

Colorado River Basin Salinity Control Project

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Colorado River Basin Salinity Control Project

In response to concerns posed by Mexico regarding the high salinity of the Colorado River water flowing into their country, the Bureau of Reclamation established the Colorado River Basin Salinity Control Project (CRBSCP). As a related, though independent, project to the Colorado River Front Work and Levee System, the CRBSCP sought to improve conditions along the Lower Colorado River. The CRBSCP authorized the construction of a variety of structures, all of which were built in an attempt to fulfill the following objectives: 1) identify salt source areas; 2) develop conservation project plans to reduce salt loads; 3) install conservation practices to reduce salinity levels; 4) carry out research, education, and demonstration activities; 5) carry out monitoring and evaluation activities, and; 6) decrease salt concentration and salt loading that increases the salinity levels of the Colorado River in order to enhance the supply and quality of water available for use by the United States and Mexico.

Project Location

Although salinity control impacted the entire Colorado River, the CRBSCP only applied to the Lower Colorado River.¹ Reclamation conducted studies on the entire river, and ultimately chose two project locations which would allow for the CRBSCP to be most effective. One project location, referred to as Title I, measures downstream from the Imperial Dam and includes Yuma, Arizona, and the section of the Colorado reaching from Yuma to the Morelos Dam and onto the Santa Clara Slough in the Gulf of California. The other project location, referred to as Title II, is located southeast of Las Vegas, Nevada, approximately four miles from Lake Mead.

Historic Setting

1. The equivalent of the CRBSCP in the Upper Colorado Region (Colorado, Utah, and Wyoming) was the Colorado River Water Quality Improvement Program (CRWQIP). The CRWQIP was authorized under the same act of Congress as the CRBSCP, the Colorado River Basin Salinity Control Act of 1974.

Prehistoric Setting

Many indigenous groups populated the Lower Colorado Region, including the Quechuan (Yuman), Mohave, Halichidoma, and Kamia. These people practiced agriculture before contact with the Spanish, perhaps as early as 800 C.E. Relying on the periodic flooding of the Colorado River, the river tribes would plant a profusion of small gardens in the flood plain. When the river overflowed, it deposited water and a layer of silt, providing fertile topsoil for the crops. Crops included maize, melons, black-eyed pea, and a variety of native vegetation.²

Historic Setting

Unlike the history of many other of Reclamation's project, that of the CRBSCP is purely political and legal. It began in 1944, when the United States and Mexico entered into United States-Mexican Water Treaty. The treaty obligated the United States to provide Mexico with a minimum delivery of 1.5 million acre-feet of Colorado River water per annum. The 1944 treaty did not emphasize water quality, thus, water deliveries to Mexico included storm runoff, return flows, and releases from upstream storage. Delivery of treaty water began in 1950 with the completion of the Morelos Dam, a Reclamation-funded dam located in Mexico built to step-up diversion of the Colorado River.

In 1961, two major problems arose in the delivery of water to Mexico. The Wellton-Mohawk Irrigation District, located along the Gila River, had problems with drainage. To maintain the groundwater level and protect the agriculture, Reclamation began to pump excess irrigation water from Wellton-Mohawk directly into the Colorado River in 1961. Due to the alkalinity of the soil, the water pumped from the Wellton-Mohawk was highly saline, or had approximately 6,000 p/m TDS (parts per million of total dissolved solids.) Mexico assumed the

2. Norris Hundley, Jr., *The Great Thirst* (Berkeley: University of California Press, 1992), p. 16-22.

amount of drainage would increase with the completion of the Main Outlet Drain, completed under the Colorado River Front Work and Levee System in December 1962, which provided a direct drain for Wellton-Mohawk irrigation water into the Colorado River. Nature further impacted the increased salinity of the Colorado River when overall river flow diminished in the early 1960s. Diminished flow meant that the available water was more concentrated with solids. For example, in 1962, the average saline concentration of the Colorado River water near Yuma increased from 800 p/m TDS to 1,500 p/m TDS.³ On November 9, 1961, Mexico formally protested to the United States regarding the unacceptability of the high-saline water being delivered.

