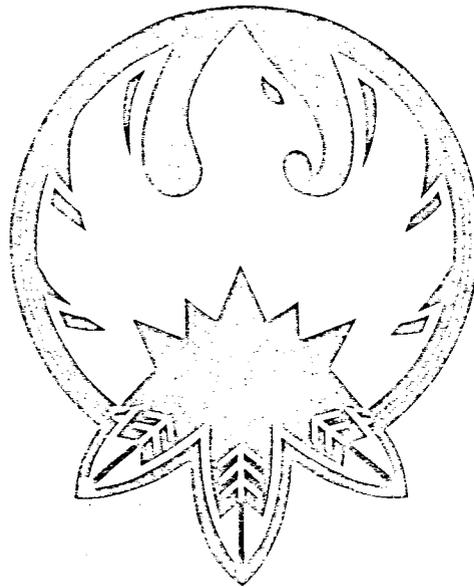


APPENDIX 3

New River Floodway

Delineations

(New River Dam to
Skunk Creek)



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Appendix 3

NEW RIVER FLOODWAY DELINEATIONS
(NEW RIVER DAM TO SKUNK CREEK)

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1. Introduction

1.01 The Phase I Design Memorandum formulated a plan for the purchase of flowage easements along the Skunk Creek and the New and Agua Fria Rivers, and for the construction of four dams and of channelization of 19.2 miles of watercourse in the vicinity of Phoenix, Arizona. The dams are Dreamy Draw Dam on Dreamy Draw, Cave Buttes Dam on Cave Creek, Adobe Dam on Skunk Creek, and New River Dam on the New River. Channelization is recommended on the Arizona Canal diversion channel. Cave Creek channel from Peoria Avenue to the Arizona Canal, and Skunk Creek in the vicinity of the Black Canyon Highway. Flowage easements recommended to be purchased are along Skunk Creek, the New River, and the Agua Fria River downstream from the confluence of the proposed Arizona Canal diversion channel with Skunk Creek.

1.02 Each of the four dams has ungated outlets that will discharge into their respective natural channels. The duration of flow varies with the volume of runoff at each of the dams and can last up to several days. The local governments are presently managing the flood plains by restricting or controlling development within the floodway and floodway fringes under authority of and in accordance with local flood plain management regulations. To assure the long-term capability to operate the dams as designed, the Federal Government is requiring that local interests manage and maintain the downstream flood plains for the life of the project under basically the same criteria.

1.03 The purpose of this appendix is twofold: (a) to delineate the 100-year flood plain, the floodway, and the floodway fringes for the New River between the proposed damsite and the confluence with Skunk Creek; and (b) to present the procedures that will be followed to properly operate and maintain this reach. This appendix, therefore, will also be extracted and become a part of the New River Dam (including New River to Skunk Creek) Operations and Maintenance Manual.

Description of Area

1.04 This appendix addresses the reach of New River extending from the proposed damsite to the confluence with Skunk Creek, northwest of the City of Phoenix, in Maricopa County, Arizona.

1.05 The New River originates in the New River Mountains, approximately 40 miles north of Phoenix, and flows generally south for about 40 miles to its confluence with the Agua Fria River. The drainage area above the Skunk Creek confluence is 181 square miles with about 164 square miles of area above the proposed New River damsite. Elevations in the watershed range from over 5000 feet in the New River Mountains to about 1200 feet near the Skunk Creek confluence. Stream gradients range from 370 feet per mile in the mountains to 10 feet per mile in the valley.

1.06 Between the proposed New River Dam and the confluence with Skunk Creek, New River is a natural channel that runs in a generally north-south direction. The confluence with Skunk Creek at the southern end of

the reach is near the eastern boundary of Sun City, Arizona. The study area extends approximately 9 miles north of this point. The channel varies in width from 20 to 1700 feet with an average width of about 600 feet. The slope varies from 0.001 to 0.009 with an average slope of 0.005. The channel consists of sand and gravel with little growth. In the upper half of the reach, the overbank areas are basically unimproved and support fairly dense desert vegetation. In the downstream half of the reach, however, much of the overbank area contains citrus orchards.

1.07 When flows exceed the streambed capacity, the floodwaters spread out onto a broad flood plain area. In the portion of the reach near the confluence with Skunk Creek, major flow shows a tendency to spread east into the Skunk Creek drainage basin.

1.08 One bridge in the reach was considered in the analysis. This bridge, at the crossing of New River by Bell Road, is approximately 1.7 miles upstream from the confluence with Skunk Creek. The bridge is slightly perched, so that it is elevated higher than the road approaching it. There will be weir flow, in the overbanks, before the bridge is overtopped.

Scope of Studies

GENERAL

1.09 The scope of these studies was generally governed by the criteria set forth in the "Flood Insurance Guidelines and Specifications," published by the Federal Insurance Administration (FIA), U.S. Department of Housing and Urban Development in February 1977.

PRIOR REPORTS

1.10 The following reports are pertinent to this study.

- a. "Interim Report on Survey for Flood Control, Phoenix, Arizona, and Vicinity (Including New River)," Los Angeles District, Corps of Engineers, January 1964.
- b. "Flood Plain Information Study for Maricopa County, Arizona, vol. V, New River Report," Los Angeles District, Corps of Engineers, April 1967.
- c. "Gila River Basin, New River and Phoenix City Streams, Arizona, General Design Memorandum—Phase I, Plan Formulation," Los Angeles District, Corps of Engineers, March 1976.
- d. "Design Memorandum No. 2, Hydrology, Part 1," Los Angeles District, Corps of Engineers, October 1974.
- e. "Design Memorandum No. 2, Hydrology, Part 2," Los Angeles District, Corps of Engineers, tentative publication, June 1982.

The overflows shown in the General Design Memorandum, Phase I, were for economic analysis only and are not pertinent to this study.

SURVEYS

1.11 Topographic maps, based on an aerial survey taken in August 1980, of the study area were developed by the Corps of Engineers. Mapping was done at a scale of 1 inch = 100 feet with a contour interval of 2 feet; map manuscripts (file AR-1775) are on file in the Los Angeles District office (LADO).

HYDROLOGIC STUDIES

1.12 General and design hydrology for Phoenix and vicinity is presented in Design Memorandum No. 2, Hydrology, Part 1, dated October 1974, and in Part 2, scheduled for publication in June 1982. Appropriate design information is summarized in the following paragraphs.

1.13 Although about half of the watershed above the damsite is mountainous and not expected to urbanize in the future, the valley area between the mountains and the Skunk Creek confluence is projected to develop fully. Subarea characteristics are given in table 1; drainage boundaries are shown on plate 1. Because the terrain below the damsite is very flat, flow could easily be directed east from the edge of the adjacent Agua Fria River basin and west from the Skunk Creek basin to New River by development in this area. Therefore, an additional 3.5 square miles of the subarea between Skunk Creek and the New River was assumed to contribute flow to the New River, and an allowance of 2000 ft³/s was provided to account for potential flow from the Agua Fria River basin.

DESIGN DISCHARGES BELOW DAMSITE

1.14 The future condition 100-year peak discharges needed to delineate the floodway between the damsite and the Skunk Creek confluence were determined from the discharge frequency relationships for urbanized areas developed for the Part 1 hydrology report. These relationships expressed n-year peak discharge as a percentage of the (standard project flood) (SPF) peak - 45 percent for the 100-year peak. SPF peak discharges below the damsite were computed using the local standard project storm. The local standard project storm is based on the assumed occurrence of a storm equivalent to the 19 August 1954 Queen Creek storm, transposed to the New River area, using the 10-year, 6-hour precipitation statistic as a transposition factor. Table 2 lists the 100-year peak discharges thus determined.

Table 1. Subarea characteristics—Future conditions.

Subarea	Drainage				Impervious		S-graph
	Area (mi ²)	L (mi)	Lca (mi)	S (ft/mi)	n	Cover (%)	
3.	10.3	5.9	3.4	44	0.023	45	Phoenix Valley
4.	10.4	6.0	3.6	40	0.020	45	Phoenix Valley

Table 2. New River peak discharges; future conditions with project.

Concentration point location	Drainage area ^a (mi ²)	100-Yr flood (ft ³ /s)	SPF (ft ³ /s)
Below damsite.....	0	2350	2665
Above Beardsley Road.....	10.3	12,000	24,000
Above Skunk Creek.....	20.7	19,000	38,000
Below Skunk Creek.....	123.6	41,000	^b 68,000
Above the Agua Fria River.....	159.7	39,000	^b 69,000

a. Area below New River damsite.
b. SPF is adjusted to account for 100-year design of ACDC, without freeboard.

HYDRAULIC ANALYSIS

1.15 Analysis of the hydraulic characteristics of the New River provided estimates of the elevation of the 100-year flood and were computed using the Corps of Engineers HEC-2 step backwater computer program. Cross sections for the backwater analysis were taken from detailed topographic maps at intervals of approximately 0.2 mile and at closer intervals at bridges and other hydraulic obstructions in order to analyze their significant backwater effects. Locations of cross sections used in the hydraulic analysis are shown on plates 2 through 8.

1.16 Manning "n" values were based on engineering judgment. In addition to field observations, guidance on selecting "n" values was supplemented by information in "Open Channel Hydraulics" by Chow and an article by H.R. Heyl titled "A Method for Adjusting Values of Manning's Coefficient for Flooded Urban Areas," in Journal Research USGS, Vol. 5, No. 5, Sept-Oct 1977, pp. 541-45. Typical "n" values used in the study were 0.03 for the channel, whereas the overbanks' values ranged from 0.04 to 0.06.

1.17 Flood discharge figures for both the 100-year and the SPF were identified at specific concentration points and extrapolated along the entire study reach based on linear proportioning of the reach length. Table 3 lists the discharges used in the study.

Table 3. New River discharges.

River mile, (RM) stationing (mile)	100 Year (ft ³ /s)	SPF (ft ³ /s)
8.35 (Skunk Creek Confluence)	41,000	68,000
9.15	17,330	68,000
9.35	17,330	34,550
9.55	15,670	31,210
10.35	14,000	28,000
11.35	12,000	24,000
12.55	10,340	20,430
13.35	8,370	15,970
14.35	6,350	11,500
15.35	4,170	6,680
16.43	2,350	2,665
17.33	2,350	2,665

1.18 During the 100-year flood event, there will be no major breakouts until the flows from New River meet those from Skunk Creek. These combined flows will flood the left overbank of New River from the confluence to about 0.5 mile upstream. In the right overbank flows leave the channel near RM 8.65 and expand to a width of about 2400 feet at the confluence. Near RM 9.35 a minor breakout, which occurs in the right overbank and reaches a maximum distance from the centerline of about 7500 feet, returns to the channel downstream near RM 8.95. Another minor breakout, which occurs in the left overbank between RM 9.75 and 9.45, reaches a maximum distance of about 400 feet from the channel centerline. In the left overbank, a gravel quarry between RM 11.35 and RM 11.65 will experience a ponded flooding condition, as will a second gravel quarry between RM 11.65 and RM 12.05. From this point upstream to the dam, floodflows remain in the immediate vicinity of the channel.

1.19 A floodway analysis was developed based on a minimum standard of limiting through the encroachment method, such that increases in flood heights were limited to 1.0 foot and hazardous velocities were not produced. For most of the study reach, with the exception of the areas in the vicinity of RM 8.35, 14.95, 16.54, 16.82, and 17.11, the boundaries of the floodway coincided with the bank stations. In those areas where the floodway limits coincided with the channel bank stations, the velocity of flow within the channel would be high and could cause severe erosion of the channel banks. The banks, therefore, should be adequately protected before attempting to encroach up to the same channel bank stations.

1.20 Bell Road is the only major bridge crossing on the study reach. Through coordination, the Flood Control District has indicated that no new bridge construction is anticipated. Consequently, the floodway and floodway fringe delineations reflect only the bridge at Bell Road.

1.21 Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the 100-year recurrence interval. (See pl. 9.)

