

# SAN LUIS VALLEY PROJECT, CLOSED BASIN DIVISION, Colorado



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## MISSION

*The Mission of the Bureau of Reclamation is to manage, develop, and protect water related resources in an environmentally and economically sound manner in the interest of the American public.*

## Historical Background

Near the end of the 19th century, a series of dry years caused severe water shortages to the farmers along the Rio Grande. These people discovered that the river which had met their needs for over 300 years no longer provided enough water. They looked north to the San Luis Valley and saw a valley-wide system of irrigation canals which industrious Colorado pioneers had just completed. The system diverted much of the water historically flowing further south.

The complaints of the Republic of Mexico were the first to receive attention. In 1898 the Republic of Mexico sued the United States for waters from the Rio Grande. This resulted in the Treaty of 1906 in which the U.S. agreed to deliver a total of 60,000 acre feet of water annually to Mexico. Elephant Butte Reservoir was constructed in 1916 to assist the U.S. in meeting the treaty commitment.

In Texas and New Mexico the water shortage persisted. An injunction on construction of reservoirs on Federal lands combined with threatened lawsuits from downstream water users, hampered further development of reservoirs needed to serve the San Luis Valley. In spite of this the valley water users managed to privately fund and construct five reservoirs between 1910 and 1913. Eight major irrigation drains were constructed in the valley to reclaim some 90,000 acres which were becoming waterlogged. The valley continued to use water.

## The Rio Grande Compact

During this period the states of Texas, New Mexico and Colorado conducted discussions on their respective water rights on the Rio Grande. In 1923 the three states seriously started trying to resolve the issue of an equitable distribution of the waters of the Rio Grande. A temporary compact was drawn up in 1928. On March 18, 1938 the Rio Grande Compact was signed by the commissioners of the three states. It was ratified by the Colorado Legislature on February 21, 1939.

The Rio Grande Compact is a complicated document which attempts to maintain the relationship of annual flows across state boundaries which had developed by the early 20th century. The terms of the Compact are flexible, recognizing annual variations in natural flow and anticipating that new sources of water for the Basin would develop. Colorado has the most difficulty meeting its delivery requirement in years when the river's flow is high. Under the Compact, states can also accumulate a debt or credit.

Colorado began to accumulate a debt after 1949 and it reached an estimated 944,000 acre feet, from 1952 to 1966 due to five large water years which occurred during that time. In 1966, Texas and New Mexico sued Colorado. This suit carried to the United States Supreme Court. In 1968 a stipulation was reached among the three states which, in essence, said that Texas and New Mexico would not proceed with further litigation if Colorado would honor its obligations under the Compact. From 1968 to 1985 the State Engineer strictly enforced the terms that Colorado had to meet to repay its debt and meet its annual

allotment. There is a clause in the compact which provides for elimination of a debt or credit if Elephant Butte Reservoir spills. In June 1985 Colorado's alleged debt of 600,000 acre feet was erased by such a spill. In 1986 and 1987 Elephant Butte spilled again insuring that Colorado's allotment was met.

#### **Authorization**

Public Law 92-514, approved on October 20, 1972, gave the Secretary of the Interior permission to construct, operate, and maintain the San Luis Valley Project, Closed Basin Division. It was later amended by Public Law 96-375-Oct. 3, 1980, Public Law 98-570-Oct. 30, 1984, Public Law 100-516-Oct. 24, 1988. Senate Bill No. 85-Apr. 20, 1989, authorized the Colorado Water Conservation Board to contribute to the cost of construction.

#### **General Description**

The Closed Basin Division is located in south central Colorado in the San Luis Valley in a topographic basin called the Closed Basin. The Closed Basin has a surface area of 2,940 square miles. The San Juan Mountains on the west and the Sangre de Cristo Mountains on the east merge to form the northern boundary of the basin. The San Luis Hills form the south boundary.

#### **Purpose of the Project**

The purpose of the Closed Basin Division project is to salvage unconfined ground water and available surface flows in the Closed Basin that would otherwise be lost to evapotranspiration by salt grass, rabbit brush, greasewood, and other vegetation. The salvaged water is delivered through a 42-mile conveyance channel to the Rio Grande to assist Colorado in meeting its commitment to the States of New Mexico and Texas, under the Rio Grande Compact of 1939, and to assist the United States in meeting its commitment to Mexico under the treaty dated May 21, 1906. The Project also provides for the delivery of water to the Alamosa National Wildlife Refuge and Blanca Wildlife Habitat Area, stabilization of San Luis Lake, recreational

facilities at San Luis Lake, and fish and wildlife enhancement.

### **PROJECT FEATURES**

#### **Salvage Wells**

The 170 water salvage wells constructed constitute the core of the Closed Basin water salvage facilities. Salvage wells range from a depth of 85-110 feet, yield 50-1100 gallons per minute, constructed with stainless steel screens and enclosed in concrete vaults. Well fields were developed in four stages. Groundwater in the Project varies in quality. Therefore, pumped waters are blended to meet the "quality of water" terms of the Rio Grande Compact.

