

2. Action Area: Overview of Project Components and Water Operations

2.1 Action Area

The project area is the area where Reclamation's and the non-Federal entities' proposed actions occur, while the action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 Code of Federal Regulations [CFR] 402.02). For this BA, the project area and action area are considered to be the same. The action area for this consultation includes Heron Reservoir and Willow Creek downstream from Heron Dam, the Rio Chama downstream from the confluence with Willow Creek, and in the Rio Grande from the Velarde downstream to San Marcial above the full reservoir pool of Elephant Butte Reservoir (figure 1). The lateral extent of the action area generally is defined by the riverside drains and associated levees located to the east and west of the main stem of the river. In situations where levees do not exist on either or both sides, the lateral extents are confined by the historical flood plain (geological constraints, such as terraces and rock outcroppings or anthropogenic constraints, such as irrigation facilities).

The river mile (RM) designations used in this document are those included in the 2002 controlled aerial photography. Caballo Dam is considered RM 0, and mile designations increase in an upstream direction.

2.2 Overview of Project Components

This section provides background on the SJC Project and the MRG Project, which is necessary to identify the nature and limitations of both Reclamation's discretionary actions and non-Federal actions.

2.2.1 The San Juan-Chama Project

Reclamation's SJC Project consists of a transbasin diversion that takes water from the Navajo, Little Navajo, and Blanco Rivers, upper tributaries of the San Juan River (of the Colorado River Basin), for use in the Rio Grande Basin in New Mexico. The firm yield⁶ of the SJC Project is 96,200 AFY, which provides Supplemental Water supplies for various communities and irrigation districts.

⁶ Firm yield is the amount of water that can be provided by a basin and reservoir system with reasonable certainty each year.

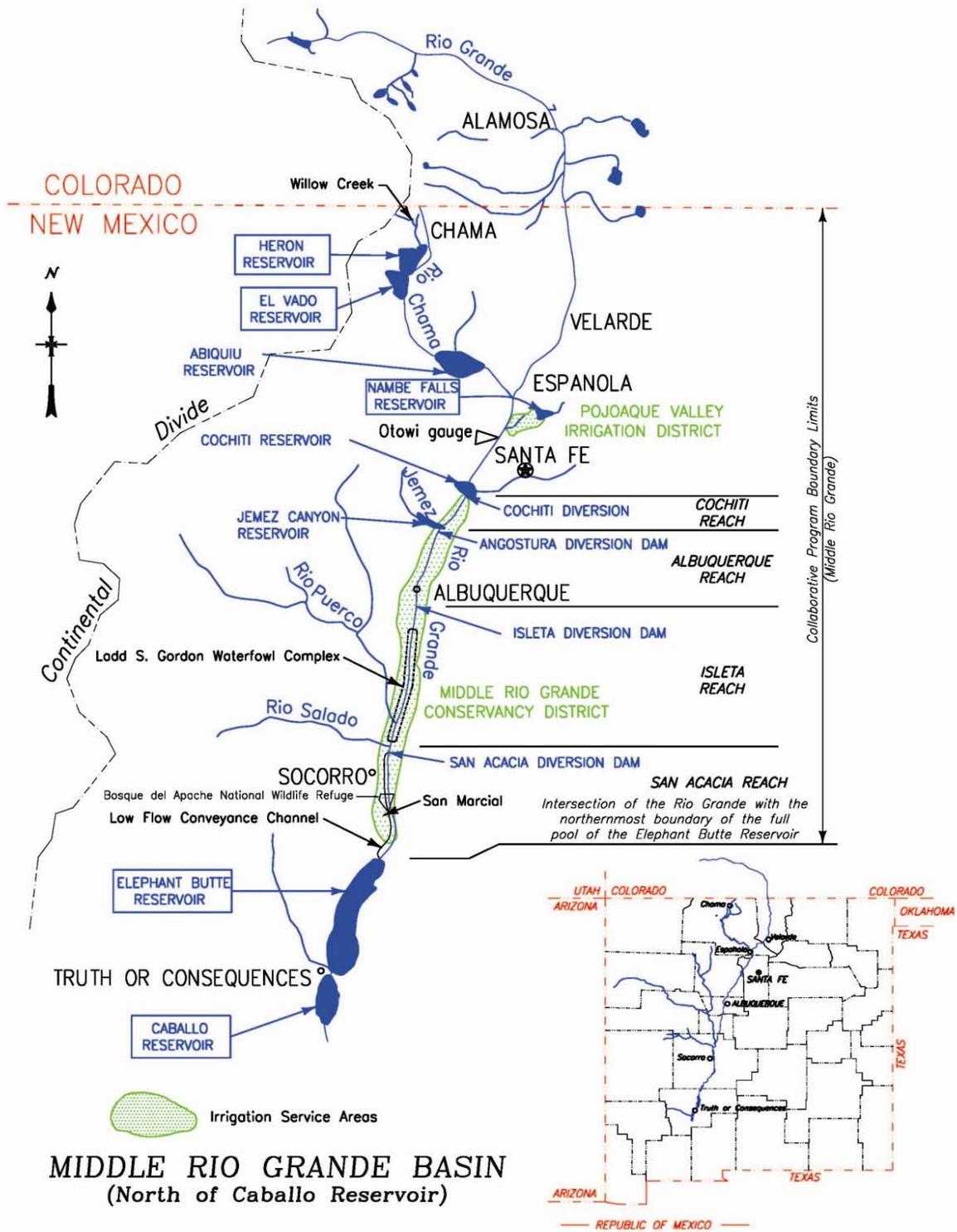


Figure 1. Map of the Rio Grande Basin – major Federal water project facilities.

