PROBLEMS AND PROJECTS OF THE ELEPHANT BUTTE IRRIGATION DISTRICT

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There are three distinctive points that I would like to discuss today. The first is the history of the Elephant Butte Irrigation District, second is Arroyo Control and finally modernization of irrigation and drainage facilities.

The Rio Grande Project, constructed and operated by the Bureau of Reclamation, in cooperation with the Elephant Butte Irrigation District of New Mexico, and the El Paso County Water Improvement District No. 1 of Texas, is located in central and south central New Mexico and in extreme west Texas. The project furnishes a full irrigation supply for about 178,000 irrigable acres of which 159,650 acres are water-right land and electric power for communities and industry in the area.

All project lands in New Mexico belong to the Elephant Butte Irrigation District while all lands in Texas belong to the El Paso Water Improvement District No. 1. The division of the two districts at the state line is probably as irregular as exists between any two states within the nation; yet the canals are continuous from one district to the other across this line. This is not inappropriate, however, since the entire Rio Grande Project is considered as Texas for the Rio Grande Compact purposes.

The Bureau of Reclamation maintains and operates the entire system including Caballo Dam, Elephant Butte Dam, and the hydroelectric power facilities through a project office at El Paso. The Bureau has an irrigation office at Las Cruces, New Mexico and one at Ysleta, Texas, and the Power Branch field office at Elephant Butte, New Mexico, to handle the actual field work. The Las Cruces Division serves the entire irrigated area above El Paso, while the lower division serves the irrigated area below El Paso. Thus, there are two distinct irrigation entities (one above the other insofar as this relates to river location), and in two separate states with operation and maintenance carried on by the Bureau through two division offices, the upper division of which overlaps into the lower district as far down as El Paso.

The system is further complicated through the supply of irrigation water to Mexico from project storage capacities and the management of this feature is under the International Boundary and Water Commission. The project is large, management is complex and the problems involved are extremely intricate at times, particularly during years of short water supply.

The districts are political entities of their respective states with authority to issue bonds and collect taxes for construction, operation and maintenance and to construct new works with requirements for reference to the electorate

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of the districts in accordance with the respective state laws. Each district is qualified under the state laws to execute a repayment contract with the Federal Government under the provisions of the Reclamation laws.

The physical features of the project include Elephant Butte and Caballo storage dams, 5 diversion dams, 581 miles of distribution system, 483 miles of land drains, a hydroelectric powerplant, 491 miles of transmission lines and 11 substations.

Waters of the Rio Grande are stored in Elephant Butte and Caballo Reservoirs and released as needed to meet irrigation requirements. The river bed serves as the principal conveyance channel to major diversions. The irrigable area starts just downstream from Caballo Dam and extends for some 155 miles downriver. Project lands occupy the river bottomland of three separate and distinct valleys: the Rincon Valley in Sierra and Dona Ana Counties, New Mexico; the Mesilla Valley in Dona Ana County, New Mexico, and El Paso County, Texas; and the El Paso Valley in El Paso County, Texas.

A short distance downstream from Caballo Dam, the point of irrigation releases to the project, the Rio Grande enters the Rincon Valley. This valley is about 32 miles long and averages 3 to 4 miles in width. The Rincon Valley terminates at the entrance to Seldon Canyon, a short narrow defile about 7 miles long. The Mesilla Valley begins at the mouth of Seldon Canyon. This valley, the largest geographical subunit of the project, extends for 62 river miles to the "Pass" in the Franklin Mountains at El Paso, Texas. The Mesilla Valley averages about 4 to 5 miles in width. The rich alluvial lands of these two valleys comprise the lands of the Elephant Butte Irrigation District with a maximum water-right area of 90,640 acres.

The mild climate, rich soil, and easily accessible irrigation water of the Rio Grande Valley have attracted human habitation for many hundreds of years. Spanish explorers found the Pueblo Indians irrigating crops in the first half of the 16th century using primitive methods which persisted until the early part of the 20th century.

American settlers arrived in the area between 1840 and 1850. Various areas of the valley were irrigated by constructing canals and simple diversion structures at strategic points along the Rio Grande. These structures because of their inability to withstand the river at flood stage were a source of continual annoyance.

