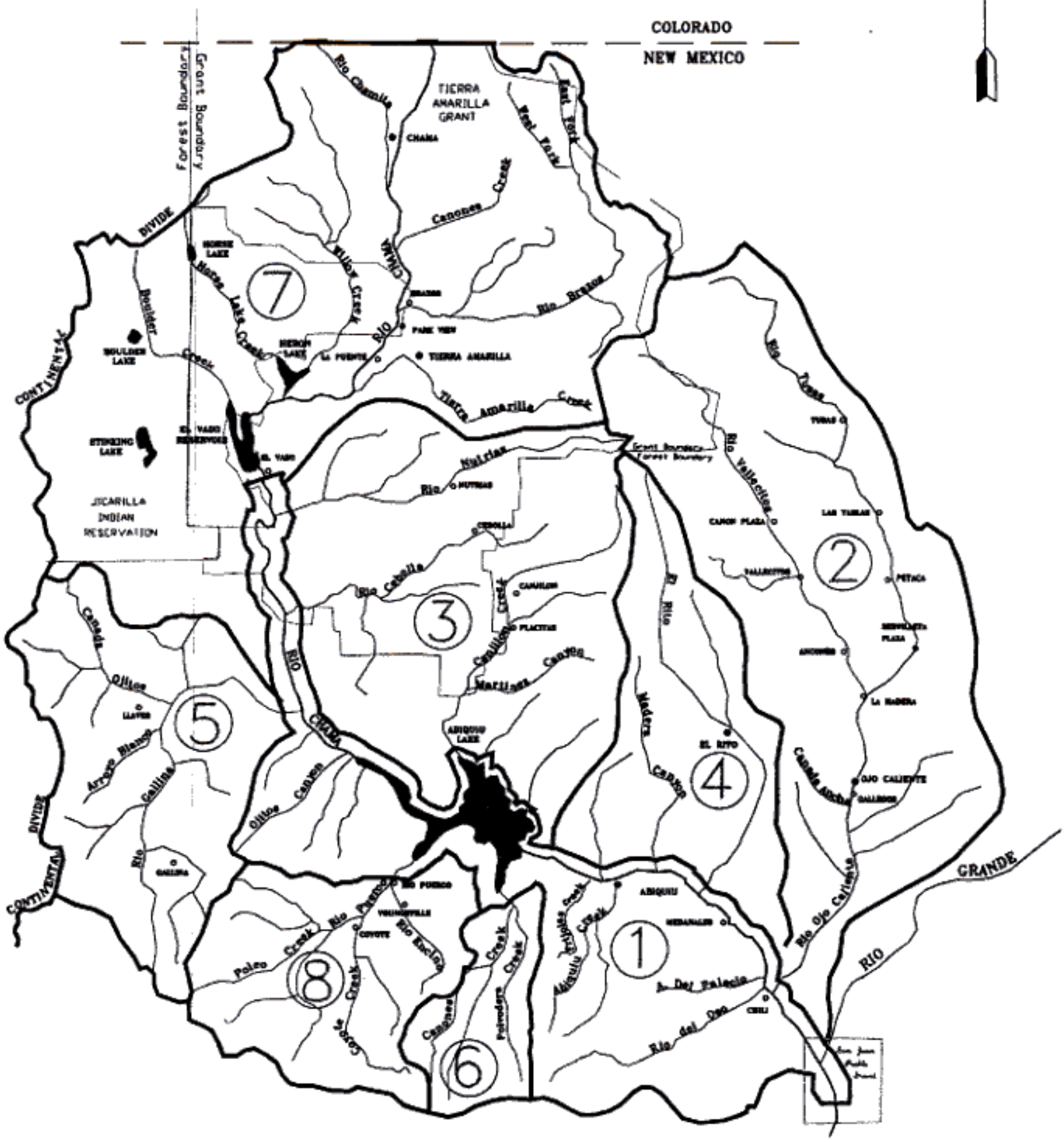
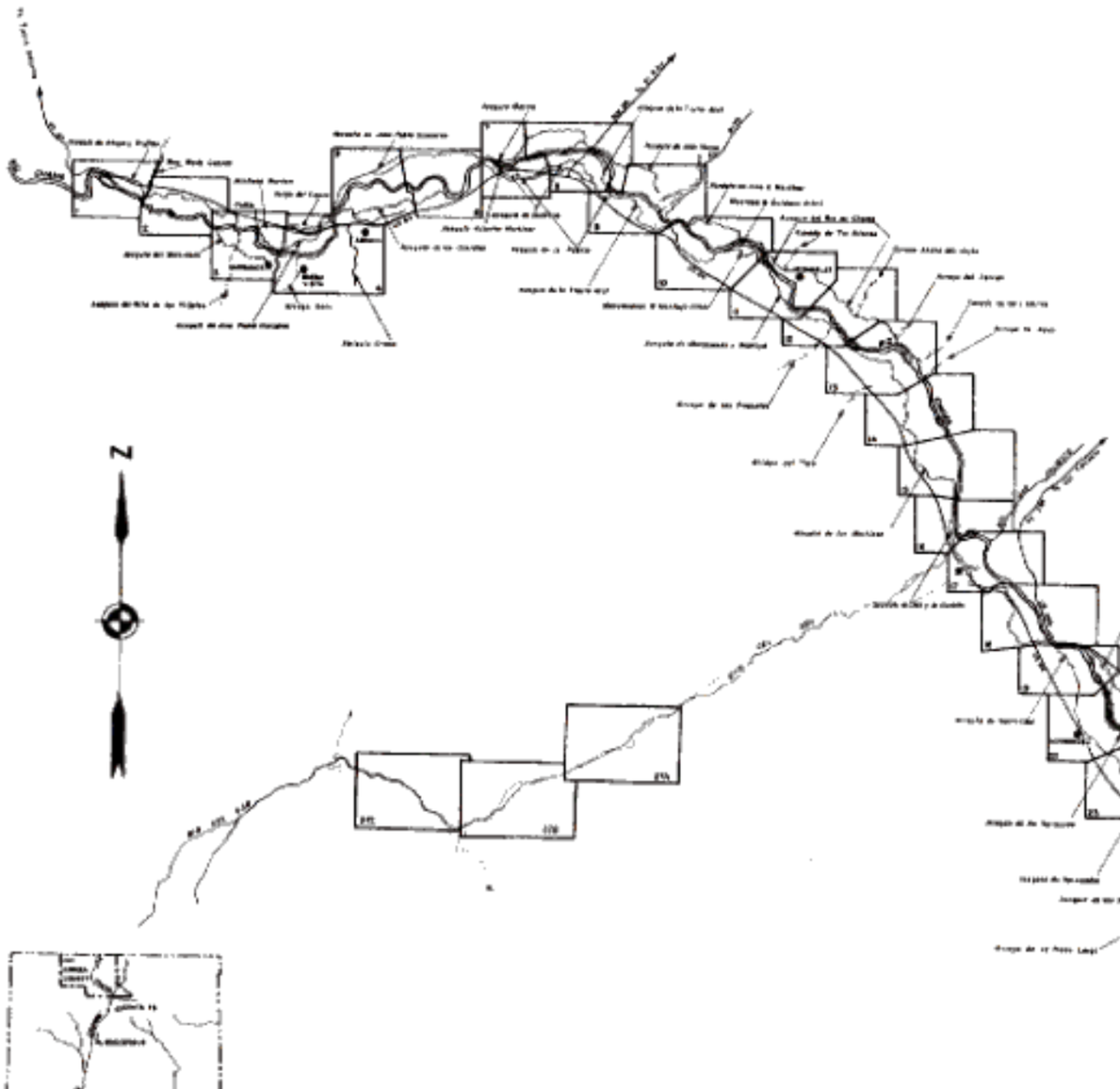


FIGURE NO. I

KEY MAP
OF
RIO CHAMA HYDROGRAPHIC SURVEY
ESPANOLA TO ABIQUIU SECTION

SCALE: 1" = approximately 1 mile



STATE OF NEW MEXICO
LOCATION MAP

L E G E N D
(applicable to individual survey maps)

- SURVEY MAP AND NUMBER
- NEW MEXICO PLANE COORDINATES, CENTRAL ZONE, 5000 FT. INTERSECTIONS
- OWNERSHIP BOUNDARY
- CROP LINES WITHIN OWNERSHIP BOUNDARY
- TRIANGULATION STATION
- TRACT NUMBER
- RIVER
- DITCH
- ARROYO
- DIVERSION DAM
- HIGHWAY
- ROAD
- TRAIL
- FENCE
- NATIONAL FOREST BOUNDARY
- GRANT BOUNDARY
- IRRIGATION, WITHIN OWNERSHIP BOUNDARY, IN DISAGREEMENT WITH STATE ENGINEER RECORDS

NOTE:
Tract numbers begin with Number 1 on each map sheet. When referring to tract numbers it is necessary to also refer to the map sheet number, thus numbers 3-11 would indicate Tract 11 appearing on Map Sheet 3.

LAND CLASSIFICATION

IRRIGATED

- Alfalfa
- Corn
- Fallow. Short number indicates number of consecutive years fallow
- Garden
- Hay
- Irrigated Native Grass
- Orchard
- Ploughed Ground
- Irrigated Permanent Pasture
- Small Grains (wheat, barley, oats)
- Pasture
- Lawn

NOT IRRIGATED

- Irrigable land fallow over four consecutive years
- Irrigable land which have never been irrigated
- Swamp or badly warped land
- Trees

STATE OF NEW MEXICO
OFFICE OF STATE ENGINEER

RIO CHAMA HYDROGRAPHIC SURVEY

1959

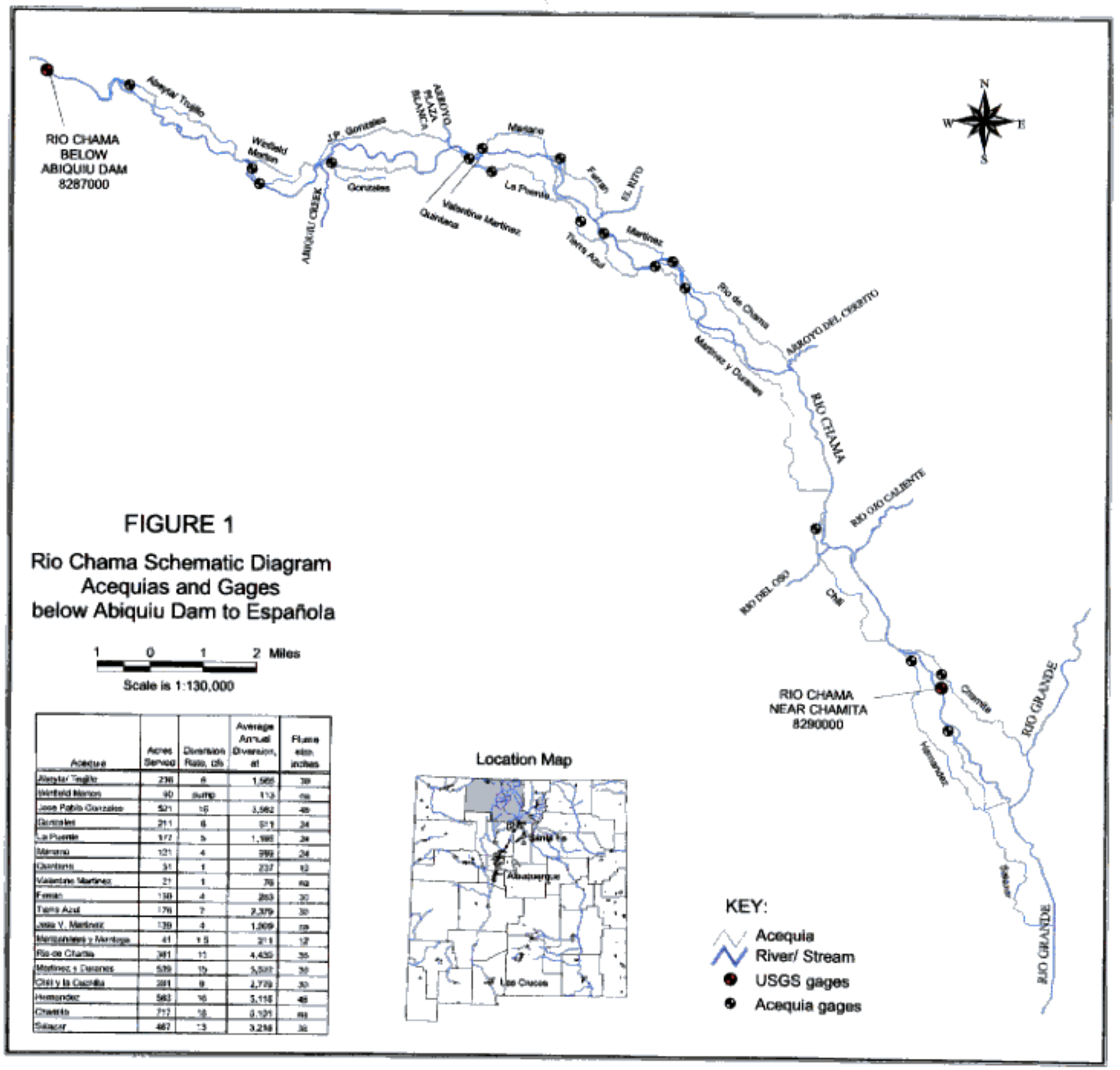


FIGURE 1

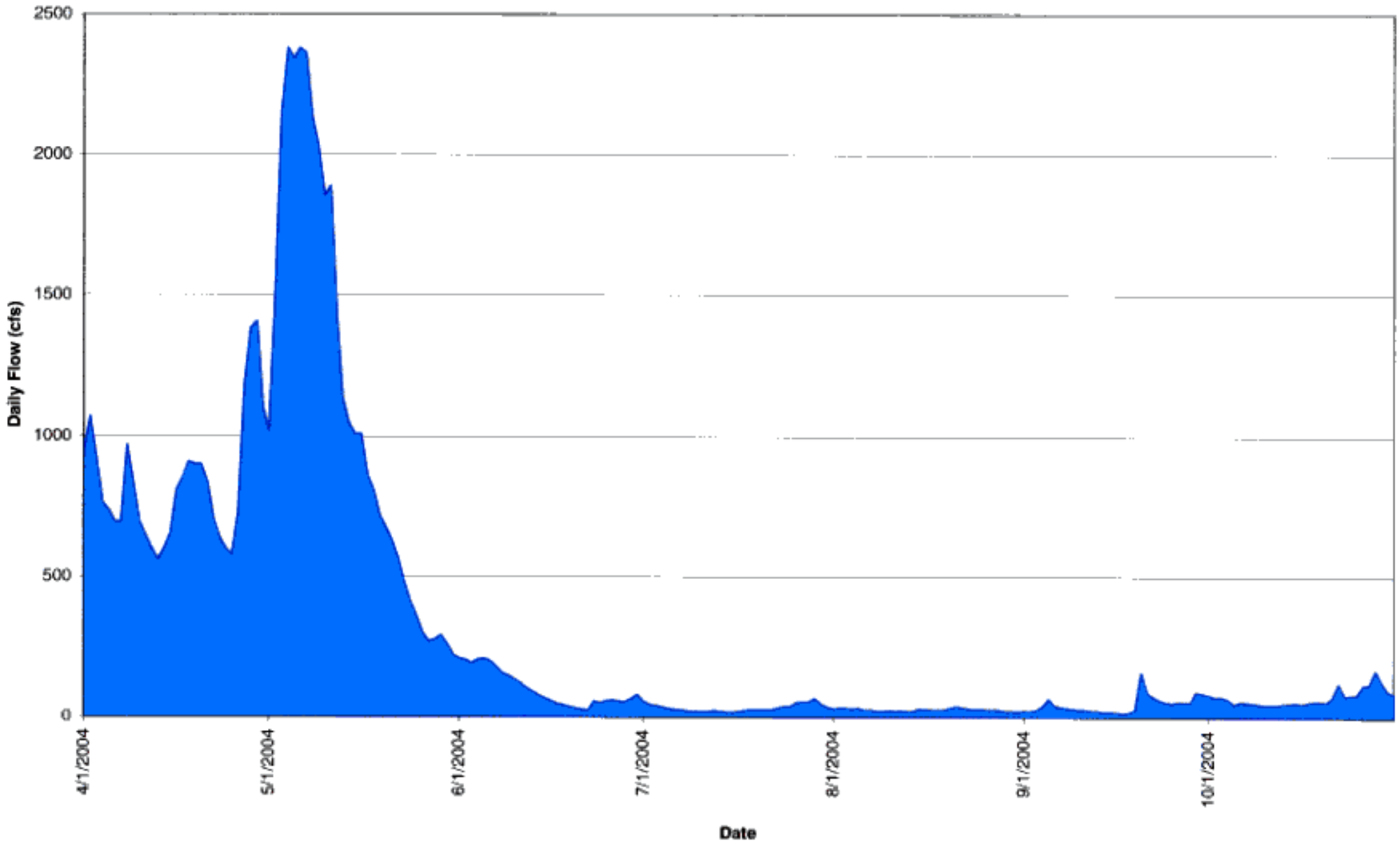
Rio Chama Schematic Diagram
Acequias and Gages
below Abiquiu Dam to Española

1 0 1 2 Miles

Scale is 1:130,000

Acequia	Acres Served	Diversion Rate, cfs	Average Annual Diversion, af	Flume size, inches
Abeytal Trujillo	236	6	1,560	30
Winfield Martin	90	pump	113	na
Jose Pablo Gonzales	521	16	3,562	48
Gonzales	211	6	911	24
La Puente	172	5	1,195	24
Mariano	121	4	999	24
Quintana	31	1	237	12
Valentine Martinez	21	1	78	na
Feman	139	4	263	30
Tierra Azul	176	7	2,379	30
Jose V. Martinez	139	4	1,009	na
Martinez/Montoya	41	1.5	311	12
Rio de Charita	361	11	4,439	36
Martinez y Duranes	576	15	5,501	30
Chili y la Cacilla	281	9	2,779	30
Hernandez	562	16	3,116	48
Chamita	717	18	8,101	na
Salazar	467	13	3,218	36

Water Supply at La Puente 2004



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INTRODUCTION

The San Juan-Chama Project made possible an average annual diversion of about 100,000 acre-feet from the Rio Blanco, the Little Navajo and the Navajo Rivers, tributaries of the upper San Juan River in Colorado, for utilization in the Rio Grande Basin of New Mexico.