To alleviate the salinity problem, in 1963, Congress allocated \$6 million for a Reclamation program called Delivery of Water to Mexico. The main features of this program included construction of underground tile drainage, the addition of 25 drainage pumps, and the modification of the main conveyance channel, all within the Wellton-Mohawk Irrigation District. Due to the nature of the construction, the Colorado River Front Work and Levee System unofficially subsumed the responsibility of the Delivery of Water to Mexico program.⁴

Both the United States and Mexico realized that a more comprehensive plan was necessary to solve the salinity control problem in the Lower Colorado River. On March 22, 1965, the United States and Mexico signed a five-year agreement known as Minute No. 218. Minute No. 218, which became effective on November 16, 1965, ordered some additional

3. "Annual Project History, Colorado River Basin Salinity Control Project, Title I, Arizona-California, 1975, Volume I," p.2.

4. Even after Congress created the CRBSCP in 1974, the Delivery of Water to Mexico remained associated with the Colorado River Front and Levee System. For the history of that project see the "Annual Project Histories: Colorado River Front Work and Levee System, Arizona-California-Nevada, 1954-1971" and the "Annual Project History, Combined Histories for the Gila Project, Yuma Project, Yuma Auxiliary Project, Delivery of Water to Mexico, and Colorado River Front Work and Levee System, Arizona-Colorado, 1968-1989." [Bureau of Reclamation Project Histories, Record Group 115; National Archives and Records Administration-Rocky Mountain Region (Denver, Colorado)]

construction, including more drainage wells in the Wellton-Mohawk Irrigation District and the Main Outlet Drain Extension (MODE). The MODE is a 12-mile long concrete-lined drain which extends the Main Outlet Drain from the confluence of the Colorado and Gila Rivers to below the Morelos Dam, allowing the United States to release water to Mexico without having it count toward the treaty amount. Construction of the MODE allowed for the second action dictated by Minute No. 218. Minute No. 218 prescribed if the United States delivered only the 1944 treaty minimum of 900 c.f.s. (cubic feet per second), then the United States had to bypass 50,000 acre-feet per annum around the Morelos Dam via the MODE. Even though the United States did not have to replace the bypassed, the diverted flow reduced the salinity of the water being delivered to Mexico to 1,245 p/m TDS.⁵

Minute No. 218 was to expire on November 15, 1970. Prior to the expiration, Mexico decided that it would not accept water that had a salinity higher than 1,240 p/m TDS and asked that an additional 40,000 to 75,000 acre-feet per annum bypass the Morelos Dam. With this action, Mexico hoped to reduce the average salinity to 1,160 p/m TDS. The United States responded with the offer of bypassing as much water as needed to reduce the average salinity to 1,140 p/m TDS. Since 1970 was an election year in Mexico, sitting President Díaz Ordaz accepted the nonspecific proposal, extending Minute No. 218 for another year, leaving it to the incoming Echeverría administration to work out the details. Although President Echeverría immediately opened discussion with the United States about the salinity control issues, they could not resolve the problems. The nations extended Minute No. 218 for an additional year, through November 15, 1972.

President Richard Nixon and President Echeverría met on June 17, 1972 to discuss the

5. "Annual Project History, Colorado River Basin Salinity Control Project, Title I, Arizona-California, 1975, Volume I," p.3.