About 1890, extensive settlement and irrigation development in southern Colorado, in addition to that which had already taken place in Central New Mexico, absorbed the normal summer flow of the Rio Grande, causing it to be dry at El Paso during more frequent and longer periods. Several small and local storage developments were proposed, but conflicting interests, including Mexico's claims for loss of water based on ancient prior right, were resolved by the Treaty of 1906, recognizing the plan proposed for developing the project under the Reclamation Act, when it was reported in 1904 that a reservoir could be created by construction of a dam at Elephant Butte which would provide sufficient water to meet the requirements of all interests.

The Rio Grande project was among the first to receive the attention of Federal Reclamation soon after the passage of the Reclamation Law of 1902. Investigation surveys were begun on the project in 1903 and a feasibility report was made in 1904.

Construction of the Rio Grande project was authorized by the Secretary of the Interior December 2, 1905, under the provisions of the Reclamation Act, and funds were allocated to initiate construction of the first diversion unit. The Reclamation Act was extended to the entire State of Texas June 12, 1906, following a partial extension for Engle (Elephant Butte) Dam in 1905.

Congress authorized the construction of Elephant Butte Dam February 25, 1905, and on May 4, 1907, $1 million nonreimbursable funds were appropriated as the State Department's share for allocation by treaty of 60,000 acre-feet of water annually to Mexico.

Construction started in 1906 with the building of Leasburg Diversion Dam and Canal. The dam and 6 miles of canal were completed in 1908 and first water was delivered through project works to three old community ditches, providing permanent diversion facilities to them.

Construction of Elephant Butte Dam was begun in 1908 but progress was delayed when difficulty in obtaining reservoir land developed. Construction of the dam proper began in 1912 and was completed in 1916, but storage operation began in January 1915.

The Elephant Butte Water Users' Association was organized and incorporated under the laws of the Territory of Arizona. The association, jointly with the El Paso Valley Water Users' Association of Texas, made its first contract with the United States for construction and repayment of the cost of the storage facilities, diversion dams, and canals on June 27, 1906.

On June 15, 1918 the district entered into a contract with the United States for construction and repayment of the irrigation distribution and drainage systems and for operation and maintenance. Additional and supplemental contracts with the United States have been negotiated since that time. The contract dated November 9, 1937, relieved the irrigation district of the repayment of its proportionate share of the cost of Elephant Butte Dam, which cost was to be repaid from power revenues. Under the terms of this contract, the district assumed the obligation to repay the remaining $5,509,135.61 of construction cost of the irrigation and drainage facilities; agreed to advance operation and maintenance funds; and also agreed to pay a storage charge of $0.10 an acre-foot of water released from storage annually for district lands. Adjustments were again made by the contract dated October 1, 1939, in which the district agrees to make 56 semiannual payments of $62,160.91 each and a final payment of the remaining balance on September 1, 1967. However, construction charges were deferred annually by the Secretary under congressional authorization for 4 years from 1955 through 1958 because of serious water shortages, making the last payment due March 1, 1971.

Additional project works authorized under more recent congressional action include Caballo Dam, a combined flood-control and power-regulating structure financed with a $1,500,000 nonreimbursable allotment transferred from the

State Department to the Bureau of Reclamation in accordance with an interdepartmental agreement dated October 9, 1935, and with additional reimbursable allotments made to the Bureau during the period 1936 to 1941; and the Elephant Butte Power development, for which funds were initially made available under the Interior Department appropriation act, fiscal year 1939.

Project Facilities

Elephant Butte Dam and Reservoir

Elephant Butte Dam is a rubble concrete straight gravity structure, 306 feet high from foundation to parapet, with crest roadway 200 feet above the riverbed, and an overall length of 1,674 feet including spillway. The reservoir has a capacity of 2,195,000 acre-feet.

The powerplant contains three identical generating units; each with a nameplate capacity of 9,000 kva which at 0.9 power factor is capable of producing 8,100 kilowatts. The Bureau of Reclamation owns 491 miles of 115,000 volt transmission lines on appropriated funds. Eleven substations are included in the system, which is interconnected with the four major private utility systems in the operating area. Through the Bureau's system, electric energy is delivered to REA cooperatives, defense installations, a municipal system, and two other power users in New Mexico.

Power generation at Elephant Butte is generally a seasonal operation depending on availability of water for irrigation. The transmission system, however, is interconnected with the Colorado River Storage Project; therefore, power is wheeled through the power system when water is not being released for generation of power.

