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AFTER ACTION REPORT

The Floods of January 1993

Flood Control District of Maricopa County April 1993

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Phoenix, Arizona 85009

April 1993

Cover photo: A record impoundment of 17,500 acre feet of water is captured behind Cave Buttes Dam on Cave Creek Wash in northeast Phoenix on January 9, 1993.

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Exhibits

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- B "This Winter, Central Arizona was soggy than Seattle", PULSE, Salt River Project, April 8, 1993
- C March 16, 1993 minutes of the Governor's Gila River Task Force
- D "Valley Takes a Soaking; Storms keep SRP hopping", PULSE, Salt River Project, January 14, 1993
- E "Floods in Arizona, January 1993", Water Fact Sheet, U. S. Geological Survey, 1993
- F January 1993 weather-related events, Department of Emergency Management, February 3, 1993
- G February 1993 weather-related events, Department of Emergency Management, March 10, 1993
- H Maricopa County Involvement in the January Floods, County Manager's report to the County Supervisors, Feb. 22, 1993
- I Report on Flood Damage and Assessment for Board of Supervisor Meeting, Department of Emergency Management, Feb. 1, 1993
- J Summary of Media Contacts for January 8, 1993
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- K Holly Acres Stormwater Emergency Action Report, Chris Ford, January 20, 1993
- L Storm Damage Report: Queen Creek and EMF, Michael Meng, January 20, 1993
- M Memorandum, Hassayampa Flooding South of Wickenburg, Susan Fitzgerald, March 3, 1993
- N Meeting minutes, Public Meeting, New River Senior Center and Daisy Mountain Fire Station, February 23, 1993
- O Letter to Buckeye-Roosevelt Natural Resource Conservation District, Neil S. Erwin, P.E., May 7, 1993
- P "Repair, Removal and Modification Alternatives for Gillespie Dam", Flood Control District of Maricopa County, February 25, 1993.
- Q Dollar costs of flood damages to District structures, FEMA and District amounts
- R Preliminary accounting of FEMA-approved damages in Arizona, May 6, 1993
- S "Floods of '93: Deja Vu all over again", Arizona Water Resources, University of Arizona, April/May 1993
"Forty Days and Forty Nights....Almost!", AFMA Newsletter, Arizona Floodplain Management Association, May 1993
- T "Tri-City Landfill Questions and Answers", Arizona Department of Environmental Quality

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- U Memorandum, MCDOT Activities During Recent Flood Emergencies.
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- V Listing of additional documentation and materials not included in
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PLATES

Plates

I. INTRODUCTION

The purpose of this report is to summarize the impact of January's storms on Maricopa County with specific emphasis on the performance of flood control structures and the District's operational response to the flood emergency. This report has been prepared pursuant to Flood Control District of Maricopa County Standard Operating Procedures for Flood Emergencies, Revised 7-1-91, wherein it states; *An after-action report will be prepared under the direction of the Deputy Chief Engineer.*

Information regarding precipitation and runoff was obtained from a storm report prepared by the Hydrology Division, Special Projects Branch. Special Projects operates a rain and stream gauge network which provides current or "real time" information about rainfall and stormwater runoff in Maricopa County.

Information on storm damage was obtained from the Maricopa County Department of Emergency Management, the Office of the Maricopa County Manager, and from reports prepared by District staff.

Additional hydrometeorological and storm damage information was obtained from the National Weather Service, Salt River Project, and others credited in footnote citations.

An effort was made to incorporate as exhibits, the various documents cited and used in the preparation of this after action report. However, a number of documents, videotapes, photographs, newspaper clippings and other materials could not be included for reasons of space. They are on file at the District. Newspaper articles and photographs are listed in Chapter IX and Chapter X of this report. Other materials are listed in Exhibit V.



Stormwater runoff in New River is captured by New River Dam, January 9, 1993.

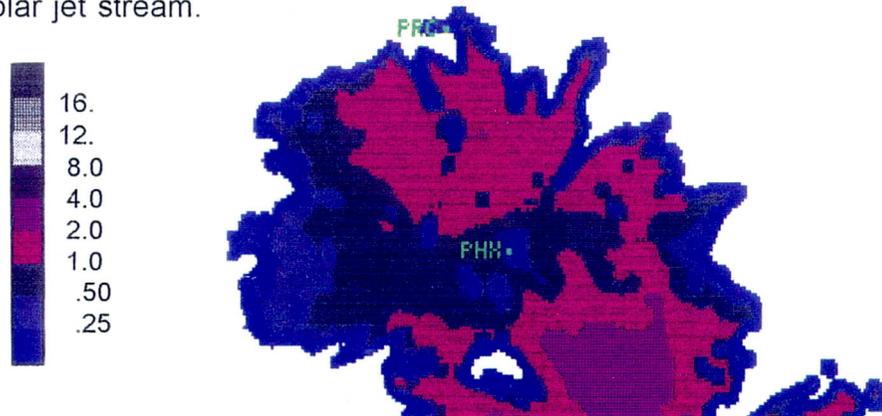
II. METEOROLOGY

The combination of a northward-displaced subtropical jetstream, with its abundant moisture supply and associated disturbances, and a southward-displaced polar jetstream, with its storm track, led to an abnormally wet period from just after Christmas 1992 to mid-January 1993.¹

During early December, the polar jetstream maintained an unusually strong west-to-east flow as it crossed the Pacific Ocean. By late December, the jet stream changed, forming a strong area of high pressure in the Eastern Pacific with upper level north-to-south winds evolving from the Arctic to the west coast. An intense storm moving through the Central Pacific amplified the high pressure area over the Gulf of Alaska and caused a "secondary" polar jet stream to form just north of Hawaii. This weather pattern persisted for several weeks and led to colder than normal conditions, with periodic Arctic outbreaks along the west coast of Canada, the northwest United States, and adjoining coastal waters. An area of low pressure developed just off the west coast.

Storms moving through the primary branch of the polar jet stream (the northern stream) around the Arctic Circle were steered southward along the west coast of the U.S., then eastward toward Arizona. These storms became more intense as they moved through the west coast low. The first in a series of storms brought heavy rains to the valleys and snow to the upper elevations of Arizona during the last week of December. Additionally, a succession of weaker storms in the "secondary" polar jet stream moved toward Arizona.

The storms in the secondary polar jet stream sometimes interacted with disturbances further south in the subtropical jet stream which generated significant "southern stream" disturbances (also referred to as the "pineapple express"). These disturbances caused several significant precipitation events that affected Arizona, and were more frequent visitors than disturbances moving through the primary polar jet stream.



Rainfall amounts for 24 hour period ending 5 A.M. January 7 (WSI, Inc)

¹ Information obtained from National Weather Service preliminary report (unpublished), "Record Arizona Floods, January and February 1993, A Hydrometeorological Overview".
(See Exhibit A)

III. PRECIPITATION

From December 1, 1992 to February 28, 1993, the accumulated rainfall on the 13,000-acre Verde and Salt River Watershed was 17.63 inches, triple the normal level and exceeding the previous record of 14.91 inches set during the winter of 1979.

The most significant rainfall events occurred on December 27-28, January 6-8, January 10, January 14, and January 16-18.

