MARICOPA COUNTY'S SUCCESS STORY (Historic)

Neil Irwin Article in APWA
March 1994

Maricopa County's success story

The 1993 Arizona floods

Neil S. Erwin, P.E.
Chief Engineer and General Manager
Flood Control District
Maricopa County, Arizona

Much has been written about the wisdom and value of providing communities with flood protection. Nightly newscasts have been filled with pictures of overtopped dams and breached levees lining the Mississippi River and its tributaries. Editorials in newspapers and "Letters to the Editor" decry the performance of failed flood control systems. And a critical look at how we safeguard ourselves from floods is not a bad thing.

The continual evaluation of choices we've made and policies we've followed is integral to good floodplain management. However, there is a place for structural flood control measures such as dams, channels and levees. Without such structures in place and operating during the winter of 1993, Maricopa County, Arizona, could have had flooding rivaling the floods in some parts of Illinois, Missouri or Iowa.

Maricopa County is located in Central Arizona and covers 9,226 sq mi (23,987 sq km). Fifty-eight percent of the state's population resides in the County, with Phoenix as its hub. The Flood Control District operates and maintains 56 flood control facilities in the County, many of which were built following severe flooding in the 1970s and early 1980s.

In January 1993, flooding returned to Arizona following a two-month precipitation record in Phoenix of 8.3 inches and 14 consecutive days of rain. The result was severe flooding along many of the rivers, washes and streams. In Maricopa County, however, flood damages were minimized by the work of the District in providing structural flood protection.

Maricopa County acts as a drain for the 50,000 sq mi (130,000 sq km) Gila River Watershed. Running through the County in a southwesterly direction is the Gila River and its main tributary, the Salt River. Both rivers run through the Metropolitan Phoenix Area, but are normally dry due to upstream dams which divert the water to irrigation canals. On occasion, heavy rains fill the reservoirs behind these dams to capacity, necessitating releases which can cause flooding downstream.

When the rain started falling hard in the second week of January, flows in the Salt River reached 124,000 cubic feet per second (cfs), yet many areas flooded in years past remained dry this time. Other areas of the Valley were likewise untouched in spite of the record rainfall. The people rejoiced at their good fortune and members of the media started calling to ask, "What's different since the last big flood? What have you done to make things better?" The answer is—quite a lot.

After severe flooding in 1978, a Governor's Task Force met to assess the problems and recommend solutions. Since that time, the District has accomplished many of the Task Force recommendations. The District joined with the Arizona Department of Transportation and the City of Tempe to channelize portions of the Salt River in East Phoenix and Tempe, protecting hundreds of acres from flooding.

A levee was constructed to protect Holly Acres, a small community repeatedly flooded by high flows in the Gila River. The levee, built in 1985 to withstand 115,000 cfs, held against at least 124,000 cfs in January.

The District cleared a 100-foot-wide (30 m) corridor of non-native "salt cedar" trees that choked the Salt and Gila Rivers, causing water to overflow the banks. Additionally, a pilot channel was constructed for low flows to help keep the river banks from eroding. This made room in January for flood waters that otherwise would have overflowed onto farmlands. Although some water did go over the banks in Maricopa County, it was far less than during the severe storms of 1980.

The District also has invested in a state-of-the-art network of more than 200 electronic gauges that transmit rainfall and stream flow information instantaneously to the District as well as to the National Weather Service to provide quick and timely flood warning.

Most notable among the District's accomplishments has been the completion of the Phoenix and Vicinity (including New River) Flood Control Project. This project includes four flood control dams and the 17-mile-long (27 km) Arizona Canal Diversion Channel (ACDC), all of which were constructed by the Corps of Engineers and performed perfectly during the January floods. Two of the dams, New River Dam and Cave Buttes Dam, each held back more than 5 billion gallons (19 billion l) of storm water.

Without the dams, storm water runoff would have flowed unimpeded into the Valley. Water captured by the ACDC instead would have ponded north of the adjacent Arizona Canal, flowing into it and overtopping it, causing flooding in Phoenix and Glendale.

Although these structures performed successfully in January, there are many areas that still need protection. The County works continually with cities and other jurisdictions on cooperative projects to provide flood control, but not all of the efforts are structural.

Since receiving legal authorization in 1986, the County has delineated more than 1,000 miles (1,609 km) of floodplain in Maricopa County. And since 1988, when ordinances went into effect that changed building standards to keep structures from causing or worsening local runoff problems, nearly 17,000 inspections were conducted to ensure that they do not. The efforts have paid off in the form of a 15% discount in flood insurance premiums for some residents of the County.