San Juan water is stored and held for release in Heron Reservoir; releases made from the reservoir are carried by the Rio Chama for delivery to the Rio Grande. Along the reach of the Rio Chama from El Vado to its confluence with the Rio Grande there are twenty-one legal acequia diversions having the natural flow of the mainstream of the Rio Chama as their source.

To prevent unauthorized diversion of imported water by the Rio Chama diversions, water rights under the twenty-one acequias in the lower Rio Chama Valley are adjudicated in the Partial Final Judgment and Decree entered in the United States District Court, State of New Mexico, ex rel., S.E. Reynolds v. Roman Aragon, et al, Cause No. 7941, for the Rio Chama Mainstream Section. The appointment of a Rio Chama Watermaster for the administration and enforcement of the Decree was made on July 26, 1971. By letter dated May 23, 1972, the State Engineer instructed the Rio Chama Watermaster to take such measures as may be necessary to prevent diversion by appropriators from the Rio Chama of waters released from El Vado Reservoir pursuant to contract.

AUTHORITY

The Rio Chama Watermaster serves under the direction of the State Engineer and under the general supervision of the United States District Court in accordance with the Partial Final Judgment and Decree No. 7941, adjudication of the Rio Chama Mainstream Section. The Rio Chama Watermaster was appointed Watermaster of the El Rito Section on June 25, 1973. A copy of these decrees and other authority can be found in the 1971, 1972, and 1973 Rio Chama Watermaster Reports.

Mr. George Shaw, the previous Rio Chama Watermaster, developed and filed additional Watermaster Rules and Regulations governing the administration of the Rio Chama adjudication in the U.S. District Court for New Mexico. These Watermaster Rules and Regulations were issued pursuant to paragraph 9 of the original Partial Final Judgment and Decree of the Court. The additional eight articles were approved by the State Engineer and the Court, dated May 30, 1972.

Mr. Shaw retired at the end of the 1996 irrigation season, and Mr. Stermon Wells assumed the duties of the position in May, 1997. At this time, the 1972 Watermaster Rules and Regulations remain in effect. Copies may be obtained from Legal Services Division, Office of the State Engineer.

GENERAL PHYSIOGRAPHIC, CLIMATIC, AND PRECIPITATION INFORMATION

The Rio Chama mainstream section flows 32 miles from the base of Abiquiu Dam to its confluence with the Rio Grande. Along the way it is joined by flows from Abiquiu Creek, El Rito Creek, Rio del Oso, and the Rio Ojo Caliente. This stretch of the Rio Chama arises as a controlled discharge from Abiquiu Dam, a 325 foot high dam completed in 1963 by the U.S. Corps of Engineers for flood and sediment control. The reservoir formed by the dam receives runoff from a 2,146 square mile mountainous watershed along with additional diverted water from the San Juan basin. This stretch of the Rio Chama cuts through the southeastern extension of the Colorado Plateau between the Chama basin to the northwest and the Rio Grande basin to the southeast. This section of the plateau consists of high mesas intricately dissected by the Rio Chama and its tributaries. Major geologic formations in this area are the Ojo Caliente sandstone, Abiquiu tuff and Lobato basalt.

The area surrounding this reach of the Rio Chama is characterized as sub-humid, with an average annual precipitation amounting to about 9.5 inches. Approximately 60 percent of the average yearly precipitation along the watercourse falls during the period from July through October in the form of brief but occasionally heavy thunderstorms, sometimes containing large hailstones.

Temperatures at Abiquiu Dam are moderately cool with a mean temperature of about 70 F degrees in the summer and 30 F degrees in the winter. Daytime winter temperatures range from the mid 30's to the mid 40's with an average of only seven days per year with high temperatures below the freezing mark. Mean average snowfall is 14.4 inches. Daytime summer temperatures range from the lower 70s to the mid 80s with an average of 21 days per year when temperatures exceed 90 F. Temperatures at the village of Ojo Caliente, only 165 feet higher in elevation than Abiquiu Dam, are also moderately cool and slightly lower than at the dam. The average annual precipitation at Ojo Caliente is 10.0 inches and mean snowfall is 22.5 inches.

The Rio Chama drops an average of 13.1 feet per mile from the base of Abiquiu Dam to the confluence with the Rio Grande. The Rio Ojo Caliente drops an average of 28.3 feet per mile from the village of Ojo Caliente to the confluence with the Rio Chama. The mile of Abiquiu Creek prior to its confluence with the Rio Chama drops 180 feet in elevation. The mile of El Rito Creek before its confluence with the Rio Chama drops 50 feet in elevation. The Rio del Oso is intermittent, and did carry some flow during the early Spring of the year 2004 irrigation season. The inflow of these tributary streams is not yet gauged.

PRECIPITATION

The following monthly and season total precipitation data was recorded at Abiquiu Dam showing the precipitation received there during the year 2004 irrigation season:

APRIL ---------- 3.10"

MAY ---------- 0.01"

JUNE ---------- 0.20"

JULY ---------- 0.84"

AUGUST ---------- 0.90"

SEPTEMBER ---------- 0.84"

OCTOBER ---------- 0.87"

2004 SEASON TOTAL ---------- 6.76"

Precipitation was not abundant during the 2004 Season. 9.5" to 10.0" is considered to be an average annual precipitation value for Abiquiu Dam. The 6.76" that was recorded during the year 2004 irrigation season was less than adequate excepting the month of April, and although 2004 was considered by some to be an average year, it was not sufficient to break the spell of the overall drought condition that has prevailed for the last few years.

Ms. Christina Serrano of the U.S. Army Corps of Engineers is stationed at Abiquiu Dam, and keeps us informed as to precipitation received at the Lake. Our thanks to Christina for maintaining these records.

2004 SEASON NARRATIVE

Dry conditions continued in the year 2004 irrigation season; the fifth year in a row of a region wide drought. Governor Johnson declared a statewide Drought Emergency on April 26th, 2002, and because of these dry conditions, drought warning letters were sent out at that time to all the acequia commissioners in the Rio Chama basin, advising that water supply would be short, and that conservation measures be adopted wherever possible. These same conditions continue to apply to the current situation, although no additional advisory was mailed.

In terms of the administration of water rights on the Rio Chama, good communication was maintained between the water users, ditch officials, and agency personnel. Meetings were held with acequia commissioners, and also between commissioners, agency personnel and consultants employed by the Interstate Stream Commission to study gauging arrangements and irrigation efficiency in the traditional irrigation district below Abiquiu Reservoir.

Spronk Water Engineers, Inc., of Denver, Colorado completed a study of gauging arrangements on the Rio Chama this year. The study reported the current status and made recommendations for future improvements, in some detail. I have not yet received the final version of the report, however Mr. Kevin Flanigan of the Interstate Stream Commission can provide copies of the report. I concur with the findings in the draft copy of the report which I received, and I am in agreement with their findings in regard to improvements that should be made, when funding becomes available for that purpose.

Due to previous agreements reached in regard to release of water stored in Abiquiu Reservoir, priority administration did not become necessary during the driest part of the summer. Various water regulation issues were addressed by our Office with good results.

Water Supply

Water supply during the year 2004 irrigation season was considered "poor", in terms of availability of native water. A great deal of water was diverted for irrigation throughout the season with very little relief in the form of precipitation. When depletion calculations due to last season's irrigation in the lower Chama valley are finalized, any calculated net depletion to San Juan/ Chama Project water will have to be repaid from the Rio Chama Acequia Association's water which is stored pursuant to contract in Abiquiu Reservoir, and subsequently released for supplemental irrigation under the terms of Surfacewater Permit #4901.

The irrigation season on the Rio Chama starts on the 1st of April and ends on the 31st of October. This past year, releases of native water from Abiquiu Reservoir were held to a modest level at the beginning of the season, in order to capture and store as much water yield from spring snowmelt as possible. This was done in accordance with federal reservoir operation plans

that had been projected for the season, the upper reservoirs were still low due to previous season's operations. Care was taken to release enough water as not to cause detriment to agricultural irrigation rights in the district below Abiquiu, as well as to water users further downriver.

Tributary inflow from El Rio del Ojo Caliente, El Rito Colorado, El Rio del Oso and other small tributaries is normally a big help to the Rio Chama acequias, since this all adds to the supply that is available for diversion by the direct flow irrigators in the lower Rio Chama valley. This year, tributary inflow, though it is not yet gauged, was observed to be unsteady and weak. Some areas remained very dry throughout the season.

Throughout the year 2004 irrigation season, agency personnel monitored the water supply situation closely, performing the required supply calculations as needed. Some of these calculations are included in this report, showing the procedures that were followed.

The hydrograph of the water supply for the 2004 season, as recorded at La Puente, is included for reference in this report.

Meetings

We have met with various acequia and MDWCA groups in the Rio Chama area during the 2004 irrigation season to address their concerns and water right issues. Some of the meetings have been requested by members of our agency to discuss filing deficiencies, lack of meter readings, or other issues. These have been cooperative meetings with generally positive results.

At the beginning of the year 2004 irrigation season, we attended several meetings where the reservoir operations plans for the year were outlined by federal officials. These plans were discussed with representatives of the Rio Chama Acequia Association, and members of other water user's organizations that were interested in what volumes of flow would likely be released during the season.

Other meetings were also held with staff members from OSE and ISC in attendance, to address planning for future infrastructure improvements to our water measurement program, both on the Rio Chama below Abiquiu Reservoir, and throughout the upper Rio Chama basin. These meetings addressed a variety of concerns, and have also discussed possible plans for funding the gauging station improvement work that will be necessary. As a result of the meetings that explored these topics, we are including with this year's report a summary of the condition of headworks and measurement stations on each ditch, showing the type of instrumentation that is currently located on each station. Discussion of improving station condition and implementation of real time data collection will continue in the future.

Rio Chama Flow Data

Daily streamflow hydrographs for the Rio Chama are routinely obtained by direct download from the USGS website. By submitting an electronic data request, other hydrologic information can be obtained from the same source.

During the year 2004 irrigation season, Mr. Paul Wells of the Office of the State Engineer, Water Resource Allocation Program, and other staff members of the Interstate Stream Commission have used river flow data from USGS to calculate estimated depletions to the river. This information has also been provided to the Rio Chama Watermaster.

The Rio Chama Watermaster conducted water measurement and did the usual data collection work this season, and also prepared hydrographs that show the diversion of water to the acequias in the irrigation district below Abiquiu Reservoir. Some of the results are included in this report.

Year 2004 irrigation season data used here is provisional data, subject to future revision or interpretation if additional or better information becomes available.

Equipment

Ten electronic data collection instruments were installed in our stations at the beginning of the year 2001 irrigation season, and were still in use during the 2004 irrigation season. These units, designated H-510 water level loggers, are capable of recording water flow data in a variety of modes, and the recorded data is summarized in this year's report. The H-510 units are also readily amenable to upgrade to real time data collection, but do need to be connected to a communication network in order to make operation in that mode possible. Some data has in past seasons been lost due to low battery conditions on the stations, and we plan to correct that situation in the future.

This year we had pretty good data capture on the stations that were equipped with dataloggers. One of the ten instruments in our possession malfunctioned and had to be returned to the shop for repair. Electrical short circuit due to lightning strike is suspected as the cause of malfunction. Another instrument returned erroneous data, for unknown reasons. The other instruments functioned well. Diversion information from other diversions in the Rio Chama valley is averaged and projected for an estimated diversion figure, which is based on observed rates of flow during site visits by the Watermaster.

Our plan for the future is to actively continue to upgrade our water measurement program by installing additional electronic water level monitoring equipment on the Rio Chama acequia diversions in Section 1, and also in appropriate locations in the upper Rio Chama basin. The Rio Chama Watermaster and other staff members will be working together to specify, purchase, and install such equipment and all necessary appurtenances, as funding for the project becomes available.

Enforcement

In accordance with the Office of the State Engineer's stated policy of active water resource management, and the Rio Chama Court Decrees, the Watermaster has taken a hands on approach to water conservation during the 2004 irrigation season on the Rio Chama. Measurements have been made, data collected, and headgates adjusted when necessary. Whenever possible, acequia commissioners have been contacted via telephone prior to headgate adjustment, and if contact is not obtained, they have been notified by certified mail of these actions.

A few violations of the State Engineer's Rules and Regulations were reported and addressed in the course of the 2004 irrigation season. Enforcement issues receiving attention from our staff included overdiversion to the maximum allowable rates of flow and unpermitted pond construction. Compliance with our efforts was not uniform. Enforcement on these issues will be more effective in the future as the adjudication of the Rio Chama basin proceeds, and also as our diversion data becomes more accurate.

Two instances of flooding due to acequia breakout were reported and addressed in the lower Rio Chama valley this year. Waste of water was prevented to the best of our abilities.

At every opportunity, we are informing Commissioners and Mayordomos on the Rio Chama to take an active part in water conservation, and also to report any suspicious activities at the measurement stations. We also continue to present the idea that the acequia water users have responsibility by New Mexico statute law for the maintenance and upkeep of these stations and equipment. Water users are encouraged to take more personal responsibility for their water usage, reporting, and conservation.

Conservation

Additional conservation of water is a worthwhile goal, and much to be desired along the Rio Chama. We are planning to identify points of return flow of water that is diverted by the Rio Chama acequias, and to implement measurement of such return flows to the river system in order to more equitably estimate depletions. Mr. Shaw has stated on many occasions in the past that it is his impression that return flow to the river is quite a large percentage of total diversions. In meeting with Rio Chama water users we continue to urge conservation of water whenever possible. At the present time, engineers for the Bureau of Indian Affairs is planning to install a return flow measurement on the Acequia de Chamita, at a location on lands belonging to San Juan Pueblo. When this project is completed, the return flow information can be incorporated into the Rio Chama Depletion model for a more accurate idea of return flows from irrigation in our area.

Conservation language is employed in every case by the Rio Chama Watermaster, both in correspondence with water users and with applicants for State Engineer permits.

Acknowledgement

Much of the information presented in this report is relayed from other sources. We would like to give general thanks to those who have freely shared their time and information with us this past season.

Special thanks again this year to Mr. Paul Wells of the Water Resource Allocation Program for all the long hours he has spent revising the depletion calculation method that remains in use, and for performing those calculations on a routine basis. Mr. Paul Wells' support in these matters has been extremely valuable to the Rio Chama program again this year.

A large volume of mail was sent this past year to applicants, permitees, water user's associations, and also in enforcement actions and investigations. We really appreciate the extra help received from other staff members in the State Engineer's Water Rights Division this year. Our thanks to those that helped us get the mail out on time, and for the other assistance received during the 2004 irrigation season.

ADMINISTRATION

Rate of Flow Administration

In Mr. Shaw's 1996 Annual Report he states that farm delivery requirements, conveyance losses, stock and domestic requirements and sand sluicing requirements were considered in establishing the maximum allowable rate of flow for each of the permitted acequia diversions on the Rio Chama. Maximum allowable water levels are clearly marked at all gauge locations in the irrigation district below Abiquiu Reservoir.

The maximum rates of flow developed in the past by Mr. Shaw and other staff members of the Office of the New Mexico State Engineer have remained in force on the Rio Chama for over 30 years. We will continue to use these rates for maximum allowable flows to the acequias in the future, until such time that they may need to be modified for any reason.

The Rio Chama acequias will operate under the Rate of Flow Administration at all times except when ordered under the Priority Administration. The following table shows the acreage served by each acequia, and lists the maximum approved rate of flow for that diversion.

RIO CHAMA ACEQUIAS
RATE OF FLOW ADMINISTRATION

Ditches listed in order from upstream to downstream:

Name	Diversion Rate (cfs)	Acres Served
Scull Ranch	pump-(not determined)	294.70
Monastery	1.0	13.7
Abeyta-Trujillo	6.0	236.25
Winfield-Morton	pump-(not determined)	90.30
Jose Pablo Gonzales	16.0	521.42
Gonzales	6.0	211.15
La Puente	5.0	177.03
Quintana	1.0	30.87
Valentine Martinez	1.0	20.82
Mariano	4.0	121.09
Ferran	4.0	130.38
Tierra Azul	7.0	175.99
J.V. Martinez	4.0	138.71
Manzanares y Montoya	1.5	40.61
Rio de Chama	11.0	380.84
Martinez y Duranes	15.0	538.91
Chili	8.0	281.11
Chamita	18.0	716.54
Hernandez	16.0	583.34
Salazar	13.0	467.27

Note: The points of diversion for the Acequia Martinez and the Acequia Duranes were combined several years ago, therefore only 20 points of diversion are shown here. The pump at Scull Ranch was used during the first part of the Year 2004 season, but not at any continuous authorized rate of flow, therefore no rate is shown here. The pump at Winfield-Morton was inactive again this season, however a new pump is planned to be installed there in the future, which will serve a reduced acreage.

Priority Administration

The Rio Chama acequias have historically been ordered by the Watermaster from the Rate of Flow Administration to the Priority Administration when the calculated available natural flow of the Rio Chama at La Puente Gauge decreases below 140 cubic feet per second. At this stage of flow, possibility exists that shortages may be imminent, and the natural flow of the Rio Chama may not be sufficient to satisfy all legal diversions along the Mainstream section. No such order was filed in the course of the 2004 irrigation season.

The Priority Administration is necessary in order to satisfy the irrigation requirements of diversions having earlier priorities and to by-pass upstream storage releases from Heron and El Vado Reservoirs. During the 2004 irrigation season the Priority Administration was not necessary due to the acequias' use of water stored in Abiquiu Reservoir, pursuant to contract with City of Albuquerque, and authorized by permit of the Office of the State Engineer. The details related to the accounting and release of this stored water fall under the jurisdiction and management of the State Engineer's Water Rights Division, and also the New Mexico Interstate Stream Commission.