The December-January total of 8.30 inches of rain in Phoenix was a two-month record, topping the 8.15 inches that fell in July and August, 1911. According to the National Weather Service, January 1993 was Phoenix's wettest on record with 5.22 inches of rain. It was also the fourth wettest month ever, trailing only July 1911 (6.47 inches), September 1939 (5.41 inches) and August 1951 (5.33 inches).²

Precipitation in the form of snow resulted in record amounts of snowpack in the watershed. Snow surveys completed in late February showed snowpack to be 233 percent of average on the Salt River Watershed, 217 percent on the Verde and 224 percent on the Gila River watershed.³

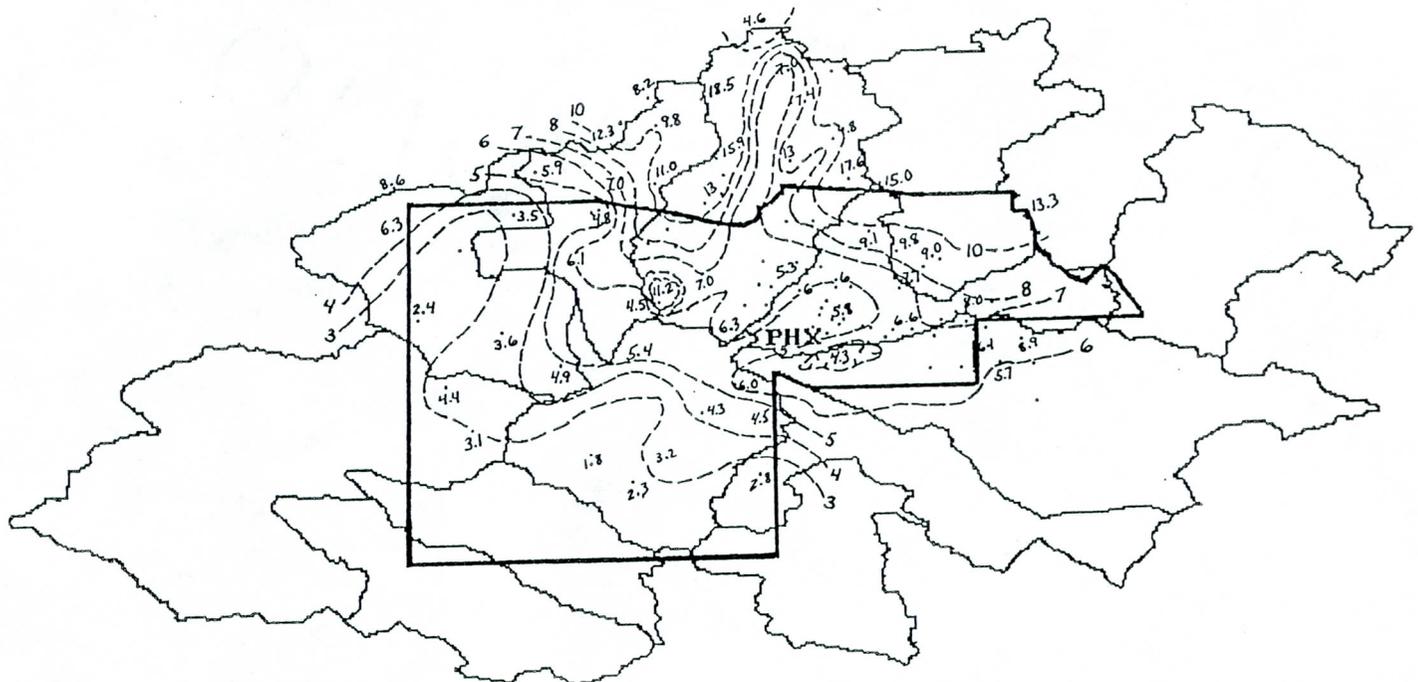
In January, 117 of the District's 128 precipitation gauges operated by the District as part of its Automated Local Evaluation in Real Time (ALERT) system recorded rainfall amounts in excess of three inches for the month. The gauge receiving the most recorded rainfall (16.50 inches) was atop Mt. Union in the Bradshaw Mountains. Other statistics relating to precipitation amounts recorded in January by District gauges include:

Number of gauges recording 15 inches of precipitation or more:	2
Number of gauges recording 10 inches of precipitation or more:	10
Number of gauges recording 8 inches of precipitation or more:	21
Number of gauges recording 6 inches of precipitation or more:	42
Number of gauges recording 5 inches of precipitation or more:	70
Number of gauges recording 4 inches of precipitation or more:	98

² Precipitation amounts as reported by SRP in April 8, 1993 newsletter, "Pulse".
(See Exhibit B)

³ Snowpack percentages attributed to Mike Franjevic, National Weather Service, in minutes of Governor's Gila River Task Force meeting, March 16, 1993. (See Exhibit C)

An Isohyetal map was produced showing some of the precipitation totals for the period December 27, 1992 through January 19, 1993.



Isohyetal Map for Maricopa County
Storms of Dec. 27, 1992
thru Jan. 19, 1993

IV. RUNOFF AND STREAM FLOWS

Heavy rainfall occurring over a short period of time on already saturated ground resulted in heavy runoff and large stream flows. Runoff into Roosevelt Lake on the Salt River was estimated at 137,000 cubic feet per second (cfs) on January 8, 1993. Inflows into Horseshoe Lake on the Verde River were estimated at 138,000 cfs on that date, an all-time record for inflows into the Verde River System.⁴ Runoff from the Gila River watershed resulted in reported inflows into San Carlos Lake of 60,000 cfs the afternoon of January 11, 1993.⁵

Contributing to the unusually high runoff was snow melt. Since the subtropical jet stream's position was farther north than is usually the case in January, subtropical heat and moisture was pushed further north than usual. As a result, areas that usually did not experience snow melt until Spring received rain on top of the snow that had already accumulated from earlier winter storms. For example, the snow level during the January 6-8 event rose to about 8500 feet mean sea level, several thousand feet above typical January snow levels.

⁴ Runoff totals as reported January 14, 1993 in Salt River Project Newsletter "Pulse".
(See Exhibit D)

⁵ Runoff estimate attributed to Ken Clouser, Bureau of Indian Affairs engineer, as reported by the Phoenix Gazette, January 12, 1993.

As runoff began accumulating in central Arizona streams, flows quickly reached flood stage on numerous rivers. An analysis of the stream flows was provided in a post-storm "Water Fact Sheet" compiled by the U.S. Geological Survey from which excerpts are reprinted below:

As small streams contributed flow to the larger streams, floods began to occur on the Verde, Salt, Gila, and Agua Fria Rivers and Rillito Creek. The accumulated waters produced floods on these streams that have only a 1-percent to 2-percent (100- to 50-year return period) chance of occurring in any given year. Although these peak flows are high, the most unusual aspect of these floods was the volume of water produced. For example, in the Gila River just above San Carlos Reservoir, the highest flood ever recorded at that site occurred in 1983 during a storm that affected the southern part of Arizona. At the peak of the flood, about 150,000 cubic feet of water passed that station. In January 1993, the highest of the three peaks that occurred in the flood is estimated to be 109,000 cubic feet per second. When the volumes of water in the two floods are compared, however, the flood of 1993 is estimated to be 76 percent larger than the flood in 1983. In 1983, the flood volume was 503,000 acre feet, but in January 1993, the prolonged period of rainfall (combined with high initial soil moisture) caused a much longer duration of flooding and the flood volume was 884,000 acre feet, more than enough water to fill the San Carlos Reservoir downstream whose available storage capacity for flood control at the time was 239,500 acre feet. Other streams also contributed water to the reservoir, resulting in a spillway discharge from the reservoir of 32,500 cubic feet per second. Of the (major rivers in Arizona), only the Salt River near Roosevelt and Big Sandy near Wickiup indicate less flood volume in the 1993 flood than for a flood with a 1-percent chance (100-year return period) of occurring at those sites. Because of the high elevation of many tributary drainages to the Salt River, part of the precipitation fell as snow which has yet to melt. This effect explains the low volume of flood runoff in the Salt River compared with (other rivers in the state).

(The complete text from the above-referenced U.S. Geological Survey fact sheet can be found in **Exhibit E.**)

On January 8, 1993, the Maricopa County Department of Emergency Management was advised by Salt River Project (SRP) that water releases passing Granite Reef Dam would be increased to 80,000-85,000 cfs due to heavy overnight rains. Later that day, SRP increased their release prediction to an estimated 150,000 cfs based on increased flows into the Verde River, combined with heavy storm runoff from streets, roads, streams and canals below the dams.⁶ In the final analysis, flows at Granite Reef Dam peaked at a lesser rate of 124,000 cfs at 10:15 p.m. January 8. This flow on the Salt River equates to about a 25-year flood event. The highest flows ever recorded at Granite Reef was 178,000 cfs in 1980.

⁶ Release scenario as reported by Department of Emergency Management in February 3, 1993 report to the National Weather Service of January 1993 weather-related events. (See **Exhibit F**)



Channelization in the Salt River in Tempe successfully contains flows of 124,000 cubic feet per second on January 8-9, 1993.