#### **Observation Wells**

A network of 82 observation wells provides water level data for both the confined and unconfined aquifers. This data is used to operate the Project within the drawdown limits prescribed by the authorizing legislation.



**Figure 1** Observation Well

#### **Pipeline Laterals**

The Project includes approximately 115 miles of pipeline laterals. These laterals transport water from the salvage wells to the conveyance channel in Stages 1 through 4. Stage 5 is a total pipe system, merging with the conveyance channel at the northwest boundary of Stage 4.

### **Conveyance Channel**

The Project conveyance channel provides the means of collecting the salvaged ground water from the pipeline laterals and delivering it to the Rio Grande. The channel is approximately 42 miles long with the design capacity increasing from 45 cfs to a maximum of 160 cfs. Bottom widths range from 8 to 22 feet, and water depths from 3.6 feet to 5.6 feet. The channel is lined with 20 mil thick PVC lining covered with 12-16 inches of aggregate and fill.



**Figure 2** Conveyance Channel

### **Structures**

Construction of the conveyance channel included two precast concrete siphons, seven check structures, road crossings, four constant head orifice (CHO) turnouts, one Parshall flume, two pumping plants, one feeder canal turnout, and one pipeline turnout. Extensive tree planting called shelter belts have been planted in areas highly susceptible to wind erosion. Drip irrigation systems have been installed to water the tree areas.



**Figure 3** View of Parshall Flume & Conveyance Channel

### **Programmable Master Supervisor Control System**

A remote control monitoring system to assist with regulating water deliveries, detecting equipment problems, obtaining and storing historical data was installed in 1985. The Programmable Master Supervisory Control (PMSC) system consists of a master station in the Project office, and 280 networked, remote computers used for equipment control and data acquisition.

### **Electrical**

The Project area, which is for the most part remote and inaccessible, is served by two public utility companies. Electrical power is furnished by Public Service Company of Colorado (PSCo) and the San Luis Valley Rural Electric Cooperative (REC). The Project is served by 96 miles of overhead primary line, 31 miles of underground primary line, and 42 miles of underground secondary service. The Project also has a solar-powered pumping system installed at one well site. This stand alone photovoltaic concentrator array pumping system was developed and installed as a joint research project of the Department of Energy and the Bureau of Reclamation.

### **Operation and Maintenance**

The Project is operated and maintained by Bureau of Reclamation personnel. A contract with the Rio Grande Water Conservation District (RGWCD) provides for civil maintenance on Project facilities.

The Project's overall operation is monitored by a three-person operating committee to insure the Project is being operated according to authorizing legislation. This committee consists of members appointed by the Secretary of the Interior, Colorado Water Conservation Board, and Rio Grande Water Conservation District.

### **Recreation Facilities - San Luis State Park**

Recreation facilities were constructed at San Luis Lake through a cooperative effort of the

Bureau of Reclamation, Colorado Water Conservation Board, and the Colorado Division of Wildlife. The area has been designated as a Colorado State Park and administered by the Division of Parks and Recreation with funding provided by the State of Colorado and the Rio Grande Water Conservation District. Facilities include roads, landscaping, fencing, picnic sites, campsites, boat ramps, fishing access areas, sanitary facilities, trails, and water systems.



**Figure 4** San Luis Lake Pumping Plant

**PROJECT DATA**  
**CLOSED BASIN DIVISION**  
**SAN LUIS VALLEY PROJECT**

	STAGE 1-2	STAGE 3	STAGE 4	STAGE 5	TOTALS
Yield - Acre Feet per Year	13,350	42,940	34,520	14,020	104,830
Yield - Cubic Feet per Second	18.5	59.4	47.7	19.4	145.0
Number of Salvage Wells	58	45	42	25	170
Range-submersible Pump Horsepower	3 to 15	7.5 - 50	7.5 - 30	5 to 20	---
Salvage Well Yield (Gpm)	90 to 240	200 to 1090	200 to 1120	100 to 620	---
Number - Underdrain Manholes with Pumps	22	--	--	--	22
Miles of Conveyance Channel	21.6	12.6	7.8	--	42
Miles of Pipeline Laterals	32.7	27.2	33.8	21.3	115
Number and Capacity of Pumping Plants	1-19 cfs	1-50 cfs	--	--	---
Miles of Access Roads	78	50	68	41	237
Miles of Electrical Dist. System:					
Overhead Primary	16	26	38	16	96
Underground Primary	10	20	1	-	31
Underground 2ndry	<u>22</u>	<u>4</u>	<u>6</u>	<u>10</u>	<u>42</u>
Total:	48	50	45	26	169
Est. Energy Usage - Kwh per Year	2,814,000	6,259,000	5,640,000	1,950,000	16,663,000
Number of Boundary Observation Wells	30	16	24	12	82
Number of Tree Area Turnouts	8	8	--	--	16