All orders to individual acequias are issued in writing by the Watermaster if and when restrictions become necessary, as required in Article 1-9 of the Watermaster's Rules and Regulations. A correspondence file maintained by the Rio Chama Watermaster includes all such orders, as well as documents that support these decisions, and the history of each year's administrative actions, in chronological order as they occurred.

Priority dates in Section 1 of the Rio Chama have been revised for this year's report, based on historical studies performed by Dr. John Baxter and legal negotiations with the attorneys that represent the parties and those representing the Office of the State Engineer. The general effect of the revision has been to recognize earlier priority dates for the lower Rio Chama acequias than were previously contained in our water right files. The dates shown below are a summary of information that has been provided to the Watermaster. A court motion was filed seeking to finalize the new dates, however final order has not been received.

When it is necessary to restrict diversions of the natural flow of the Rio Chama in order to by-pass storage releases, the following priority dates will be used to determine seniority.

REVISED PRIORITY DATES FOR RIO CHAMA ACEQUIAS:
As of December 1, 2004

Scull Ranch Pump	1/26/1948 (from WATERS database)
Winfield Morten Pump	2/20/1947 (from WATERS database)
Monastery Pump	5/1/1904 (per Declaration 01821)
Acequia de Abeyta y Trujillo	1735 (State's Motion filed June 2003)
Acequia de Jose V. Martinez	1735 "
Acequia Mariano	1734 "
Acequia Valentin Martinez	1734 "
Acequia de la Puente	1734 "
Acequia de Quintana	1734 "
Acequia de la Tierra Azul	1734 "
Acequia de Jose Ferran	1734 "
Acequia de Jose Pablo Gonzales	1734 "
Acequia de los Gonzales	1734 "
Acequia del Rio de Chama	1724 "
Acequia de los Duranes	1724 "
Acequia de Manzanres y Montoya	1724 "
Acequia de los Martinez	1724 "
Acequia de Chili y la Cuchilla	1715 "
Acequia de Chamita	1714 "
Acequia de los Salazares	1714 "
Acequia de Hernandez	1714 "

Note: The diversions at Winfield Morton, Monastery of Christ, and Scull Ranch are pumps lifting water directly from the river. The rest of the diversions listed are either community or private ditches that intake water from the river by diversion dam and/or headworks.

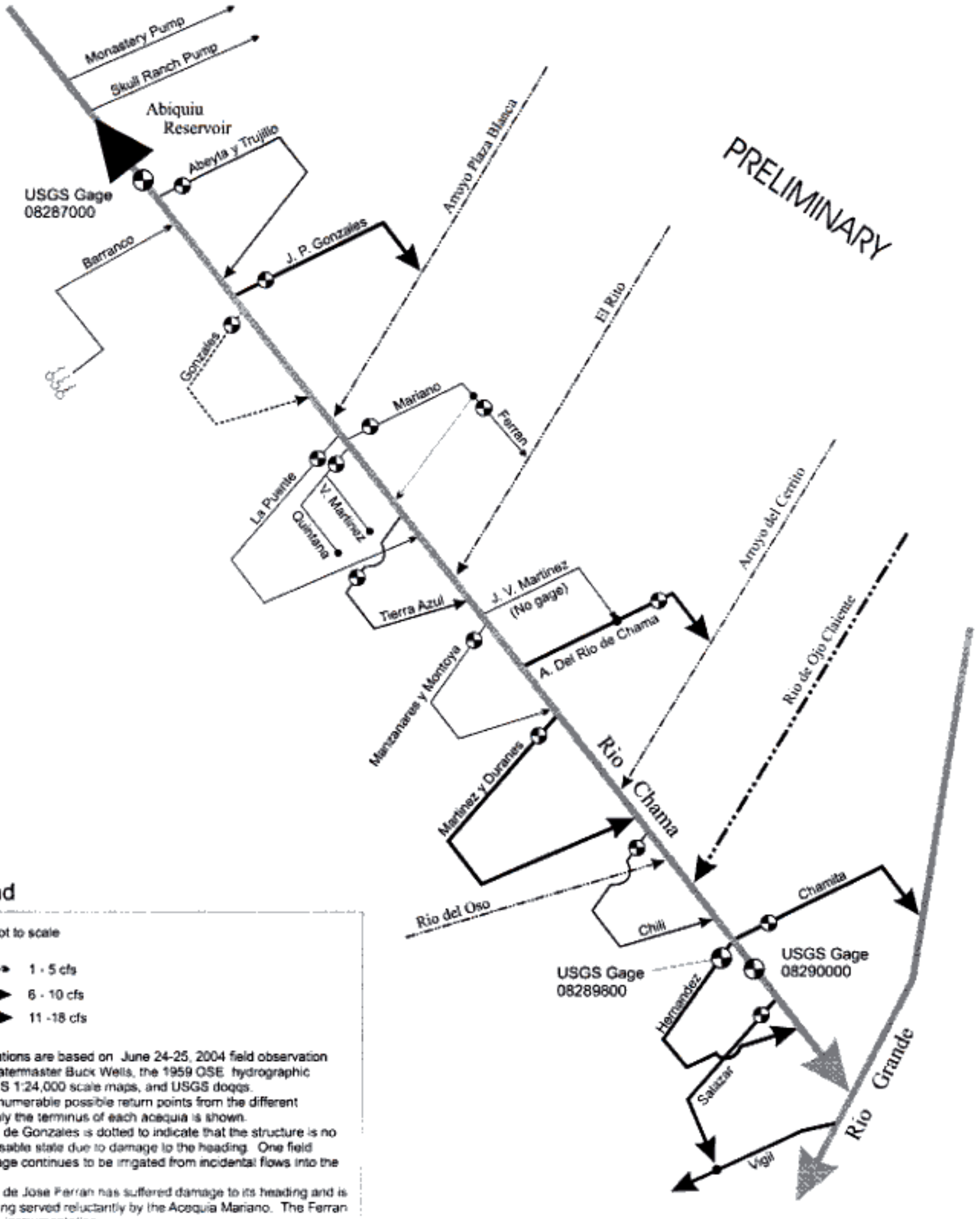
Section 1: Rio Chama Acequia or Point of Diversion	2004 Season Estimated Diversion Summary	Authorized Diversion (Authorized Rate of Flow x 214 Days in Irrigation Season x 1.98 ac-ft/cfs/day)	Adjudicated Amount (Acreage on acequia x Duty of 3.0 ac-ft per annum)
Salazar	5,148	5508	1402
Chamita	5,365	7627	2150
Hernandez	4,670	6780	1750
Chili	2,931	3390	843
Martinez y Duranes	5,346	6356	1617
Rio de Chama	4,452	4661	1143
Manzanares y Montoya	446	636	122
Jose Valentin Martinez	1,188	1695	416
Tierra Azul	2,772	2966	528
Ferran	831.6	1695	391
Mariano	2,220	1695	363
La Puente	1,980	2119	531
Quintana	297	424	93
Val. Martinez	148.5	424	62
Gonzales	960	2542	633
Jose Pablo Gonzales	4,711	6780	1564
Winfield-Morten	not operational	not determined	271
Abeyta Trujillo	2,014	2542	709
Scull Ranch **	52	442	442
Monastery	report not rec'd	41	41
Total:	**43,592**	**58,262 ac-ft**	**15,537 ac-ft**

Note that authorized flow often exceeds adjudicated amount

due to need for hydraulic head in ditch

** FDR at Scull Ranch is 1.5 AFA

Schematic Diagram of the Acequia and Gaging System on the Rio Chama from Abiquiu Reservoir to the Rio Grande



Legend

Drawing not to scale

- 1 - 5 cfs
- 6 - 10 cfs
- 11 -18 cfs

Relative locations are based on June 24-25, 2004 field observation with OSE Watermaster Buck Wells, the 1959 OSE hydrographic survey, USGS 1:24,000 scale maps, and USGS doqqs.
Given the innumerable possible return points from the different acequias, only the terminus of each acequia is shown.
The Acequia de Gonzales is dotted to indicate that the structure is no longer in a usable state due to damage to the heading. One field above the gage continues to be irrigated from incidental flows into the ditch.
The Acequia de Jose Ferran has suffered damage to its heading and is presently being served reluctantly by the Acequia Mariano. The Ferran flume has no instrumentation.
The Acequia Valentin Martinez is being served by the Acequia Quintana heading.

RIO CHAMA ACEQUIA MEASUREMENT STATIONS BELOW ABIQUIU DAM
CURRENT STATUS OF MEASUREMENT EQUIPMENT AND CONDITION OF HEADWORKS
As of 10/31/2004, the end of the 2004 Season

Note: A status report on the measurement stations and equipment in use on the Rio Chama normally accompanies the Watermaster's annual report. Due to discussion of modernization of these stations, and planned upgrade to real-time data collection, an estimate of required costs was requested. Vendors and contractors have been contacted, but some quotes that are needed have not yet been received. For that reason, the costs reported here are very rough estimates, and can be considered preliminary figures for planning purposes only. A memo from Shawn Williams, Assistant Rio Chama Watermaster dated October 27, 2000, was circulated to all interested parties, and discussed the average figure of $8,000 per station for installation of new, modern, water measurement stations. Various site specific factors may raise this cost for the construction of any particular station that may have special requirements. For rehabilitation of any particular station, a more detailed engineering study may be required. In the future, new stations will be needed in the upper Chama basin as well, to support an integrated surface water management plan for the whole basin.

This year, a more comprehensive assessment study was performed by Spronk Water Engineers, Inc., of Denver, Colorado. The final report has not been received by the Watermaster, however a copy may be obtained from Kevin Flanigan of the Interstate Stream Commission. My understanding of the study is that detailed recommendation was made for station repair and replacement, and their findings should substantially agree with the information presented below:

ABEYTA / TRUJILLO 08287020
H-510 on station, needs radio and battery charging equipment in order to upgrade to real time data collection. Parshall flume is in serviceable condition. Headworks are in fair condition. Estimate of current needs =
Radio and charging equipment will be about $3,000.

WINFIELD MORTON 08287040
Pump site, temporarily inactive and not equipped. No irrigation currently occurring at this location. If this station is re-activated water users will bear the cost of metering equipment.

JOSE PABLO GONZALES 08287060
H-510 on station, needs radio and battery charging equipment. Parshall flume is in serviceable condition. Corps of Engineers headwork renovation project was completed in the Fall of 2001. Estimate of current needs = Radio and charging equipment will be about $3,000.

GONZALES 08287150
A-71 on station; Measuring station and headworks need to be completely rebuilt. Estimate of current needs =
Modernization of instrumentation will be about $1500
Radio and charging equipment will be about $3,000.
Headwork renovation will be about (quote not received)
Total will be about (not yet available)

LA PUENTE 08287200
H-510 on station, needs radio and battery charging equipment. Parshall flume is in poor condition. Headworks are in poor condition, and in need of renovation. Estimate of current needs =
Radio and charging equipment = $3,000
Flume replacement will be about $1,500
Headwork renovation project $3,500
Total cost will be about $ 8,000

QUINTANA 08287250
No instrument on station, needs a new equipment enclosure, and complete equipment upgrade. Radio and battery charging equipment are needed. Local ditch association previously requested that the existing 1' flume and measurement station be relocated. Headworks are in satisfactory condition at this time. Estimate of current needs =
Modernization of instrumentation = $1,500

Radio and charging equipment = $3,000
Flume replacement will be about $1,500
New instrument enclosure (quote not yet received)
Total estimated cost will be about $ 8,000

VALENTINE MARTINEZ 08287270
No measurement instrument is on station at this time. Diversion is rarely used, but is equipped with a 1 foot wide Parshall flume, which is in fair condition. A new equipment enclosure, stilling well, radio equipment and battery charging equipment will also be needed. Headworks are in satisfactory condition at this time. Estimate of current needs =
Installation of instrumentation = $1,500
Radio and charging equipment = $3,000
Flume replacement will be about $1,500
Station renovation, new enclosure and stilling well (quote not yet received)
Total estimated cost will be about $ 8,000

MARIANO 08287300
H-510 and 28 AH battery on station, needs radio and battery charging equipment. Parshall flume is in serviceable condition. Headworks are in poor condition and should be renovated. Estimate of current needs =
Radio and charging equipment = $3,000
Flume replacement will be about $1,500
Headwork renovation project $3,500
Total cost will be about $ 8,000

FERRAN 08287400
Not equipped with data recorder. This ditch has recently been reactivated by informal agreement to use the tailwater from an upper ditch, the Mariano. The Ferran diversion dam washed away several years ago, and has not been rebuilt. Diversion dam may possibly be replaced in the future; at that time a new station would be needed. (~ $ 8,000 ; rough estimate)

TIERRA AZUL 08287600
Not equipped. The stilling well and equipment enclosure are badly damaged. The headworks are also in very poor condition. Both headworks and measurement station need to be re-built. Estimate of current needs =
New Instrumentation = $1,500
Radio and charging equipment = $3,000
Flume replacement will be about $1,500
Headwork renovation project $3,500
Renovation of enclosure and stilling well (quote not yet received, figure $2,000)
Total cost will be about $ 11,500

JOSE V MARTINEZ 08288050
Not equipped. Station has been destroyed by vandalism, and flume has been removed. Measuring station needs to be completely replaced. Headworks at POD were rebuilt by water users in 2000. Headworks are in serviceable condition. Estimate of current needs =
Radio and charging equipment = $3,000
Flume replacement will be about $1,500
New enclosure and stilling well, plus installation, (quote not yet received)
Total estimated cost will be about $ 8,000

MANZANARES Y MONTOYA 08288100
Not currently equipped with instrumentation. Parshall flume with 1 foot wide throat is in serviceable condition, however, the entire measurement station should be replaced with new equipment in order to make upgrade to real time data collection. Headworks are in serviceable condition. Estimate of current needs =
Installation of new measurement equipment = $1,500
Radio and charging equipment = $3,000

Flume replacement will be about $1,500
New enclosure and stilling well, plus installation, (quote not yet received)
Total cost estimated will be about $ 8,000

RIO DE CHAMA 08288150
Entire station was relocated and rebuilt and equipped with an H-510 unit prior to the beginning of the 2003 season. Headworks are in serviceable condition, but in need of some repair and stabilization. Estimate of current needs =
Radio and charging equipment = $3,000
Headwork repair project $1,500
Total cost will be about $ 4,500

MARTINEZ Y DURANES 08288200
H-510 unit on station. Radio and battery charging equipment needed. Existing Parshall flume is in poor condition and needs to be replaced. Headworks are in fair to poor condition, and renovation is recommended. Estimate of current needs =
Radio and charging equipment = $3,000
Flume replacement will be about $1,500
Headwork renovation project $3,500
Total cost will be about $ 8,000

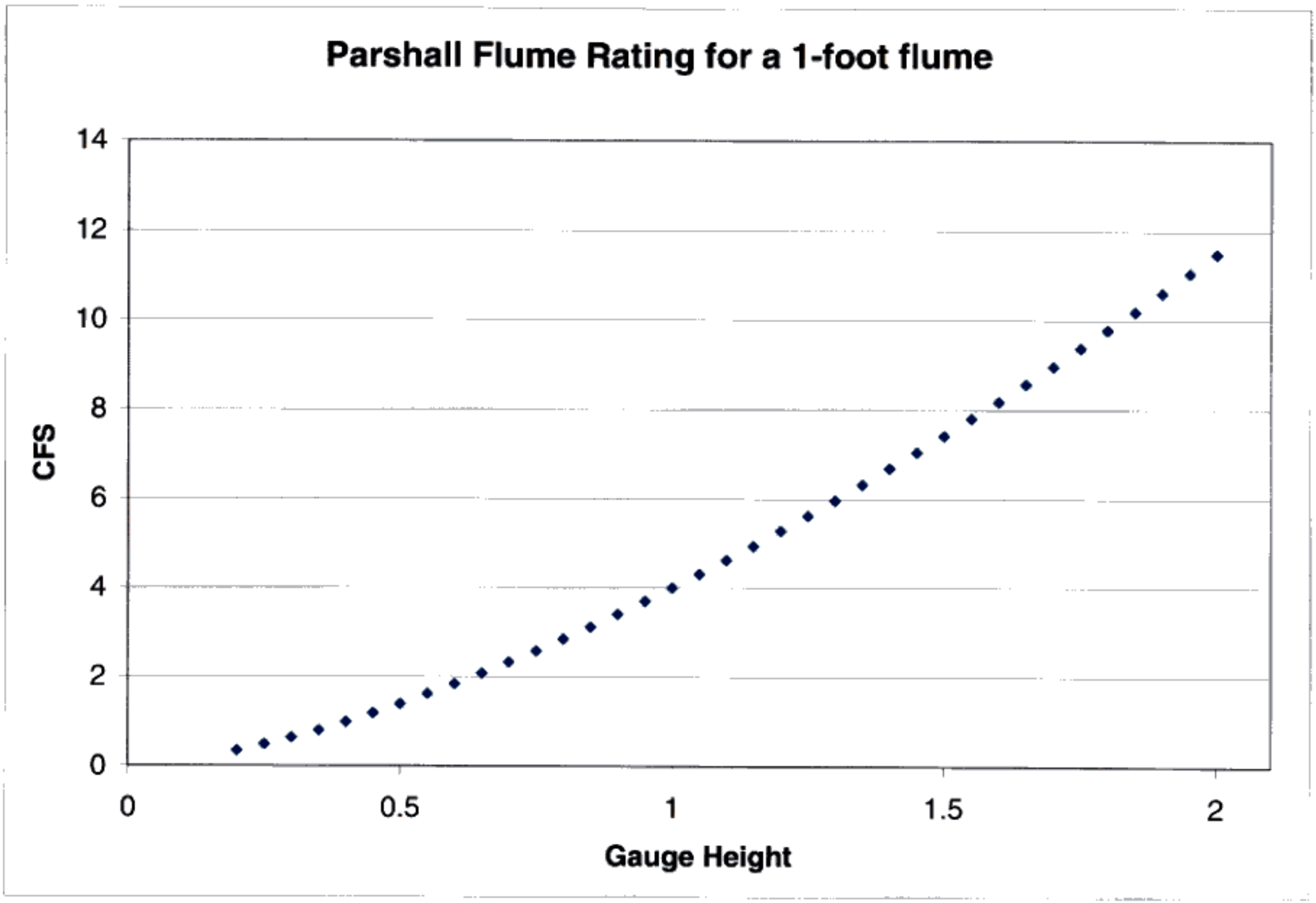
CHILI 08288300
H-510 unit on station. Radio and battery charging equipment needed. Parshall flume is in serviceable condition. Headworks are in serviceable condition. Estimate of current needs =
Radio and charging equipment = $3,000