Releases in January from dams upstream of Granite Reef Dam on the Salt and Verde Rivers included a record release on January 8 of 111,100 cfs from Horseshoe Dam on the Verde River. Bartlett Dam had a release of 114,000 cfs on that date, while spillway releases from Roosevelt Dam on the Salt River were at 11,300 cfs.⁷ Releases at Roosevelt Dam were complicated by construction which was underway to elevate the dam by 77 feet to improve storage capacity and provide flood control. One of the spillways was temporarily dammed to allow the construction. On January 19, the temporary, or coffer, dam was overtopped as the reservoir attained its highest elevation ever.

On January 18, flows in the Salt River rose rapidly to 80,000 cfs and continued at that rate for one day, gradually dropping to 15,000 cfs on January 31. Flows in the Salt River as of this writing were 700 cfs at Granite Reef, with releases to increase April 27, 1993 to 4,000 cfs and continue at that level through May, 1993.

Flows in the Gila River above its confluence with the Salt River originated primarily from releases at Coolidge Dam in Gila County, and from the Gila tributaries of the San Pedro and Santa Cruz Rivers in Pinal County. Spillway releases from Coolidge Dam began on January 11 and peaked the evening of

⁷ Release rates as reported by SRP in March 31, 1993 video entitled "Summary of Water Releases - January 1993".

January 20 at 32,800 cfs.⁸ Flows in the Santa Cruz River were estimated at 30,000 cfs at Tucson on January 19.⁹

Below its confluence with the Salt River, the Gila River attained an estimated peak discharge of 137,300 cfs on January 8 at 7:45 P.M. as recorded by a District stream gauge located at the Estrella Parkway crossing. Flows in the Gila River accumulated behind Painted Rock Dam west of Gila Bend, resulting in a record impoundment of 2.8 million acre-feet of water, which is 117% of capacity. The surface area was estimated at 150 square miles.¹⁰ Water eventually began flowing over the spillway of Painted Rock Dam on February 21 and peaked February 27 at 26,000 cfs.¹¹ This was the first time since the dam's construction in 1963 that releases occurred at the spillway.



A large lake forms behind Painted Rock Dam on the Gila River as seen from the air on February 3, 1993.

⁸ Peak release from Coolidge Dam as reported by the Arizona Daily Star, January 22, 1993. Date of initial spillway release as reported by the Phoenix Gazette, January 12, 1993.

⁹ Santa Cruz River flows as reported in the Tri-Valley Dispatch, January 20, 1993.

¹⁰ Acre-feet as attributed to Joe Dixon, Corps of Engineers, in minutes of Governor's Gila River Task Force meeting, March 16, 1993. Surface area of Painted Rock Reservoir as reported March 10, 1993 by Maricopa County Department of Emergency Management in synopsis of weather-related phenomena for the month of February, 1993. **(See Exhibit G)**

¹¹ Painted Rock releases as reported by Phoenix Gazette, March 5, 1993 and confirmed by Public Affairs Office, Corps of Engineers, Los Angeles District.

While flows in the Salt and Gila Rivers were of greatest concern in terms of flooding, flows in lesser rivers and streams were also monitored. In some cases, peak flows were monitored using stream gauges installed by the District. In other cases, peak flows were estimated "after the fact" by surveying high water marks. Listed below are the January peak discharges recorded or estimated by the District on selected rivers, streams and washes.

	<u>Peak Discharge</u>
Agua Fria River at Buckeye Road	2,600 cfs
Cave Creek below Carefree Highway	13,800 cfs
Cave Creek at Cactus Road	1,370 cfs
Centennial Wash at SPRR	270 cfs
Hassayampa River at Hwy 60/89 in Wickenburg	16,500 cfs
Hassayampa River at Box Canyon	29,000 cfs
Hassayampa River at Wagner Road	13,800 cfs
Indian Bend Wash at Indian Bend Road	3,900 cfs
Indian Bend Wash at McKellips Road	3,100 cfs
New River at New River Road	28,500 cfs
New River at Glendale Avenue	6,980 cfs
Skunk Creek above 83rd Avenue	1,200 cfs
Skunk Creek at 1-17	4,980 cfs
Waterman Wash above Elliot Road	1,100 cfs

Flows in the Agua Fria River below Lake Pleasant were primarily due to releases from New Waddell Dam and from New River, a tributary of the Agua Fria. Releases from New Waddell Dam began on January 17 after concerns were expressed by the Bureau of Reclamation that the reservoir behind the newly constructed dam (completed in October, 1992) was filling too fast. The Bureau's concerns were documented by the *Phoenix Gazette* in a story published January 20, from which excerpts are reprinted below :

Lake Pleasant has nearly doubled in size because of recent heavy rains, forcing federal engineers worried about the lake's untested dam to release water into the Agua Fria River "The design was to fill it up to a certain level and watch it for awhile, and then fill it to a higher level and watch that for awhile," said Robert Herring, regional superintendent of the Maricopa County Parks and Recreation Department. "We were going to fill it at the rate of a foot a day," Chuck Morfoot of the Bureau of Reclamation said. "Instead, we were filling up at a foot an hour."

Along with the stormwater, large amounts of wood and other debris entered Lake Pleasant, forcing the lake's closure to watercraft until the material could be removed. County Parks Director William Scalzo said some of the debris included 55 gallon drums, along with several larger tanks. The *Phoenix Gazette* reported that the tanks contained petroleum products....*"The Maricopa Parks and Recreation Department said one of the tanks discovered last week floating in the lake was a 10,000-gallon underground fuel tank that had about 400 gallons of gasoline in it. (Another tank) was a 2,000-gallon oil tank. Hazardous materials experts were called in to pump out the tanks and remove them from the lake."*

V. EMERGENCY DECLARATIONS

The County Board of Supervisors signed a County Emergency Declaration on Friday January 8. A State Emergency was declared the same day by Governor Fife Symington. A Presidential Federal Disaster Declaration was signed by President Bush on January 19.

VI. EVACUATIONS ¹²

Approximately 200 families in the community of Holly Acres were evacuated January 8 when rising waters threatened to overtop a levee constructed by the District in 1985 to protect the community. Holly Acres is located near the confluence of the Gila and Salt Rivers. The levee successfully protected the community and the evacuees were allowed to return to their homes late on January 9. (See section of this report on FCD structure performance for additional information regarding the performance of the Holly Acres Levee)



Flows in the Gila River are held back January 9, 1993 by a levee protecting homes and property in Holly Acres. Crews placed sand bags across 115th Avenue to keep water from surging northward.

¹² Evacuation information obtained from two reports: 1.) "Maricopa County Involvement in the January Floods", County Manager Report to the Board of Supervisors, February 22, 1993, (See Exhibit H) and 2.) "Report on Flood Damage and Assessment for Board of Supervisors Meeting", Robert H. Bishop, Department of Emergency Management, February 1, 1993. (See Exhibit I)

Also evacuated were six families from the 51-unit Hawaiian Mobile Home Park located west of Country Club Road in Mesa.

As a result of road closures, 16 families in the New River area became stranded. Some families stayed at the New River Community Center until they were able to return home.

Fifteen families in a trailer park five miles south of Wickenburg were forced to evacuate due to flooding along the Hassayampa River. The American Red Cross opened shelters at a Wickenburg church and hotel to accommodate those evacuated.

VII. FLOOD CONTROL DISTRICT PERFORMANCE

The County activated the Emergency Operations Center (EOC) on a 24-hour basis starting January 7 in response to the continued rain, water releases and potential flooding in the County. The EOC was staffed by the Maricopa County Department of Emergency Management, the Flood Control District, the Maricopa County Department of Transportation (MCDOT), the Sheriff's Office and the Central Arizona Chapter of the American Red Cross.