Colorado River salinity control problem. In conclusion, they issued a joint communique announcing their desire to find a permanent solution that would receive joint approval from both countries. In addition, in July 1972, the United States and Mexico signed Minute No. 241 which superseded Minute No. 218. Minute No. 241 mandated that the United States bypass 118,000 acre-feet of Colorado River through the MODE. Unlike previous agreement, Mexico had the option of whether to use the bypassed water toward fulfilling the 1944 treaty totals. The bypass water regulated by Minute No. 241 reduced the salinity of the water being delivered to Mexico from 1,245 p/m TDS in 1971 to 1,140 p/m TDS on June 30, 1973.⁶

A month later, on August 16, 1972, President Nixon assigned former Attorney General, Herbert Brownell, Jr., as his special representative to forge a permanent solution. Brownell was to be assisted by an Interagency Task Force which included members from the Department of the Interior, Army Corps of Engineers, Environmental Protection Agency, Council on Environmental Quality, Office of Science and Technology, Office of Management and Budget, Domestic Advisory Council, and the United States Section of the International Boundary and Water Commission.

Within one year, Brownell and the Interagency Task Force had found successful resolution. On August 30, 1973, President Nixon and President Echeverria approved a joint recommendation about the salinity control problem proposed by Special Representative Herbert Brownell, Jr. and Secretary of Foreign Relations of Mexico Lic. Emilio O. Rabasa. The International Boundary and Water Commission incorporated the agreement into Minute No. 242, calling it the “Permanent and Definitive Solution to the International Problem of the Salinity of the Colorado River.” Although Minute No. 242 resolved numerous problems, it touched on two

6. “Annual Project History, Colorado River Basin Salinity Control Project, Title I, Arizona-California, 1975, Volume I,” p.4.

issues specifically relevant to the CRBSCP. First, Minute No. 242 mandated that the United States adopt a measure to assure that between January 1, 1974 and July 1, 1974, the approximately 1.36 million acre-feet delivered to Mexico upstream from the Morelos Dam have an annual average salinity of no more than 115 p/m TDS, plus or minus 30, over the annual average salinity of the Colorado River water arriving at the Imperial Dam. Once achieved, the salinity of the water was to be maintained for perpetuity. Second, Minute No. 242 limited both the United States and Mexico to the pumping of groundwater in its territory near the Arizona-Sonora border at San Luis to 160,000 acre-feet annually.⁷

Project Authorization

In September 1973, Reclamation prepared a booklet on the salinity control issue called “Colorado River International Salinity Control Project.” The passage of Minute No. 242 meant that Reclamation had to deliver usable, low saline water to Mexico. Despite previous attempts to improve the salinity content in excess irrigation water from the Wellton-Mohawk area, the condition of the water remained abominable. A serious problem now confronted Reclamation. To exclude Wellton-Mohawk drainage water as part of the Treaty delivery would require elimination of irrigation operations in the area or a total bypass of all Wellton-Mohawk via the MODE. To bypass all of the Wellton-Mohawk water would mean a loss of between 175,000 and 220,000 acre-feet per annum from the Colorado River system which would have to be replaced from upstream storage. The Wellton-Mohawk drainage water unquestionably needed to be treated, however, Reclamation needed the funding. On June 24, 1974, under Public Law 93-320, Congress enacted the Colorado River Basin Salinity Control Act, which authorized the construction, maintenance, and operation of certain works on the Colorado River to control the

7. “Annual Project History, Combined Histories for the Gila Project, Yuma Project, Yuma Auxiliary Project, Delivery of Water to Mexico, and Colorado River Front Work and Levee System, Arizona-Colorado, 1973,” p.3.

salinity of water delivered to users in the United States and Mexico. Congress made available the first year appropriations of \$26 million on July 1, 1974.

Congress divided the Colorado River Basin Salinity Control Act into two titles. Title I of the CRBSCP, located downstream of Imperial Dam to the United States-Mexico border, consisted of three units: the Coachella Canal Unit, the Desalting Complex Unit, and the Protective and Regulatory Pumping Unit. Title II of the CRBSCP, which included all of the Lower Colorado River upstream from the Imperial Dam to Lake Mead, featured only one unit, the Las Vegas Wash Unit.

On September 4, 1980, under Public Law 96-336, Congress amended the CRBSCP, increasing the appropriations ceiling for Title I. The increase in funding made available additional monies for fish and wildlife mitigation.