CHAMITA 08289500
#1- not equipped, inactive, this station has been removed due to Corps of Engineer Project work, and replacement is not anticipated.
#2- H-510 and 28 AH battery on station, radio and battery charging equipment are needed. Headworks are in serviceable condition. Estimate of current needs =
Radio and charging equipment = $3,000

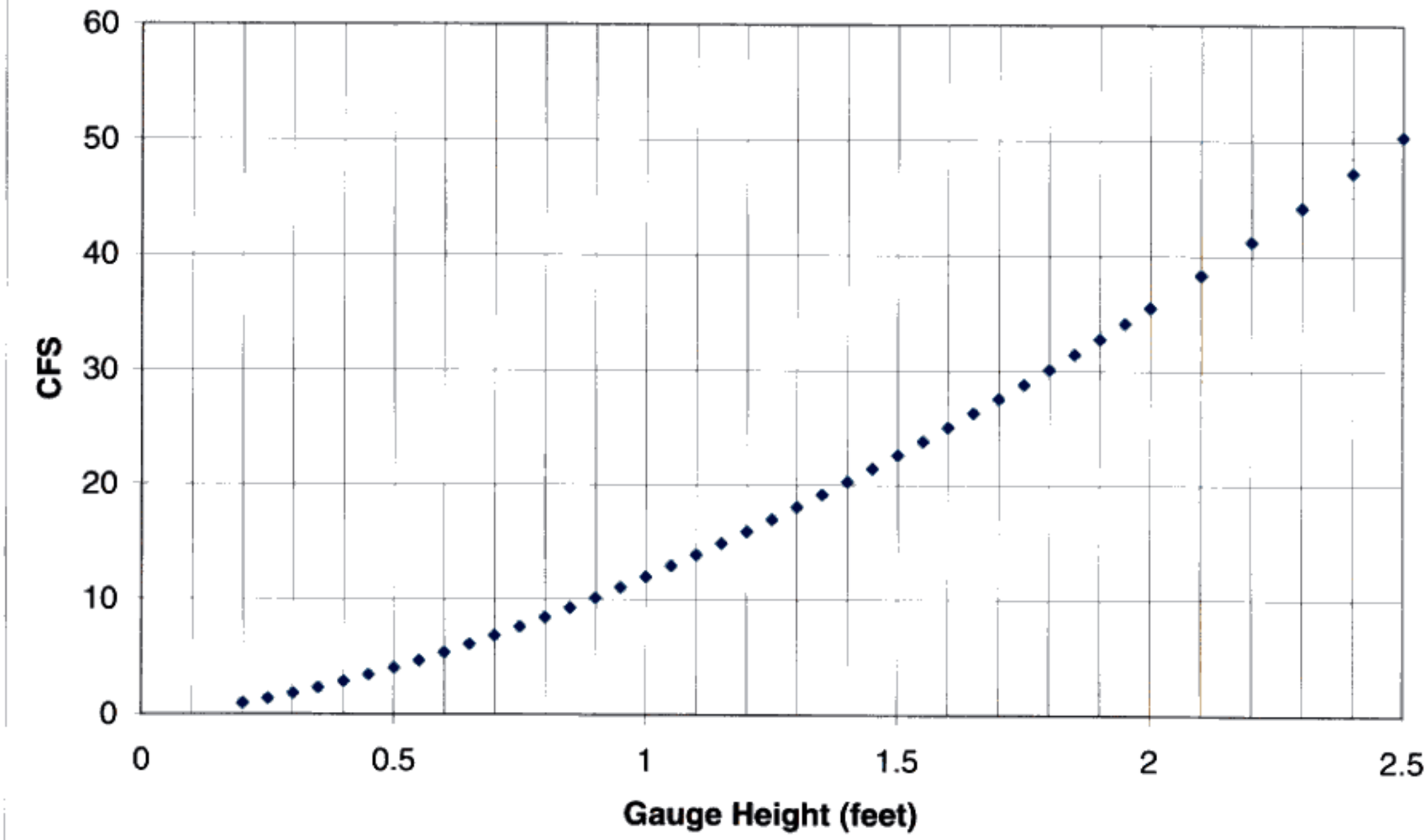
A return flow measurement station on this ditch at Chamita has been previously proposed, a new station will need to be located, designed and constructed. Estimated cost =
Instrumentation = $1,500
Radio and charging equipment = $3,000
Flume installation will be about $1,500
New enclosure and stilling well will be needed (quote not yet received)
Total cost will be about $ 8,000

HERNANDEZ 08289800
H-510 is on station. Radio and battery charging equipment are needed. Headworks are in serviceable condition. Estimate of current needs =
Radio and charging equipment = $3,000

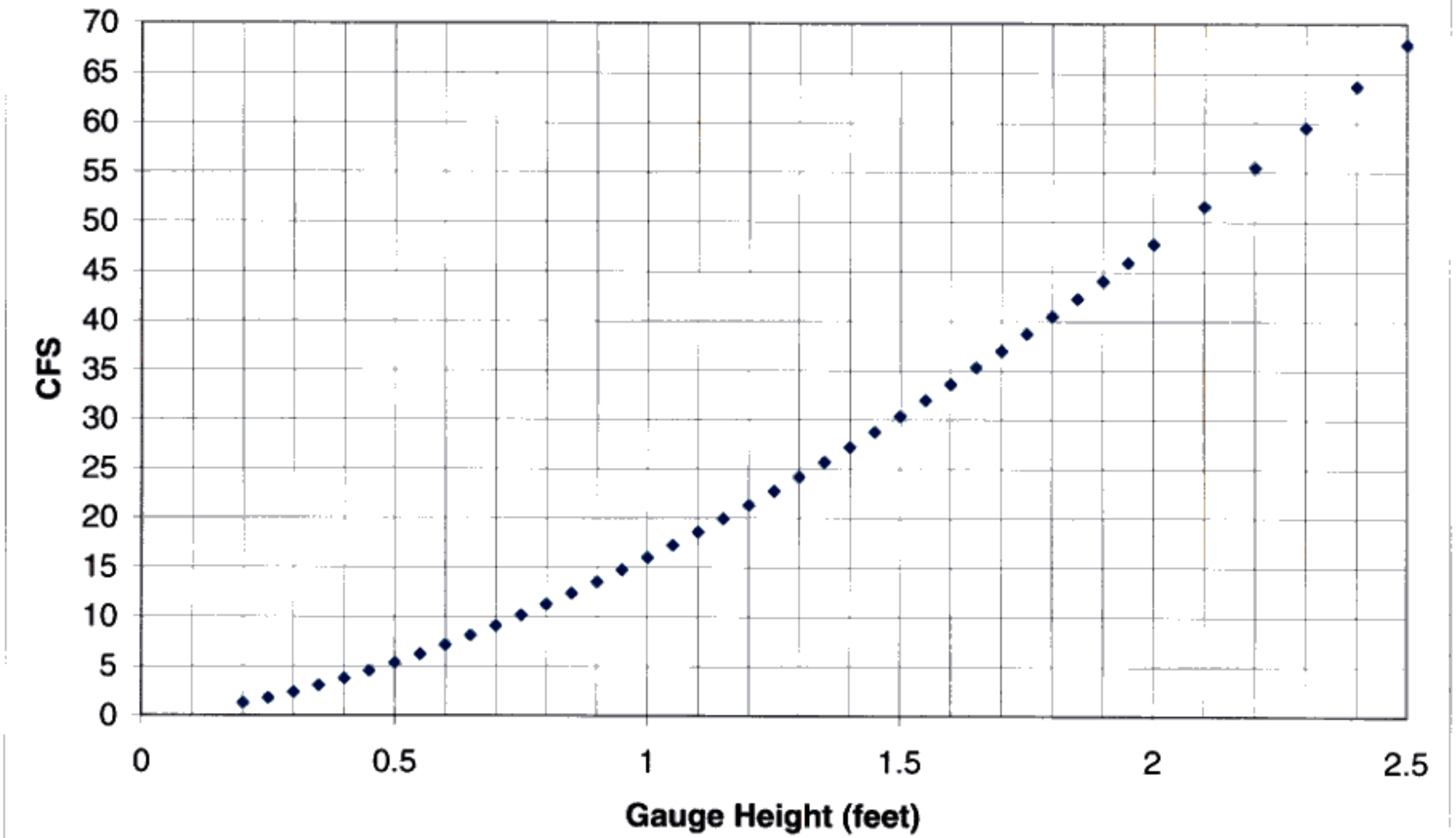
SALAZAR 08290100
H-510 unit and 28 AH battery on station. Radio and battery charging equipment are needed. Flume is compromised by subsidence and in need of replacement, the whole station should probably be replaced. Headworks need repair or renovation. Estimate of current needs =
Station replacement = $8,000
Radio and charging equipment = $3,000
Headwork renovation project $3,500
Total cost will be about $ 14,500


Parshall Flume Rating for a 1-foot flume
CFS
14
12
10
8
6
4
2
0
0
0.5
1
1.5
2
Gauge Height