A. Flood Warning

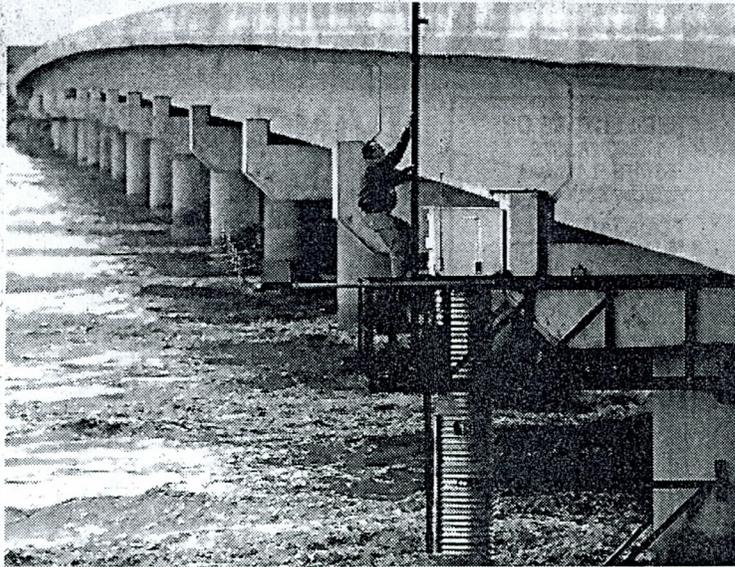
Information regarding rainfall and runoff was collected and analyzed at the District by hydrologists with the Special Projects Branch. Much of the information was obtained from the District's Automated Local Evaluation in Real Time (ALERT) system. Information exchange occurred between the District and the EOC and various agencies throughout the county, including Salt River Project, Bureau of Reclamation, U.S. Geological Survey, National Weather Service, Arizona Department of Transportation, Corps of Engineers, and state emergency management offices.

Among the information disseminated to various agencies was river forecast information for locations below the confluence of the Salt and Gila Rivers. Hydrology Division staff used water release information and travel times to estimate flows at particular points of interest. This was especially helpful to local transportation authorities charged with monitoring bridge crossings. A total of 13 such river forecasts were made during the month of January. The forecasts produced from known flow data were reasonably accurate, while others produced from quantitative precipitation forecasts were limited by the accuracy of the input information.

Coordination between the District and MCDOT's Operations and Traffic Engineering Divisions was facilitated by regular meetings of the division heads and the Assistant County Manager for the Transportation and Development Agency, using the Flood Alert Room and adjoining areas as an operations center. Included in the effort were public information coordinators from the District and

MCDOT who responded to inquiries from the public and media, wrote and disseminated news releases, and documented agency activities for later inclusion in after action flood reports. A summary of media inquiries received January 8-11, and copies of news releases produced during the January flood event are found in **Exhibit J**.

Hazardous duty



Paul F. Gero/The Arizona Republic
Tom Kiefer, a flood-control worker for Maricopa County, has to be careful as he climbs around above the rushing Gila River. Kiefer was checking equipment Saturday on the Estrella Freeway over the river.

The overall performance of the ALERT system during the flood event was exemplary. The Datacommand software installed in October 1992 simplified and compiled ALERT information into useful decision-making products such as visual representations of pool depths behind District structures.

Although several precipitation and water-level gauges became inoperative at various times during the storms, recent installation of additional gauges throughout the County minimized the effect of the inoperative gauges. Two gauges...on the Salt River at 24th Street and on Cave creek at Cave Creek Road...were damaged beyond repair. The Holly Acres precipitation gauge was removed on January 9 because it faced inundation by the rising Gila River. Numerous ALERT system alarms were received and reacted to by District hydrologists either at the terminal or at home via the DECtalk dialout system. The "Flood Emergency Procedure Plan" which defines the chain of command and information flow path for the District during emergencies was followed during the January events and appeared to work well for its intended in-house purpose. However, Special Projects reported that the inclusion of MCDOT and other Transportation and Development Agency activities within the emergency plan caused some confusion and duplication of effort.

B. Flood Observation

Throughout the course of the flood emergency, observers were dispatched from the Hydrology, Engineering, Planning and Construction/Operations Divisions to observe and report on flooding incidents and flood control structure operations. In the case of Hydrology Division staff, they additionally identified high water marks at various locations. Observations by Hydrology staff occurred January 11 at the locations listed below.

Field Observation Sites

ACDC at 67th Avenue
Agua Fria River at Camelback Road
Agua Fria River at Lower Buckeye Road
Ashbrook Wash in Fountain Hills
Cave Creek at Cactus Road
Cave Creek at Carefree Highway
Cline Creek downstream of New River Road
Deadman Wash downstream of I-17
Galloway Wash at School House Road
Gila River at 115th Avenue
Gila River at Tuthill Road Bridge
Hassayampa River at Patton Road
Hassayampa River at Highway 89 bridge
Hassayampa River at Old US 80
Indian Bend Wash at Tatum Blvd
Indian Bend Wash at McKellips Road
Little San Domingo Wash at Highway 85
Mockingbird Wash
Monarch Wash
Morgan City Wash at Lake Pleasant Exit
New River at Carefree Highway
New River 0.8 miles south of Carefree Highway
New River at New River Bridge
New River at Northern Avenue
New River at Thunderbird Road
Rio Verde Area along Forrest Road
Rodger Creek upstream of New River Road
Rowe Wash at School House Road
Salt River at 51st Avenue
Salt River at 91st Avenue
San Domingo Wash upstream of Highway 85 bridge
Skunk Creek at Pinnacle Peak Road and 35th Avenue
Skunk Creek at New River Road
Skunk Creek at Desert Hills Road
Skunk Creek at Carefree Highway
Skunk Creek at 83rd Avenue
Sols Wash upstream of Tegner Road
Waterman Wash at Elliot Road Alignment

C. Emergency Repairs

The Construction and Operations Branch (C & O) focused their attention on the performance of District flood control structures. Crews monitored large impoundments behind Cave Buttes and New River Dams and flows in the Arizona Canal Diversion Channel (ACDC). On occasion, C& O staff also monitored river crossings, such as the I-10 crossing over the Gila River. In Holly Acres, crews worked Friday January 8 to bolster the Holly Acres Levee to prevent flows from reaching nearby homes. A summary of the effort prepared by C & O is reprinted below.

"On January 8, 1993, the storm water flows from the Salt River and the Gila River were threatening to top the dike on the north side of the river. Action was taken to reduce the possibility of flooding. At the east end of the dike, water was controlled by constructing a diversion levee. The levee measured approximately 1000 feet long by 12 feet wide by 8 feet high. Fill from the neighboring farmland was used to construct the levee. 96,000 cubic yards of material was excavated. Sand bags were brought to the site along with 183 tons of sand. An estimated 15,000 bags were placed on the road crossing at 115th Avenue on both the north and south sides of the river." (See Exhibit K, "Holly Acres Stormwater Emergency Action Report")

In the East Valley, crews monitored the Buckhorn Mesa Watershed Project structures and worked to repair damages to the East Maricopa Floodway caused by flows from Queen Creek which breached a dike and flowed overland into the floodway. A summary of the emergency repair effort follows;

"The crew assigned to the East Maricopa Floodway reported that Queen Creek had breached its north levee at Queen Creek Road near the Recker Road Alignment. The water from Queen Creek began flowing northwest through the farmland, entering the East Maricopa Floodway from the south bank, just east of the Higley Road Bridge. The team leader...notified the O & M Branch of the situation and was instructed to repair the breach at Queen Creek. The repairs were completed on January 11 at 2300 hours. On January 12-14, FCD crews reinforced the area of the breach and two additional areas that were determined to be in jeopardy. On January 13, crews began temporary repairs to the damaged area of the East Maricopa Floodway." (See Exhibit L, "Storm Damage Report: Queen Creek and EMF")

D. Drainage Complaints

The Engineering Division's Stormwater Drainage Branch reported receiving 23 drainage inquiries between January 1 and January 15. A summary of the inquiries was written by the Branch Chief is reprinted below.

"The majority of the complaints have been nuisance reports (e.g., landscaping being washed down the street, standing puddles, etc.). Two complaints were reports of drainage violations not linked to any specific rainfall event. Two were in reference to a dike being breached in the Harquahala Valley that caused significant erosion, though no homes were flooded. Flooding of homes occurred at 99th Avenue and Southern. The residents blamed (ponding behind an elevated) Southern Avenue. In the field, I observed significant flooding of streets and yards at 107th Avenue and southern, and significant erosion along 115th Avenue and Southern".