Reclamation maintains this water in a Project pool at Heron Reservoir; and depending upon the available supply, Reclamation allocates the water to contractors on January 1 of each year. The diversions out of the Colorado River Basin are limited by statute, and the releases from Heron for SJC Project contractors are limited by statute and contract.

This influx of water into the Rio Grande Basin is allowed because Congress authorized the SJC Project in 1962 (Public Law 87-483), which amended the Colorado River Storage Project Act of 1956 (Public Law 84-485) to allow diversion of a portion of New Mexico's allocation of Colorado River Basin water into the Rio Grande Basin of New Mexico. A limit of the SJC Project water is that it must be beneficially consumptively used in New Mexico.

2.2.1.1 Heron Dam and Reservoir

Heron Dam and Reservoir (Heron) on Willow Creek in northern New Mexico was built in the late 1960s and is the principal storage reservoir for SJC Project water from the San Juan River system of the upper Colorado River Basin. Only imported SJC Project water may be stored in Heron Reservoir requiring all native flows to be bypassed; therefore, Rio Grande Compact requirements do not apply. Contractors take possession of the water at the outlet works of Heron Dam upon release and are required to take delivery of their annual allotment by December 31 of the irrigation year, unless a waiver for delivery in the subsequent year is authorized. Carryover storage across multiple years is not currently authorized at Heron Reservoir; therefore, water not used by the required date reverts to the SJC Project pool.

2.2.1.2 Nondiscretionary Duties and the Minnow Rider

Reclamation has discretion over the timing of releases of SJC Project water to the extent that those releases are consistent with the contractors call for water. Reclamation has the following nondiscretionary duties with the respect to Heron Reservoir:

- Meet contract obligations within the SJC Project firm yield to contractors, consistent with calls from contractors regarding timing and volume of releases.
- Maximize storage to yield sufficient water to fulfill contracts in current year and out-years.
- Keep within a safe storage amount of approximately 401,000 acre-feet (AF).

In 2004, Congress enacted legislation that limited Reclamation's discretion to use San Juan Chama Project water for ESA purposes (Public Law 108-447). Section 208(a) of the legislation states that:

“Reclamation, may not obligate funds... and may not use discretion...to restrict, reduce, or reallocate any water stored in Heron Reservoir or delivered pursuant to SJC Project contracts...to meet the requirements of the Endangered Species Act, unless such water is acquired or otherwise made available from a willing seller or lessor and the use is in compliance with the laws of the State of New Mexico....”

While not challenged directly, the court has already construed the statute as a permanent bar to nonvoluntary use of SJC Project water for ESA purposes, which is a significant restriction in Reclamation’s discretion over the use of SJC Project waters.

2.2.2 The Middle Rio Grande Project, Including the MRGCD

The MRG Project is comprised of El Vado Dam and Reservoir on the Rio Chama, and the Diversion Dams, which are used to divert water and deliver it to lands within the MRGCD service area, including lands of the Six MRG Pueblos. Reclamation owns and operates El Vado Dam and Reservoir and owns the Diversion Dams; however, MRGCD operates and maintains the Diversion Dams, as well as the delivery infrastructure and riverside drains and wasteways. Reclamation does not have discretion to operate the diversion of Rio Grande flows through the Diversion Dams because Reclamation does not hold the New Mexico State Engineer permit, which authorizes such diversion of water.

2.2.2.1 The History of the MRG Project

Irrigated agriculture in the MRG dates back to the Pueblos’ diverting the waters of the Rio Grande for irrigation purposes. Spanish colonists expanded upon earlier irrigation systems and created a system of Acequia’s during the 17th and 18th centuries and irrigated agriculture expanded further during the 19th century. However, during the first half of the 20th century the habitability and agricultural productivity of the Middle Rio Grande Valley declined because of inefficient water delivery, poor drainage, and frequent floods. The MRGCD was formed to address these problems in a comprehensive manner.

In 1923, the New Mexico legislature passed the Conservancy Act (New Mexico [NM] Stat. section [§] 73-14-1 through 73-19-5), which provided the legal framework for the organization and operation of conservancy districts throughout the State. On August 26, 1925, pursuant to that law, New Mexico’s District Court approved the organization of the MRGCD, which is a quasi-governmental entity, with established geographic boundaries, a publicly elected Board of Directors, with specific powers and authorities, including the power to make assessments within its boundaries for services. One of its purposes was to rehabilitate existing irrigation systems and to consolidate the river headings of approximately 80 independent Acequia associations into a more efficient and manageable

system. MRGCD originally combined these headings into six locations, later reduced to four diversions off the Rio Grande. In addition, a system of drains and wasteways was created to return unused water back to the Rio Grande, eliminating water logging and alkali problems that had plagued the early Acequia systems.