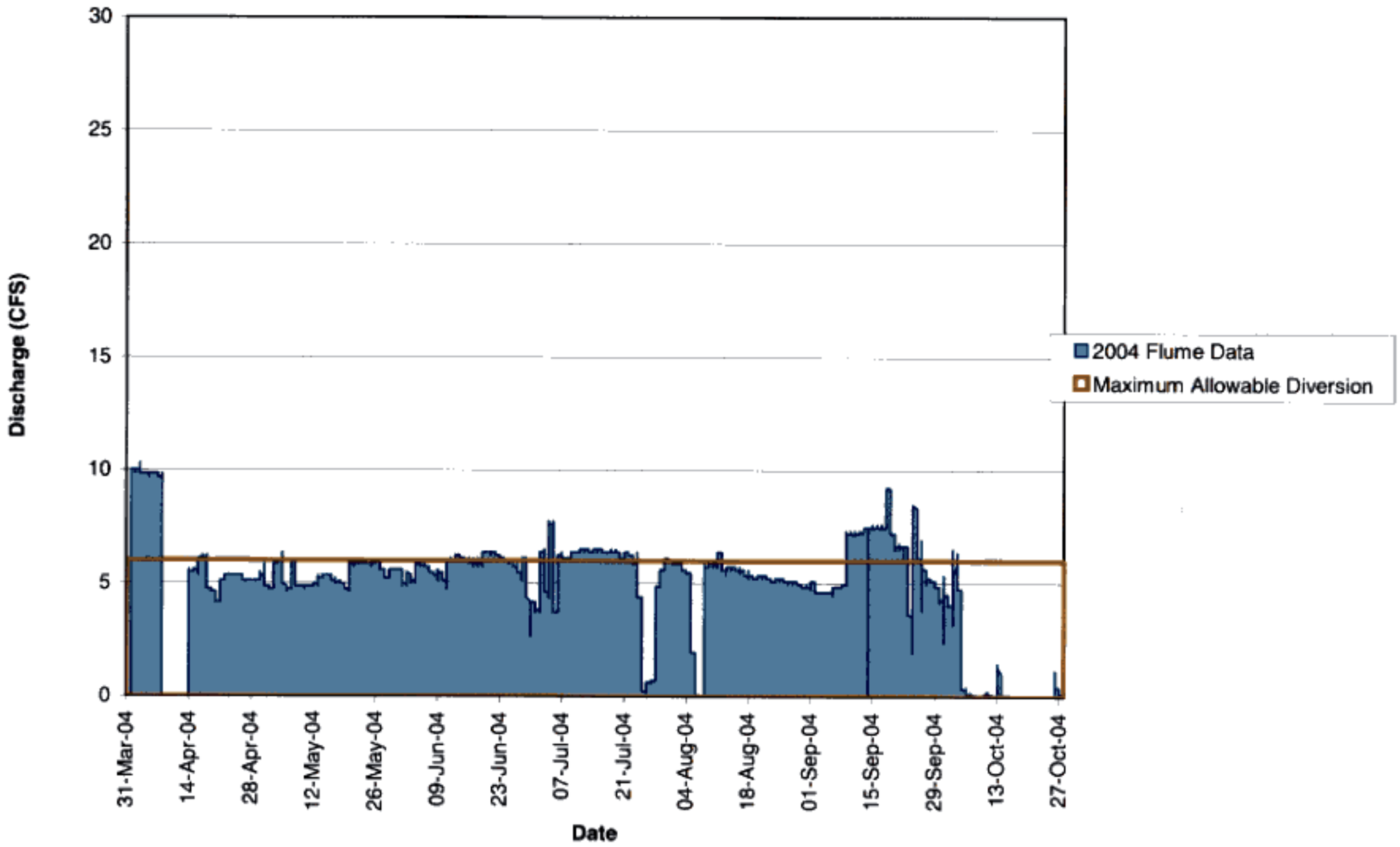
Rating for a 3-foot Parshall Flume



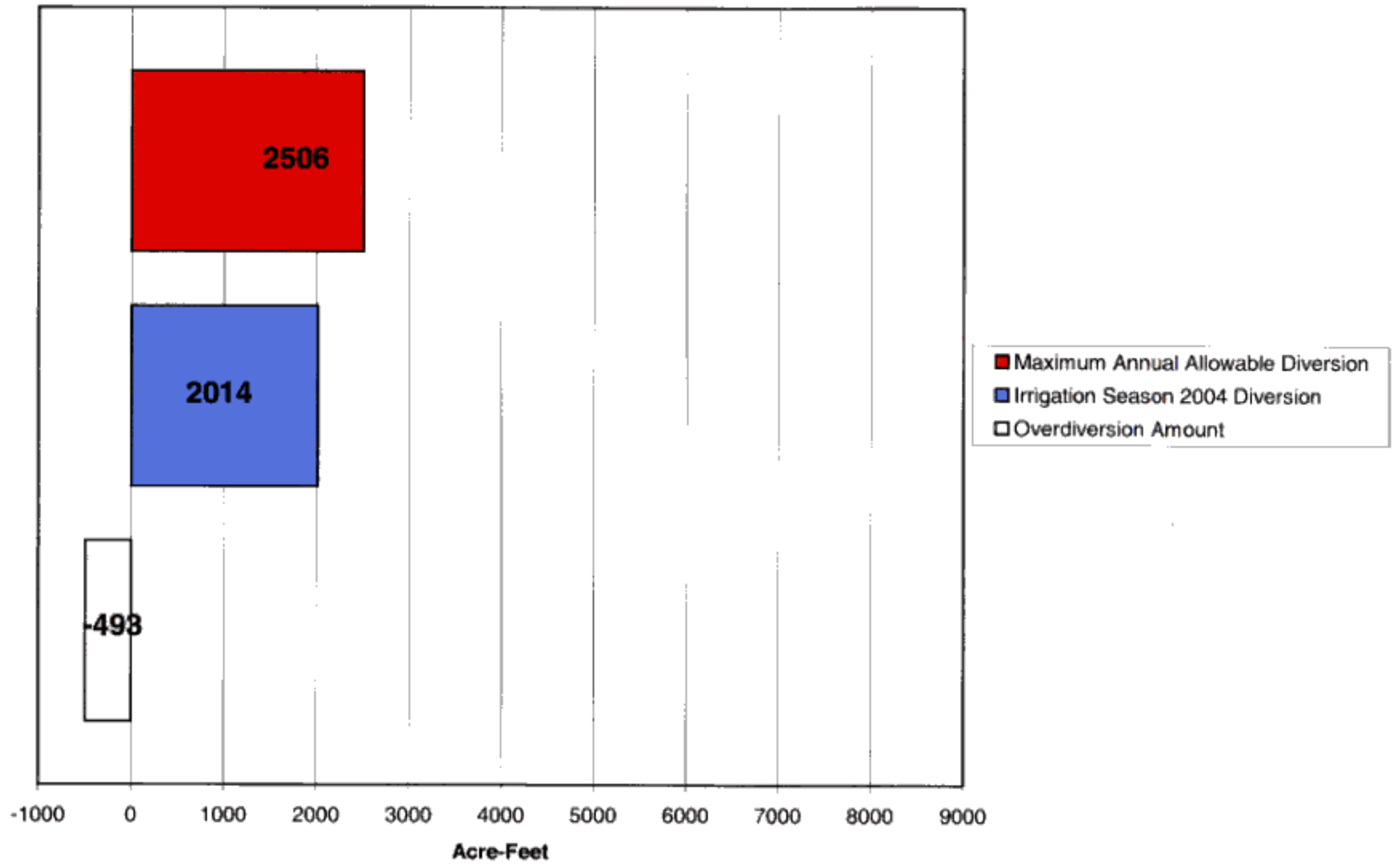
Rating for a 4-foot Parshall Flume



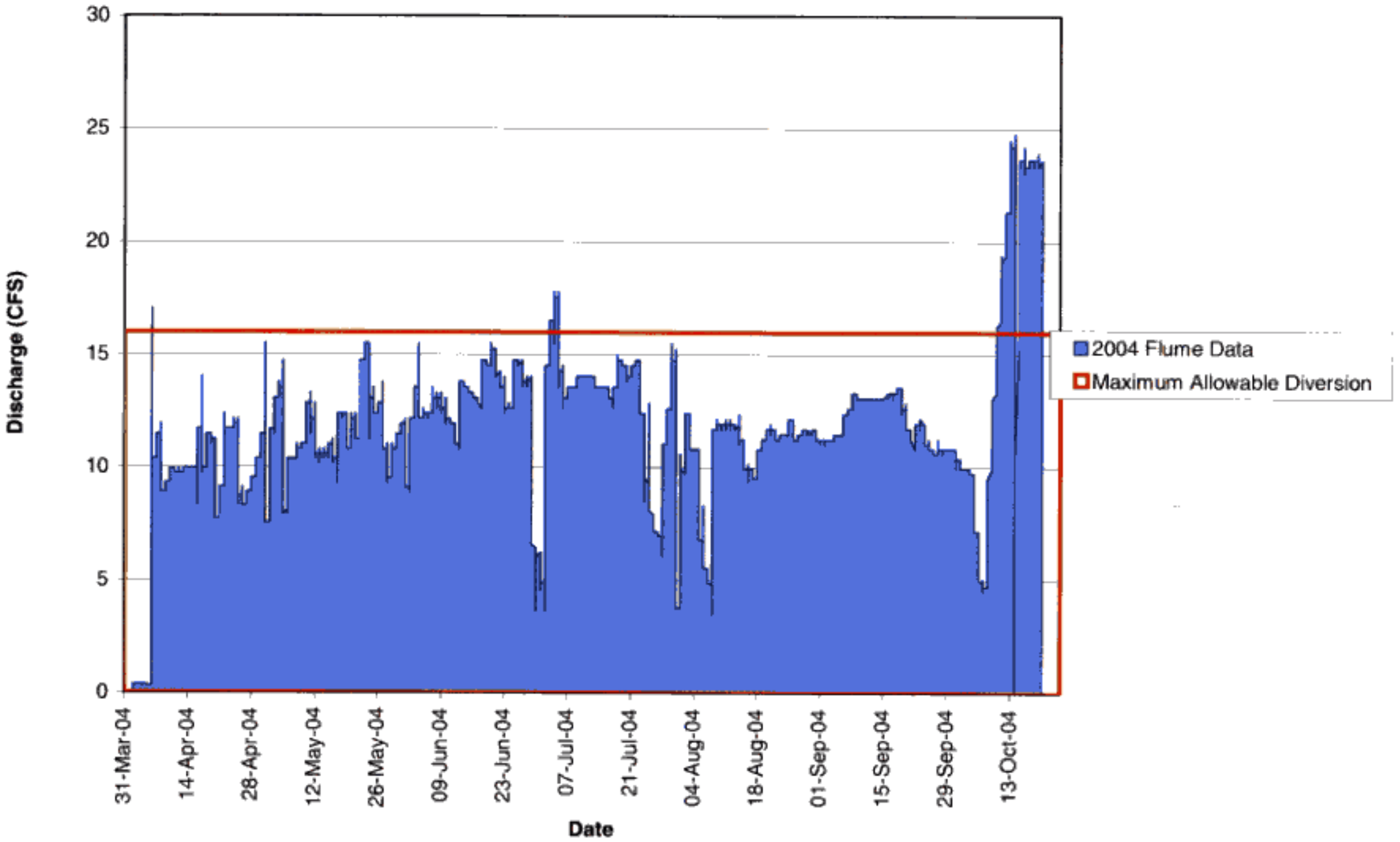
A.T. Acequia Hydrograph -2004



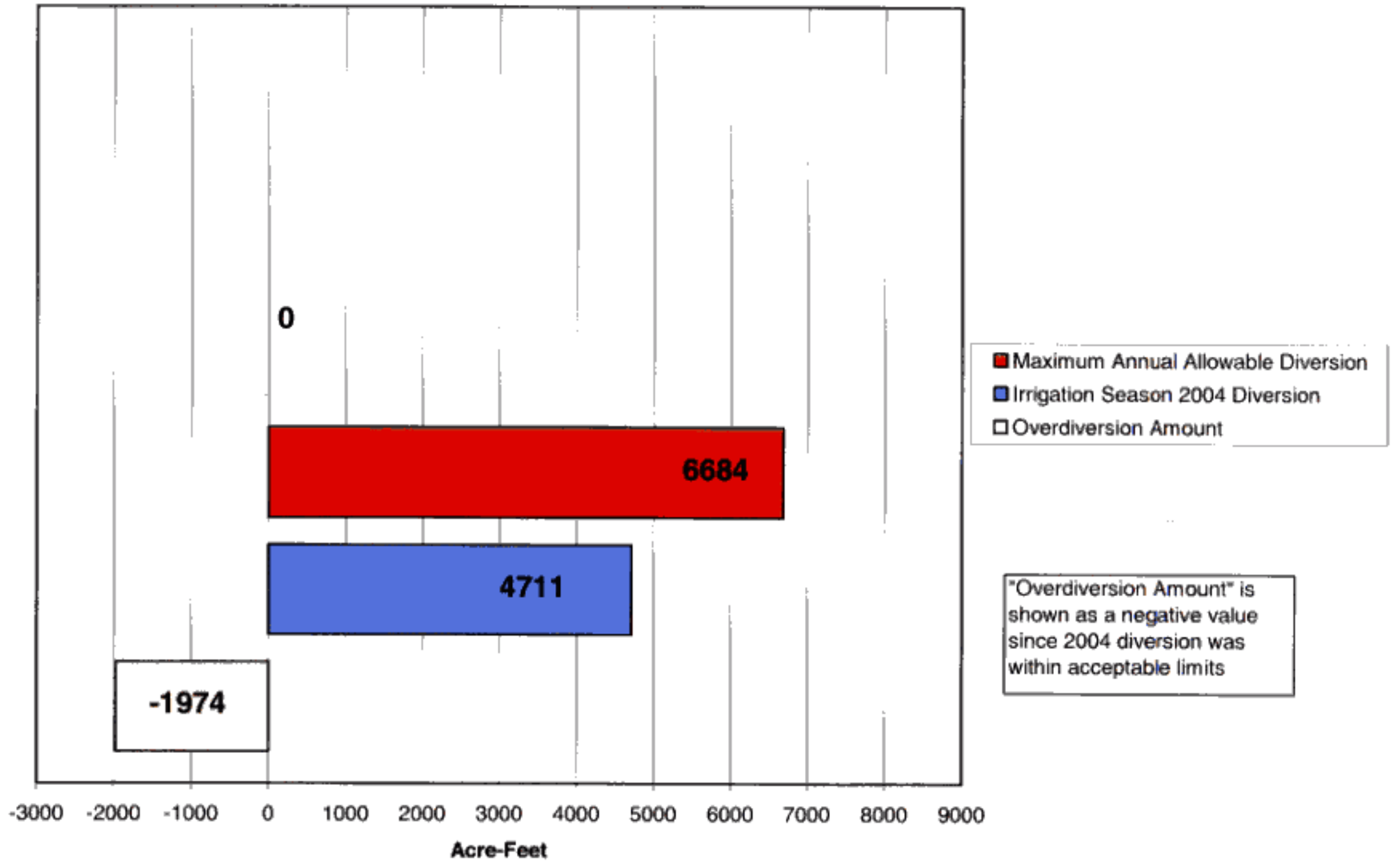
A.T. Acequia Diversion Volume



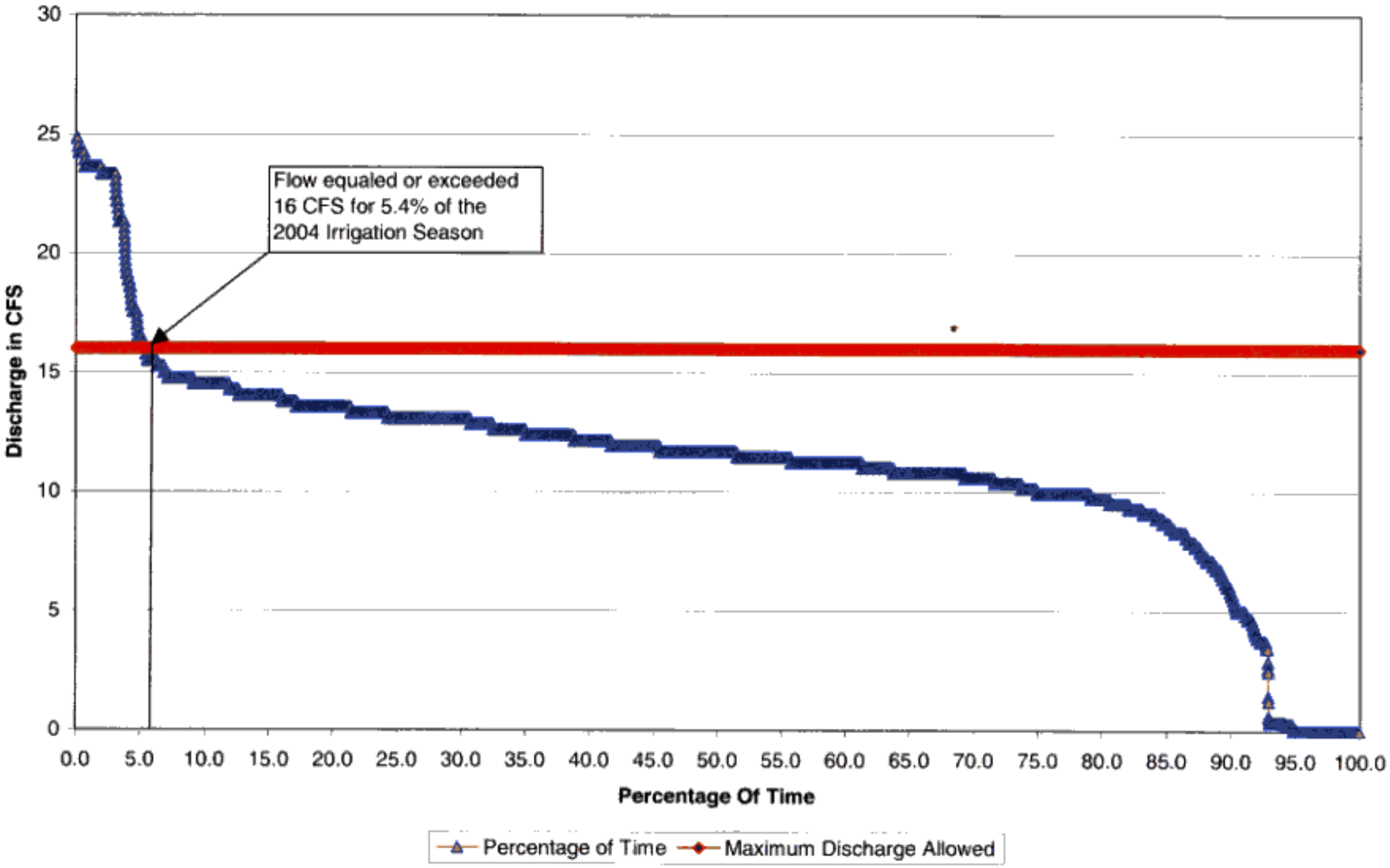
J.P. Gonzales Acequia Hydrograph -2004



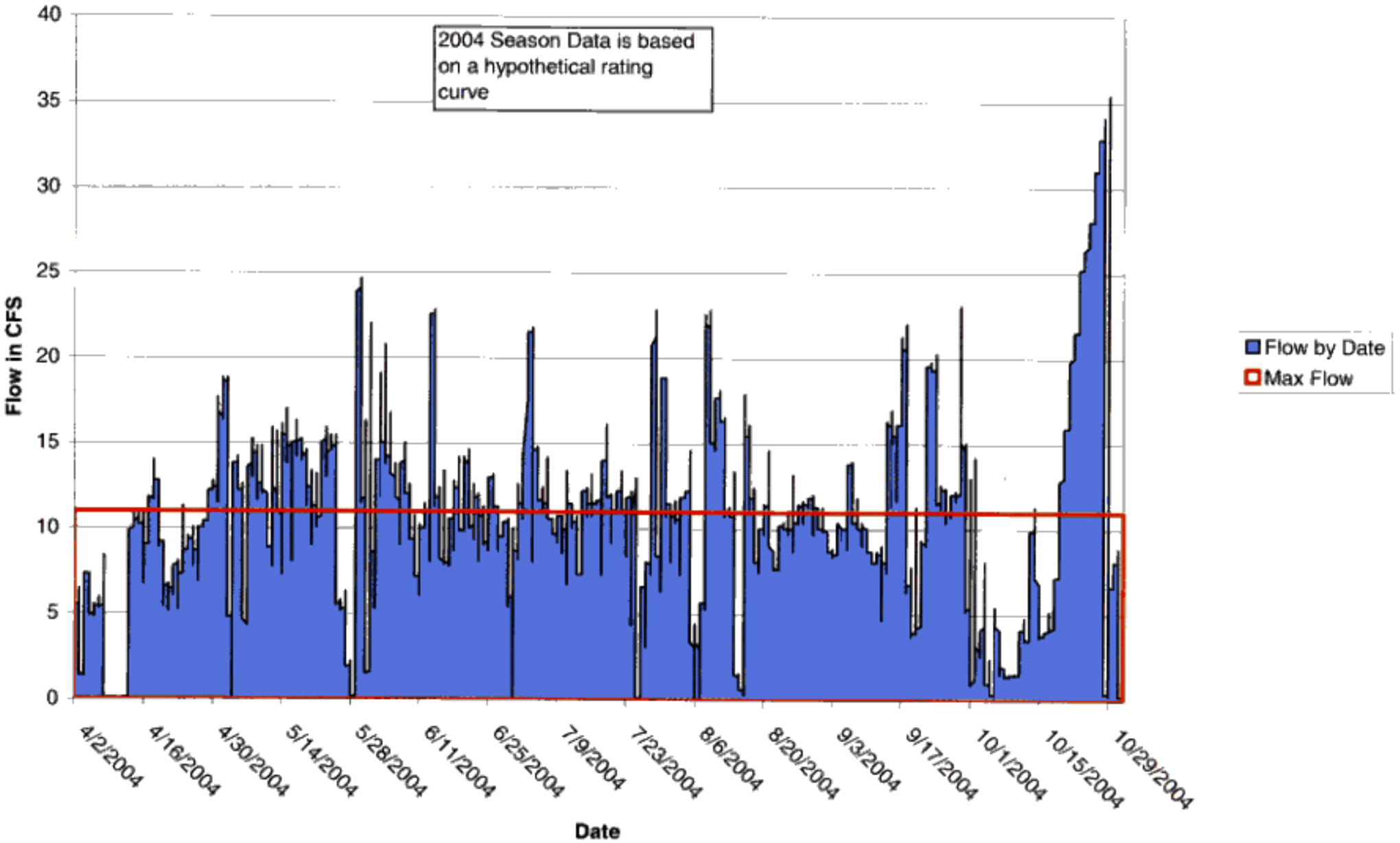
J.P. Gonzales Acequia Diversion Volume 2004