ARROYO CONTROL PROJECTS

There are two categories of arroyo control projects. The first category of these projects is where arroyos that originate in the adjacent hill areas bordering the valleys discharge water directly to the floor of the valley. This water then spreads out over irrigated land and the irrigation, distribution and drainage facilities. Many times the irrigation facilities have been washed away completely by the flow of this water. Other times, the water accumulates in the distribution drainage system, and passes eventually to the river. Due to the large amount of trash involved in these arroyo flows, it is quite common for the structures in the system to become plugged. All of these problems are largely eliminated by the construction of arroyo dams and reservoirs.

The second category of these arroyos are the ones that discharge directly to the Rio Grande. These arroyos generally have much larger watersheds than the ones in the former category. These arroyos also bring large amounts of sand, gravel, silt, and trash to the river. The silt is then immediately carried into the irrigation system and deposited in the bottoms of canals and laterals. The sand moves downriver and eventually is carried into the irrigation system where it is also deposited in canals and laterals. The removal of this silt and sand from the irrigation facilities costs literally tens of thousands of

dollars annually. In addition, these deposits choke the capacity of the ditches to the extent that sometimes it is difficult to adequately meet peak demands on the system. The discharges from several of these large arroyos that may occur at the same time creates a flooding situation that is potentially very hazardous to downriver communities and lands.

The district's program that has been completed, is now under construction, or is contemplated for the future would largely eliminate all of the problems mentioned above. The benefits from these works are realized not only in the Elephant Butte Irrigation District, but as well in the downriver communities such as El Paso and Juarez and lands of the El Paso County Water Improvement District No. 1 and the Hudspeth County Conservation and Reclamation District No. 1.

MODERNIZATION OF THE IRRIGATION AND DRAINAGE FACILITIES

The Rio Grande Project of which the Elephant Butte Irrigation District is the larger part, is an old project, dating back to the period 1915-1925. Additionally, many of the irrigation ditches now in use go back well beyond that point in time. In fact, some ditches on the project go back to the late 1600's. When the project was formulated, many of these old ditches were incorporated into the system that we know today. Furthermore, the Rio Grande was re-directed and re-channeled in the 1930's. Thus, many irrigation facilities that were placed by virtue of a former position of the Rio Grande have now no real reason to be in their present location.

In contemplating modernization of such a system as this, it would seem logical to re-examine and re-engineer the distribution facilities to minimize and eliminate as many of these redundant facilities as possible. Accordingly, it has been suggested that a complete re-evaluation of the distribution system be made. This concept, known as the Archer Plan, very briefly would consider the following: A re-regulating reservoir would be constructed somewhere on the project downstream from the last diversion in the Mesilla Valley. The primary canals would remain in their same general locations. From these primary canals, laterals would extend at about right angles from each side of the canal to the river or hill line. These laterals would be spaced at about one mile intervals and would serve from about 600 to 1800 acres each. It is contemplated that these laterals would be in a pipe conduit. The main canals would be equipped with a system of on-site automatic checks and a series of wasteways that would discharge to the river and ultimately to the re-regulating reservoir. These automatically controlled checks would maintain a constant head over the pipe conduits, thus permitting a non-varying irrigation head. Fluctuations caused by turning on or off of irrigations in the pipelines would be compensated for by the automatic checks in the primary canal. If, for instance, irrigations were turned off to a large extent in the evening, the extra water accumulating in the primary canal system would be automatically released to the river, and thence to the re-regulating reservoir. If next morning, irrigations were turned on again, the fluctuation again would be taken care of by the automatic checks, reducing the amount of water being wasted to the river and the re-regulating reservoir. This system would operate within the capacity limits of the main canal. Releases from storage reservoirs would be of proper amounts to satisfy all systems and irrigation water would be re-regulated for downstream use at the re-regulating reservoir.

It is felt that with a system of this sort, several major benefits would accrue. Demand irrigation would be possible. That is to say that a wateruser could plan his irrigation for a certain hour of a certain day and be reasonably confident of going out and turning on his irrigation water at that precise time and getting it in the amount that he ordered. Another major benefit would be that irrigations could be largely turned off during the evening hours or weekends or holidays. Finally, such a system would involve much less operating labor than is currently used on the existing system. Another bonus would accrue from the vastly reduced maintenance in going from an open earth system to a pipe system. This reduction in labor could perhaps do much toward paying for the cost associated with re-engineering the system.