MRGCD's plan to reclaim land and provide a more stable water supply in the MRG included the construction of drainage and irrigation works, levees for flood control, and El Vado Dam and Reservoir. The geography of the Middle Rio Grande Valley is such that the lands of the Six MRG Pueblos are interspersed between non-Indian lands. Therefore, engineering logistics and the need for rights of way on Pueblo lands required that MRGCD include the Pueblos in its plan to reclaim the valley. Additionally, because the project would benefit those Pueblos, MRGCD sought a contribution of construction costs as well as future operation, maintenance, and betterment works costs from the United States on behalf of the Pueblos.

Congress passed the Act of March 13, 1928 (1928 Act) (45 Stat. 312) to support the Conservancy Project, which included funding for the Pueblos' share of construction costs and obligated the MRGCD to operation, maintenance, and betterment (OM&B) the works for the benefit of Pueblo lands. The 1928 Act divides Pueblo lands into two categories:

1. Lands that were irrigated at the time and were "prior and paramount to any rights of the district."
2. Lands that would be "newly reclaimed" by the Conservancy Project.

The Act obligated the MRGCD to provide future OM&B benefitting the "prior and paramount" lands free of charge, and stated that "newly reclaimed lands shall be recognized as equal to" non-Pueblo lands in the MRGCD, and "protected from discrimination in the division and use of water." Pursuant to the 1928 Act, the BIA and the MRGCD entered into an agreement (the 1928 Agreement) whereby MRGCD agreed to construct works and provide OM&B for the Pueblos. Specifically, MRGCD agreed to provide OM&B to prior and paramount lands free of charge and to newly reclaimed lands for a proportional share of costs. In 1935, Congress enacted legislation ("1935 Act," [49 Stat. 887]), which stated that MRGCD shall treat the Pueblos' newly reclaimed lands the same as other district lands and reiterated that the MRGCD shall OM&B prior and paramount lands without charge.

Beginning in 1930, the MRGCD created drains, levees and diversion dams, consolidated the irrigation network through a system of new main and lateral canals, and built El Vado Dam and Reservoir on the Rio Chama. In 1935, construction was effectively completed; and El Vado Reservoir began operating. However, after construction, MRGCD had difficulty raising tax revenue in the

agricultural valley struggling under the Great Depression. Catastrophic flooding in 1941 and 1942 destroyed the ability of the Rio Grande to efficiently transport water to Elephant Butte Reservoir. Coupled with a series of dry years following the flooding, New Mexico fell into a debit status on its obligation to deliver a portion of Rio Grande water to Texas under the Rio Grande Compact. In 1947, Reclamation and the Corps completed a comprehensive plan intended to improve and stabilize the Rio Grande through the MRG and to facilitate Rio Grande Compact deliveries to Texas. This plan included dams for flood and sediment control, rehabilitation of the Middle Rio Grande Valley’s irrigation and drainage system, and extensive river channelization works. Congress authorized the recommended plan in the Flood Control Acts of 1948 and 1950 (Public Law 80-858; Public Law 81-516). Congress authorized the Corps to construct flood control reservoirs and levees for flood protection, authorized Reclamation to undertake the rehabilitation of the Conservancy Project and maintenance of the river channel, and to pay off outstanding MRGCD bond indebtedness.

In exchange for rehabilitating its project and paying its debts, MRGCD entered into a repayment contract with Reclamation in 1951 (1951 Contract), whereby it agreed to convey to the United States title to MRGCD’s “works” and its storage permit at El Vado.^{7, 8} The 1951 Contract confirmed MRGCD’s obligation to OM&B the MRG Project for the Pueblos and authorized Reclamation to eventually relinquish OM&B duties associated with the Diversion Dams to the MRGCD. In the 1970s, Reclamation fulfilled its statutory requirement under Reclamation law to transfer OM&B duties associated with project irrigation works to the owners of the lands irrigated, by transferring OM&B duties associated with the Diversion Dams to the MRGCD.⁹ Reclamation exercised its statutorily authorized discretion to retain the OM&B duties associated with storage and release of water at El Vado, but MRGCD became obligated to pay for those services.

⁷ Section 6 of the Reclamation Act of 1902 states: “title to and the management and operation of the reservoirs and the works necessary for their protection and operation shall remain in the Government until otherwise provided by Congress.” (32 Stat. 389)

⁸ Paragraph 13(e) of the 1951 Contract, obligates the MRGCD to pay OM&B costs associated with the Pueblos’ newly reclaimed lands if Congress fails to appropriate sufficient funds to cover the costs.