Construction History

Coachella Canal Unit, Title I

Reclamation built the 123 mile Coachella Canal, under the authorization of the Boulder Canal Project - All-American Canal system in 1948, as a means of delivering Colorado River water to agricultural communities of California's Coachella Valley. The passage of Minute No. 242 forced Reclamation to find ways to conserve water. Due to a lack of lining in the canal, evaporation, and non-native water absorbing vegetation, much of the water flowing through the Coachella Canal disappeared before arriving in the fields. In 1975, Reclamation studies indicated that by lining the first 49 miles of the Coachella Canal, that approximately 132,000 acre-feet of water per annum could be conserved and delivered to either California farmers or to

Mexico.⁸

Even though Reclamation only planned on lining the first 49 mile of the Coachella Canal, for engineering reasons, Reclamation decided to shift the entire canal, running it parallel to the original ditch. Reclamation jointly awarded a contract for the construction of the first 33 miles of the Coachella Canal, reach 1A, to Ball, Ball, and Brosamer, Inc. and G.H.B., Co. on September 8, 1978.⁹ Reclamation awarded the contract for the second section of the Coachella Canal, reach 1B, in May 1979. On November 18, 1980, Reclamation released water into the concrete-lined portion of the Coachella Canal for the first time.¹⁰ By July 1983, the contractors had completed the entire Coachella Canal and Reclamation returned operation and maintenance duties to the Coachella Valley Water District.

The old Coachella Canal remained unused until 1988. As part of the Groundwater Recharge Project sponsored by the Board of Colorado River Water Users, the Coachella Valley Water District and the neighboring Imperial Irrigation District constructed a new turnout at the end of the new Coachella Canal. From November 22, 1988 through March 1989, the water users filled a ten mile reach of the old Coachella Canal to test the seepage rates, groundwater quality, and groundwater elevation.¹¹

As mention in the project authorization section, Congress appropriated additional money, especially for wildlife mitigation, to the CRBSCP in 1980. Because they now had the funding, Reclamation began a series of fish and wildlife mitigation projects throughout the CRBSCP. For

8. "Annual Project History, Colorado River Basin Salinity Control Project, Title I, Arizona-California, 1975, Volume I," p.54.

9. "Annual Project History, Colorado River Basin Salinity Control Project, Title I, Arizona-California, 1978, Volume IV," p.34.

10. "Annual Project History, Colorado River Basin Salinity Control Project, Title I, Arizona-California, 1980, Volume VI" p.12.

11. "Annual Project History, Colorado River Basin Salinity Control Project, Title I, Arizona-California, 1988, Volume XIII" p.9.

example, on July 17, 1981, Reclamation, the California Department of Fish and Game, and the Coachella Valley Water District signed a Memorandum of Understanding to share the cost in building deer watering facilities.¹² By supplying the deer and other native animals with watering facilities, ideally, it prevented them from drinking from and accidentally falling into the canals.

Desalting Complex Unit, Title I

Reclamation implemented six measure in the Desalting Complex Unit in an attempt to reduce the quantity and improve the quality of the Wellton-Mohawk drainage so that it could be credited toward deliveries to Mexico. The six measures are: construction of the Yuma Desalting Plant, construction of a bypass drain the Morelos Dam to the Santa Clara Slough, construction of the MODE siphon, implementation of the Wellton-Mohawk Irrigation Efficiency Improvement Program, Wellton-Mohawk Acreage Reduction, and Painted Rock Reservoir land acquisition and operation schedule modification.

The major feature of the Desalting Complex Unit is the reverse osmosis membrane desalting plant. The purpose of the plant is to reduce the salinity of the drainage water pumped from the Wellton-Mohawk Irrigation and Drainage District before returning the water to the Colorado River. The plant is located about 4 miles west of Yuma, Arizona, near the Arizona Public Service Company's Yucca Power Plant. Prior to being officially named the Yuma Desalting Plant, it was known as the Yucca Site.