2. Flood Plain Management Applications

General

2.01 The prime objective of this appendix is to establish criteria so that local governments will adopt sound flood plain management programs. Therefore, flood boundary maps designed to assist communities in developing sound flood plain management measures have been included herein. Discharges used in delineating floodways and floodway fringes are the ungated releases from New River Dam during the 100-year flood described in the hydrology portion of this appendix, plus any tributary flows intercepted below the dam.

Flood Boundaries

2.02 In order to conform to a national standard without regional discrimination, the 100-year flood (adopted by FEMA as the base flood) is used for the purpose of flood plain management. The boundary of the 100-year flood has been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1 inch = 200 feet with a contour interval of 2 feet.

2.03 Small areas within the flood boundaries may lie above the flood elevation and, therefore, not be subject to flooding. Because of limitations of the map scale, such areas are not shown.

Floodways

2.04 Encroachments on flood plains, such as artificial fill and structures, would reduce the flood-carrying capacity of New River and increase the flood heights, thus increasing the flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. The concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent flood plain areas that must be kept free of encroachment in order to carry the 100-year flood without substantial increases in flood heights. As minimum standards, the Corps of Engineers limits such increase in flood heights to 1 foot, provided that hazardous velocities are not produced. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in figure 1. This floodwater surface rise constraint is in agreement with the Maricopa County 1977 Flood Plain Regulations for Unincorporated Areas (section 3.11). The amended flood plain regulations are included as Exhibit A of this appendix.

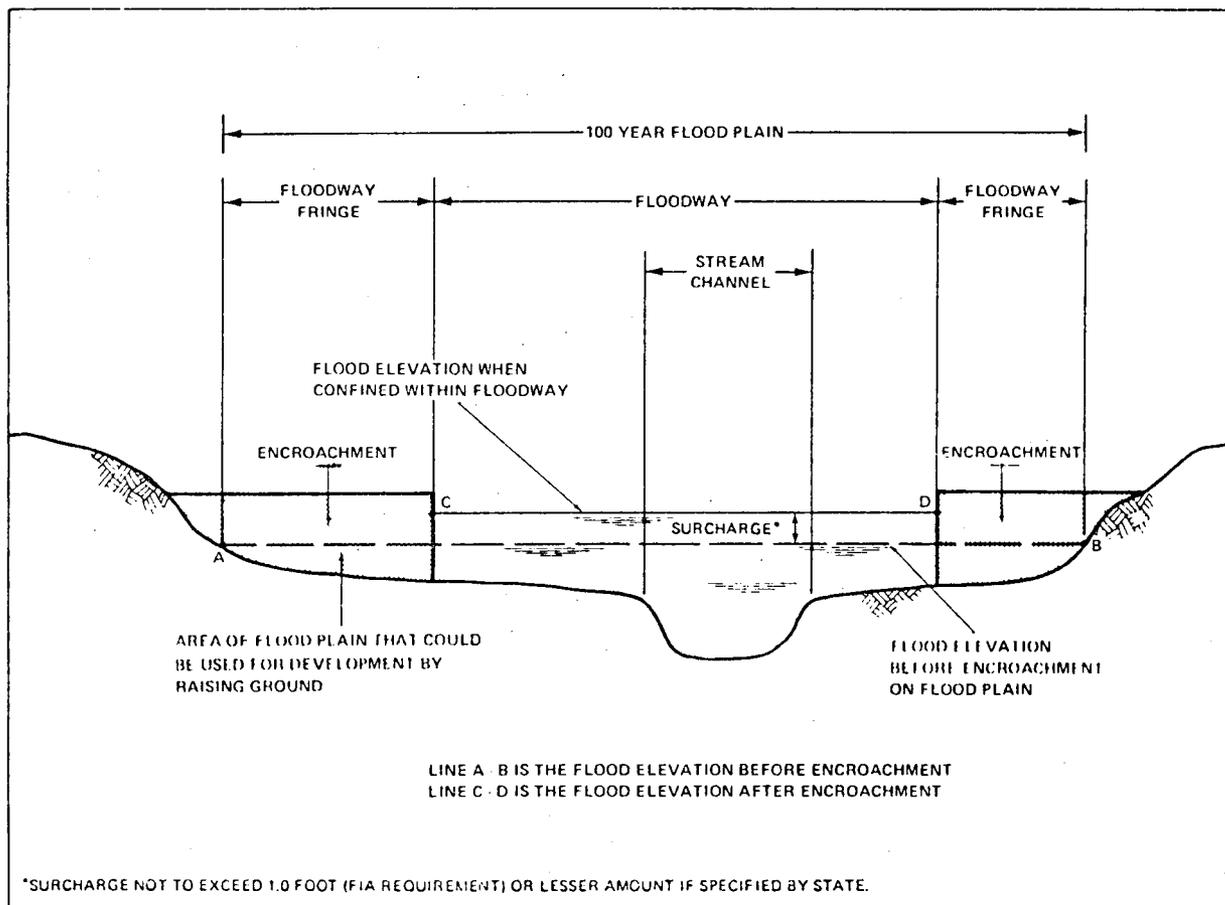


Figure 1. Floodway schematic.

2.05 The floodway proposed for this study was computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations are tabulated in table 4 at selected cross sections for New River from the damsite to the Skunk Creek confluence. The primary influence on the computation of this floodway was the location of the channel bank stations.

2.06 As shown on the delineation of flood boundary and floodway maps (pl. 2 through 8), the floodway boundaries were determined at discrete cross sections and the boundaries were interpolated between cross sections. In cases where the 100-year flood and floodway boundaries are close together, only the floodway boundary has been shown.

2.07 The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1 foot at any point. For purposes of hydraulic computations, it has been assumed that the floodway fringe area is filled in solid and has neither overbank storage nor floodflow capacity.

2.08 Selection of floodway and floodway fringe limits has been coordinated with officials of the Flood Control District of Maricopa County.

Table 4. New River floodway data.

River mile (RM)	Width	Section area (ft)	Mean velocity (ft ²)	Water Surface Elevation		
				with floodway (ft ³ /s)	W/O floodway (MSL)	Diff. (ft)
Skunk Creek confluence						
8.35	1639	7604	5.4	1165.08	1164.13	0.95
8.55	712	4223	9.7	1166.78	1166.65	.13
8.75	1235	6798	6.0	1170.26	1170.15	.11
8.95	1676	4299	9.5	1174.29	1174.29	.00
9.15	169	1430	12.1	1179.33	1178.93	.40
9.35	328	2129	8.1	1183.73	1183.11	.62
9.55	257	1413	11.1	1186.57	1186.36	.20
9.75	195	1164	13.5	1192.28	1192.26	.02
9.95	225	1632	9.6	1198.14	1198.13	.01
10.01	236	1658	9.5	1198.99	1198.99	.00
Bell Road						
10.03	258	1932	8.1	1200.34	1199.34	1.00
10.15	410	1947	8.1	1201.93	1201.93	.00
10.35	445	1836	7.6	1205.69	1205.64	.05
10.55	370	1398	10.0	1210.38	1210.38	.00
10.75	328	1629	8.6	1215.99	1215.96	.03
83rd Avenue						
10.95	265	1261	11.1	1220.42	1220.41	.01
Union Hills Drive						
11.15	399	1869	7.5	1225.98	1225.78	.21
11.35	210	1103	10.9	1229.31	1229.31	.00
11.55	257	1585	7.6	1233.70	1233.69	.02
11.75	820	3113	3.9	1235.93	1235.93	.00
11.95	524	1322	9.1	1238.51	1238.51	.00
12.15	541	1638	7.3	1246.20	1246.20	.00
12.35	668	1758	6.8	1251.73	1251.73	.00
12.55	355	1211	8.5	1257.25	1257.25	.00
12.75	292	1182	8.8	1262.81	1262.73	.09
12.95	454	1316	7.9	1268.80	1268.62	.19
13.15	514	1727	6.0	1273.56	1273.56	.00
13.35	415	1190	7.0	1277.26	1277.08	.18
13.55	310	1473	5.7	1280.40	1280.40	.00
13.75	234	796	10.5	1286.15	1286.15	.00
13.95	561	1626	5.2	1292.23	1292.04	.19
14.15	434	982	8.5	1297.74	1297.53	.21
14.35	355	1087	5.8	1304.31	1303.70	.61
14.55	281	769	8.3	1308.82	1308.61	.21
14.75	460	994	6.4	1316.34	1315.34	1.00
14.95	325	1050	6.1	1320.91	1320.10	.81
15.15	462	1186	5.4	1324.48	1324.40	.08

Table 4. Continued

River mile (RM)	Width	Section area (ft)	Mean velocity (ft ²)	Water surface elevation		
				with floodway (Ft ³ /s)	w/o floodway (MSL)	Diff. (ft)
15.35	123	408	10.2	1328.54	1328.54	0.00
15.55	544	1068	3.9	1334.59	1334.53	.06
15.75	307	613	6.8	1338.55	1338.55	.00
15.95	313	771	5.4	1334.14	1334.04	.10
16.41	430	746	3.2	1358.66	1357.70	.96
16.54	480	644	3.7	1360.39	1359.49	.90
16.73	90	248	9.5	1364.78	1364.53	.25
16.92	127	277	8.5	1367.70	1367.70	.00
17.11	70	257	9.2	1372.63	1371.76	.87
17.33	50	234	10.0	1380.54	1380.34	.20

3. Management and Maintenance of the Floodway and Floodway Fringes

3.01 The floodway and floodway fringe delineations contained in this appendix must be adopted by the Flood Control District of Maricopa County. Subsequent to these actions the Flood Control District is responsible for the managing and maintaining of the floodway and floodway fringes, in accordance with established flood plain management criteria, to assure the unobstructed passage of floodwaters of 100-year storms. Maintenance includes the removal of excessive plant growth and deposits of sediments that would obstruct flows and appreciably increase flood plain widths.

3.02 In accordance with the Code of Federal Regulations, Title 33, Navigation and Navigable Rivers, Chapter II Part 208-Flood Control Regulations, paragraph (g) channels and floodways, the Department of the Army hereby furnishes local interests an operations and maintenance procedure for the New River from New River Dam to the Skunk Creek confluence to assist them in carrying out their mandatory obligation under the code. A reprint of the code (extract) is included as Exhibit B.

Overall Responsibility

3.03 The Flood Control District of Maricopa County, Arizona, is required to have an organization capable of adequately operating and maintaining this project. The Flood Control District shall appoint an official (referred to as the "Superintendent" in the basic regulation) who shall be responsible for the development and proper functioning of Maricopa County's operation and maintenance organization in accordance with suggestions given in the discussion titled "The Superintendent's duties."

ASSISTANCE FROM THE CORPS OF ENGINEERS

3.04 The District Engineer of the Los Angeles District of the Corps of Engineers (LAD) will furnish following assistance to the Superintendent as follows:

a. "As-constructed" drawings of the project at the time the project is transferred.

b. Make prior determination that any proposed encroachment, improvement, excavation, or construction within the rights-of-way, or alteration of the project works will not adversely affect the functioning of protective facilities, and furnish the Superintendent with an approval thereof in writing.

c. Assist the Superintendent, as may be practicable, in his duties of ascertaining storm developments having flood-producing potentialities, and in carrying out flood-fighting operations.

d. At the discretion of the Superintendent, be available for consultation and review of solutions that are being considered to correct dangerous conditions resulting from floodflows.

THE SUPERINTENDENT'S DUTIES

3.05 The general duties of the Superintendent, which are declared in the Code of Federal Regulations, Title 33, include the following:

Operation

3.06 The Superintendent shall have both banks of reaches of less than 2 feet of freeboard patrolled during a 50-year-or-greater frequency flood, and shall take measures to protect those reaches attacked by the current or by wave action. Levees shall be observed for sand boils or unusual wetness of the landward slope so as to be certain that:

- There is no indication of slides or sloughs developing.
- No low reaches exist that may be overtopped.
- No other conditions exist that would endanger their structural integrity.