⁹ Section 6 of the Reclamation Act of 1902 (32 Stat. 389) states: “when payments required by this Act are made for the major portions of the lands irrigated from the waters of any of the works herein provided for, then the management and operation of . . . irrigation works **shall** pass to the owners of the lands irrigated.” See the August 24, 2011, Memorandum from the Regional Solicitor, Intermountain Region, to the Regional Director, Bureau of Reclamation, Upper Colorado Region (finding that Acts of Congress subsequent to the 1902 Act have not altered the requirement that irrigation districts take over operation and maintenance of the project’s “irrigation works” once the users have made the required payments to Reclamation).

2.2.2.2 El Vado Dam and Reservoir

MRGCD initiated construction of El Vado Dam in 1929 and completed it in 1935. Reclamation operates El Vado Dam and Reservoir pursuant to the 1951 contract with the MRGCD. The total maximum storage of El Vado Reservoir is about 196,000 AF, though sediment and operational restrictions have reduced its effective capacity to about 180,000 AF. El Vado is used to store native Rio Grande and SJC Project water for MRGCD and to store native flows to ensure there is sufficient supplies for the prior and paramount lands of the Six MRG Pueblos pursuant to the “Agreement: Procedures for the Storage and Release of Indian Water Entitlement of the Six Middle Rio Grande Pueblos,” approved by the Secretary of the Interior, December 28, 1981, (1981 Agreement) (discussed below). MRGCD is not a party to the 1981 Agreement. When space is available, Reclamation and MRGCD may store SJC Project water in El Vado Reservoir for other users and other purposes. Storage of large volumes of SJC Project water may take place for extended periods of time.

Consistent with Article XVI¹⁰ of the Compact, water is held in El Vado each year regardless of Article VII restrictions, to ensure that water can be provided to meet the demand for the Six MRG Pueblos, which is tracked separately with a daily accounting model and released to specifically meet the demand for the Pueblos. Pursuant to the 1928 Act, the Pueblos have the prior and paramount right to divert Rio Grande natural flow; but due to diversions by others, sufficient natural flow may not always be available to the Pueblos when needed. Consequently, the Secretary of the Interior designates space in El Vado Reservoir to ensure that water is available for prior and paramount lands of the Six MRG Pueblos should the natural flow prove insufficient. This water can be released to meet irrigation demand for prior and paramount lands, as discussed below.

Within El Vado Dam sits a Federal Energy Regulatory Commission-regulated hydroelectric plant that is owned and operated by Los Alamos County. The plant operates as a “run of the river” facility; therefore, releases are not made for the sole purpose of generating power, but power is a byproduct of releases made for MRG Project purposes.

2.2.2.3 The MRGCD Divisions

MRGCD is comprised of four divisions: Cochiti, Albuquerque, Belen and Socorro, serving irrigated lands from Cochiti Dam to the Bosque del Apache National Wildlife Refuge (BDANWR). At the downstream end of the MRGCD, remaining water from the MRGCD system is delivered onto the BDA.

¹⁰ “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.”

2.2.2.3.1 Cochiti Division

MRGCD diversions begin at Cochiti Dam to the Cochiti East Main and Sile Main Canals and deliver water to irrigators on both sides of the Rio Grande. Diversions at the Cochiti Dam serve the Cochiti, Santo Domingo, San Felipe and Santa Ana Pueblos together with the communities of Peña Blanca, Sile, and Algodones.

2.2.2.3.2 Albuquerque Division

Angostura Diversion Dam, a concrete low head fixed weir, diverts water from the Rio Grande to serve the Albuquerque Division of the MRGCD. The Albuquerque Division provides irrigation water for the Sandia, Santa Ana, and Isleta Pueblos and non-Indian irrigators from various communities, including Bernalillo, Corrales, Alameda, Albuquerque, Los Ranchos, and the South Valley area.

2.2.2.3.3 Belen Division

Isleta Diversion Dam diverts water from the Rio Grande to serve the Belen Division of the MRGCD. Isleta Dam is a low-head (4.3-foot) structure comprised of a series of radial gates, which may be lifted entirely from the water if desired, or lowered to whatever position is required to provide the operating head for the intake works. Isleta Diversion Dam is located on Isleta Pueblo. Belen is the largest division in the MRGCD, accounting for nearly 50 percent (%) of irrigated lands. The Belen Division serves Isleta Pueblo, several New Mexico Department of Game and Fish refuges, the Sevilleta National Wildlife Refuge, and irrigators from various communities including Bosque Farms, Peralta, Los Lunas, Tome, Los Chavez, Belen, Casa Colorado, and Las Nutrias.

2.2.2.3.4 Socorro Division

About 55 miles downstream from the Isleta Diversion Dam, the San Acacia Diversion Dam provides water for the Socorro Division of MRGCD. San Acacia Diversion Dam is similar to Isleta Dam, being a series of radial gates across the Rio Grande, though with a larger operating head of approximately 7.5 feet (ft). In addition to San Acacia Dam, the Socorro Division relies substantially on return flows from Belen Division via the Unit 7 Drain. At the southern end of the Socorro Division, two canals and two drains have delivered water onto the BDA, in addition to the Low Flow Conveyance Channel (LFCC).