The Yuma Desalting Plant is more a less a giant strainer. The Main Outlet Drain Extension (MODE) delivers excessive drainage water from the Wellton-Mohawk Irrigation District to the intake at the Yuma Desalting Plant. Some of the high-saline water bypasses the

12. On April 21, 1981, Reclamation and the Bureau of Land Management signed a similar Memorandum of Agreement to construct and maintain wells, windmills, and water tank devices, to improve conditions for local wildlife. "Annual Project History, Colorado River Basin Salinity Control Project, Title I, Arizona-California, 1981, Volume VII," p.11-2.

desalting treatment, and is instead diluted and directly delivered to the Santa Clara Slough through the MODE Bypass Drain. The remained of the water moves through a series of pretreatment chemical filters which removes the larger sediment and softens the water. A pipeline carries the excess sediment, referred to as sludge, to a disposal site on the Yuma Mesa. The partially cleaned water then moves through a reverse osmosis desalting membrane which decreases the salinity to a treaty deliverable ratio. The desalted water is then returned to the Colorado River for delivery to Mexico.

In 1971, Reclamation established a mobile test facility at the Yucca Site to determine the type of equipment needed for the Yuma Desalting Plant. The facility expanded in 1973 with the installation of a larger intake and pretreatment testing system. The expansion attracted desalting membrane manufacturers who brought tests units to the facility for experimental purposes. By 1975, nine companies had installed test units at the Yucca Site, nearly all of which were commercial size and configuration. The desalting membrane manufacturers installed the test units at their own expense. The Federal Government supplied only the work space and the pre-treated drainage water.

From February 26 through August 2, 1976, Reclamation solicited proposals for the desalting membrane to be installed in the permanent Desalting Plant. All of the manufacturers that had installed test units at the Yucca Site put in a bid. On September 30, 1977, Reclamation jointly awarded the desalting membrane contract to Hydranautics and Fluid Systems. In October 1977, two of the other bidders, Dow Chemical and E. I. Dupont, protested the awarding of the contract, stating that the recipients did not have the highest quality and most cost effective

product.¹³ A year later, on September 22, 1978, the General Accounting Office denied the protests of the membrane manufacturers. Reclamation reissued the contract to Hydranautics and Fluid Systems on October 10, 1978.

Reclamation tested the pre-treatment system in a similar method as desalting membrane. After the construction of the pre-treatment testing site in 1973, Reclamation started testing several processes including utilizing diatomaceous earth, potassium permanganate, manganese zeolite, alum flocculation, and partial lime softening. The partial lime softening process proved to be the most reliable method. In December 1979, Reclamation awarded the contract for the first phase of construction of the Yuma Desalting Plant, the Pretreatment I site.

Hydranautics and Fluid Systems continued to test the desalting membrane. In December 1980, Reclamation informed Hydranautics and Fluid Systems that their desalting membrane had failed the final proof test and that they must keep working on perfecting the product. By June 1982, Hydranautics and Fluid Systems completed testing with success and Reclamation subsequently closed the testing facility. In August 1982, Reclamation awarded the contract for the second phase of construction to the Brinderson Corporation of Yuma, Arizona. Brinderson Corporation also received the contract for the third phase of construction, the desalting building, on March 8, 1985. The value of this contract was \$35,419,195.¹⁴

Reclamation completed construction of the Yuma Desalting Plan in the late 1980s. In 1992 and 1993, the Yuma Desalting Plant went on-line at approximately one-third of its maximum capacity. Because of increased water flows in the Colorado River, and thus lower salinity, the benefits of the Yuma Desalting Plant became unnecessary. The Yuma Desalting

13. "Annual Project History, Colorado River Basin Salinity Control Project, Title I, Arizona-California, 1977, Volume III" p.23-4.