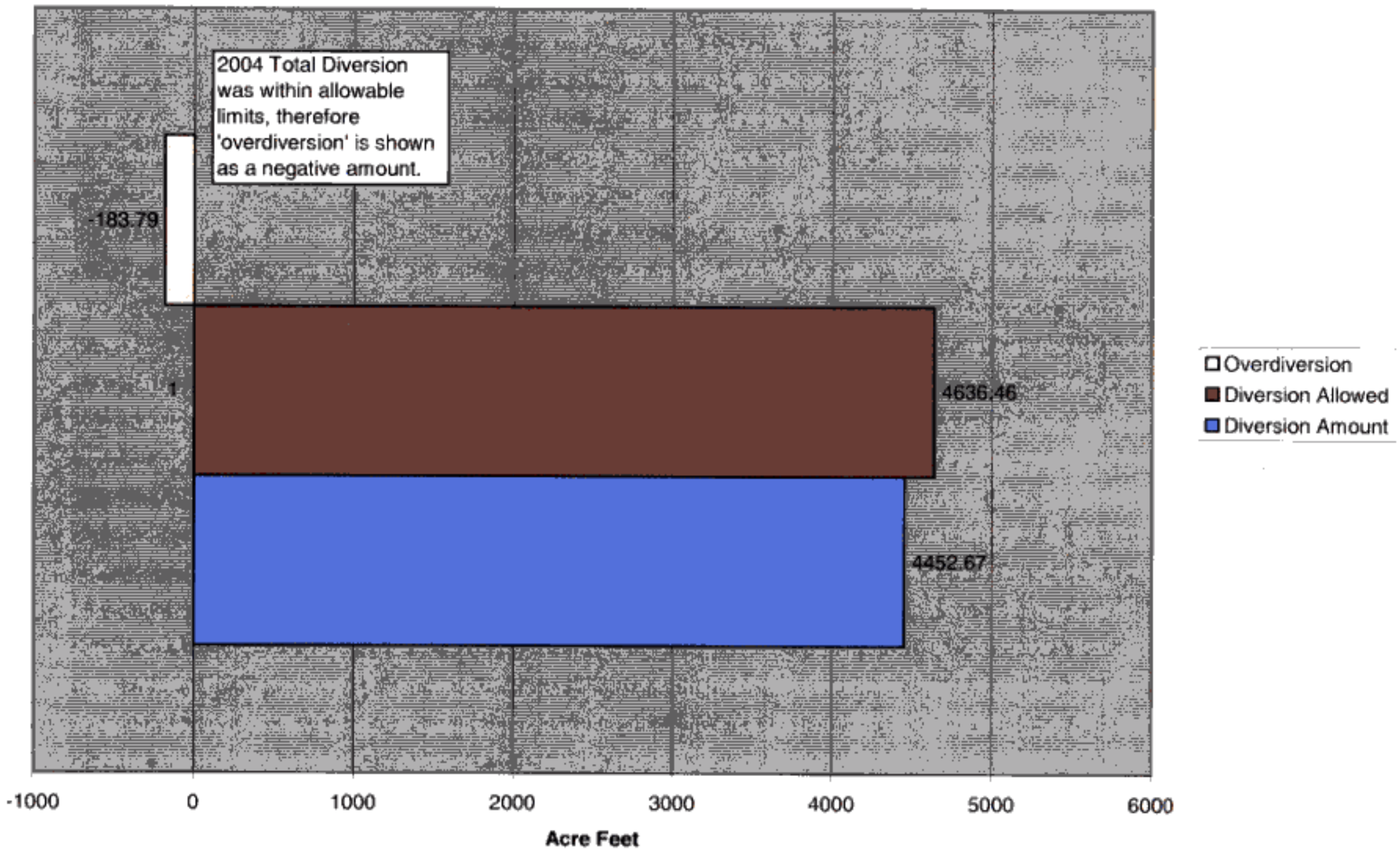
Flow Duration Curve J.P. Gonzales 2004



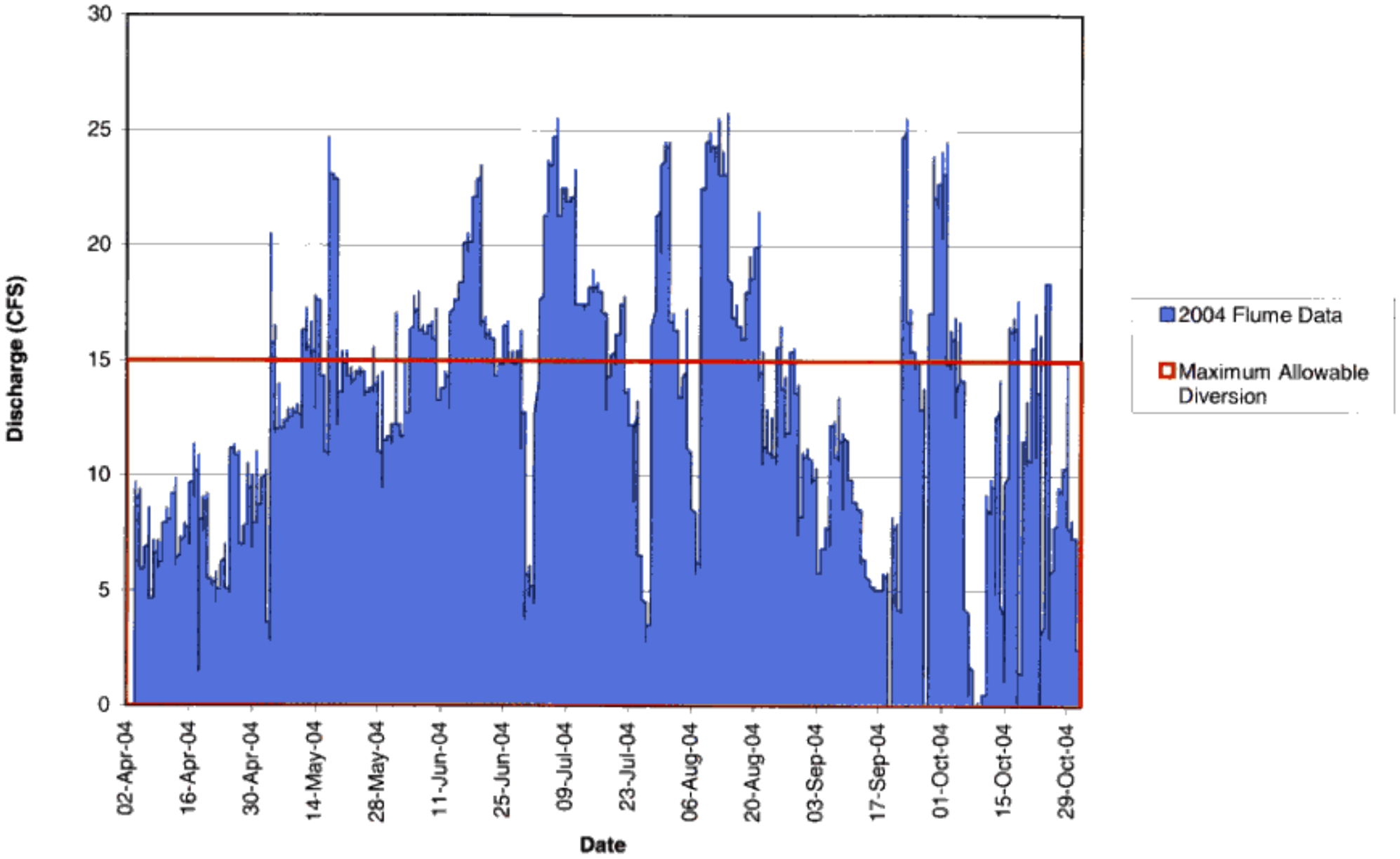
Acequia del Rio de Chama 2004



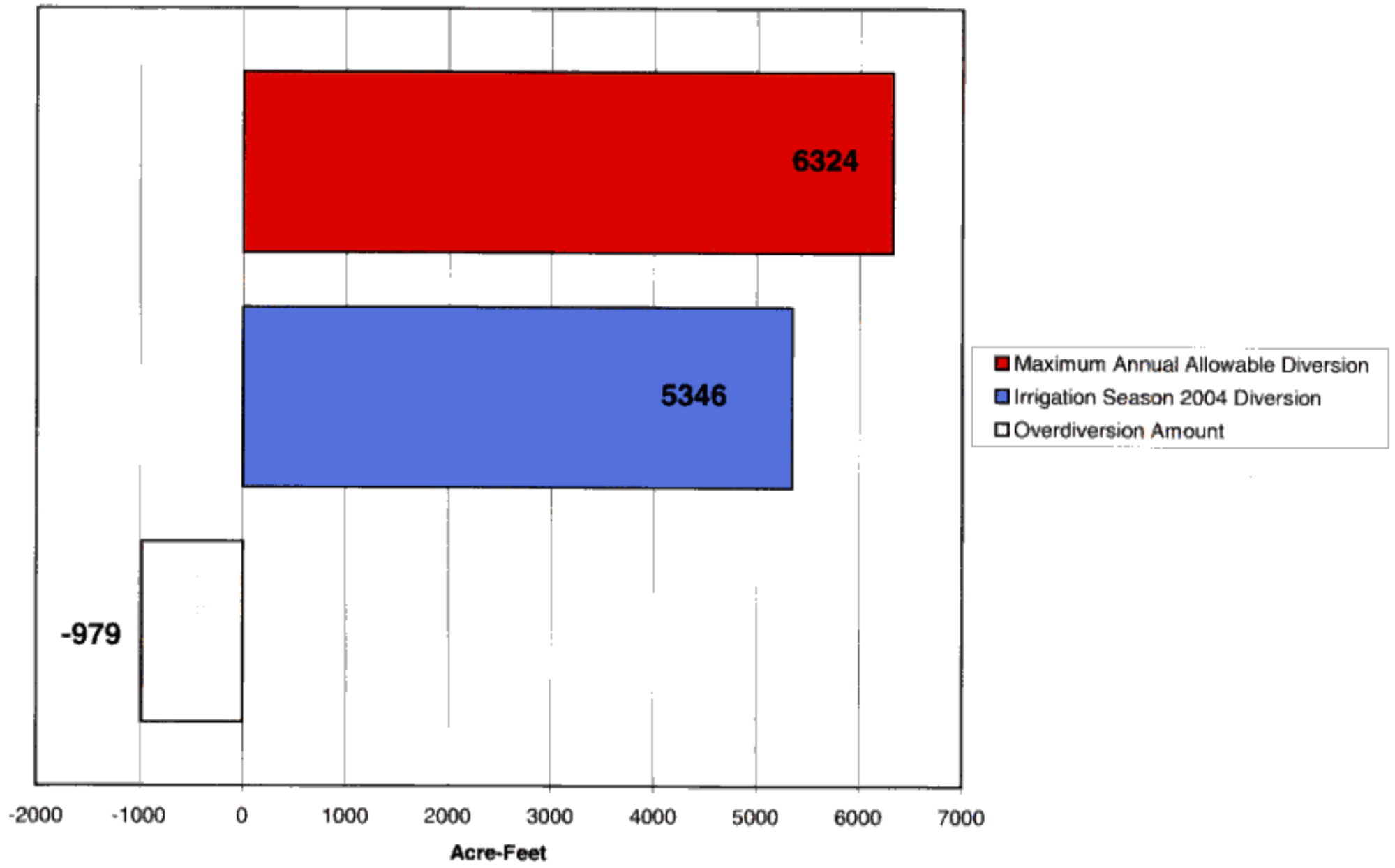
Acequia del Rio de Chama-2003 Irrigation Volume



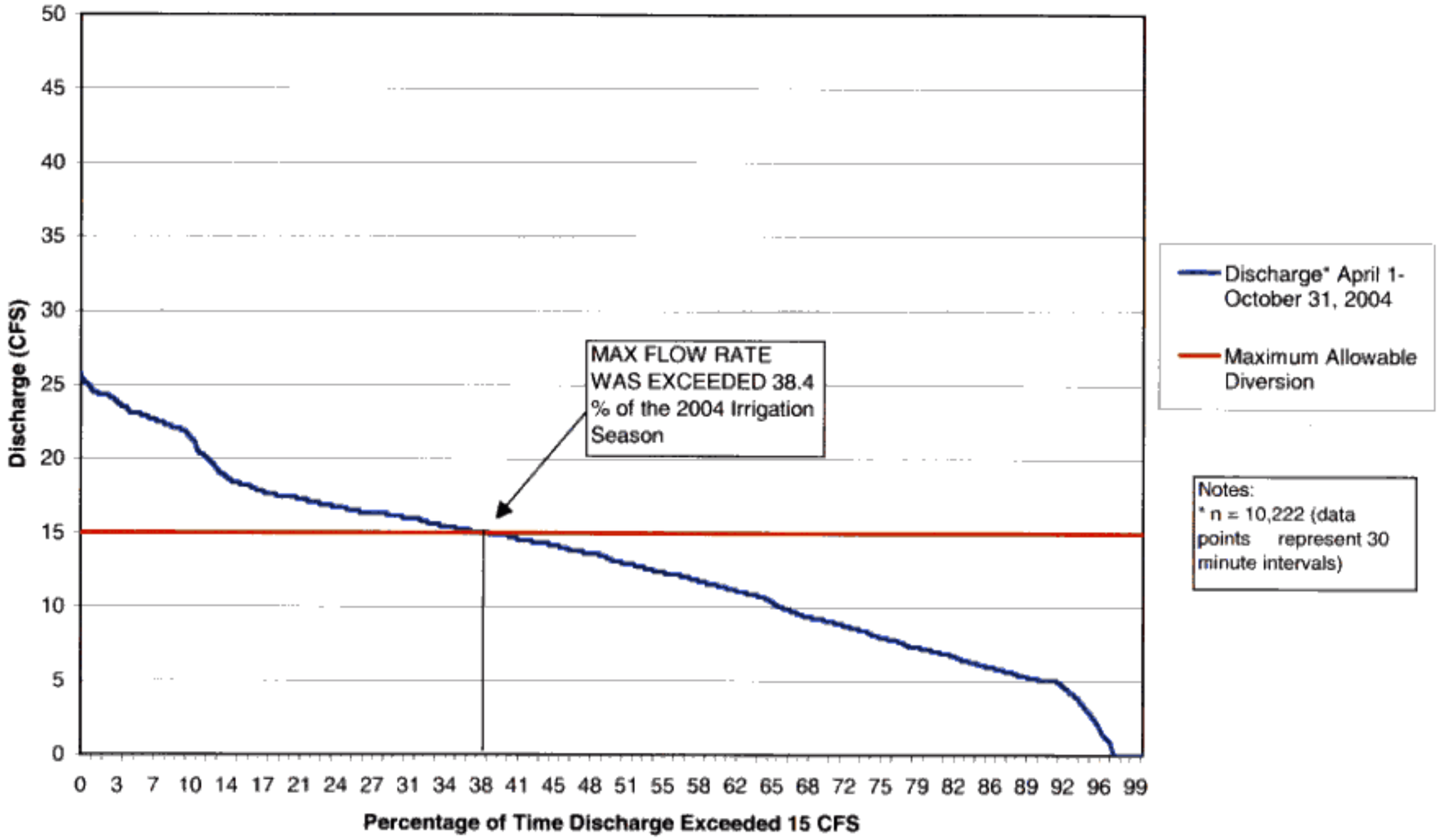
Martinez y Duranes Acequia Hydrograph -2004



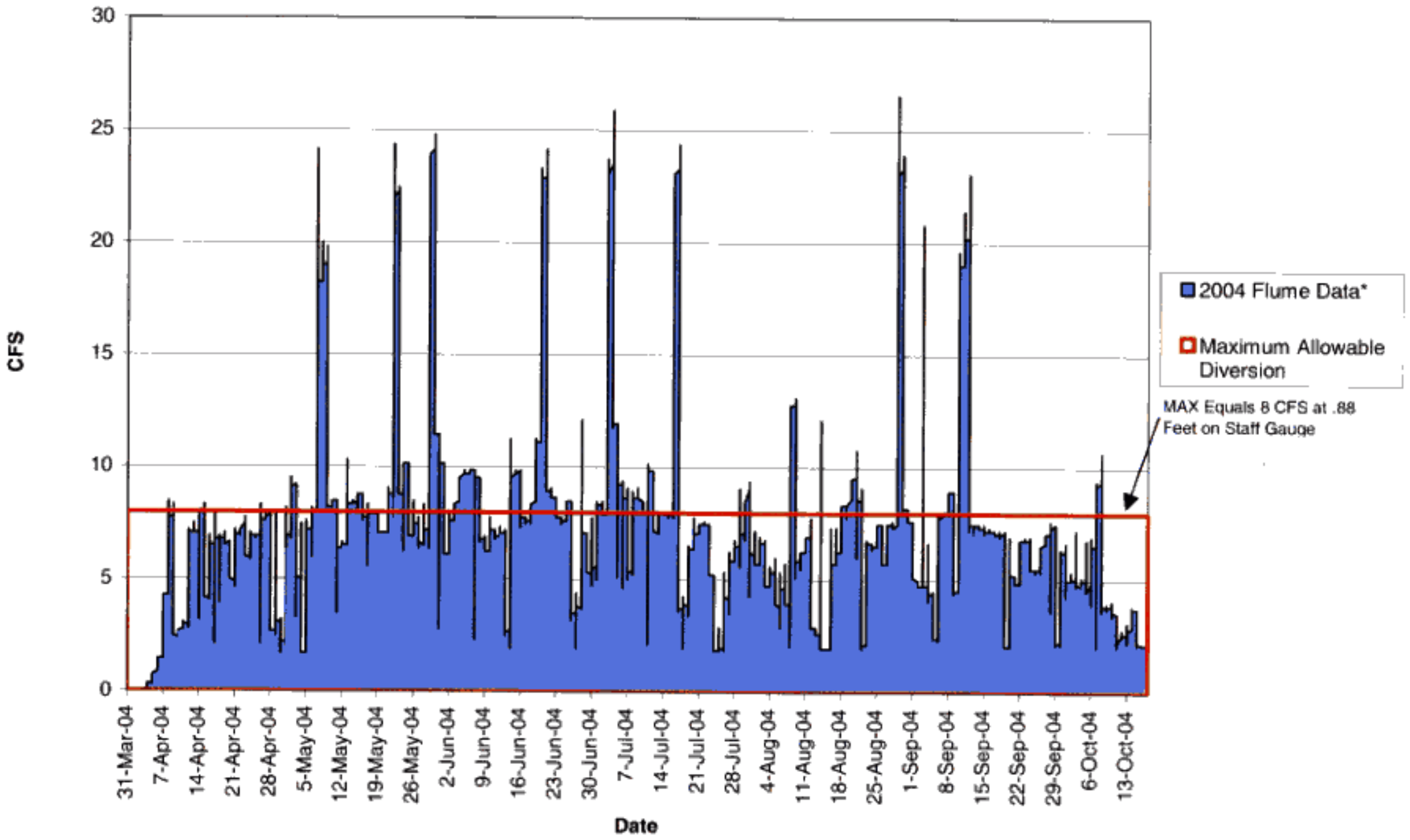
Acequia de Martinez y Duranes Diversion Volume



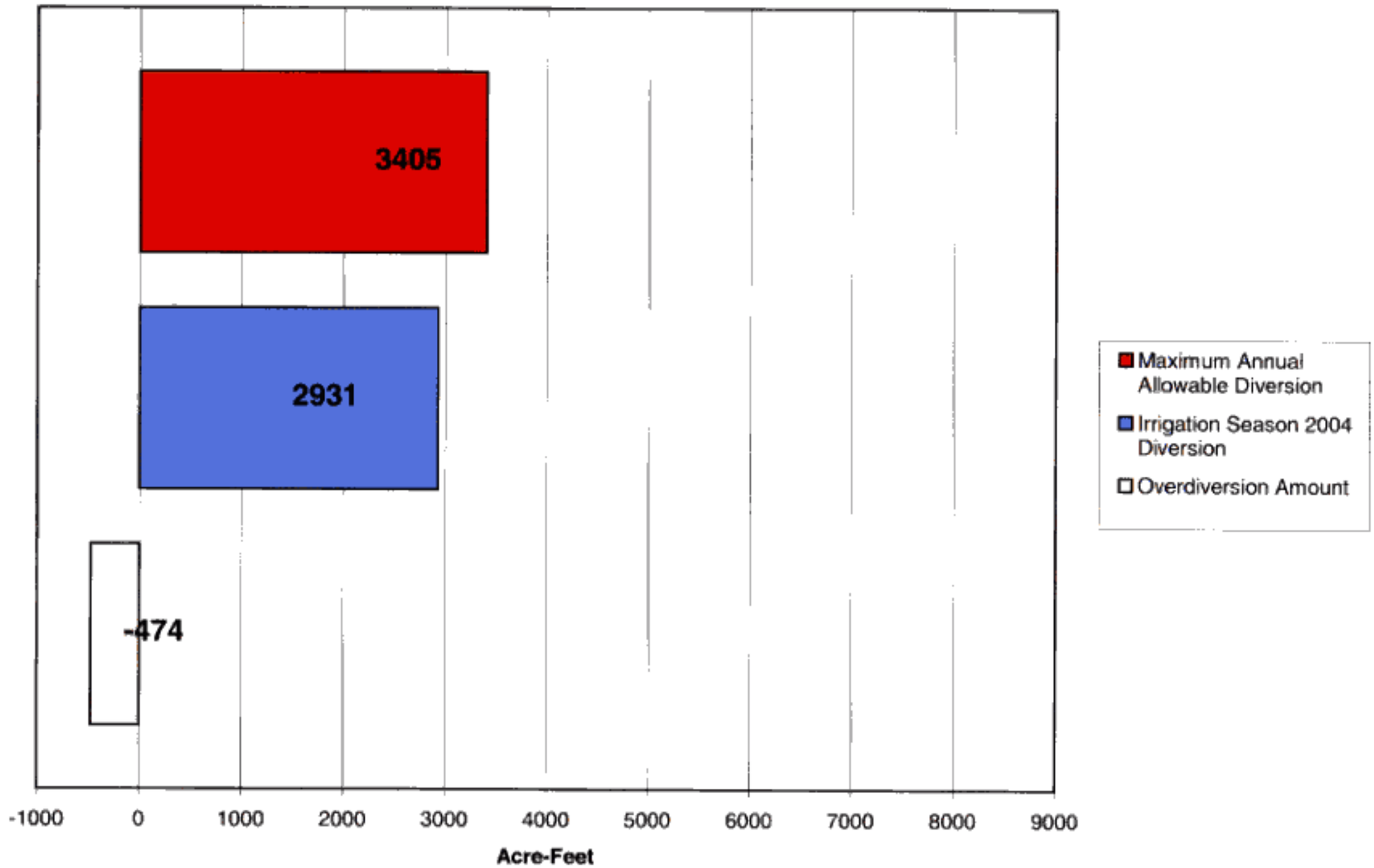
Flow Duration Curve Martinez y Duranes
2004