2.2.2.4 The MRG Project Diversion Dams

MRGCD constructed the Diversion Dams in the 1930s, including the Isleta Diversion Dam, which was constructed on lands belonging to the Isleta Pueblo. Pursuant to the MRG Project authorization, Reclamation rehabilitated Isleta Diversion Dam in 1955, San Acacia Diversion Dam in 1957, and Angostura Diversion Dam in 1958. In 1975, the original Cochiti Diversion Dam was demolished by the Corps during construction of Cochiti Dam and was replaced by intake works for the Sile Canal and Cochiti Main Canals incorporated into the Corps' structure. After completion of Cochiti Dam construction, the Corps

transferred the rebuilt canal headworks to Reclamation. MRGCD currently operates the Diversion Dams as “transferred works” under the 1951 Contract, within the bounds of Federal law, and within the scope of its conferred authority.

The annual quantity of water that the MRGCD has diverted over the last 10 years is as follows:

Total surface water diversion from Rio Grande:	368,610–375,772 AFY	
Average surface water diversion from Rio Grande:	371,516 AFY	
Cochiti Diversion:	58,623–68,030 AFY	Average: 63,802 AFY (17%)
Angostura Diversion:	77,511–86,692 AFY	Average: 81,833 AFY (22%)
Isleta Diversion:	206,417–208,866 AFY	Average: 207,951 AFY (56%)
San Acacia Diversion:	14,923–21,364 AFY	Average: 17,931 AFY (5%)

2.2.2.5 The MRG Project and MRGCD Water Rights¹¹

In 1930, the MRGCD obtained NMOSE Permit No. 1690 (Storage Right) to appropriate and store up to 198,110 AF of water in El Vado Reservoir for lands newly reclaimed by the MRGCD (both Pueblo and non-Pueblo lands). In 1931, the MRGCD obtained NMOSE Permit No. 0620 (Natural Flow Diversion Right), which changed the points of diversion for natural flow water rights appurtenant to lands irrigated prior to the formation of the MRGCD from 71 existing irrigation systems (Acequias) to the Diversion Dams, and authorized use of the Diversion Dams to divert water for those lands.¹²

In accordance with Federal Reclamation law and New Mexico law, the MRGCD and/or the property holders served by the MRGCD, including the Six MRG Pueblos, retain the Natural Flow Diversion Right (Permit No. 0620). Pursuant to the 1951 Contract, as security for repayment of that contract, on May 28, 1963, the MRGCD executed a “Transfer and Assignment of Water Rights,” whereby it conveyed Storage Right (Permit No. 1690) to the United States; but in accordance with section 8 of the Reclamation Act of 1902, which requires Reclamation to follow State law, the right to use the water appropriated under that permit remained appurtenant to the land irrigated in the MRGCD. The 1951 Contract has now been fully repaid. MRGCD erroneously attempted to transfer the Natural Flow Diversion Right pursuant to the 1951 Contract;

¹¹ The water rights of the property holders served by the MRGCD, or any possible water rights of the MRGCD itself, have not yet been quantified or adjudicated.

¹² In its application for Permit No. 0620, the MRGCD asserted water rights appurtenant to 123,267 acres of land: 80,785 acres of land irrigated prior to the Conservancy Project; and 42,482 acres of land reclaimed through the Conservancy Project.

however, the New Mexico Supreme Court ordered the MRGCD to retain its right (Permit No. 0620) to divert the natural flow through the Diversion Dams.¹³ The Court stated that the MRGCD was only permitted by New Mexico law to transfer “new filings and new water” to Reclamation.

2.2.2.6 The Low Flow Conveyance Channel

The floods of the early 1940s and the drought of the 1950s created a condition where the Rio Grande river channel below BDANWR had become a series of disconnected segments separated by sediment plugs and delta deposits. Depletions due to evaporation and use by growing vegetation increased, and caused difficulties for New Mexico to meet its Compact delivery obligations beginning in the mid-1940s.

To reduce consumption of water, provide more effective sediment transport, and improve valley drainage, and as part of the MRG Project’s river channelization program, Reclamation constructed a 54-mile long artificial channel, the LFCC, running alongside the Rio Grande between San Acacia, New Mexico and Elephant Butte Reservoir. The LFCC is protected from the river by a continuous spoilbank levee, and is the subject of complex hydrologic interactions between the Rio Grande and irrigated lands. Operation and maintenance of the low flow channel are continuing Reclamation responsibilities.

The basic concept behind the LFCC is that depletion of water can be reduced by diverting some or all of the river’s flow into a narrower, deeper, and more hydraulically efficient channel. The LFCC exposes relatively less water surface area to evaporation and is less prone to loss of water by seepage than the natural river channel. The higher flow velocities in the low flow channel can also move more sediment than the river, especially at lower discharges. The LFCC has a nominal capacity of 2,000 cfs, and the maximum recorded mean daily discharge of the LFCC at San Acacia is 1,950 cfs.

At its upper end, the LFCC behaves as a canal, but downstream from Escondida, New Mexico, it transitions to function as a drain. The LFCC can discharge to the Rio Grande, under certain conditions at the 9-mile outfall near Escondida; however, there is typically little or no flow in the LFCC at that point.