14. "Annual Project History, Colorado River Basin Salinity Control Project, Title I, Arizona-California, 1985, Volume X," p.1.

remains in a ready reserve status, and if needed, could be working to full-capacity within one year of start-up. Despite its off-line status, the Yuma Desalting Plant provides lab facilities for a water quality program that teaches hydrologists from around the globe the newest methods in desalinization.

Between 1963 and 1965, Reclamation built Main Outlet Drain Extension (MODE)¹⁵ to convey high-saline water directly from the Wellton-Mohawk Irrigation District to the Morelos Dam. Although this diversion increased the quality of the water being delivered to Mexico, too much high-saline water continued to pollute the Colorado River. To remove this water completely from the deliveries to Mexico, Reclamation decided to construct a bypass drain which would permit diverted water to sent directly from the Morelos Dam to the Santa Clara Slough located in the Gulf of California.

Although located wholly in Mexico, the United States funded the entire construction of the 53 miles concrete-lined Bypass Drain. On August 28, 1976, Reclamation awarded a contract for the construction of the uppermost 15.94 miles of the Bypass Drain to Contri Construction, Inc. Reclamation held groundbreaking ceremonies near the Morelos Dam on September 21, 1976 at which Commissioner of Reclamation Gilbert G. Stamm made opening remarks.¹⁶ Anxious to complete the project, Mexico, who was responsible for construction of the lower reach of the Bypass Drain, had awarded their contracts and commenced construction by November 1975. Reclamation and Mexico completed construction of the Bypass Drain in early 1977, and on July 1, 1977, water from Wellton-Mohawk flowed directly to the Santa Clara for the first time.

15. The MODE was constructed under the authorization of the Colorado River Front Work and Levee System, Delivery of Water to Mexico program.

16. "Annual Project History, Colorado River Basin Salinity Control Project, Title I, Arizona-California, 1976, Volume II," p.43-5.

In addition to constructing the Bypass Drain, Reclamation improved the MODE by installing a new siphon. In order to maintain a reliable flow of water through the MODE from the Wellton-Mohawk area to the Yuma Desalting Plant, a 12.5-foot-diameter semicircular metal flume had to be replaced with a buried concrete pipe siphon. Because of its proximity to the historical significant Yuma Crossing, Reclamation conducted an archaeological survey the spring of 1973. The survey team concluded that no adverse affects would occur with the installation of the new siphon. On October 10, 1975, Reclamation awarded the contract for the installation of the new MODE siphon to Sully-Miller Contracting, Co. of Long Beach, California. The contractor began installing the 3,300 feet long and 10-foot-diameter siphon on November 10, 1975. Work was completed on June 9, 1976, at a final cost of \$2,263,962.85.¹⁷

Since the Wellton-Mohawk Irrigation District proved to be a major source of the salinity control problem, Reclamation made efforts to improve that land. In 1975, Reclamation started the Wellton-Mohawk Irrigation Efficiency Improvement Program in an effort to reduce irrigation flows. The program is a combination of several programs - on-farm system improvements, irrigation management services, and research and demonstrations, accelerated education, and the work of the Technical Field Committee- all of which targets awareness of the local water users. For example, the on-farm system improvements program presents to local farmers better methods to conserve water. If the growers are willing to make the improvements, the Federal Government subsidizes 75 percent of the total cost.¹⁸ Through implementing these programs in concert with the other aspects of the Desalting Complex Unit, Reclamation hoped to reduced the drainage flow in the Wellton-Mohawk District from 207,000 acre-feet in 1974 to 167,000 acre-

17. "Annual Project History, Colorado River Basin Salinity Control Project, Title I, Arizona-California, 1976, Volume II," p.60.

18. "Annual Project History, Colorado River Basin Salinity Control Project, Title I, Arizona-California, 1976, Volume II," p.50.

feet in 1981, and ultimately down to 136,000 acre-feet annually.