The Hydrology Division's Floodplain Management Branch responded to flooding complaints from residents living along the Hassayampa River south of Wickenburg and the Nature Conservancy. A Floodplain Representative and a District Public Involvement Coordinator met with about 30 residents on March 1 to hear their concerns and provide recommendations for floodproofing and other flood mitigation possibilities. A summary of the meeting is found in **Exhibit M**, along with a copy of a letter sent to the District requesting assistance.



This trailer was among many damaged by Hassayampa floodwaters on January 8, 1993 downstream of Wickenburg below the Nature Conservancy

A District representative also attended public meetings February 23 in the community of New River convened by the Maricopa County Department of Transportation to address citizen concerns about transportation problems caused by the January rains. A summary of the meeting is attached as **Exhibit N**. As a result of the meeting and subsequent discussions about possible solutions to the immediate flood threat, an agreement between the District and Soil Conservation Service was entered into by the agencies to restore damaged river banks at two locations along New River where floodwaters breached the banks in January.

E. Structure Performance

All District flood control facilities functioned as designed, and no failures occurred.

Flows in the Arizona Canal Diversion Channel began registering on District gauges the morning of January 7 and peaked on January 11 with a depth of 3.6 feet at 67th Avenue. The peak discharge at this location was 480 cfs.



Stormwater from January rains flow in the Arizona Canal Diversion Channel at the 67th Avenue crossing as seen on January 11, 1993.

Peak flows in New River at New River Road were estimated at over 28,000 cfs, causing significant impoundments of stormwater behind New River Dam which peaked January 8 at 4:13 p.m. with a depth of 44 feet and storage of 15,000 acre feet.



Stormwater runoff collects behind New River Dam on January 9, 1993 and is released slowly downstream.

The largest impoundment of stormwater ever recorded behind Cave Buttes Dam occurred during the flood event when 17,500 acre feet of stormwater impounded behind the structure to a depth of 75.8 feet. The peak occurred on January 11.



Cave Creek Dam, built in 1923, is shown nearly submerged within the Cave Buttes Dam Reservoir on January 9, 1993

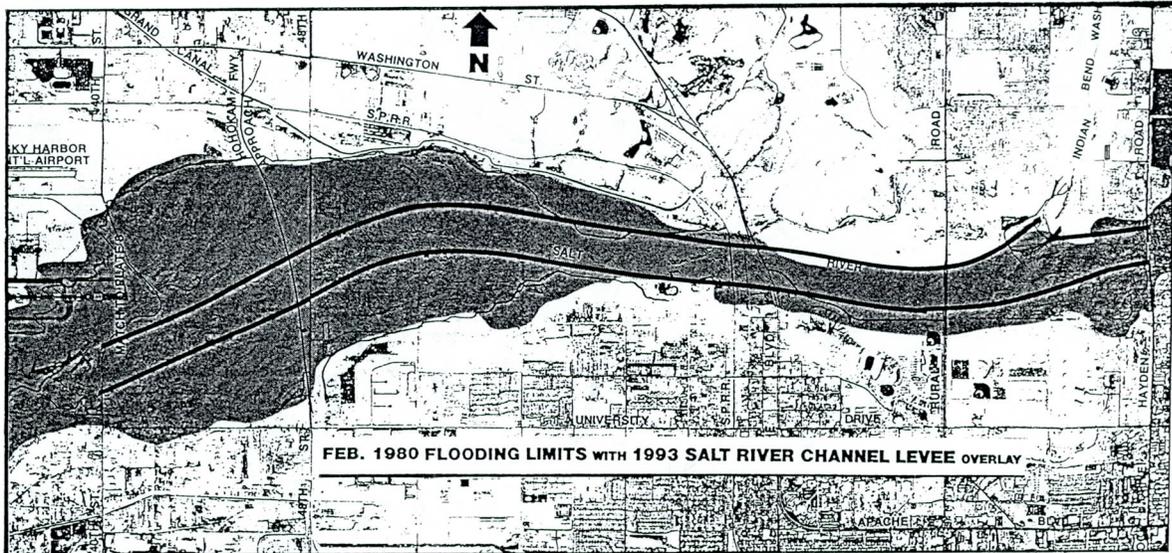
Impoundments behind Adobe Dam on Skunk Creek peaked the afternoon of January 8 with a depth of 13 feet and 1039 acre feet. Stormwater impoundments behind Dreamy Draw Dam were minor, with depths of just over 5 feet. The peak impoundments at these and other District structures are displayed below.

*Flood Control District of Maricopa County
January 1993 Storms*

Floodwater Storage Impoundments

Structure Name	ID #	Maximum Percent Full	Peak Storage (ac-ft)	Peak Stage (ft)	Peak Outflow (cfs)	Date / Time
Adobe Dam	5532	6.0	1039.0	13.00	1162.0	1/08 - 17:35
Apache Jct. FRS	6672	0.0	0.0	2.10	0.0	1/11 - 07:52
Buckeye FRS #1	5202	0.0	0.0	0.00	0.0	na
Buckeye FRS #2	5207	0.0	0.0	1.60	0.0	1/08 - 06:20
Buckeye FRS #3	6812	0.0	0.0	4.14	0.0	1/08 - 06:15
Cave Buttes Dam	6397	38.0	17494.0	75.78	407.0	1/11 - 09:25
Dreamy Draw Dam	6297	0.0	0.0	5.33	63.0	1/18 - 13:17
Guadalupe FRS	6502	5.0	15.0	4.80	0.0	1/11 - 05:53
Harquahala FRS	no gage	xx	xx	xx	xx	xx
McMicken Dam	5447	1.0	315.0	3.60	158.0	1/11 - 07:34
New River Dam	5607	34.0	14986.0	44.40	2300.0	1/08 - 16:13
Powerline FRS	6682	0.0	10.8	3.86	no rating	1/11 - 11:09
Rittenhouse FRS	6702	9.0	359.0	11.00	112.0	1/11 - 11:32
Saddleback FRS	5112	0.0	0.0	0.00	0.0	na
Signal Butte FRS	6627	12.0	166.0	13.30	0.0	1/11 - 14:24
Spookhill FRS	6062	0.0	0.0	6.70	0.0	1/11 - 07:29
Sunnycove FRS	5247	3.0	7.0	8.80	gate closed	1/19 - 05:19
Sunset FRS	5232	5.0	5.0	4.20	gate closed	1/18 - 22:19
Vineyard FRS	6687	13.0	573.0	4.80	102.0	1/11 - 12:09
White Tanks #3	5417	0.0	125.0	2.60	187.0	1/11 - 02:34
White Tanks #4	6822	0.0	744.0	0.50	57.0	1/10 - 23:40

Levees constructed along the Salt River in Tempe successfully contained flows of 124,000 cfs, although an analysis of levee erosion is underway. The diagram below shows the location of the levees relative to the areas inundated in February 1980 when 178,000 cfs flowed down the Salt River. The levees are designed for flows of up to 215,000 cfs. Minor damage caused by erosion was reported on several channels and floodways elsewhere in the County, including the East Maricopa Floodway, Skunk Creek Channel at 35th Avenue, Pass Mountain Diversion Channel, Spookhill Outlet Channel, Signal Butte Floodway and Bulldog Floodway.



The New River channelization project presently under construction between Bethany Home Road and Olive Avenue sustained significant erosion damage due to its unfinished state, but repairs were addressed through change orders negotiated with the contractor.

Other erosion damage occurred along the Salt and Gila Rivers west of 91st Avenue where the District is maintaining a 1000-foot corridor and low-flow channel. Almost all of the District's maintenance roads and access routes were destroyed. An assessment of the clearing project's success at confining the larger flows was made by the District in a May 7 letter to the Buckeye-Roosevelt Natural Resource Conservation District.