¹³ *Middle Rio Grande Water Users Association v. Middle Rio Grande Conservancy District*, 57 NM 287, 299–300 (1953).

2.3 Overview of Water Operations

Beginning as early as March of each year, water management agencies, including Reclamation, the MRGCD, the State, the Service, the BIA, the Albuquerque Bernalillo County Water Utility Authority (ABCWUA), and the United States Geological Survey (USGS), participate in coordination calls to share information regarding current river flows, reservoir storage, target releases, areas of drying, the status of the silvery minnow and other timely issues.

The tools that Reclamation uses for its water operations include flow and storage data provided by stream gages and computer models that predict water availability and account for water as it moves through the reservoir and river system of the MRG. Reclamation uses these tools to operate its facilities, account for the movement and co-mingling of SJC Project and MRG Project water supplies, and develop annual operating plans based on forecasted snow melt runoff and other factors. Water operations are facilitated by monitoring to ensure that desired flows are achieved.

Reclamation’s primary tool for meeting the forecasted ecological needs of listed species is its Supplemental Water Program (Program), which is included as a conservation measure in this BA. The Program consists of:

1. Water acquisition and storage
2. SJC Project waivers of mandatory release dates from Heron Reservoir
3. Pumping and conveying water from the LFCC to the Rio Grande

2.3.1 The Rio Grande Compact and Article VII Storage Restrictions

The 1938 Rio Grande Compact (53 Stat. 785) is a Federal law that poses significant restrictions on water management in the MRG. The Compact apportions the native waters of the Rio Grande among the States of Colorado, New Mexico, and Texas; and the provisions of the Compact are administered by the Rio Grande Compact Commission. For purposes of the Compact, “New Mexico” is the reach between Otowi gage and Elephant Butte Reservoir, which is roughly equivalent to the action area for this BA. The allocation excludes tributary inflows along this reach of river—these inflows are not subject to Compact restrictions. Article XVI of the Compact states:

“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.”

Also, SJC Project water is imported transbasin water, subject to the terms of the Upper Colorado River Compact; but after diversion by Reclamation, this water is not subject to Rio Grande Compact restriction.

The Compact does not require Colorado or New Mexico to deliver the exact amount of water scheduled annually each and every year but allows for the accumulation of over-deliveries (credit) and under-deliveries (debit). Although it is up to each State to decide how its water is used, any new use has to be balanced by reduction of an existing use or through the use of a new or imported source of water, such as SJC Project water, since the Compact puts an upper limit on basinwide water depletions.

Regardless of how wet a period may be, New Mexico's depletions between Otowi gage and Elephant Butte Reservoir are capped at 405,000 AFY plus local tributary inflows. In wet years, the increasingly higher flows must be delivered downstream, and associated carriage losses for that water must be made up for out of New Mexico's allocation; in very wet years, these carriage losses can deplete New Mexico's entire allocation. For this reason, wet years are more likely than dry years to result in a Compact debit; in many cases, debits accrued in wet years must be made up for in dry years. This eliminates the possibility of "saving" water in wet years for use to meet the needs of endangered species in dry years.

Several Compact restrictions affect reservoir operations in post-Compact reservoirs (constructed after 1929) and associated surface water management. Reclamation's Heron Reservoir is excluded from these restrictions because it is only authorized to store imported transbasin SJC Project water.

Under Article VI of the Compact, New Mexico's maximum accrued debit is limited to 200,000 AF. If New Mexico is in debit status, New Mexico must retain water in storage at all times to the extent of its accrued debit. If a spill occurs, the accrued credits for Colorado or New Mexico, or both, are reduced in proportion to their respective credits by the amount of the actual spill. Colorado or New Mexico may release accrued credits in part or in full in advance of an actual spill. Following an actual or hypothetical spill, all accrued debits for Colorado or New Mexico, or both, are cancelled.

Under Article VII of the Compact, whenever usable water in the Rio Grande Project storage account at Elephant Butte and Caballo Reservoirs is less than 400,000 AF, New Mexico and Colorado may not increase the storage of native Rio Grande Basin water in upstream reservoirs constructed after 1929. Usable water is defined as water in Elephant Butte and Caballo Reservoirs that is available for release to the Rio Grande Project. In New Mexico, the primary impacts of Article VII storage prohibitions are experienced at El Vado Reservoir. Article VII also provides that, upon acceptance by Texas, New Mexico may

relinquish accrued delivery credits so that New Mexico may store an equivalent amount of water in post-1929 upstream reservoirs when storage restrictions are in effect.

2.3.2 Water Accounting

All water flowing through the basin is accounted for to ensure that it is used in compliance with applicable laws. This includes SJC Project water that moves between reservoirs or is released for contractors, water acquired and stored under Reclamation's Supplemental Water Program, and MRGCD's irrigation water. All reservoir storage and flows at particular gages are accounted for to ensure that Colorado is meeting its Compact obligation to New Mexico and that New Mexico is meeting its obligation to Texas.