In close conjunction with the Wellton-Mohawk Irrigation Efficiency Improvement Program, the Wellton-Mohawk Acreage Reduction aimed to reduce the amount of irrigable land in the district. The Colorado River Basin Salinity Control Act required Reclamation to reduce the amount of irrigable land from 75,000 acres to 65,000 acres. The Federal Government already owned a portion of the land, making it easy to take it out of production. Reclamation purchased the remainder of the land from the state of Arizona and from private owners. In June 1978, Reclamation recorded the last deed completing 10,000 acre purchase of the Wellton-Mohawk Acreage Reduction.¹⁹

The Painted Rock Dam is a major flood control project located on the Gila River, approximately 20 miles northeast of Gila Bend, Arizona. The United States Army Corps of Engineers completed construction of the dam on January 18, 1960, and have since operated it to control flooding at the confluence of the Colorado and Gila Rivers. Although the Painted Rock Dam provides temporary flood storage space in its reservoir, the Dam does not effectively handle excessive runoff during flood seasons. The Colorado River Basin Salinity Control Act required Reclamation and the United States Army Corps of Engineer to design a new flood release schedule for the Painted Rock Dam so that the release did not exceed the downstream channel capacity. In addition, the act authorized the acquisition of additional land to be purchased for the expansion of Painted Dam Reservoir. However, because Painted Rock Dam is a United States Army Corps of Engineer project, it was determined by a Federal Court that the Corps of Engineers lacks legal authority to use the land. Although new release schedules have been devised, Painted Rock Dam continues to cause flooding and sedimentation problems along the

19. "Annual Project History, Colorado River Basin Salinity Control Project, Title I, Arizona-California, 1978, Volume IV," p.2.

Lower Colorado River.

The Colorado River Basin Salinity Control Act of 1974 authorized a minimal amount of funding for fish and wildlife mitigation. On May 1, 1978, Reclamation awarded the first wildlife mitigation contract for the drilling of a well at Hunter's Hole that would allow animals to more easily access drinking water.²⁰ Funding increased for fish and wildlife mitigation when Congress amended the Colorado River Basin Salinity Control Act on September 4, 1980. Within a few years Reclamation committed to several wildlife mitigation projects, the majority of which fell under the Desalting Complex Unit. As was the case with many of the fish and wildlife mitigation projects, Reclamation joined forces with other agencies, such as the United States Fish and Wildlife Service, State Game and Fish Departments, and the Bureau of Land Management. The following is a list of some of Reclamation's larger mitigation projects and the approximate date when construction began: Revegetation of Mittry Lake (June 1984), construction of the Fortuna Fish Pond (September 1984), acquisition of San Felipe Creek (July 1985), and the restoration of the Finney-Ramer Habitat in the Imperial Wildlife Refuge (July 1985).²¹

Protective and Regulatory Pumping Unit, Title I

In the early 1970s, Mexico began drilling wells and installing pumps to tap into the ground-water source near the San Luis, Arizona-Sonora border. By December 1972, Mexico had drilled 40 wells and installed 11 pumps, which at full-capacity could recover up to 320,000 acre-feet per annum.²² Reclamation studies indicated that within 50 years, Mexico's

20. "Annual Project History, Colorado River Basin Salinity Control Project, Title I, Arizona-California, 1978, Volume IV," p.1.

21. "Annual Project History, Colorado River Basin Salinity Control Project, Title I, Arizona-California, 1985, Volume XI," p.6-7.

22. Regardless of maximum capacity, Minute No. 242 limited both Mexico and the United States to pumping only 160,000 acre-feet per year. "Annual Project History, Colorado River Basin Salinity Control Project, Title I, (continued...)

groundwater recovery program would adversely affect gravity drainage in the Yuma Valley. Representatives from Reclamation met in Boulder City, Nevada, from February 24-28, 1975, to discuss alternatives. Reclamation decided to build 35 wells, with a total pumping capacity of 125,000 acre-feet per year.