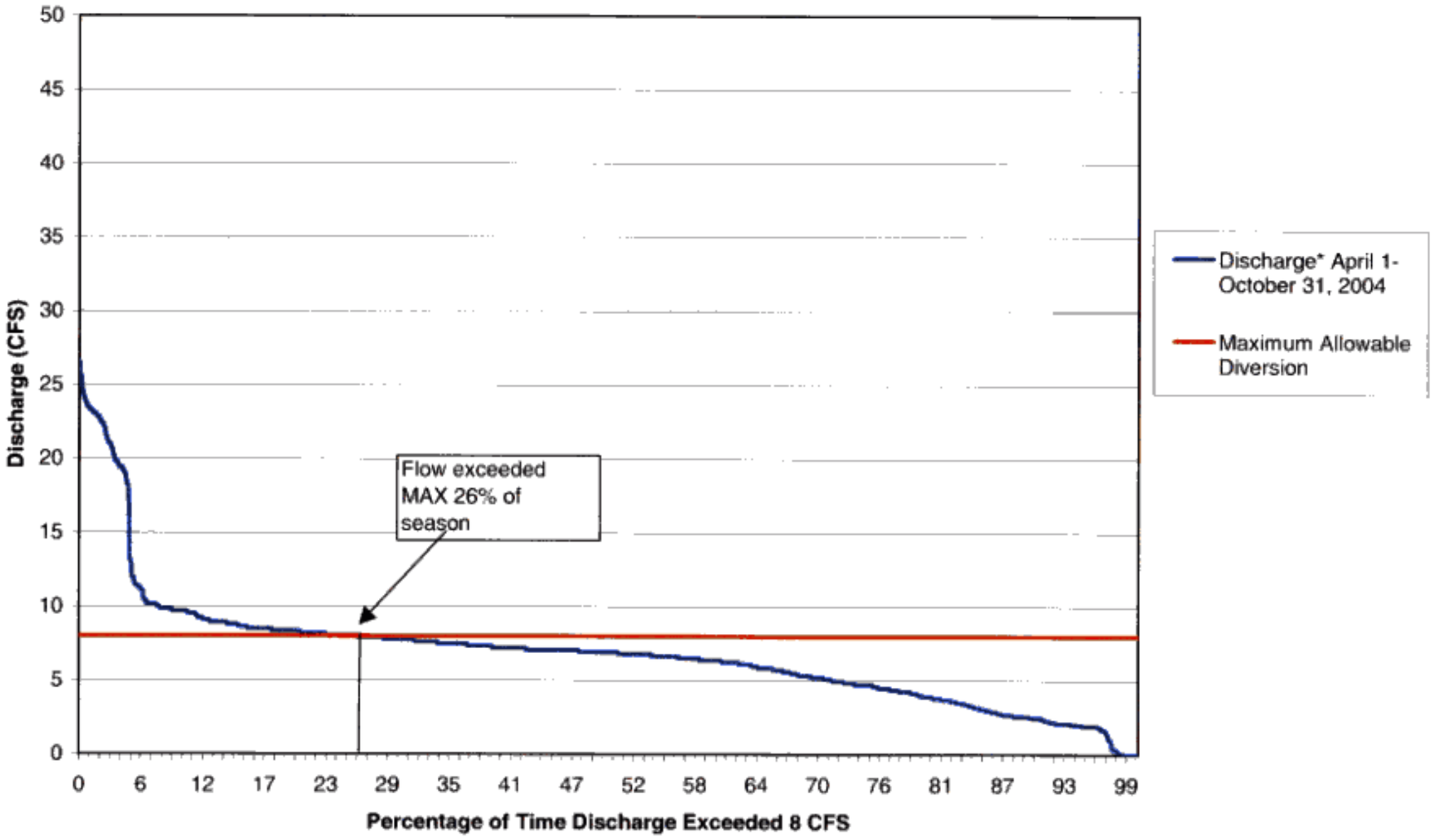
Acequia Chile Hydrograph - 2004



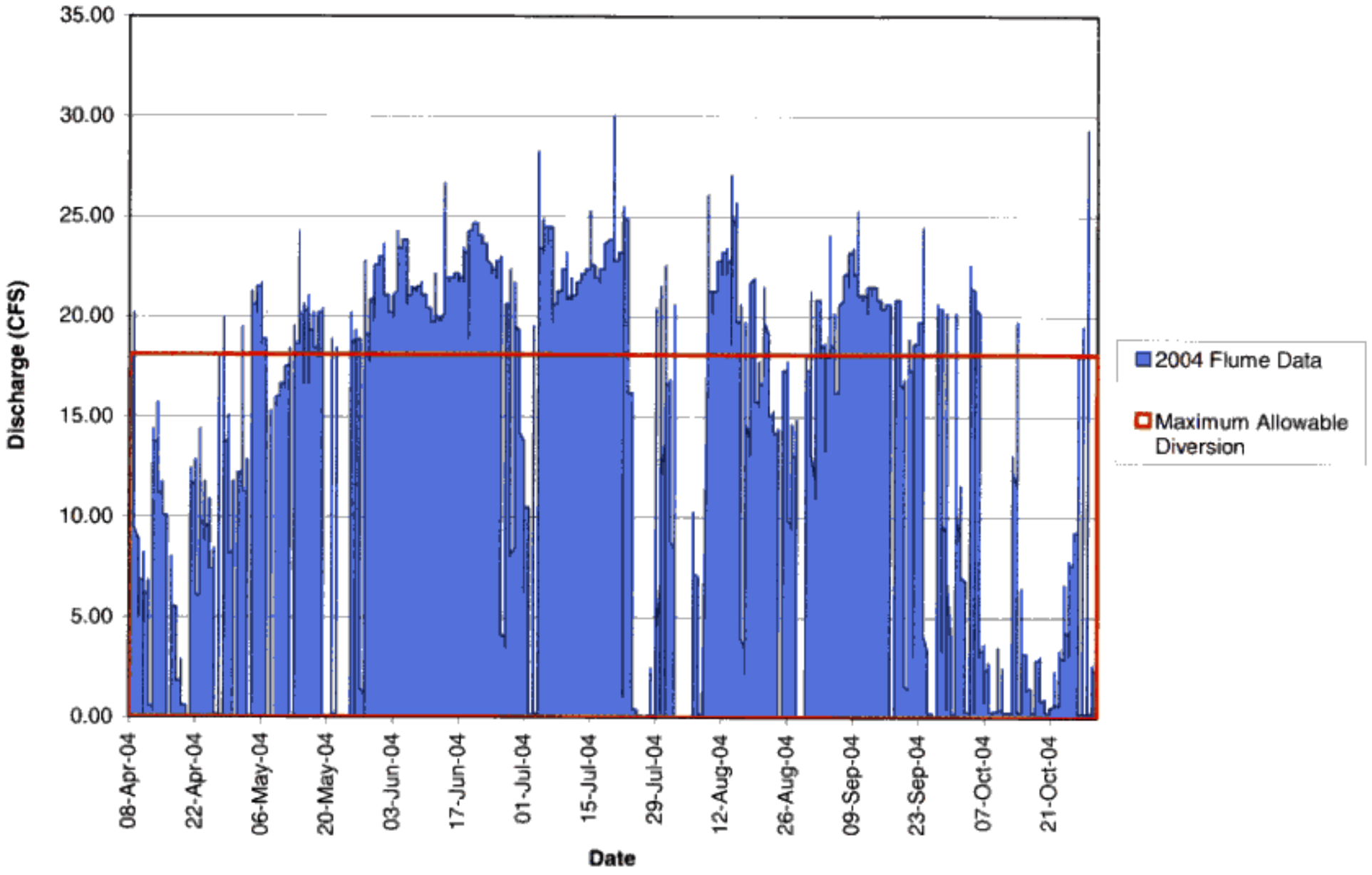
Acequia Chili Diversion Volume



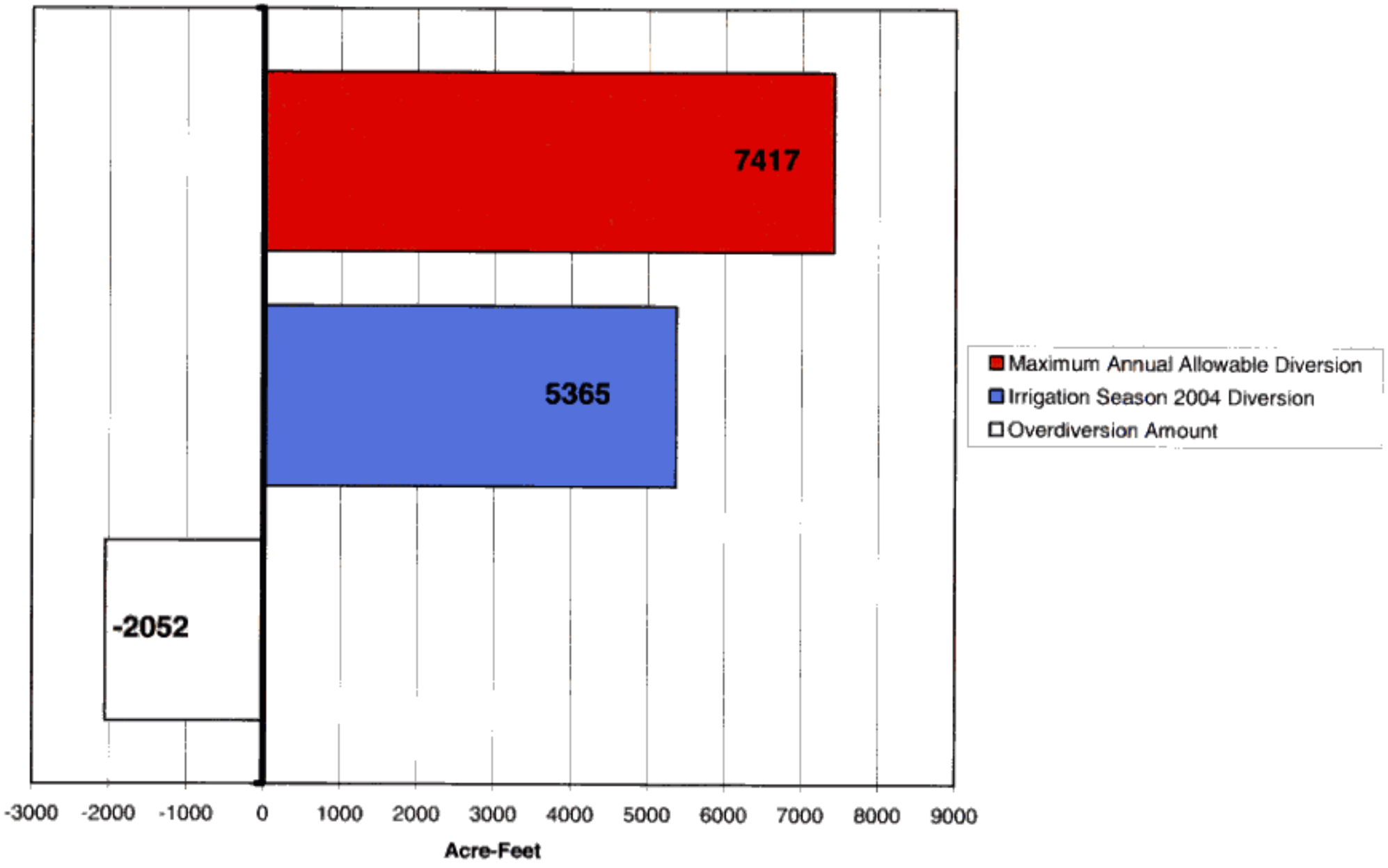
Flow Duration Curve Acequia de Chili
2004