3.07 The Superintendent shall observe the upstream side of bridges (including their piers) during periods of high water to detect debris build-up that would jeopardize the ability of the bridge to pass the expected flood stage or threaten its structural integrity. Large objects that become lodged against the piers, wing walls, or banks shall be removed expeditiously.

3.08 The Superintendent shall take appropriate advance measures to insure the availability of adequate manpower and materials to meet all contingencies. He shall take immediate steps to control any condition that endangers the levees and to repair the damaged sections.

3.09 The Superintendent shall thoroughly inspect the improved channel, floodway and/or levee immediately following each 50-year-or-greater flood.

3.10 As soon as practical, the Superintendent shall initiate action to correct the damage to the banks, rip-rap, levee, and other flood control structures.

Maintenance

3.11 The Superintendent shall periodically inspect the improved channels, floodway levees, and bridges prior to the beginning of the annual flood season. Inspections shall ascertain that the hydraulic conveyance and the structural integrity have not been diminished by verifying that:

- The channel, levee, or floodway is clear of brush, weeds, and wild growth that would increase the Mannings channel "n" value by more than 15 percent above the 1981 HEC-2 computer model value for each reach. Tree trunks with branches at least 6 feet above the ground shall not occupy more than 5 percent of the cross-section width of the floodway.
- The channel, levee, or floodway has not been obstructed by deposits of debris, solid-waste accumulation, gravel-mine stockpiles, stationary processing equipment, and unauthorized structures.
- The formation and location of sand bars and phreatophytes will not increase WSEL by more than 1 foot in that reach.
- Banks are not being damaged by rain or wave action, and riprap sections are in good conditions.
- Levee sections have not been subject to settlement, sloughing or loss of cross section area; no carving on either land side or creek side; no seepage, saturated areas or sand boils have occurred; burrowing animals have been exterminated; toe drainage system is in good working condition; crown of levee is shaped for proper drainage, and the roadway is well maintained; no unauthorized recreational vehicular traffic on the sideslopes; and no right-of-way encroachments are being made that would reduce the efficient functioning during flood emergencies.
- Upstream bridge area is to be no less than the following value
Bell Road Bridge: 3000 ft²

3.12 Immediate steps shall be taken to correct all dangerous conditions disclosed by such inspections. The Superintendent shall take measures to promote the growth of grass on the sideslopes. Where practical, measures shall be taken to retard levee bank erosion by planting suitable growth on the river side slopes.

METHOD OF REPORTING

3.13 The Superintendent shall present the results of the annual maintenance inspection to LADO at the Superintendent's office within 60 days after inspection is completed. The items to be reviewed shall include but not be limited to:

- All permits for floodway encroachment.
- Tabulation of the hydraulically significant modifications made to the HEC-2 computer deck during the last report period. The technical hydraulic consideration and judgments that were an integral part of the mathematical modeling updating and analysis shall be presented in detail. In the event of unresolved differences in hydraulic modeling techniques, the Superintendent shall furnish a current HEC-2 deck to LADO for independent analysis.
- HEC-2 computer printouts using the current floodway widths and "n" values.

- Cross-section plots of surveyed sediment range lines and bridge opening areas.
- Photographic and/or electronic documentation of shoals and phreatophyte development.
- A written report summarizing the annual inspection presentation, along with support documentation, shall be forwarded to LADO within 30 days after the briefing.

3.14 Post 50-year (or greater) frequency flood operation inspection report will normally be a timely verbal summary to LADO by the Superintendent, followed by a brief written summary along with documentation of any abnormal operation. A permanent record (photographic or electronic) and a hydraulic analysis shall be made of all reaches or structures that suffered a significant deterioration and that could fail during a 100-year frequency flood. The sediment range line survey and analysis (para 3.17) shall be made an integral part of the written operational inspection report.

3.15 Representatives of the LADO Construction-Operations Division, South Pacific Division, and Office of the Chief of Engineers shall conduct periodic condition surveys to verify the ability of the floodway to convey the 100-year flood and to verify that all maintenance items have been complied with.

3.16 The Corps of Engineers shall establish dry-land category C sediment ranges (Corps of Engineers, EM 111-2-4000, Reservoir Sedimentation Investigation Program, 15 November 1961) at River Mile 11.75, 13.95, 15.55, and 16.63. The sediment range lines will be used to assess the stability of the New River bed in maintaining the flow conveyance efficiency determined by this study. The locations chosen are in reaches that normally would experience minimum scour, but could experience aggradation that would increase the local water surface profile above those shown on plate 9. Relocation, addition, or deletion of sediment ranges may be required as the dynamic hydraulic operation of New River with the New River Dam Project is better understood. Plate 10 illustrates the cross sectional dimensions along the range lines as determined from topographic maps used in this study. Upon adoption of appendix 2, flood boundary delineations, the Corps of Engineers shall establish vertical and horizontal control survey monuments outside the 100-year flood plain, and provide a precise cross-section plot for the control standard at each of the monitoring sediment range lines.

3.17 The Superintendent shall survey the sediment range lines as an integral part of the post 50-year (or greater) frequency flood operation inspection (para 3.14). The survey data shall be compared to the Corps of Engineers initially surveyed cross-section plots. Analysis of the effects of any stream bed changes on the New River conveyance capacity shall be made by the Superintendent. Analysis results and plots shall be submitted to LADO as part of the written operation inspection report.

4. Cost Estimates

4.01 The floodway fringe delineations with their respective water surface profiles were computed for New River between the proposed damsite and Skunk Creek using August 1980 topography updated to include any new construction. No major new development or changes in topography are anticipated prior to completion of the final delineations. The delineations, however, will be reviewed and updated as necessary prior to publishing the data as an appendix to the New River Dam O&M manual. The cost estimate will be included in the O&M manual.

4.02 Four sediment range lines will be established along New River to monitor creek bed stability. The cost of establishing and monumenting this range and the cost of the initial cross-section survey will be included in the O&M manual.

5. Conclusions

5.01 In accordance with the local cooperation agreement, the Corps of Engineers has delineated the designated floodway and floodway fringes for New River from New River Dam to the Skunk Creek. The delineations have been coordinated with the Flood Control District of Maricopa County. The approved delineations, which will be incorporated into the New River Dam O&M manual, must be adopted by the Flood Control District and used as the basis for management of the designated floodway and floodway fringes.

5.02 The Operations and Maintenance procedures for New River from New River Dam to Skunk Creek have been presented to the local interests through the Flood Control District of Maricopa County, Arizona, in accordance with applicable sections of the Code of Federal Regulations, Title 33, Navigations and Navigable Rivers, Chapter II, Part 208 Flood Control Regulation, Paragraph (g) channels and floodways by The Department of the Army. The procedures herein presented include organizational responsibility of the Flood Control District operation and maintenance for 50-year (or greater) frequency flood and annual inspection and reporting requirements.

Pertinent Data (Continued)

Physical Data - Channels (Continued)			
	100-Year Design discharge (ft ³ /s)	Top width (ft)	Depth (ft)
Below Arizona Canal diversion channel confluence	^e 35,000	(f)	(f)
At New River confluence	^e 35,000	(f)	(f)
New River			
Below New River Dam	^e 2,665	(c)	(c)
Above Skunk Creek confluence	^e 19,000	(c)	(c)
Below Skunk Creek confluence	41,000	(f)	(f)
At Agua Fria River confluence	39,000	(f)	(f)
Agua Fria River			
Below New River confluence	^e 95,000	(c)	(c)
At Gila River confluence	^e 89,000	(f)	(f)
Dreamy Draw			
Below Dreamy Draw Dam	220	(c)	(c)
At Arizona Canal diversion channel	1,000	(c)	(c)
Arizona Canal diversion channel			
At 40th Street	6,800	36	21
Below Dreamy Draw confluence	10,000	50	24.5
Above Cave Creek confluence	15,000	60	22.5
Below Cave Creek confluence	^e 25,000	168	22
At Skunk Creek confluence	^e 29,000	445	20

(R)

- a. Does not include 2-foot settlement allowance.
- b. Does not include 1.83-foot settlement allowance.
- c. These sections to be managed in accordance with flood plain management criteria. The width and the depth of the flood plain vary.
- d. The design discharge was limited by the capacity of Peoria Avenue bridge. The 100-year discharge is estimated at 16,000 ft³/s.
- (R) e. Revised design discharges are presented in the Phoenix, Arizona and Vicinity (Including New River), Hydrology, Part 2 Report, scheduled for completion March 1983. (R)
- f. Flowage easements to be acquired at these sections. The width of the flowage easement and the depth of flow vary.

Pertinent Data

(R) Physical Data - Dams		
DREAMY DRAW DAM (As Built)		
Drainage area	sq mi	1.3
Dam (rolled earthfill)		
Crest elevation	ft msl	1,418
Maximum height above streambed	ft	50
Crest length	ft	448
Freeboard	ft	5
Spillway (detached, broadcrested)		
Crest elevation	ft msl	1,405
Crest length	ft	100
Elevation of maximum water surface	ft msl	1,413
Outlet works (ungated conduit)		
Diameter of conduit	ft	3
Length of conduit	ft	264
Intake elevation	ft msl	1,368.7
Saddle dike		
Crest elevation	ft msl	1,418
Crest length	ft	1,060
Maximum height above existing ground	ft	20
Reservoir		
Area at spillway crest	acre	26.7
Capacity (gross) at spillway crest	acre-ft	317
Storage allocation below spillway crest		
Flood control	acre-ft	281
Sedimentation (100-year storage)	acre-ft	36
Standard project flood		
Total volume (6 hours)	acre-ft	320
Peak inflow	ft ³ /s	3,600
Peak outflow	ft ³ /s	220
Drawdown time	hr	19.5
Probable maximum flood		
Total volume	acre-feet	770
Peak inflow	ft ³ /s	11,000
Peak outflow	ft ³ /s	7,000
Drawdown time	hr	7.5
CAVE BUTTES DAM (As Built)		
Drainage area	sq mi	191
Dam (rolled earthfill)		
Crest elevation	ft msl	^a 1,679.1
Maximum height above streambed	ft	109
Crest length	ft	2,275
Freeboard	ft	5
Spillway (detached)		
Crest elevation	ft msl	1,657.1
Crest length	ft	510
Elevation of maximum water surface	ft msl	1,674.1

Note: See footnotes at end of tabulation.

Pertinent Data (Continued)

Physical Data - Dams (Continued)		
Outlet works (Ungated conduit)		
Diameter of conduit	ft	3.75
Length of conduit	ft	548.5
Intake elevation	ft msl	1,560.3
Saddle dike No. 1		
Crest elevation	ft msl	1,679.1
Crest length	ft	935
Maximum height above existing ground	ft	39
Saddle dike No. 2		
Crest elevation	ft msl	1,679.1
Crest length	ft	9,005
Maximum height above existing ground	ft	55
Saddle dike No. 3		
Crest elevation	ft msl	1,679.1
Crest length	ft	3,245
Maximum height above existing ground	ft	10
Reservoir area at spillway crest	acre	1,820
Capacity (gross) at spillway crest	acre-ft	46,600
Storage allocation below spillway crest		
Flood control (net)	acre-ft	40,900
Sedimentation (100-year storage)	acre-ft	5,700
Standard project flood		
Total volume	acre-ft	42,200
Peak inflow	ft ³ /s	54,000
Peak outflow	ft ³ /s	486
Drawdown time	day	48
Probable maximum flood		
Total volume	acre-ft	122,000
Peak inflow	ft ³ /s	172,000
Peak outflow	ft ³ /s	100,600
Drawdown time	hr	61
ADOBE DAM (As Built)		
Reservoir		
Drainage area	sq mi	89.6
Dam (rolled earthfill)		
Crest elevation	ft msl	^b 1,403.0
Maximum height above streambed	ft	65
Crest length	ft	11,220
Freeboard	ft	5.5
Spillway		
Crest elevation	ft msl	1,377.8
Crest length	ft	36
Elevation of maximum water surface	ft msl	1,397.5
Outlet works		
Size of conduit	ft	5.92W x 8.83H

Note: See footnotes at end of tabulation.