The river flows that we experienced last year and early this year confirmed our performance expectations. Throughout most of this thirty-four mile reach, the flood flows were concentrated within the 1000-foot corridor. In a few areas, such as downstream from the Tuthill Road Bridge, the flood flows broke out of the corridor and followed some of the pre-clearing alignments.....We have also identified the vicinity of Cotton lane, Tuthill Bridge to Airport Road, and the Powers Butte area as severe break-out areas that will need additional analysis to determine what our future actions should be. (See Exhibit O for complete text)

At the western end of the District's clearing project is Gillespie Dam, a privately-owned concrete dam constructed in 1921 as a diversion structure to divert surface water from the Gila River to irrigation canals supplying water to more than 50,000 acres of farmland in the Gila Bend area. On January 9, an approximately 100-foot section of the dam failed. As of the writing of this report, the breach is now approximately 230 feet. A report prepared by the District's planning branch outlines four alternative approaches to repair or replacement of the dam. This report is attached as **Exhibit P**.



Breached section of Gillespie Dam as seen on January 24, 1993.

Total damages to District structures as reported to the Federal Emergency Management Agency was \$350,383 (**See Exhibit Q**). This amount does not include the \$160,000 change order for damages to the New River Channelization Project under construction, or damages to the Salt-Gila Clearing Project for which damage estimates are not yet available. The damage figure noted above is considered "preliminary" because continuing flows and impoundments at some District structures prevent complete assessments. An agreement was reached with FEMA on reimbursement of \$54,000 in labor and equipment costs associated with emergency work performed by the District at the height of the flood event.

Damages to public facilities statewide as preliminarily approved by FEMA was \$33,154,424 as of May 6, 1993. This figure covers FEMA eligible costs only, and does not include federal highways, Bureau of Indian Affairs, agricultural damages, etc. The preliminary accounting of FEMA approved damages in Arizona as provided by the Arizona Department of Emergency and Military Affairs is attached as **Exhibit R**.

VIII. FLOOD DAMAGES

In Maricopa County, the severest flood damage for the most part was confined to the areas adjacent to the Salt and Gila Rivers. Comparatively speaking, however, flows in these rivers did more damage to counties bordering Maricopa County, namely, Gila, Pinal and Yuma Counties. Flood damages in Gila and Pinal County were associated with releases from Coolidge Dam which caused flooding in the downstream communities of Winkleman and Hayden in Gila County and Kearney, Riverside and Kelvin in Pinal County. An area in Gila County known as Winkleman Flats was the most seriously damaged, with an estimated 150 homes flooded.¹³ The severest property damage occurred in Yuma County where damages to agricultural land, homes and roads was in the millions of dollars.

Narrative summaries of flood damages occurring in other parts of the state can be found in **Exhibit S**: "Floods of '93: Deja Vu all over again", Arizona Water Resources, Water Resources Research Center, University of Arizona, April/May 1993; and "Forty Days and Forty Nights.....Almost!", AFMA Newsletter, Arizona Floodplain Management Association, May 1993.

A. General

Among the most dramatic events associated with the flooding in Maricopa County was the erosion of the Tri-City Landfill on the Salt River Pima-Maricopa Indian Community, the collapse of portions of a Tempe bridge under construction at Mill Avenue, the failure of a 200-foot span of Gillespie Dam on the lower Gila River and the record impoundment of floodwaters behind Painted Rock Dam.

Maricopa County flood damages were summarized in a February 22 report by the County Manager to the Board of Supervisors. Excerpts from that report are reprinted below (in *italics*), with additional background information provided as indicated.

Arlington School and six farm houses located in the Arlington area received flood damage as the floodwaters spread throughout the unchanneled areas of the west county. High water marks in these homes and the school were about 24 inches.

¹³ Estimate of flooded homes as reported in Phoenix Gazette, January 12, 1993.

Although damage was not extensive, considerable cleanup effort was needed to reopen the school. Four homes, two mobile homes, and three farms were damaged in the area of 227th Avenue and Beloat Road and had high water marks of about 24 inches.

Farms along Beloat Road west of Tuthill Road, feedlots along Beloat Road and a dairy near 195th Avenue and Highway 85, as well as several dairies at Beloat and Airport Roads, received damage, including loss of livestock.

The El Paso Natural Gas pipeline (crossing the Gila River near Gillespie Dam) received damage during the flood event. Two separate explosions were reported.

From the Arizona Republic, January 22, 1993: "The second major natural gas explosion in three days sent flames into the night sky south of Buckeye on Thursday (1/21/93) about 1:10 A.M. The first explosion and fire, 13 miles to the west on the same El Paso Natural Gas pipeline, occurred late Tuesday (1/19/93) after floodwaters on the Gila ruptured the line and river debris or a nearby electrical line ignited the escaping gas."

Business establishments receiving damage include many of the sand and gravel operations located in or near the river bed. Tanner companies estimated their losses at \$1.4 million.

Phoenix reported the Verde Water Treatment Plant received considerable damage from high water and would probably have to be shut down for several months. Preliminary cost estimates for the City of Phoenix to repair flood damages, including mitigation efforts, is estimated at \$4.2 million. Half of the estimate is for funds to replace the embankment lost at Sky Harbor International Airport along the north bank of the Salt River below the southern runway as well as to improve the riverbank with reinforced barriers to prevent future erosion.



Erosion of soil cement levees along north bank of Salt River in Tempe

Thunderstorms, hail and tornados associated with the severe weather patterns were reported on January 17. Tornados were sighted in New River, Chandler, Apache Junction, Gilbert and Scottsdale, with only Scottsdale reporting damage.

From Maricopa County Department of Emergency Management: "On January 17th, at 12:40 p.m., a tornado touched down in north Scottsdale near 64th Street and cholla damaging eighteen homes, four with major and 14 with minor damage. No injuries were reported."¹⁴

From the Phoenix Gazette, January 19, 1993: "The most severe flooding in the valley appeared to be in Laveen, where a clogged drainage ditch along Baseline Road near 59th Avenue pushed water into five farm houses, the Red Cross reported. Residents were angry that the County had spent money on an expensive flood control study, instead of cleaning out the ditch. 'Instead of solving a very simple problem, the county government resorts to studies that have no validity,' said Ron Schlosser, a resident in the area."

From the Phoenix Gazette, February 7, 1993: "The January floods took a heavy toll. About 1050 people applied for help from the state's disaster field offices, state officials said. Half of the applicants reported damaged homes."

B. Tri-City Landfill

A major breach in the Tri-City Landfill on the Salt River Pima-Maricopa Indian Reservation is one of the more serious environmental and health concerns. Landfill contents spilled into the Salt River and were carried downstream, littering the banks and the river bottom.

From the Phoenix Gazette, January 11, 1993: "By Sunday afternoon (1/10/93) a 400 by 80 foot section of the Tri-City Landfill was missing, State officials said. Because of the contamination from the landfills and broken sewage lines, the State Department of Health Services issued a public health advisory warning that water or food exposed to flood waters should not be consumed."

From the Phoenix Gazette, January 12, 1993: "State officials said 55,000 cubic yards of trash – about 3,000 garbage truck loads – has fallen into the river since late January 8. The landfill straddles the river north of Mesa near McDowell Road and the Beeline Highway."

From a January 14 report to the Phoenix City Council Natural Resources Subcommittee by the Arizona Department of Environmental Quality (ADEQ) : "Serious erosion of the landfill began Friday morning, January 8, 1993, when Salt River Project increased flows to 124,000 cubic feet per second. ADEQ engineers estimated the landfill was losing anywhere from five feet to 30 feet of its contents each hour into the river...By Monday, January 11, engineers estimated that a total of 139,000 cubic yards of the landfill – or an estimated 75 x 1,000 x 50 feet – had been washed down the river. Releases may have contained a combination of municipal solid waste, construction debris, household hazardous waste, industrial and medical waste." (**See Exhibit T, "Tri-City Landfill Questions and Answers"**)

¹⁴ Synopsis of weather-related events for Maricopa County during the month of January 1993, Robert H. Bishop, February 3, 1993.

From the Phoenix Gazette, January 16, 1993: "Scottsdale decided January 15 to temporarily stop hauling its garbage to the landfill, taking it instead to Maricopa County's Cave Creek Landfill."

From Phoenix Gazette Editorial, February 11, 1993: "Not only was the public health not threatened by what turned out to have been mostly construction debris from the landfill, those dizzying estimates of the amount of garbage that were carried into the river now seem to have been vastly exaggerated."