As early as October 1975, Reclamation began drilling test wells. On December 15, 1976, Reclamation awarded a contract to Dreiling, Inc. for the construction of the first six wells at a cost of \$585,975.90.²³ By November 1978, Reclamation awarded two other contracts for the construction of an additional 15 wells. Although the original plan stated that the Yuma Mesa Well Field would consist of 35 wells, only 21 were ever built; all were completed by July 1979.²⁴ The protective and regulatory pumping unit at Yuma Mesa began operating on April 27, 1981.

The wells intercepted the ground-water flowing southward from Yuma Mesa to Mexico and returned it to the Colorado River through a pipeline called the Two-Forty-Two Lateral, built from 1977 to 1978. The pipeline starts near well no. 22 and extends 12.4 miles west along the Southerly International Boundary to the previously constructed Yuma Project's Boundary Pumping Plant near San Luis, Arizona.

Las Vegas Wash Unit, Title II

The Las Vegas Wash Unit of the CRBSCP is located 12 miles southeast of Las Vegas, near Henderson, Nevada, and 3.5 miles west of Lake Mead. As originally proposed, Reclamation divided construction of the Las Vegas Wash Unit into two stages. The first stage, an evaporation plan, included a 1,300 foot long sub-surface barrier dam which would divert

22. (...continued)

Arizona-California, 1975, Volume I," p.59.

23. "Annual Project History, Colorado River Basin Salinity Control Project, Title I, Arizona-California, 1976, Volume II," p.70.

24. "Annual Project History, Colorado River Basin Salinity Control Project, Title I, Arizona-California, 1978, Volume IV," p.38-9.

water into a pipeline. The pipeline would carry a maximum capacity of 10 c.f.s. of water approximately 3.5 miles to a 625 acres evaporation pond where the excess saline could be removed. In addition, the first stage incorporated a surface flow bypass system which would convey the municipal wastewater directly to a technologically advanced wastewater treatment plant. The second stage featured a desalination plant to be installed near Las Vegas, however, Reclamation did not anticipate construction until 2000.²⁵

Although Reclamation already had a definite plan, in 1978, they began to conduct additional studies on the Las Vegas Wash Unit. Reclamation focused on identifying the major sources of salt loading and on developing a cost-effective solution. Reclamation developed and considered the following four strategies: groundwater collection, groundwater prevention, ground flow reduction, and no action. Groundwater prevention proved to be the best solution, as it prevented the surface flows from ever coming in contact with the high-alkaline soil. In 1985, Reclamation built the Pittman Bypass Pipeline which conveys fresh cooling water used by local industries directly into the drainage area of the Las Vegas Wash. Rather than discharging the relatively low-saline water into an unlined ditch, the Pittman Bypass Pipeline prevents the water from seeping into the soil. Because of unresolved environmental and lack of local consensus, Reclamation constructed no other features of the Las Vegas Wash Unit. In 1989, Reclamation officially ceased all efforts in the unit.²⁶

Conclusion

Unquestionably, the CRBSCP has achieved its goal of helping to provide clean Colorado River water for its users both in the United States and in Mexico. However, the CRBSCP raises

25. United States Department of the Interior, Bureau of Reclamation, "Colorado River Salinity Control Project-Title II, Las Vegas Wash Unit, Nevada - Definite Plan Report, May 1977," p.1-10.

26. United States Department of the Interior, Bureau of Reclamation, "CRBSCP - Point Source Division, Las Vegas Wash Unit, Nevada, Final Report, September 1989."

some questions regarding the mission of Reclamation. The primary purpose is the CRBSCP is water quality control, which historically speaking, has not been a commission of Reclamation. Yet the era of big dam building is over, and perhaps, instead of being an anomaly, improvement projects such as the CRBSCP will exemplify the goals of Reclamation in its second century.

About the Author

Lara Bickell received her B.A. and M.A. from Pepperdine University. She wrote her M.A. thesis on newspaper publisher Eugene C. Pulliam and his influence as a booster in post-World War II Phoenix, Arizona. She is currently working on her doctorate in American history at Claremont Graduate University. Lara lives in Los Angeles with her husband and a menagerie of animals.

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