Pertinent Data (Continued)

Physical Data - Dams (Continued)		
Length of conduit	ft	289.5
Intake elevation	ft msl	1,338.0
Reservoir area at spillway crest	acre	1,320
Capacity (gross) at spillway crest	acre-ft	18,350
Storage allocation below spillway crest		
Flood control (net)	acre-ft	15,650
Sedimentation (100-year storage)	acre-ft	2,700
Standard project flood		
Total volume	acre-ft	17,000
Peak inflow	ft ³ /s	66,000
Peak outflow	ft ³ /s	1,890
Drawdown time	hr	229
Probable maximum flood		
Total volume	acre-ft	61,000
Peak inflow	ft ³ /s	119,000
Peak outflow	ft ³ /s	12,000
Drawdown time	hr	122
Skunk Creek channel and levees (under construction)		
Standard project flood		
Peak inflow	ft ³ /s	54,000
Channel		
Base width	ft	241-271
Length	ft	2,729
Levees		
Maximum height above existing ground	ft	24.8; 25.5
Length	ft	5,136; 8,369
Top width	ft	16
Crest elevation	ft msl	Varies
NEW RIVER DAM		
Drainage area	sq mi	164
Type of dam earthfill	--	Compacted earthfill
Main embankment		
Crest elevation	ft msl	1,486.7
Maximum height above streambed	ft	104
Crest length	ft	2,320
Freeboard	ft	5.6
Spillway		
Crest elevation	ft msl	1,456.2
Crest length	ft	75
Elevation of maximum water surface	ft msl	1,481.1
Maximum spillway overflow	ft ³ /s	29,850
Outlet conduit		
Interior dimension	ft	9.5H x 6.25W
Length	ft	433
Inlet elevation	ft msl	1,389.25
Outlet elevation	ft msl	1,386.31
Maximum outflow (PMF)	ft ³ /s	3,150

Note: See footnotes at end of tabulation.

Pertinent Data (Continued)

Physical Data - Dams (Continued)

Energy dissipator		
Length	ft	60.98
Width	ft	31.0
Floor elevation	ft msl	1,372.0
Wall height	ft	22.0
Outlet channel		
Base width	ft	16.0
Side slope	--	2.5H on 1V
Levee height	ft	15.5
Length	ft	730.32
Reservoir area		
Spillway crest	acres	1,780
Maximum water surface	acres	2,900
Capacity (gross)		
Spillway crest	acre-ft	43,520
Maximum water surface	acre-ft	102,520
Storage allocation below spillway crest		
Flood control (net)	acre-ft	38,600
Sedimentation	acre-ft	4,920
Standard project flood		
Total volume	acre-ft	49,300
Peak inflow	ft ³ /s	45,000
Peak outflow	ft ³ /s	2,665
Drawdown time	hr	242
Probable maximum flood		
Total volume	acre-ft	105,000
Peak inflow	ft ³ /s	144,000
Peak outflow	ft ³ /s	33,000
Drawdown time	hr	79

Physical Data - Channels

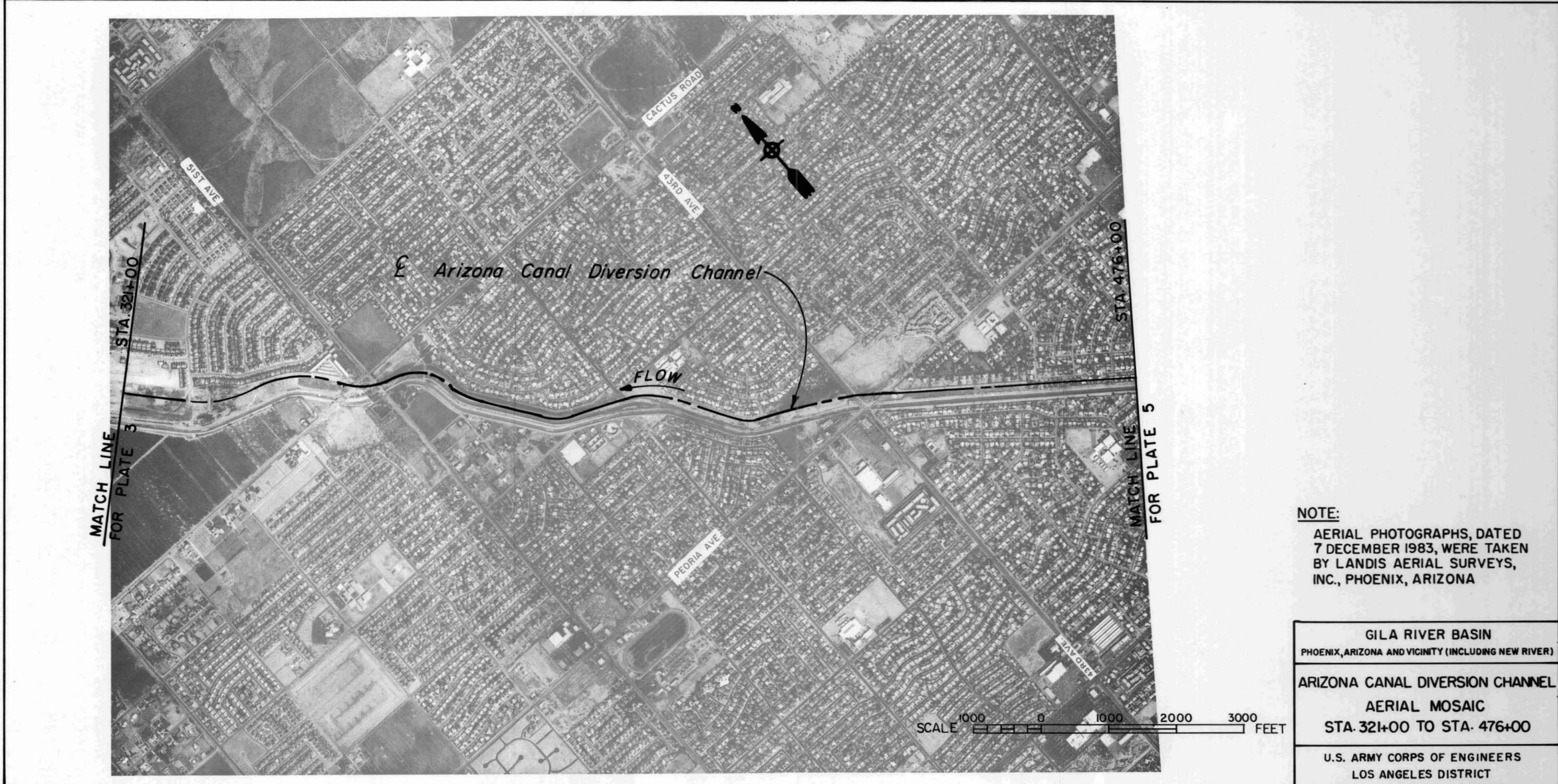
	Design discharge (ft ³ /s)	Top width (ft)	Depth (ft)
Cave Creek			
Below Cave Buttes Dam	486	(c)	(c)
At Greenway Road	14,000	(c)	(c)
At Arizona Canal	^d 15,000	140	10
Skunk Creek			
Below Adobe Dam	1,890	(c)	(c)
Above Arizona Canal diversion channel confluence	^e 13,000	(c)	(c)

Note: See footnotes at end of tabulation.



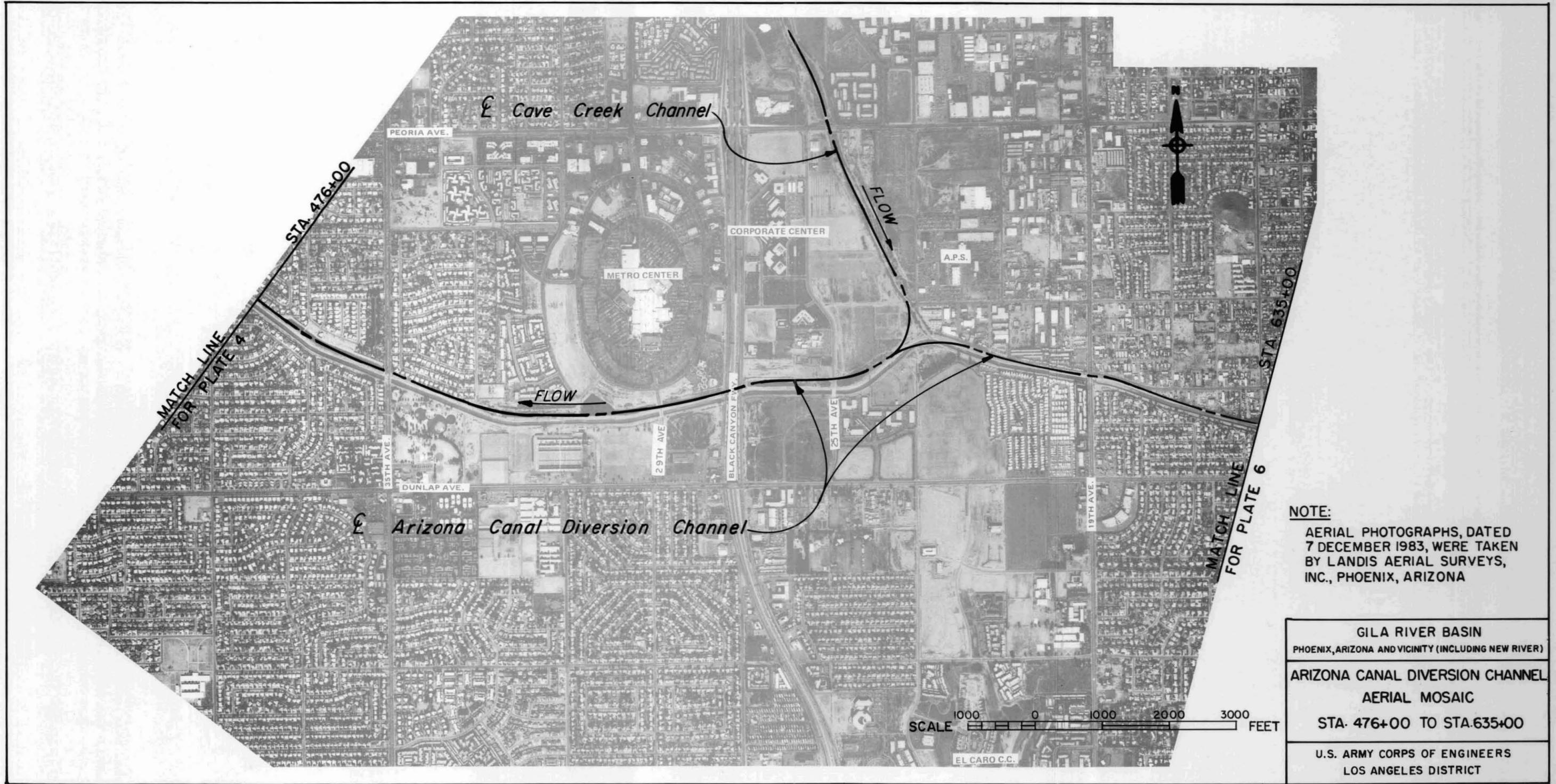
NOTE:
 AERIAL PHOTOGRAPHS, DATED
 7 DECEMBER 1983, WERE TAKEN
 BY LANDIS AERIAL SURVEYS,
 INC., PHOENIX, ARIZONA

GILA RIVER BASIN
 PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
 ARIZONA CANAL DIVERSION CHANNEL
 AERIAL MOSAIC
 STA. 129+50 TO STA. 321+00
 U.S. ARMY CORPS OF ENGINEERS
 LOS ANGELES DISTRICT