From The Arizona Republic, April 9, 1993: "SRP has committed more than \$25,000 in cash, staff and other resources to clean up the estimated 3500 garbage truck loads of trash and debris along 39 miles of the river from Mesa to Avondale."

From The State Press, March 12, 1993: "Tempe's 9-day cleanup netted 344 tons of garbage."

(**Note:** The District became involved in cleanup efforts along the Salt River by identifying ownership of 3,899 parcels along the river in order to send letters requesting access for trash removal. Detailed maps showing areas of inundation and access routes were prepared by GIS staff for use in the Great Salt River Cleanup held May 22, 1993. An estimated 19,500 volunteers assisted in the cleanup effort.)¹⁵

C. Roads and Bridges

The dramatic media video of the new Mill Avenue Bridge construction forms falling into the Salt River focused the public's attention on bridge safety.

From the Tempe Tribune, January 10, 1993: "Winter runoff on January 8 swept away four of the uncompleted (new Mill Avenue) bridge's nine spans, along with construction shoring, scaffolding and tons of iron reinforcing rods...The new \$6.6 million new Mill Avenue bridge had been scheduled for completion this summer. That deadline has been pushed back at least into the autumn said Jim Jones, the city's director of Public Works. Flood Insurance taken out by construction contractor Edward Kraemer and Sons should cover rebuilding costs. It appears that the four spans that had already been poured with concrete and completed were not damaged by the flooding. A fifth span near the center of the river channel, which had been nearly finished, was toppled. Its poured concrete arches and decking now lie on the river bottom. The other spans the flood swept away hadn't yet been poured with concrete. All that was lost with those were the plywood forms, iron reinforcing rods and steel I-beam shoring."

During the entire event only the unbridged crossings and the Gilbert Bridge, the 35th Avenue Bridge and the 51st Avenue Bridge were closed in the metropolitan area. Bridges over the Gila River on Highway 85 and Old U.S. 80 to Gila Bend were subject to closure on several occasions either from flooding or during the relocation and explosions of the El Paso Natural Gas pipeline. The Interstate 10 bridge over the Gila River was closed for several hours during the storm to remove tanks floating down the river. Flows from the Gila River under the Interstate 10 bridge nearly closed the structure on a few occasions.

¹⁵ Volunteer estimate as reported in the Arizona Republic, May 23, 1993.

Roads and streets closed by the flooding throughout the county were extensive. The (Maricopa County) Department of Transportation placed more than 1,000 barricades and closed 64 roads. (See Exhibit U, "MCDOT Activities During Recent Flood Emergencies). The (Maricopa County) Department of Emergency Management assumed the responsibility of reporting to the media and to the general public the status of road conditions throughout the area. Total damage to Maricopa County Transportation facilities is estimated at \$1,000,000.

The following table lists the estimates of resources spent over and above normal work:

Sheriff's Office	3,000 hours
Flood Control District	1,100 hours
Department of Emergency Mgt.	600 hours
Department of Transportation	1,800 hours

Total	6,500 hours

D. Loss of Life

Numerous successful rescues were made by the Sheriff's Office, Sheriff's Posse, Search and Rescue, and municipal and Rural/Metro fire units. Unfortunately, two deaths were reported in the county as a result of the storms. One individual fell from a horse in the Agua Fria River and drowned, and the other individual was believed to have walked into the Salt River as a suicide.

From the Arizona Republic, January 22, 1993: "Floodwaters about 40 miles north of Phoenix drowned a fifth apparent victim (in Arizona) late Wednesday (1/20/93) when Hector Chivera, 21, of Rock Springs, was swept down the Agua Fria River as he tried to cross it on horseback on his way to Black Canyon City. Maricopa county Sheriff's Sgt. Jay Ellison also identified an apparent suicide victim on the Gila River at 67th Avenue as Dennis D. Petrinjak, 35, of Phoenix. Witnesses told deputies that Petrinjak drove his pickup to the river Wednesday (1/20/93), left it running, got out, waded into the water and was swept downstream."

In addition to the two January deaths, a dentist and doctor canoeing in the Salt River in Tempe drown March 24 when their canoe capsized when passing over a grade control structure downstream of the McClintock Road bridge.

From the Tempe Tribune, March 27, 1993: "Authorities pulled the bodies of Dr. James Wilson and Dr. Finis Taylor from the Salt River late Thursday afternoon, downstream from a flood control hydraulic. The hydraulic, which creates a 15-foot deep, powerful undertow, had separated the two men from their canoe at about noon."

Area newspapers documented other deaths associated with the January flooding.

From Tri-Valley Dispatch, January 20, 1993: "Pinal County officials recovered the body of a 39-year-old woman from a pickup truck stuck in the overflowing Gila River near Sacaton since Saturday. Diane Eckert, of Chandler, was a passenger in the truck that sank after the driver tried to get across U.S. Highway 587."

From the Phoenix Gazette, February 7, 1993: "Sgt. Kevin Lewis, a BIA police officer, was missing for three weeks until his body was discovered February 4 on a sand bar in the (Gila) river."

A near fatality at the Cave Creek Sediment Basin also was reported by local papers. A teenager who walked around a barricade was swept into the basin and had to be rescued by firefighters who swam out to her.

From the Arizona Republic, January 19, 1993: "Heather Bartholomew, 15, was exhausted, cold and scared after she was pulled from the normally dry retention basin in Cave Creek Park, but she seemed alright otherwise, authorities said.....'She was trying to keep her head over the water,' Battallion Chief Al Sipes said. 'It was so deep that she couldn't even stand up.' Sipes said the retention basin ordinarily is dry and grassy, but the rain-swollen Cave Creek Wash runs through it, so it lately has resembled a small lake."

IX. NEWSPAPER ARTICLES

Local newspapers provided extensive coverage of the January 1993 flood event. Listed below is an index of the articles collected by the District. Those shown **highlighted** make some mention of the District and are included in this report as part of **Exhibit V**. The remaining newspaper clippings (not highlighted) are on file with the District.

DATE	PUBLISHER	TITLE OF ARTICLE
1-9-93	Phoenix Gazette	Salt threatens to swamp homes in low-lying areas
"	"	Landfill's contents may flow down Salt
"	"	Earlier floods created grief for motorists, homeowners
"	"	Water pours out of Roosevelt Dam (photo & caption)
"	"	Surging water ripped scaffolding from half-completed Mill Ave Bridge (photo & caption)
"	"	Once again river threatens to wash away family's home
"	"	Water rips scaffolding from bridge
"	"	Valley River Crossings (map)
"	Arizona Republic	Arizona inundation old story
"	"	Waster flows into waters from sewage, landfill
"	"	Unfinished spans prove no match for fury of Salt
"	"	Woman clings to tree in creek
"	"	Valley Floodplains (map & photo)
"	"	Saturated soil adds to river flows
"	"	Central Arizona Dams, Rivers, and Canals (map)
"	"	Evacuation is 5th in 15 years for one district
"	"	How water flow is measured
"	"	Garbage slides into Salt River
"	Tempe Tribune	Floods often tested valley's preparedness/ A history of floods
1-10-93	Arizona Republic	Flooding will leave cesspools
"	"	In parts of Tucson, flood-isolated homes just a copter hop away
"	"	Water shows it's tougher than memory (editorial)
"	"	Floods to have little effect on crops, officials say
"	"	Sad memory of '83 flood won't wash away
"	"	Winslow, Navajo areas flooded - 400 evacuated
"	"	Arizona braces for more rain, flooding