2.3.3 Snowmelt Forecasting and the Upper Rio Grande Water Operations Model

The snowmelt runoff forecast for a given year is a key factor in Reclamation's annual water operations. Starting in January or February, Reclamation begins monthly tracking of the Natural Resources Conservation Service's (NRCS) snowmelt runoff forecasts. NRCS operates and maintains an extensive, automated system (SNOWpack TELEmetry or SNOTEL) designed to collect snowpack and related climatic data in the Western United States and Alaska. NRCS field staff collects and analyzes data on depth and water equivalent of the snowpack and provides estimates of annual water availability and spring runoff on a monthly basis from January–May. Reclamation, in coordination with the Corps, enters the projected March–July runoff volumes into the Upper Rio Grande Water Operations Model (URGWOM) to model the flows for the entire year. URGWOM is a set of daily time-step, river reservoir models for the basin using RiverWater® software. URGWOM was used for the hydrologic effects analyses in this BA.

2.3.4 The Annual Operating Plan

Each year, Reclamation's Albuquerque Area Office develops the Middle Rio Grande Annual Operating Plan (Annual Operating Plan) in coordination with the Corps and with additional input from water users such as the MRGCD, the New Mexico Interstate Stream Commission (NMISC), ABCWUA, and Santa Fe. The planning process includes compiling the necessary data, making key assumptions, and modeling water operations to estimate actual operations from the present through the remainder of the year. The Annual Operating Plan combines compiled data and major assumptions such as: the runoff forecast; predicted

monsoon conditions; forecasted environmental needs; river recession;¹⁴ silvery minnow recruitment flows; and drought storage of Supplemental Water. The model includes the following:

- Snowmelt runoff projection.
- Projection of percentage of average Heron Reservoir inflow.
- Whether MRGCD can anticipate a full irrigation season.
- How much storage MRGCD will need to utilize through the irrigation season.
- How much native water should be maintained in El Vado to assure the Six MRG Pueblos have sufficient water for their prior and paramount lands.
- How forecasted environmental needs will be met throughout the irrigation season.
- Whether and the degree to which Supplemental Water Program releases will be needed to meet environmental needs.
- Whether additional Supplemental Water supplies may be needed.
- Whether or for how long Article VII of the Compact will remain in effect.
- When weekend recreational flows can be provided on the Rio Chama.

The Annual Operating Plan estimates for each reservoir the daily amount of acre-feet stored and the rate of inflow and outflow for a period of time beginning April 1 and ending December 31. The Annual Operating Plan is presented in April to respective agency staff as well as to the public. The below graph (figure 2) is an example of an operating plan hydrograph for El Vado Reservoir. The Annual Operating Plan is a prediction and rarely plays out through the year precisely as expected. While snowpack projections are generally sound by mid-April, variability in the pattern of melt and, in particular, the amount and distribution of summer precipitation tend to cause actual water flow and management to increasingly deviate from the Annual Operating Plan as the year progresses.

¹⁴ Drying of the river after June 15 must be managed carefully so that the drying limits outlined in the 2003 BiOp are not exceeded. Reclamation, the Corps, NMISC, and the MRGCD determine the plan for the managed recession.

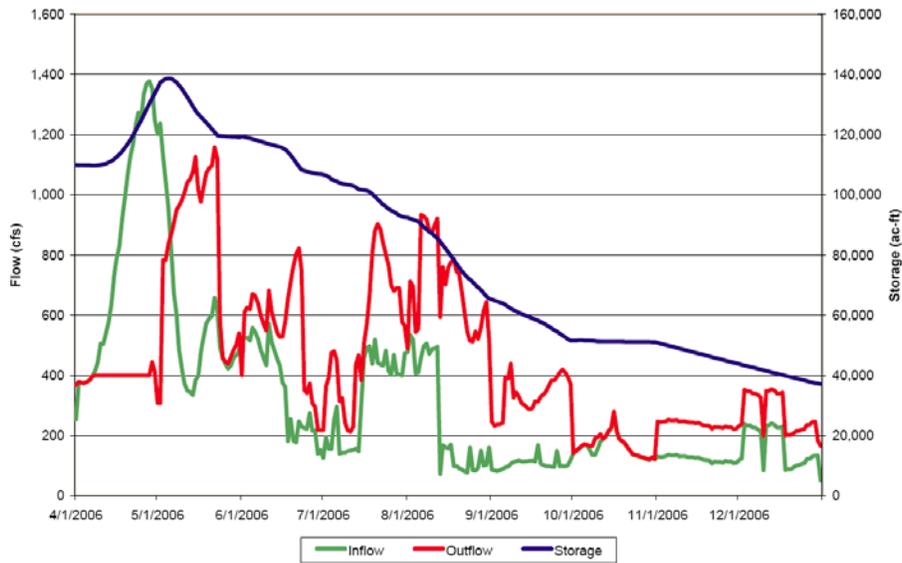


Figure 2. Annual operating plan hydrograph for El Vado Reservoir.