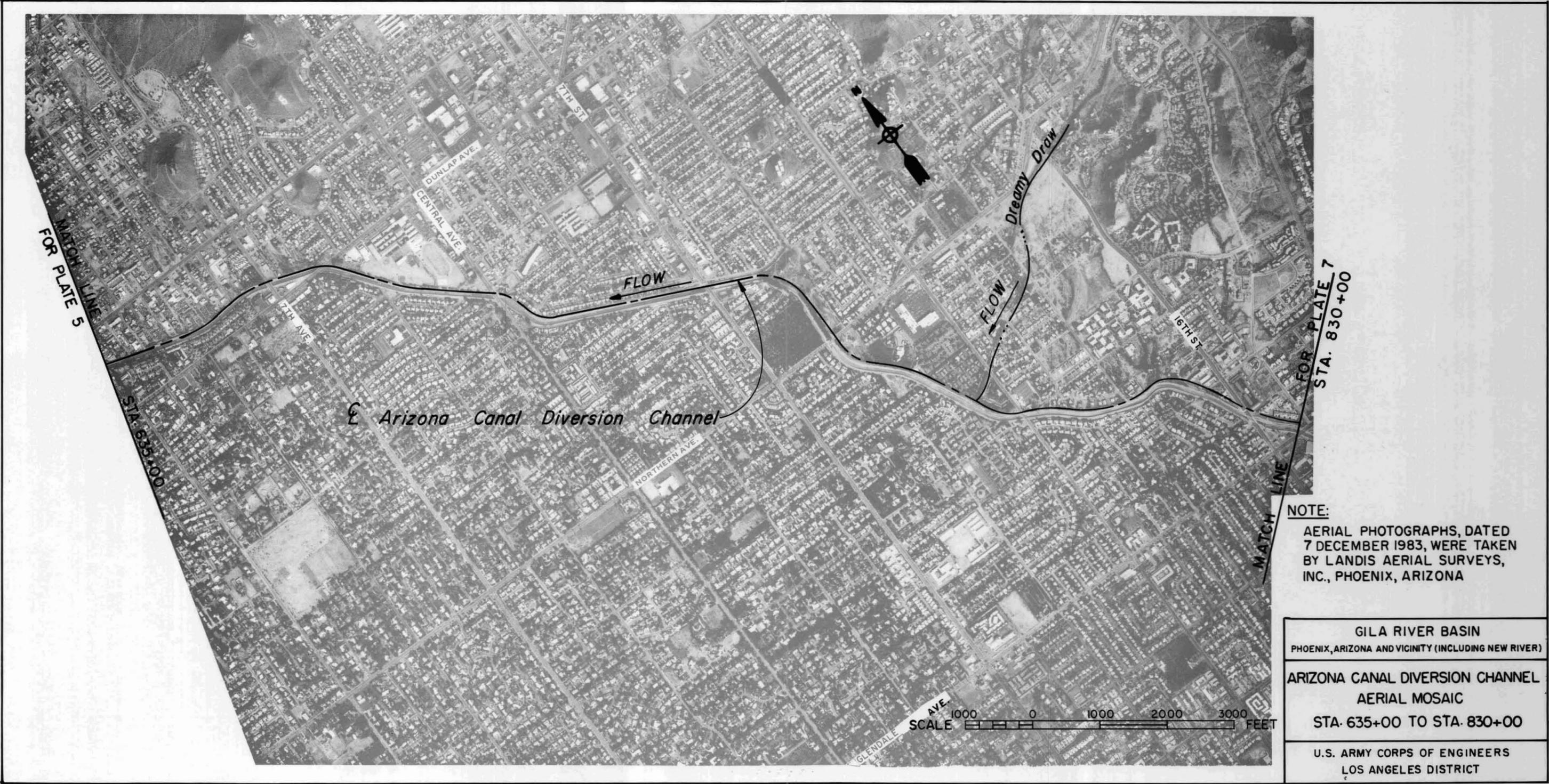
NOTE:
 AERIAL PHOTOGRAPHS, DATED
 7 DECEMBER 1983, WERE TAKEN
 BY LANDIS AERIAL SURVEYS,
 INC., PHOENIX, ARIZONA

GILA RIVER BASIN PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
ARIZONA CANAL DIVERSION CHANNEL AERIAL MOSAIC STA. 321+00 TO STA. 476+00
U.S. ARMY CORPS OF ENGINEERS LOS ANGELES DISTRICT



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GILA RIVER BASIN PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
ARIZONA CANAL DIVERSION CHANNEL AERIAL MOSAIC STA. 476+00 TO STA. 635+00
U.S. ARMY CORPS OF ENGINEERS LOS ANGELES DISTRICT



MATCH LINE
FOR PLATE 5

STA. 635+00

Arizona Canal Diversion Channel

FLOW

FLOW

Dreamy Draw

16TH ST

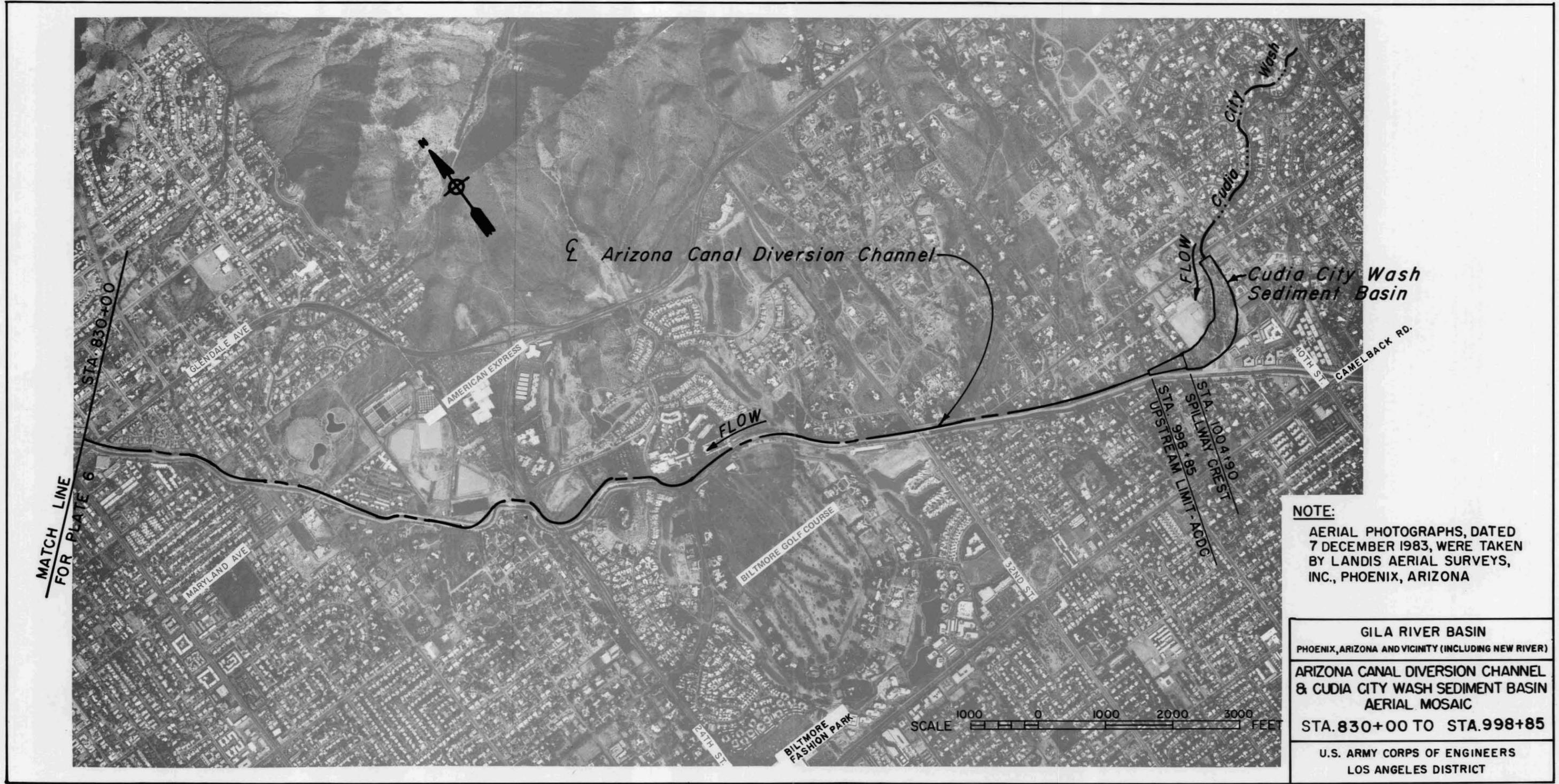
MATCH LINE
FOR PLATE 7
STA. 830+00

SCALE 0 1000 2000 3000 FEET

NOTE:
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BY LANDIS AERIAL SURVEYS,
INC., PHOENIX, ARIZONA

GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
ARIZONA CANAL DIVERSION CHANNEL
AERIAL MOSAIC
STA. 635+00 TO STA. 830+00