DATE	PUBLISHER	TITLE OF ARTICLE
1-10-93	Tempe Tribune	Emergency duty had a familiar ring
"	"	Rainy days not over yet
"	"	Planned dams could have eased valley flooding
"	"	Damage noted as fresh storm targets valley
1-11-93	Phoenix Gazette	Flood control measures work fantastically in first major test
"	"	Valley gets break in rain, flooding
"	Arizona Republic	Flood insurance: System keeps valley above water (map)
"	"	Homeowners' policies offer varied protection
"	"	Golfers and 'snowbirds' holed up by rain, floods
"	"	Rain covers soggy state, more is due
1-12-93	Phoenix Gazette	For flooded Winkelman, the worst is yet to come
"	"	Canyon grandeur can't displace sight of sludge in Salt
"	"	Dumping ground of excuses
"	"	Emergency planners cast wary eyes to skies
"	Arizona Republic	New River floods, strands 100
1-13-93	Tempe Tribune	Gila River flood warning issued as storm moves in
"	"	Loss of bridge fails to dampen spirits
1-14-93	Phoenix Gazette	Gila County scrambles for disaster plan
"	"	DPS sinks tanks headed for bridge
"	"	Under water in Winkelman
"	"	Flood control system worked (editorial)
1-15-93	Syracuse New York Herald-Journal	Powerful Force (photo & caption)
"	Yuma Daily Sun	Residents want government to purchase homes
"	Arizona Republic	Coolidge Dam still holding (photo & caption)
"	"	Coolidge Dam still up
"	"	Salt's banks to be armored at landfill
"	Tempe Tribune	Flooding's toll on environment may cost millions
1-16-93	Arizona Republic	Federal flood aid sought by governor
"	"	Uneasy clients could doom tribal landfill
"	"	When deluge ends, repairs, grieving start
"	"	Salvage from the storm; act swiftly to reduce losses
"	Phoenix Gazette	Flooding may worsen; Roosevelt Dam construction imperiled
"	Arizona Republic	Dry and dry again: Rain-related woes
1-17-93	Tempe Tribune	Release was unavoidable officials say
"	"	Record-breaking rain to douse valley/Scottsdale temporarily switches landfills
"	Arizona Republic	Run river run
"	"	Stupidity storm warnings
1-18-93	Phoenix Gazette	Flood proves channelization works
"	Tempe Tribune	14 Scottsdale homes look like a bomb dropped after tornado
"	"	Strained dams threaten water release
1-19-93	Phoenix Gazette	Break in storm cuts water releases
"	Arizona Republic	Teen girl pulled from raging waters
1-20-93	"	Gas line explodes under Gila River
"	"	Arizona to get financial help, break from rain
"	Tri-Valley Dispatch	Santa Cruz River breaks into CAP Canal
"	"	Interstate 8 lanes closed (photo & caption)
"	"	Who'll stop the rain (photos and captions)

DATE	PUBLISHER	TITLE OF ARTICLE
1-22-93	Arizona Republic	Gila, Santa Cruz Rivers recede
1-24-93	"	Rains, floods a mess for recreation industry
"	"	Firms, workers count losses, return to jobs
"	"	Past lessons fail to avert deaths, damage
1-26-93	Phoenix Gazette	EPA called landfill safe without test
"	"	Landfills haunt us/Orme Dam needed (letters to editor)
1-30-93	"	Get it straight: flood water not "released", dams not for flood control
2-1-93	Phoenix Gazette	Easy Targets: Tri-City Landfill and the Indians
2-6-93	Tempe Tribune	ASU, Mesa Schools stop using landfill
2-7-93	"	January floods speak of ambivalence
2-10-93	Phoenix Gazette	Calamity crops: floods devastate farms, ranchlands
"	"	Tribe's full control on landfill plans worries the state
2-14-93	Arizona Republic	Arizona underwater
"	"	Floods Dangerous Legacy (photo & caption)
"	"	The SRP: Valley's lifeline
2-15-93	Phoenix Gazette	Heavy rains replenishing water supply
"	"	Under Siege (photo & caption)
2-16-93	Tempe Tribune	Ecological method of flood control offers advantages
2-22-93	Arizona Republic	Bracing for more floods/Earthen dam in canyon gives way
2-23-93	Phoenix Gazette	Farmers moves out as Gila rises
2-24-93	"	Farmers rush to avoid Gila's wrath
"	"	Prices rising with flood; Yuma County braces
2-27-93	Tempe Tribune	Yuma County farms could be flooded a month
3-1-93	Phoenix Gazette	Water flow from dam may have peaked
3-2-93	Arizona Republic	Yuma flooding turns deadly, worker drowns
3-4-93	Phoenix Gazette	Rampaging river forces shutdown of pumping plant
3-5-93	"	Gila River crests, but fields to remain flooded
3-12-93	State Press (ASU)	Landfill supplying Salt River garbage to be moved
3-27-93	Tempe Tribune	City, state to weigh river safety
4-6-93	Phoenix Gazette	Improve PIR access (letter to editor)
5-10-93	"	Reclaiming the habitat
5-12-93	Mesa Tribune	Victims weren't reckless
5-23-93	Arizona Republic	19,500 volunteers clear Salt River of flood trash
unknown	Phoenix Gazette	Melting snow poses new threat on Gila
"	"	Storms wash out forest roads, trails
"	"	Rains renew worries over dam's safety
"	"	Flood control work pays off in northwest valley
"	Arizona Republic	Blame for Gila flooding countered
"	Tempe Tribune	Stopping the floods
"	unknown	Trash bill to rise if landfill closes/SRP pledges \$25,000 to Salt River cleanup
"	unknown	Flooding reminds us we can never truly control water/SRP deserves praise, not flood of innuendos and half truths (letters to editor)

X. PHOTOGRAPHS

Numerous photographs and slides were taken by staff during and subsequent to the January flood event. Below is a listing of those photos and slides on file with the District's Public Information Coordinators.

PHOTOS

<u>SUBJECT</u>	<u>DATE</u>
ACDC @ Skunk Creek (aerials)	1-9-93
ACDC @ 67th Avenue	1-11-93
Adobe Dam (aerials)	1-9-93
Agua Fria River @ Lower Buckeye Road	1-11-93
Agua Fria River @ Camelback Road	1-11-93
Cave Buttes Dam (aerials)	1-9-93
Cave Buttes Dam Reservoir and Outlet	1-22-93
Cave Creek @ Cactus Road	1-11-93
Harquahala Ranches #1 and #2 (breached dike)	1-15-93
Hassayampa River below Nature Conservancy (flooded trailer park)	1-11-93
Hassayampa River @ ADOt rest area So. of Wickenburg	1-11-93
Holly Acres	1-8-93
Holly Acres (aerials)	1-9-93
Morgan City Wash @ Hwy 74	1-11-93
New River Dam (aerials)	1-9-93
New River @ Northern Avenue	1-11-93
New River @ Thunderbird Avenue	1-11-93
New River @ Carefree Hwy	1-11-93
New River @ Union Hills	1-19-93
New River @ Deer Valley Road	1-19-93
New River @ Olive Avenue	1-22-93
New Waddell Dam/Lake Pleasant	2-15-93
Old Cave Creek Dam (aerials)	1-9-93
Painted Rock Dam and Reservoir	1-24-93
Painted Rock Dam and Reservoir (aerials)	2-3-93
Painted Rock Dam and Reservoir	2-4-93
Salt River @ Mill Avenue	1-9-93
Salt River @ 51st Avenue	1-11-93
Salt River @ 91st Avenue	1-11-93
Salt River @ 115th Avenue	1-11-93
Salt River Levee erosion in Tempe	1-22-93
Skunk Creek @ 83rd Avenue	1-11-93
Unnamed tributary to Agua Fria @ Hwy 74	1-11-93

SLIDES

<u>SUBJECT</u>	<u>DATE</u>
ACDC @ 43rd Avenue	1-21-93
ACDC @ 67th Avenue	1-21-93

SLIDES (Continued)

<u>SUBJECT</u>	<u>DATE</u>
ACDC West of Thunderbird	1-21-93
Adobe Dam	1-9-93
Cave Buttes Dam	1-9-93
Gila River @ SR 85 Bridge	1-22-93
Gila River @ 115th Avenue (aerial)	1-9-93
Gila River at 115th Avenue	2-16-93
Gila River at 123rd Avenue	2-16-93
Gila River @ Citrus Road Alignment	2-16-93
Gila River @ Airport Road	2-16-93
Gila River @ Tuthill Bridge	2-16-93
Gila River @ Arlington	2-16-93
Gila River @ Gillespie Dam	2-16-93
New River Dam, Reservoir and Outlet	1-8-93
New River @ Glendale Avenue	4-9-93
New River @ Olive Avenue	4-9-93
New River Dam	1-9-93
Old Cave Creek Dam	1-9-93
Salt River at 51st Avenueq	4-93
Salt River east of 24th Street Fwy Exit	4-93