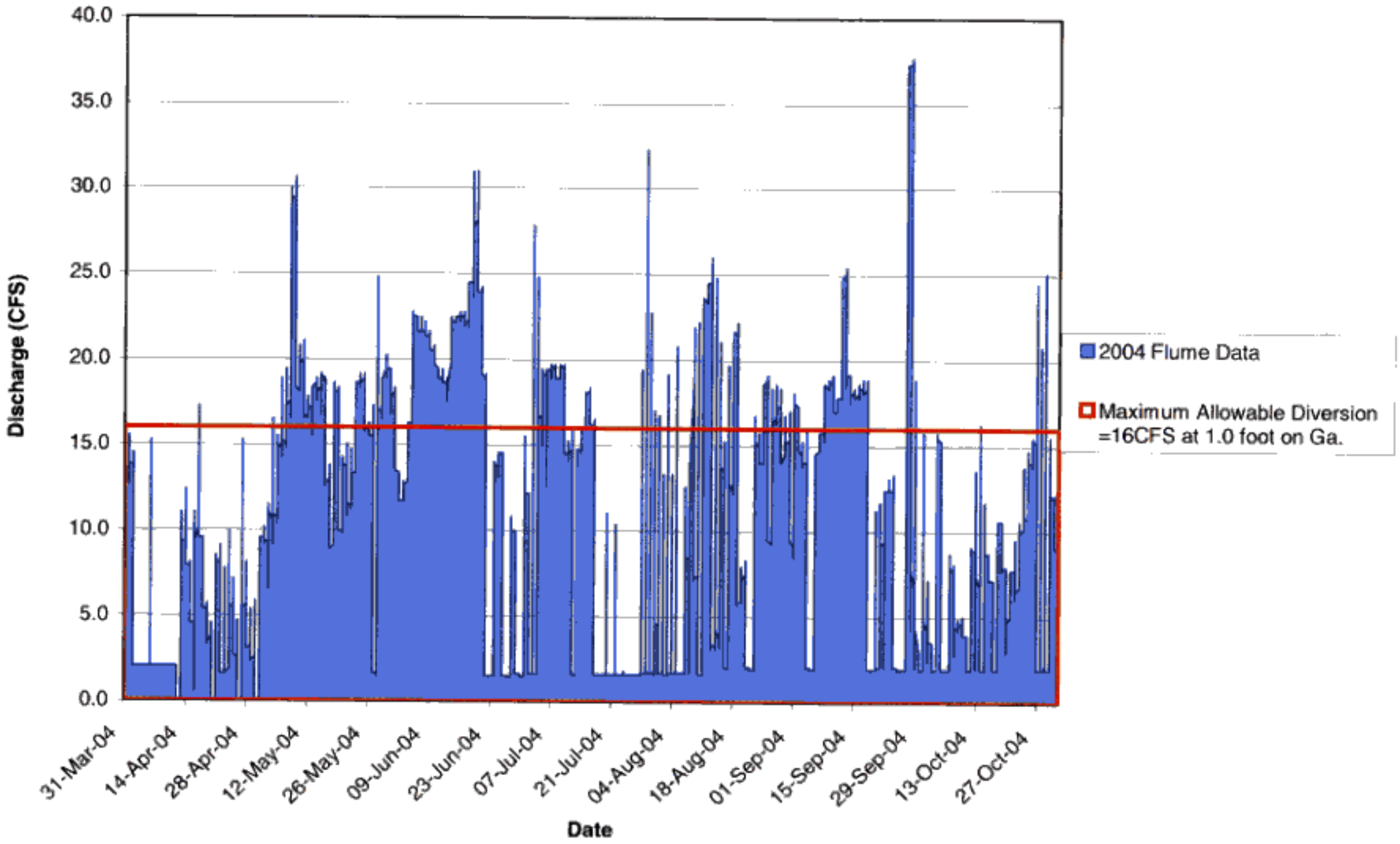
Acequia Chamita Hydrograph -2004



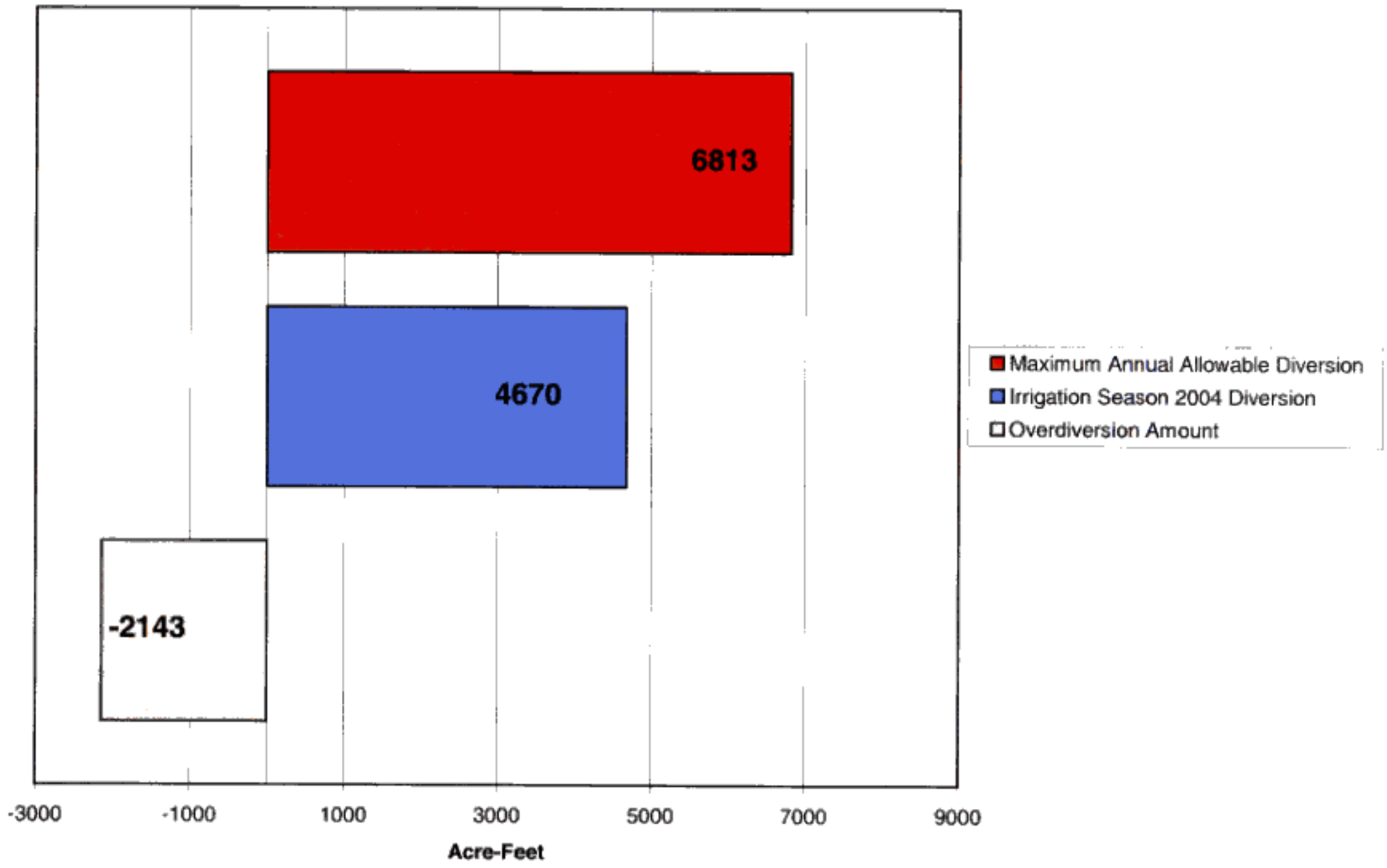
Acequia Chamita Diversion Volume



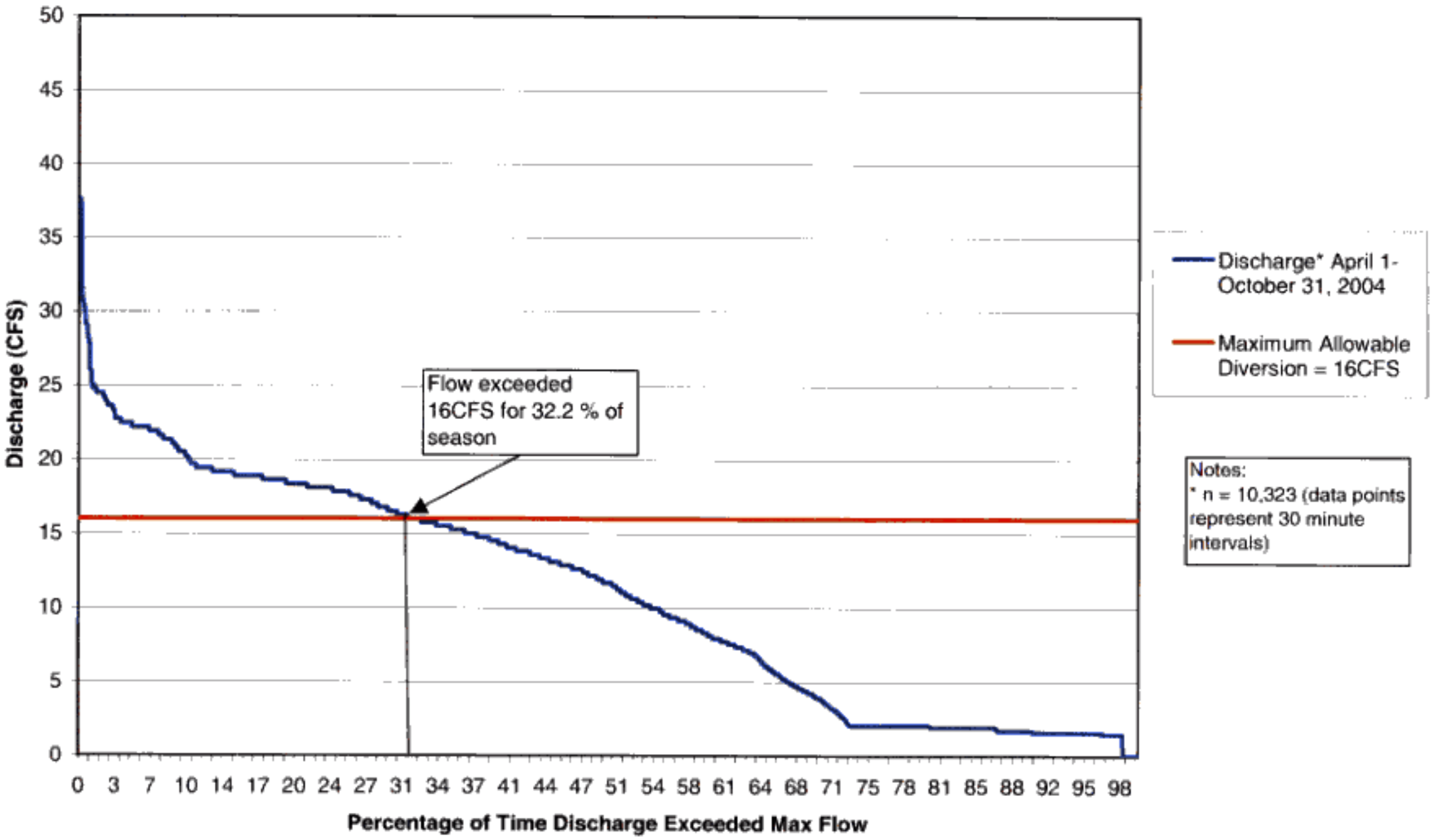
Acequia de Hernandez Hydrograph 2004



Acequia de Hernandez Diversion Volume



Flow Duration Curve Acequia de Hernandez
2004



MEMORANDUM
OFFICE OF THE STATE ENGINEER
WATER RIGHTS

Date: 9 June 2004

Subject: Rio de Chama Acequia Association - Use of Stored Water
Calculation Method for 2004 Irrigation Season

To: Kevin Flanigan, Interstate Stream Commission
Bill Miller, Consultant for Rio de Chama Acequia Association
Dennis Romero, Interstate Stream Commission

Cc: Peter Burck, Hydrology
Buck Wells, Rio Chama Watermaster

From: Paul Wells

INTRODUCTION

The attached calculation method (attachment A) will be used to determine the total amount of stored water in Abiquiu Reservoir used by the Rio de Chama Acequia Association during the 2004 irrigation season. The model relies on reasonable assumptions based on the best information available. The model has been in use since the 2000 irrigation season and continues to be refined over time.

The calculation method determines the use of stored water by the Rio de Chama Acequias Association for each day of the irrigation season. Each daily calculation is based on the hours of 1 am to midnight at the Chamita Gauge.

The calculation method treats the RCAA as one unit. At this time, treating the association as one unit is administratively preferable to making a calculation for each ditch. The current method may change in the future as better instrumentation and measurement devices come on-line.

PLANS FOR THE 2004 IRRIGATION SEASON

The following updates have been made to the model for the 2004 irrigation season:

1) The acreage used in the bosque credit calculation has been updated from 1622 to 850 acres, based on an updated review of aerial photos for the region.

2) The calculation for the stretch of the Rio Chama between El Vado and Abiquiu Reservoir was changed to charge losses in a prorated share between native flows and project water.

Additional updates and projects planned for 2004 include:

1) Investigate ditch return flows by installing a flume on the Acequia Chamita. This will provide a starting point on what amount of water is directly returned to the river system.
3) Should return flow credits off of the Chamita and Hernandez gauges be adjusted to account for the variability in return flow throughout the irrigation season?
3) Natural flow into Heron Reservoir may be updated on a monthly basis through the irrigation season.
4) Alternate methods for modeling the use of stored waters by the RCAA continue to be explored by the model team. At this time, the current method employed is considered the best available given the current data and measurement resources available. However, an alternative method needs to be developed to provide for QA/QC of the model.
    a) Base a model on the measured flow into the member ditches of the RCAA. The Rio Chama Watermaster administers the ditches between Abiquiu Reservoir and the confluence of the Rio Chama with the Rio Grande. By taking the measurements of the acequias, the amount of water diverted off of the Rio Chama is known, but the use of water by the acequias is not quantifiable. Factors that are difficult to quantify include unmeasured return flow points, some of the lower acequias re-divert water that has flowed through member ditches upstream, there is return flow to the Rio Chama from flood irrigated lands that are located near or adjacent to the Rio Chama, and there are times during the year when the Rio Chama between Abiquiu reservoir and the confluence with the Rio Grande is a gaining reach.
    b) Investigate using CIR to determine water use for the fields irrigated by the member ditches of the RCAA.

SHIFTS IN USGS DATA

The model is susceptible to shifts the USGS applies to their real-time stream flow data during the irrigation season. During previous irrigation seasons the USGS has adjusted their data for the Chamita Gauge causing significant changes to the modeled use of water by the RCAA. When reviewing calculated use of stored water early in the irrigation season, be aware the USGS may adjust the readings at any of their stream-flow gauges and that any such adjustment could significantly change the modeled use of stored water by the RCAA.

CHAMITA GAUGE

Significant concern exists within the modeling group about possible errors in gauge readings at the USGS Chamita Gauge (USGS #82900000). The condition of the concrete channel is satisfactory at best and there is silting and accumulated debris in the concrete channel and around the bridge posts that effect the reliability of the gauge readings (In contrast, the gauge below Abiquiu Reservoir is located in a stretch of the river that runs through a rocky canyon. The accuracy of the Lower Abiquiu Gauge can be assumed to be significantly better than the Chamita Gauge).

The Chamita Gauge should be studied to determine if there are ways of improving the measurement of water. ISC is coordinating with the USGS to review this matter in more detail. One other factor that is difficult to quantify is when during the irrigation season the Rio Chama between Abiquiu Reservoir and the confluence of the Rio Chama with the Rio Grande is a gaining reach.

LAG TIME

The following assumptions were made concerning lag times on the Rio Chama:

1) There is a 9 hour lag between the La Puente Gauge and Abiquiu Reservoir
2) There is a 7 hour lag between El Vado Reservoir and Abiquiu Reservoir
3) The lag time between Abiquiu Reservoir and the Chamita Gauge will be adjusted based on flow in the river.

The 2004 model may be revised to reflect that lag time is dependent on the flow in the river. The adjustment of the lag time for the reach of the Rio Chama below Abiquiu Reservoir is still under review. One of the following two options for lag time may be implemented in 2004 for this reach:

1) Lag time will be adjusted in steps (flow less than 200 cfs, flow 200-400 cfs, 400-700 cfs, 700-1000 cfs, or greater than 1000 cfs)

2) Equation relating lag time to flow in the river will be incorporated into the model (equation from Table 8 of the Upper Rio Grande Water Operations Model documentation – see attached)

CALCULATION SPREADSHEET

The method for determining the use of stored water for the 2004 irrigation season is described below:

Columns 1-6: USGS Provisional Realtime Streamflow Data
Column 7: Flow in Rio Chama at the La Puente Gauge

Column 8: Credits any gain to the Chama River from flow in Boulder Creek. The credit was established as 1.3% of the flow in the Rio Chama at La Puente based on the calculations shown on attachment B.

Column 9: Credits for natural flow releases from Heron Reservoir. The daily credit is based on the calculations shown on attachment C.

Column 10: Estimate of the natural flow of the Rio Chama and tributaries into El Vado Reservoir (Column 7 + Column 8 + Column 9).

Column 11: Credits any gain, and deducts any loss (in a prorated share), that occur in the Rio Chama between El Vado Reservoir (gauge #08285500) and the upper gauge (#08286500) at Abiquiu Reservoir (Column 3 - Column 2). If there is a loss in this section, the loss charged native flow shall be determined by multiplying the calculated loss by the RCAA flow ratio (see attachment D).

Column 12: Credits any gain from tributaries to the Chama that flow into Abiquiu Reservoir. Credit includes flows from Cañones Creek, Canjilon Creek, and Rio Puerco de Chama. The credit was established as 71% of the flow in the Rio Ojo Caliente above La Madera based on the calculations shown on attachment B.

Column 13: Combines the credits (Column 11 + Column 12).

Column 14: Estimates the natural flow in the Rio Chama below Abiquiu Dam (Column 10 + Column 13).

Column 15: Estimates total depletion on the Rio Chama between Abiquiu Dam and the Chamita Gauge (Column 4 - Column 6).

Column 16: Accounts for return flows from the Chamita, Salazar, and Hernandez Ditches, and the diversion by the Salazar Ditch, which all occur downstream of the Chamita Gauge. The credit was estimated by assuming that below the Chamita Gauge the Chamita and Hernandez ditches contribute a return flow of 17 cfs to the Rio Chama (assumed 50% of the average diversion of 34 cfs). The net depletion from the Salazar Ditch is assumed to be 7 cfs (assumed 50% of the average diversion of 14 cfs), so the net effect to the Rio Chama below the Chamita Gauge is a credit of 10 cfs.

Column 17: Calculation of the RCAA flow ratio (see attachment D)

Column 18: Credit for evaporation of project water that occurs in the river on the stretch of the Rio Chama between Abiquiu Reservoir and the Chamita Gauge. The credit will be calculated based on the calculations shown on attachment D.

Column 19: Calculation of ditch charge (see attachment E)

Column 20: Credit for evapotranspiration of project water that occurs in the bosque on the stretch of the Rio Chama between Abiquiu Reservoir and the Chamita Gauge. The credit will be calculated based on the calculations shown on attachment E.

Column 21: Total of credits (Column 16 + Column 17 + Column 18).

Column 22: Estimates the daily use of stored water by the Rio Chama Acequias Association for each hour of the day (Column 15-Column 14-Column 19).

The average daily use of stored water is then calculated by taking the sum of the values for each hour and dividing by 24. The daily deficit from column is then converted from cfs to acre-feet.

SEASONAL DEPLETION FOR THE 2004 IRRIGATION SEASON
Through October 31, 2004

	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	7.80	1.01	0.00	0.00
3	0.00	0.00	37.00	0.00	0.00	0.00
4	0.00	0.00	113.37	0.00	2.94	0.00
5	0.00	0.00	47.73	0.60	0.00	0.00
6	0.00	0.00	14.68	0.00	3.84	0.00
7	0.00	0.00	0.00	0.00	3.84	0.00
8	0.00	0.00	0.57	198.81	32.36	0.00
9	0.00	0.00	2.55	3.48	26.08	0.00
10	0.00	0.00	0.39	4.48	33.79	0.00
11	0.00	0.00	0.00	4.41	20.54	0.00
12	0.00	0.00	0.00	1.43	15.32	0.00
13	0.00	0.00	0.00	0.00	14.79	2.25
14	0.00	0.00	2.86	0.00	12.60	0.00
15	0.00	0.00	1.87	0.00	10.49	0.00
16	0.00	0.00	0.95	0.00	3.82	0.00
17	0.00	0.00	0.78	0.00	3.02	0.00
18	0.00	0.00	3.24	23.27	6.19	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	1.02	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	44.09
23	0.00	0.00	0.00	0.00	0.00	105.75
24	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	4.97	0.00	0.00
26	0.00	0.00	0.00	1.17	0.00	0.00
27	0.00	0.00	0.00	0.85	0.75	19.91
28	0.00	0.00	26.11	0.00	0.00	0.00
29	0.00	0.00	27.33	0.00	0.00	0.00
30	0.00	0.00	43.47	0.00	0.00	0.00
31	0.00		8.88	0.00		0.00
TOTAL	0.00	0.00	340.61	244.50	190.38	171.99
La Puente Average	1016.58	111.04	34.03	27.86	49.01	

SEASONAL TOTAL **947 Acre-feet**

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Water Resources

Provisional Data Disclaimer

Data from realtime streamflow gages are relayed to the District's office through telephone lines or the Geostationary Operational Environmental Satellite (GOES) data-collection system. Data are transmitted from each station at intervals of either 3 or 4 hours and are loaded onto the District's computer system.

Realtime data available on the District Home Pages are **provisional** data that have not been reviewed or edited. These data may be subject to significant change and are not citeable until reviewed and approved by the U.S. Geological Survey. Realtime data may be changed after review because the stage-discharge relationship may have been affected by:

- backwater from ice or debris such as log jams
- algal and aquatic growth in the stream
- sediment movement
- malfunction of recording equipment

Data are reviewed periodically to ensure accuracy. Each station record is considered **provisional** until the data are published. The data are usually published within 6 months of the end of the water year (Sept 30).

Data users are cautioned to consider carefully the provisional nature of the information before using it for decisions that concern personal or public safety or the conduct of business that involves substantial monetary or operational consequences.

Information concerning the accuracy and appropriate uses of these data or concerning other hydrologic data may be obtained by contacting the individual listed on the data page.

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