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



MATCH LINE
FOR PLATE 6
STA. 830+00

Arizona Canal Diversion Channel

FLOW

Cudia City Wash
Sediment Basin

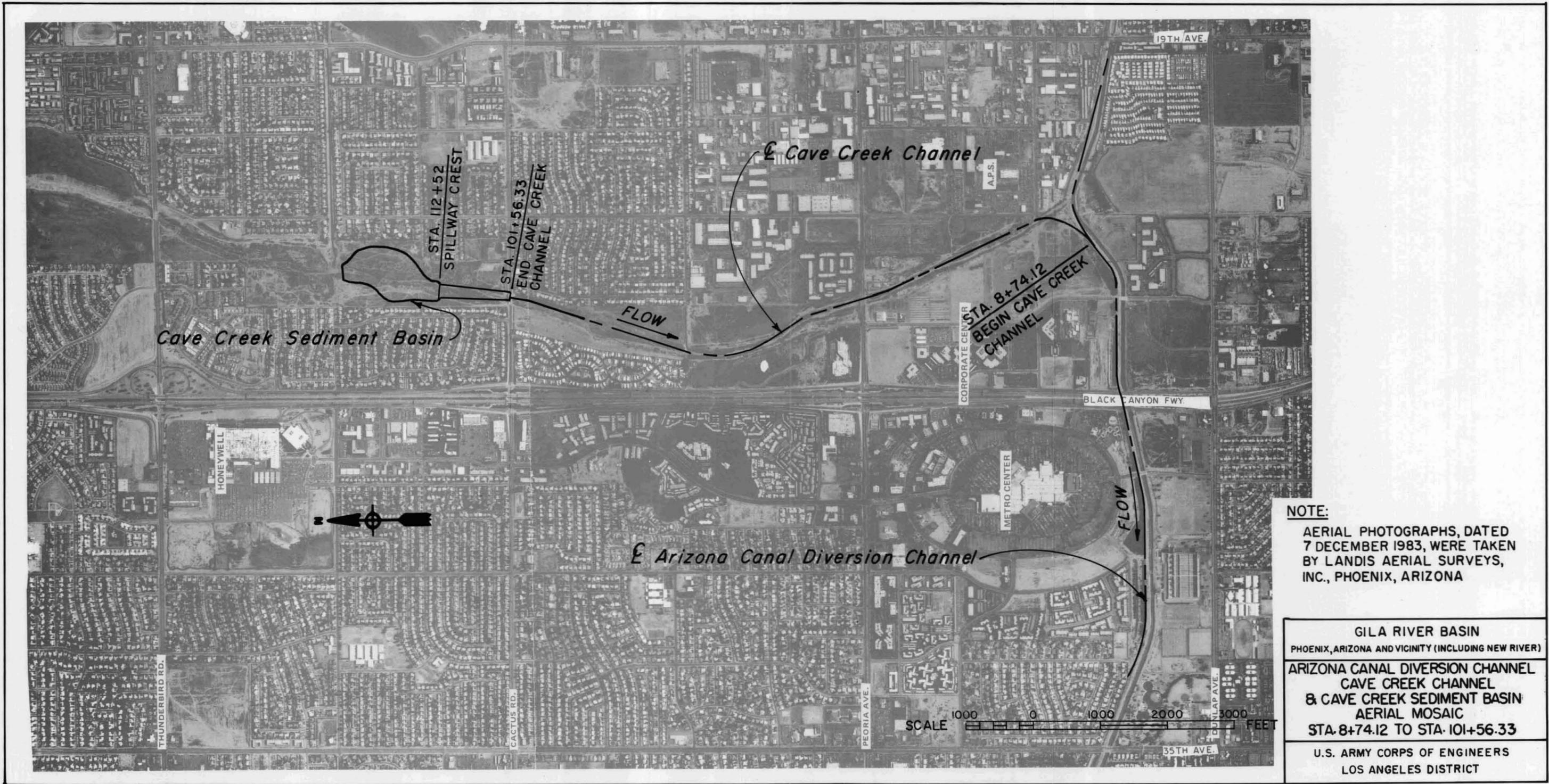
FLOW

STA. 998+85
UPSTREAM LIMIT - ACDC
STA. 1004+90
SPILLWAY CREST

NOTE:
AERIAL PHOTOGRAPHS, DATED
7 DECEMBER 1983, WERE TAKEN
BY LANDIS AERIAL SURVEYS,
INC., PHOENIX, ARIZONA

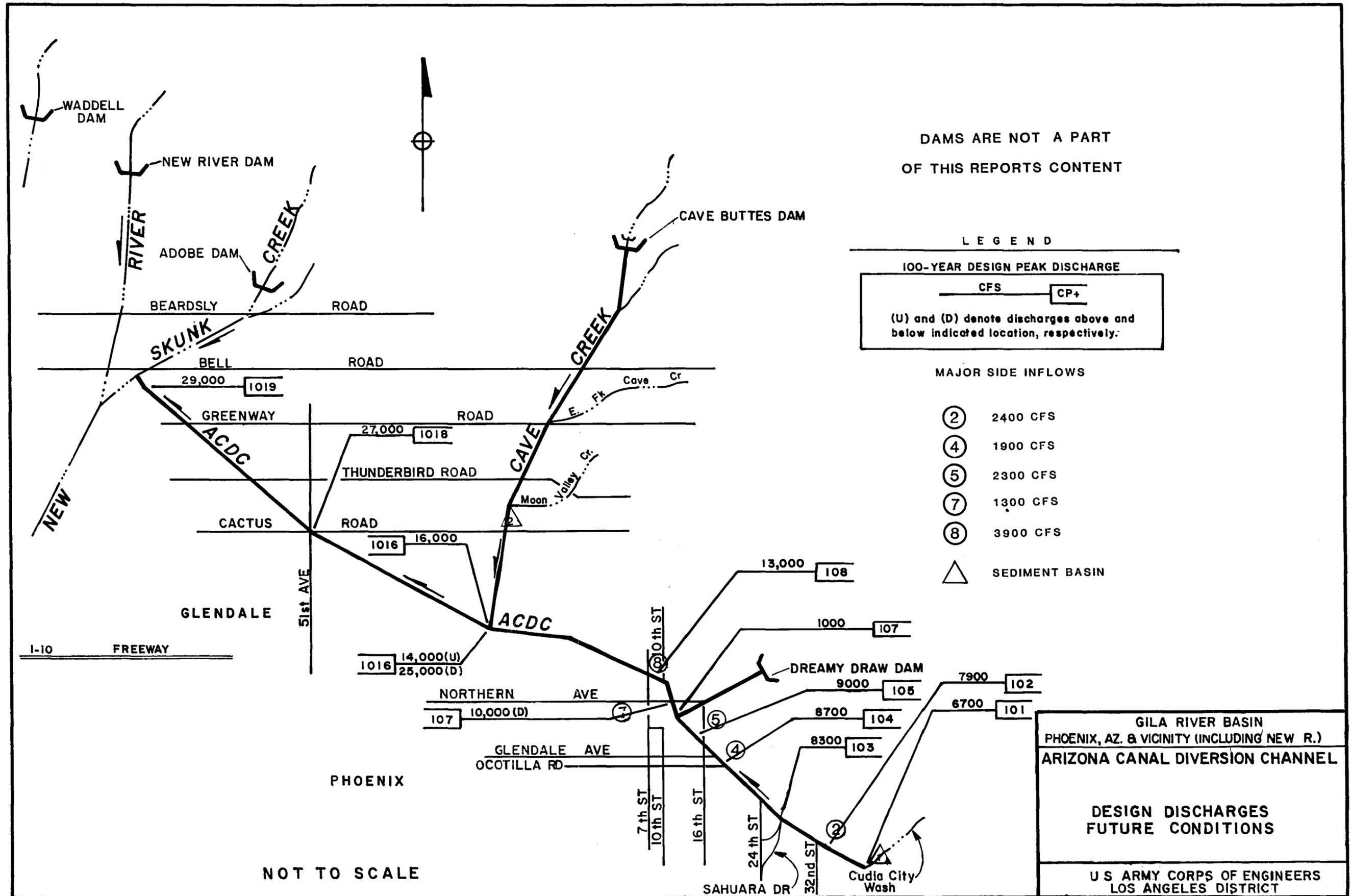
SCALE 1000 0 1000 2000 3000 FEET

GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
ARIZONA CANAL DIVERSION CHANNEL
& CUDIA CITY WASH SEDIMENT BASIN
AERIAL MOSAIC
STA. 830+00 TO STA. 998+85
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

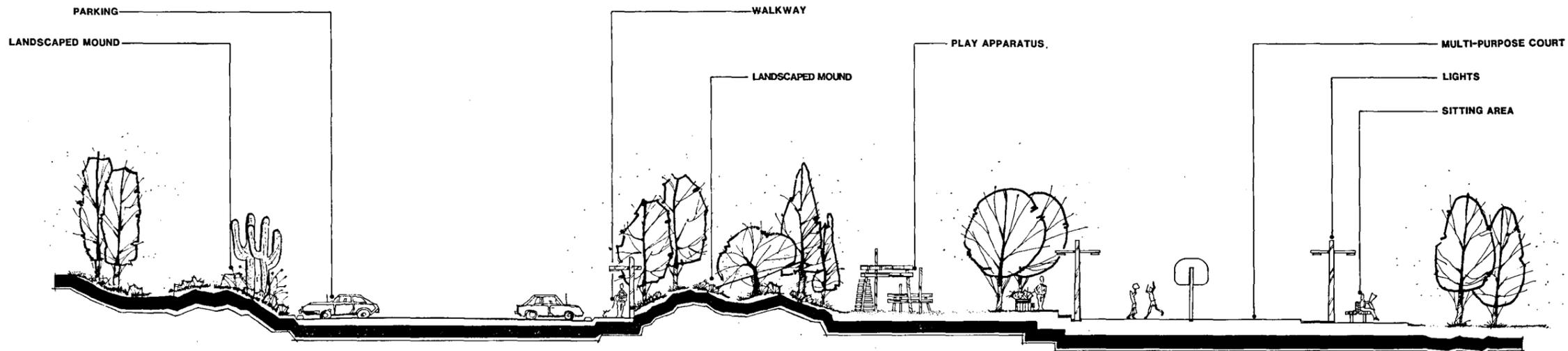


NOTE:
 AERIAL PHOTOGRAPHS, DATED
 7 DECEMBER 1983, WERE TAKEN
 BY LANDIS AERIAL SURVEYS,
 INC., PHOENIX, ARIZONA

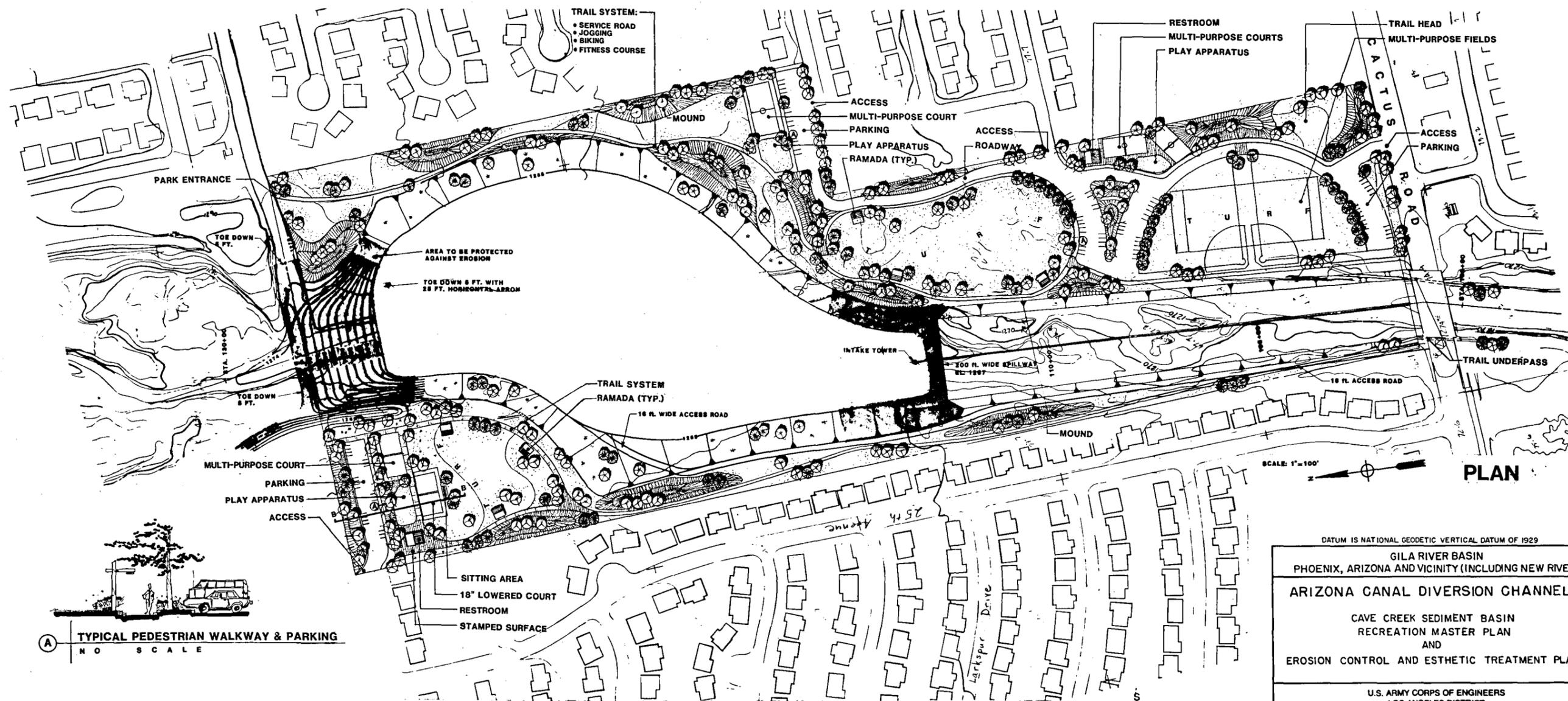
GILA RIVER BASIN
 PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
 ARIZONA CANAL DIVERSION CHANNEL
 CAVE CREEK CHANNEL
 & CAVE CREEK SEDIMENT BASIN
 AERIAL MOSAIC
 STA. 8+74.12 TO STA. 101+56.33
 U.S. ARMY CORPS OF ENGINEERS
 LOS ANGELES DISTRICT



VALUE ENGINEERING PAYS



B-B SECTION / ELEVATION • SCALE: 1" = 10'