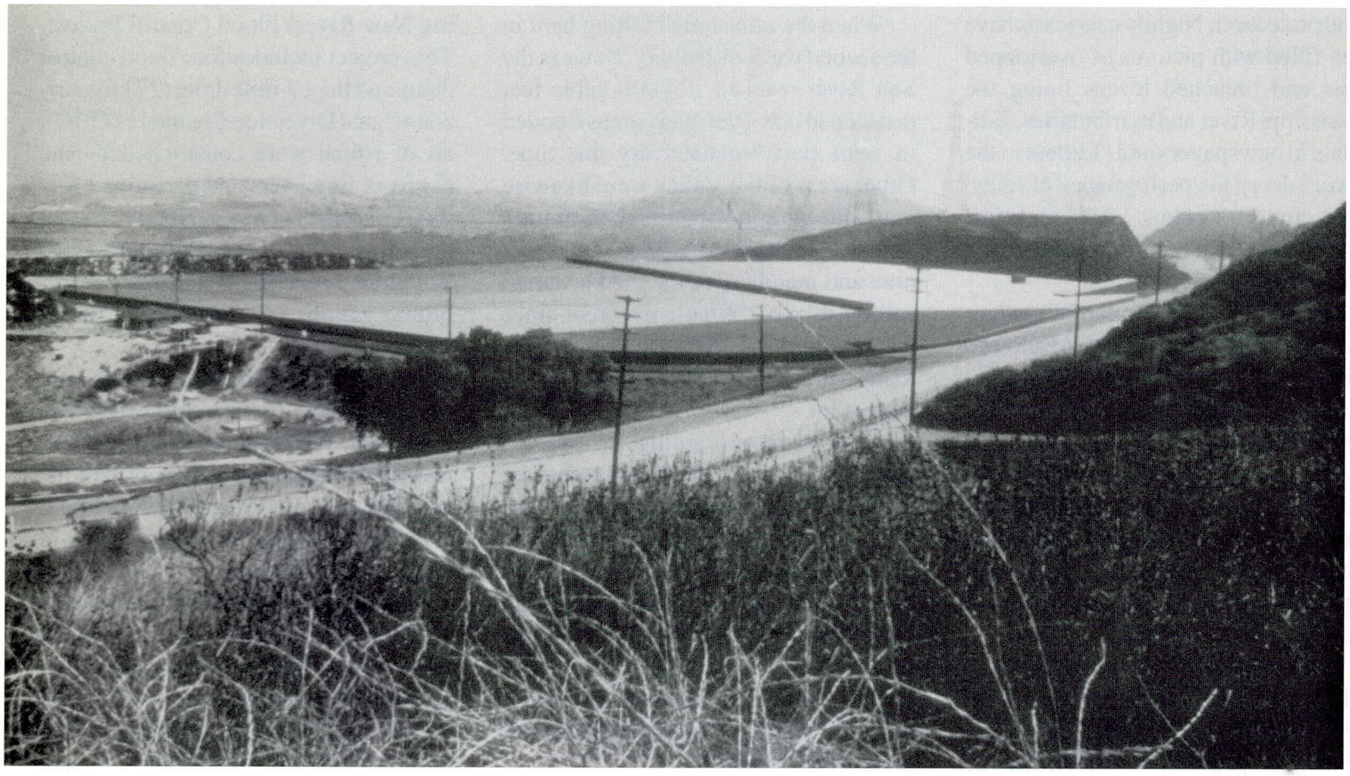
For many areas of the nation, including Arizona, 1993 will be remembered for the devastating flooding that occurred. But Maricopa County also has learned the value of preparedness and the mitigating impact flood control structures can have when the floods come.

♦

Editor's Note: This article is based on a presentation made at the 1993 International Public Works Congress and Exposition held last September in Phoenix.

Aluminum reservoir cover brings cost, performance

Custom installation required special design considerations to eliminate electrical danger



In anticipation of a mandate that their reservoirs either be covered or filtered, the Los Angeles Department of Water and Power weighed their options and decided that an aluminum cover would be the most cost-effective for the 600,000 sq. ft. (55,800 m²) Lower Van Norman reservoir.

A 600,000 sq. ft. (55,800 m²) reservoir cover of painted aluminum panels — believed to be the largest cover of its type — has been erected over the Lower Van Norman By-Pass Reservoir in Mission Hills, California, about 22 miles (35 km) northwest of downtown Los Angeles. The massive roof, which required a special grounding system due to the presence of high voltage overhead power lines, has been designed to provide a range of cost and performance benefits — including seismic safety, good aesthetics, low maintenance and life-cycle cost economy.

The Los Angeles Department of Water and Power (DWP) designed and engineered the cover in anticipation of a new regional Water Quality Board requirement stating that open reservoirs must either be covered or the outflow must be filtered before being fed into the distribution system. Filtration of the 78.2 million gallon (355 million liter) reservoir would have been extremely costly, so the DWP did a study to compare three types of coverings: 1) a rubber cover which would float on the surface of the water; 2) a rigid concrete cover; and 3) a timber frame with lightweight painted aluminum panel roofing. A 60-year life-cycle cost projection revealed that the aluminum cover would be the most cost-effective.

Design Considerations

Design of the aluminum roofing system involved several challenges — the most unusual being the grounding requirements. To prevent the possibility of electrical arcing from overhead power lines, the DWP designed a ground cable loop which would extend around the perimeter of the reservoir and connect to the roof. Kevin J. Brown, DWP project manager, explained how this was accomplished.

"We needed to find some way to create an electrical bond between and among the aluminum panels to assure grounding throughout the roof," he said. "To meet this need, we specified all panels with a bare (unpainted) metal strip at the lap joints, to be sealed with an electroconductive gel. This unique design effectively solved our grounding requirements."

Aesthetics was another concern in designing the roof. For local residents who had a view of the site, the DWP wanted the cover to be attractive.

"Our solution was to design a color scheme to break up the mass of the 13-acre (5 hectare) roof structure and give it a visual pattern," explains Brown. "To accomplish this, we selected four shades of earth tones in transitional colors. These were compatible with the desert look of the area, without being overly bright. Use of multiple colors for this type of roof is quite unusual."