2.3.5 Operation for Prior and Paramount Lands

The 1981 Agreement between the Six MRG Pueblos Irrigation Committee,¹⁵ the Secretary’s Designated Engineer, BIA, and Reclamation established U.S. Department of the Interior policy for designating a volume of water in storage at El Vado Reservoir to ensure water demand on the Pueblos’ lands with prior and paramount water rights can be met each year. The 1981 Agreement sets out the often overlapping responsibilities and authorities of Reclamation, BIA, and the MRGCD related to ensuring the Pueblos’ prior and paramount water rights for 8,847 acres of land, although the MRGCD is not a party to the 1981 Agreement.

It provides that Reclamation, jointly with the Designated Engineer, calculate the storage requirements of the Six MRG Pueblos, and that Reclamation and MRGCD annually store water in and release water from El Vado Reservoir to satisfy Pueblo water entitlements. It also provides the protocol for the Six Pueblos to call for releases of the water stored for their prior and paramount water needs. As discussed in section 1, MRGCD is obligated by statute, contract, and State permit to divert water for the Pueblos; and those actions are included in the description of MRGCD’s proposed actions. The prior and paramount operations ensure that the Pueblos will receive an adequate supply of water for lands with prior and paramount water rights.

¹⁵ The Six Middle Rio Grande Pueblos Irrigation Committee was the predecessor organization to the Coalition of the Six Middle Rio Grande Pueblos.

2.3.6 MRGCD Water Management

MRGCD operates pursuant to Federal and State statute and contractual authority. MRGCD meets irrigation demand with smaller diversions. This, in turn, allows MRGCD to remain in full operation for a longer irrigation season or to save water for subsequent seasons.

MRGCD regularly coordinates its operations and plans with other water management agencies, which helps ensure that sufficient water is available to meet irrigation demands as well as the needs of listed species. MRGCD's coordination includes:

- Regular participation in Reclamation's MRG Coordination Conference calls, in which the MRGCD relays information on:
 - Plans for diversion at each of its diversion structures; any plans it has for "bypass" of flows (leaving of water in the river rather than diverting it).
 - Changes in conditions or operations that may affect Reclamation's requirement to release Supplemental Water.
- Coordination with Reclamation's RiverEyes program and the Service's fish rescue program. As noted previously, MRGCD has, at times, intentionally routed flows to wasteways or drains to assist the Service with rescue.
- Emergency flow releases at specific locations as needed for ESA purposes.

2.3.6.1 MRGCD Borrow/Payback Arrangements

MRGCD participates in "borrow/payback" arrangements with Reclamation and the ABCWUA for water storage and movement between Heron, El Vado, and Abiquiu Reservoirs. These arrangements may be either to increase flows on the Rio Chama Wild and Scenic portion to an appropriate level for recreational whitewater rafting or to increase winter base flows for health of sport fisheries on the Rio Chama. "Borrow/payback" arrangements most commonly involve moving water for ABCWUA water from Heron Reservoir to Abiquiu. For a variety of practical reasons (measurement, gate adjustment, evaporation loss, etc.), the movement of this water sometimes occurs by borrowing MRGCD's SJC Project water from El Vado Reservoir and replacing it at a later date with the ABCWUA's SJC Project water from Heron Reservoir. The "borrow/payback" arrangements also sometimes may involve Reclamation's Supplemental Water for the Rio Grande silvery minnow (RGSM).

2.3.6.2 MRGCD Measurement

MRGCD operates and maintains a system of measurement stations, or gages, along its canal and drain network. These gages report water level and rates of flow back to the MRGCD on 30-minute intervals. This includes information on water diverted from the Rio Grande, how water is being distributed to various canals or service areas, and water being returned to the Rio Grande through wasteway and drain outfalls. Data is collected via FM radio telemetry, processed (converted from raw electronic signals to usable values and units), then transferred by the current file transfer protocol to three separate computer databases (MRGCD, Reclamation, and the Corps). This entire process occurs automatically, 24 hours a day, throughout the year. Reclamation hosts a Web site, created and maintained jointly by Reclamation and MRGCD, on which this data is displayed publicly. Data is displayed in near real-time (20 to 30 minutes after collection).

At present, MRGCD provides data from about 130 sites on its system and continues to add several new locations each year. In addition, MRGCD collects, processes, and distributes data from Reclamation's RGSM pumping sites in Socorro County and the NMISC's RGSM Atrisco habitat project in Bernalillo County. Processed information also is collected from other entities, including the USGS (stream flow gages on the Rio Grande) and the ABCWUA (diversion from and return flow to the Rio Grande). All of this data is displayed along with MRGCD information on the Reclamation Web site, allowing both the public and water managers to quickly observe water movement and distribution throughout the MRG.

MRGCD maintains its gage network through periodic calibration measurements using a variety of flow measuring devices. In addition, MRGCD makes flow measurements in unengaged areas of its system and along the Rio Grande itself. Measurements made on the Rio Grande by MRGCD are often used to understand where nontypical or unexpected loss is occurring. MRGCD shares this information with Reclamation, the USGS, and other water management entities.