DATUM IS NATIONAL GEODETIC VERTICAL DATUM OF 1929

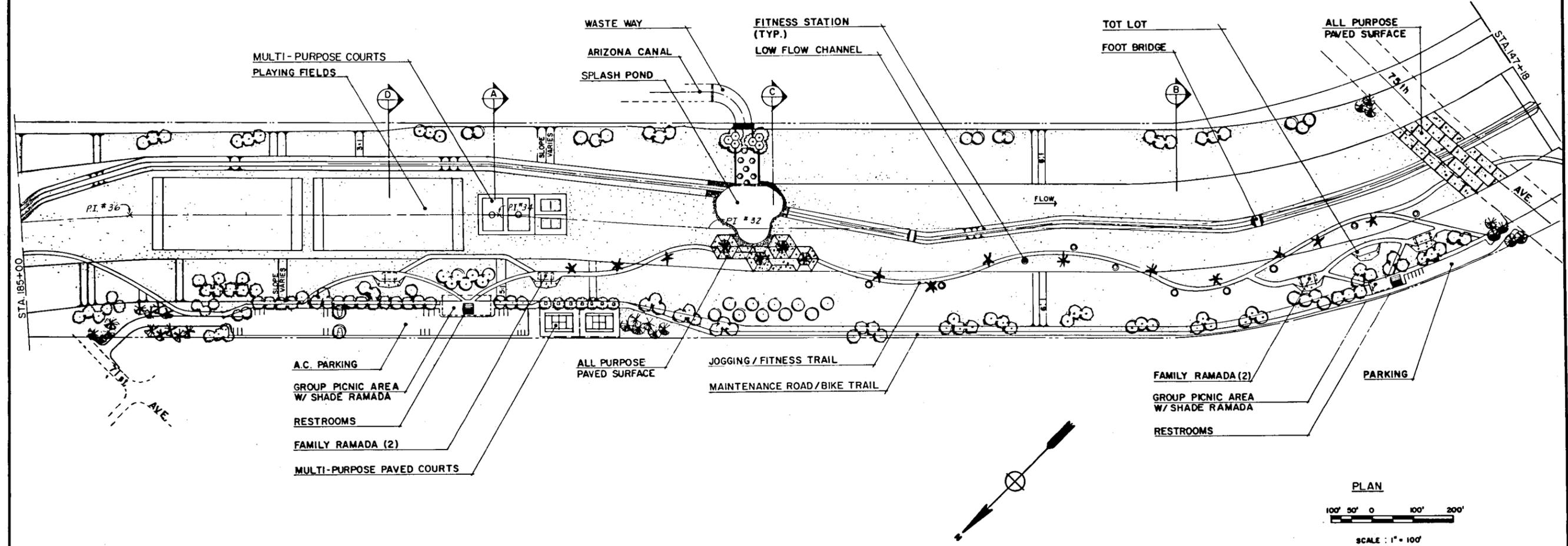
GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)

ARIZONA CANAL DIVERSION CHANNEL

CAVE CREEK SEDIMENT BASIN
RECREATION MASTER PLAN
AND
EROSION CONTROL AND ESTHETIC TREATMENT PLAN

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

VALUE ENGINEERING PAYS



THIS PLATE REFLECTS MASTER PLAN LEVEL DESIGN. FEATURE DESIGN LEVEL DETAIL WILL BE PRESENTED IN A SUBSEQUENT RECREATION DESIGN MEMORANDUM.

DATUM IS NATIONAL GEODETIC VERTICAL DATUM OF 1929

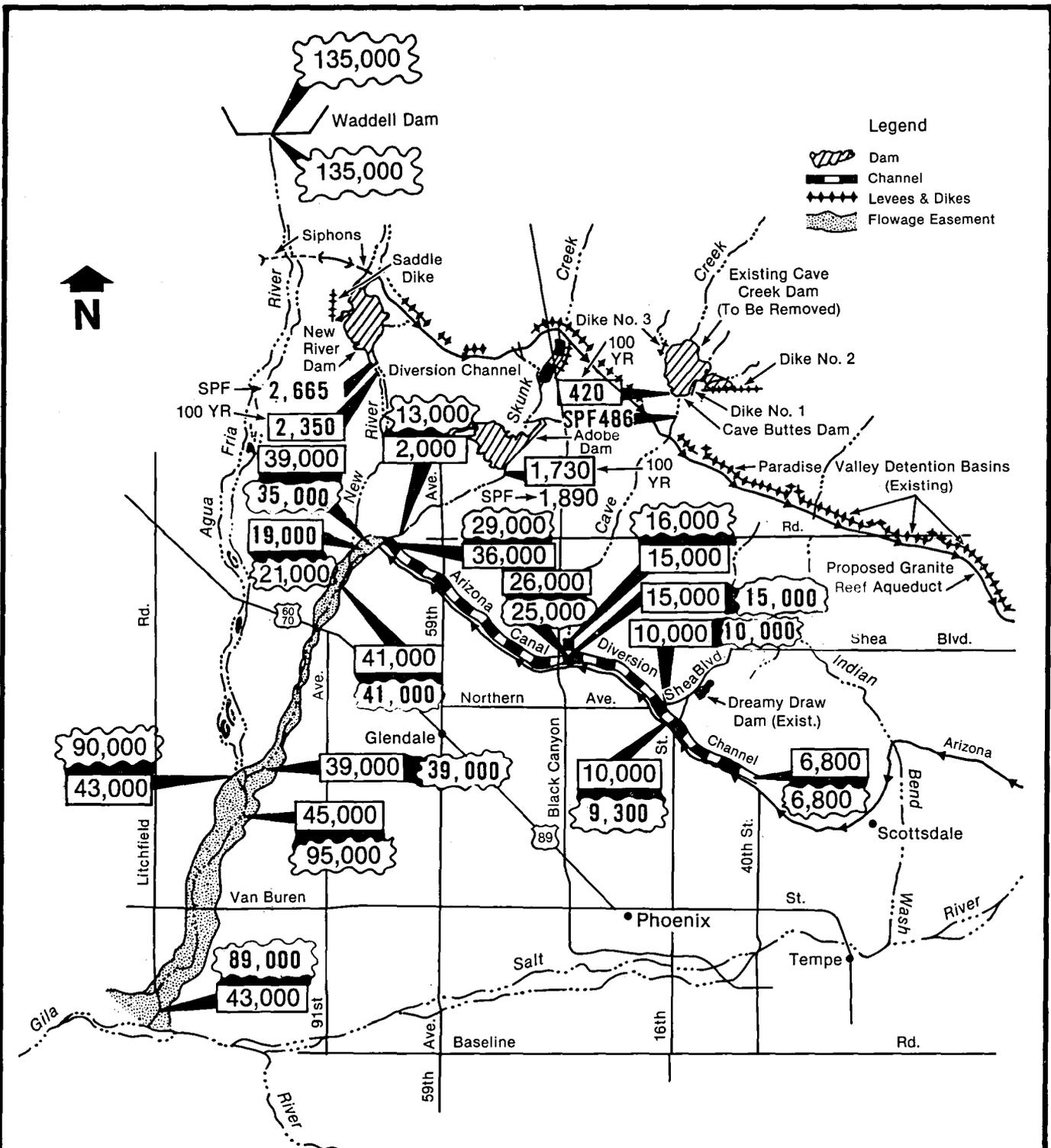
GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)

ARIZONA CANAL DIVERSION CHANNEL

CITY OF PEORIA REACH
RECREATION MASTER PLAN
AND
EROSION CONTROL AND ESTHETIC TREATMENT PLAN

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

SAFETY PAYS



Legend

- Dam
- Channel
- Levees & Dikes
- Flowage Easement

NOTES:

1. Discharges and flow rates are in c.f.s. based on future conditions of development.
2. SPF discharges given at dams; 100-year flow rates given for channels, except as noted.

LEGEND

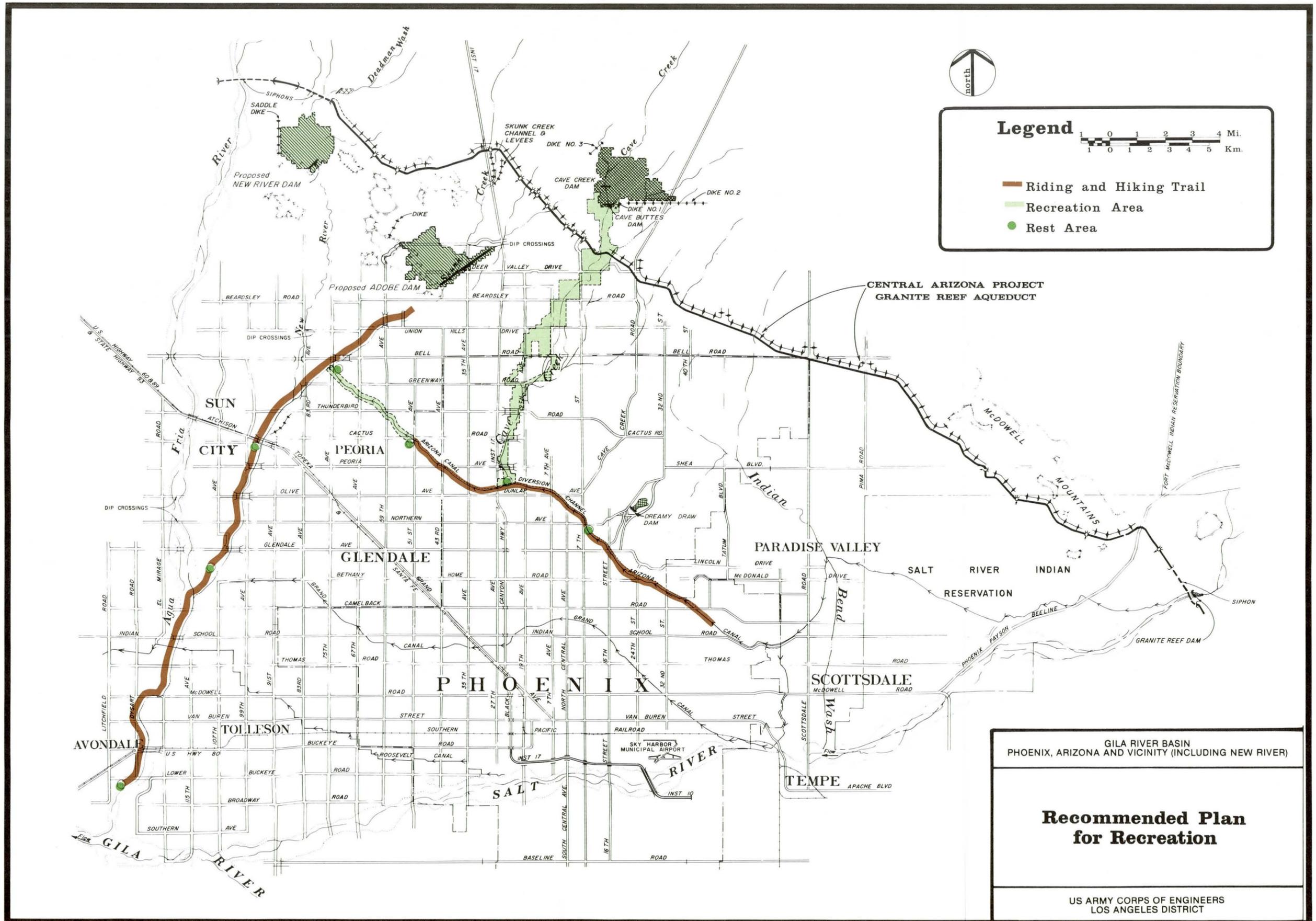
- Phase I Design Discharges
- Revised Design Discharges

SCALE 1 0 1 2 3 4 5 MILES

GILA RIVER BASIN,
NEW RIVER & PHOENIX CITY STREAMS, AZ

REVISED
DESIGN DISCHARGES
FOR
RECOMMENDED PLAN

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



Legend

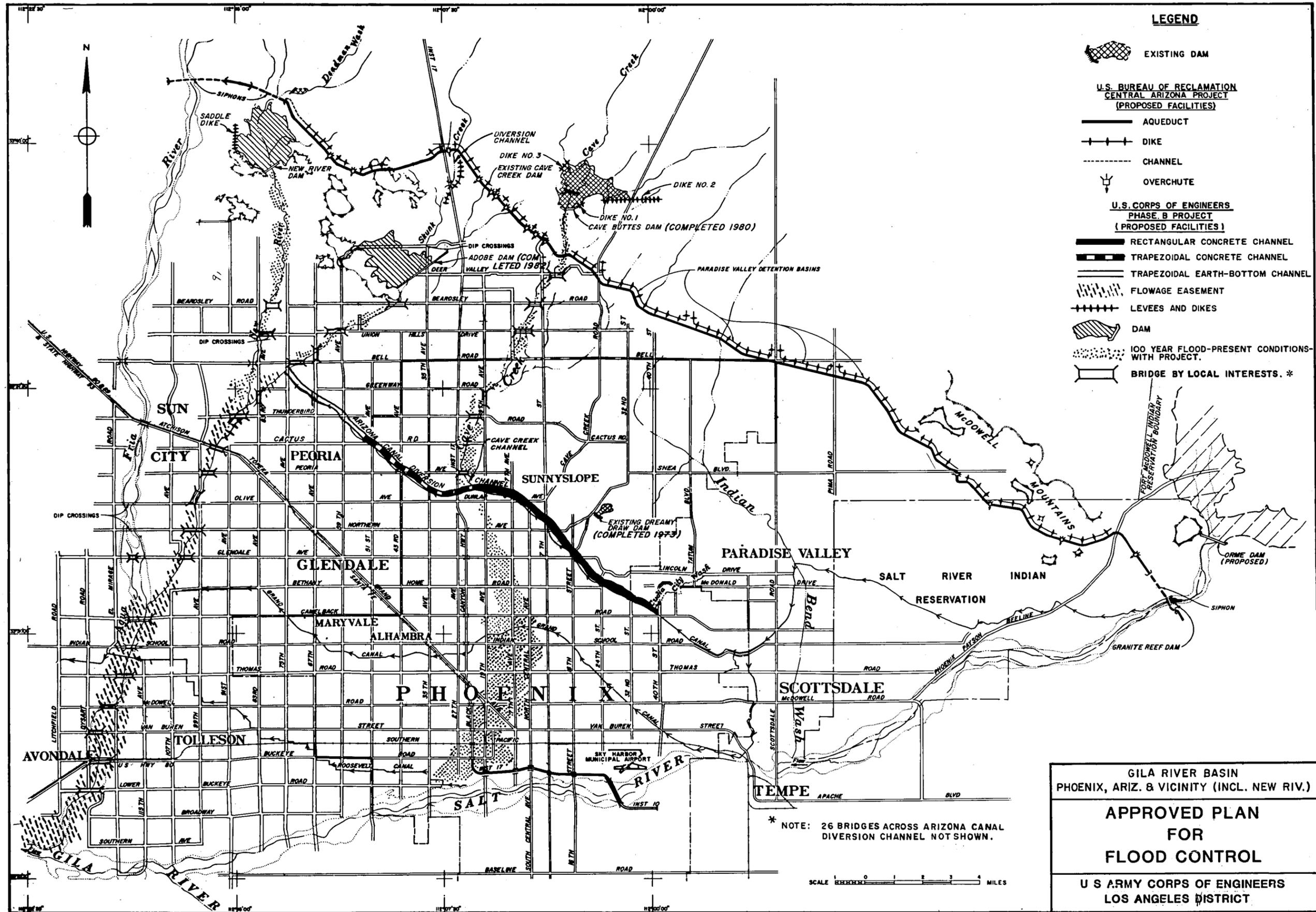
0 1 2 3 4 Mi.
0 1 2 3 4 5 Km.

- Riding and Hiking Trail
- Recreation Area
- Rest Area

GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)

**Recommended Plan
for Recreation**

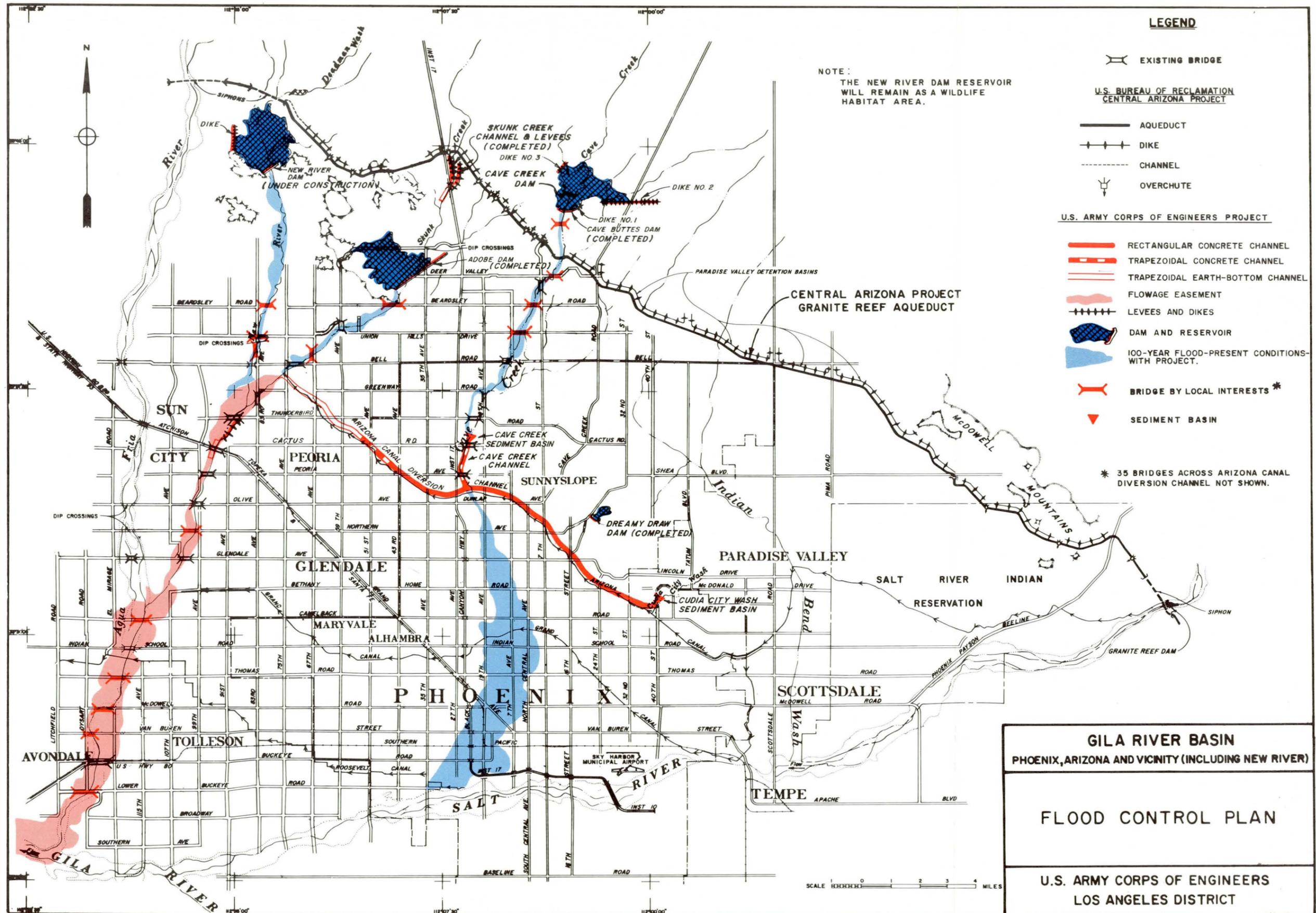
US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



GILA RIVER BASIN
PHOENIX, ARIZ. & VICINITY (INCL. NEW RIV.)

**APPROVED PLAN
FOR
FLOOD CONTROL**

U S ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



LEGEND

EXISTING BRIDGE

**U.S. BUREAU OF RECLAMATION
CENTRAL ARIZONA PROJECT**

AQUEDUCT

DIKE

CHANNEL

OVERCHUTE

U.S. ARMY CORPS OF ENGINEERS PROJECT

RECTANGULAR CONCRETE CHANNEL

TRAPEZOIDAL CONCRETE CHANNEL

TRAPEZOIDAL EARTH-BOTTOM CHANNEL

FLOWAGE EASEMENT

LEVEES AND DIKES

DAM AND RESERVOIR

100-YEAR FLOOD-PRESENT CONDITIONS WITH PROJECT

BRIDGE BY LOCAL INTERESTS *

SEDIMENT BASIN

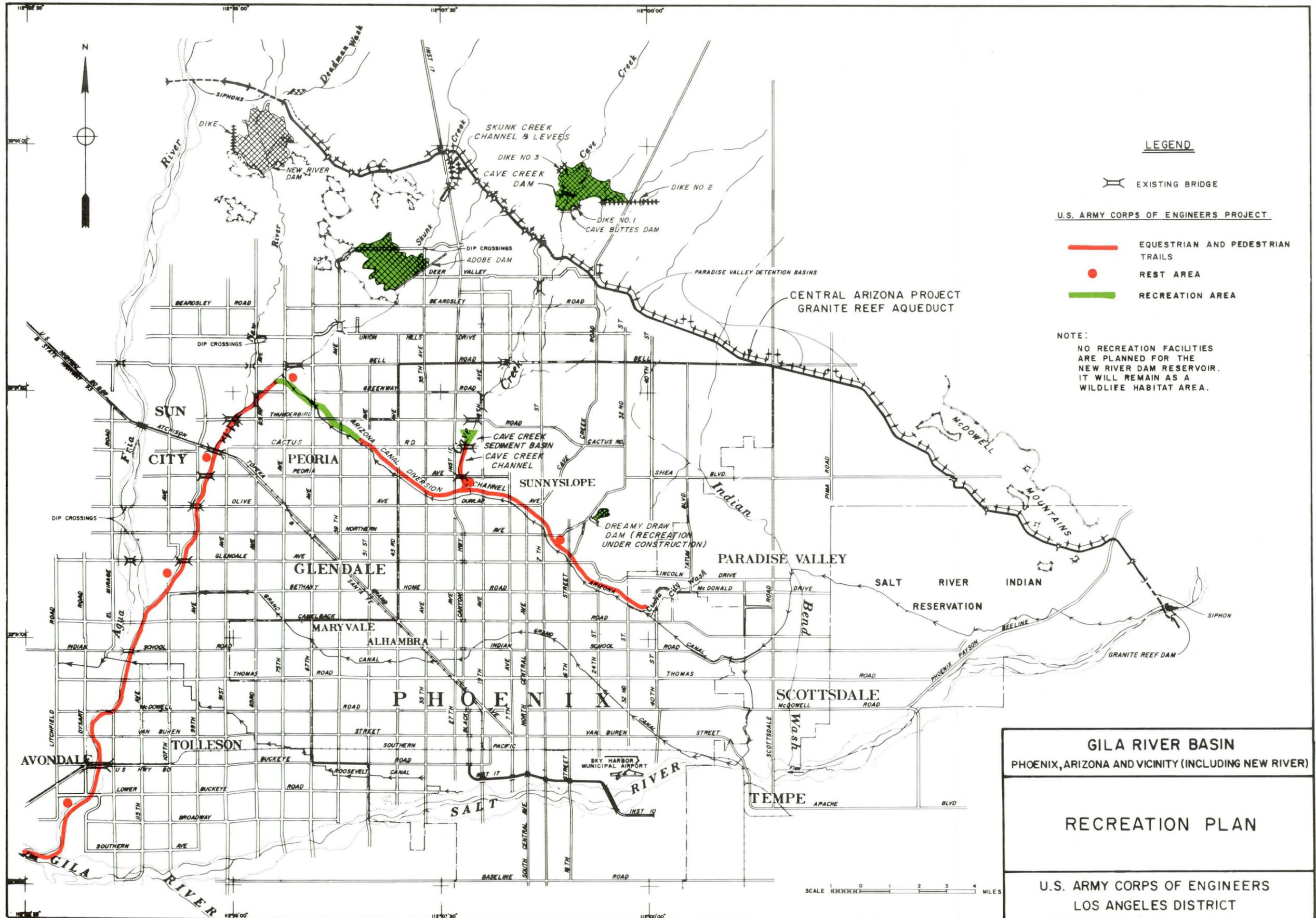
* 35 BRIDGES ACROSS ARIZONA CANAL DIVERSION CHANNEL NOT SHOWN.

NOTE:
THE NEW RIVER DAM RESERVOIR
WILL REMAIN AS A WILDLIFE
HABITAT AREA.

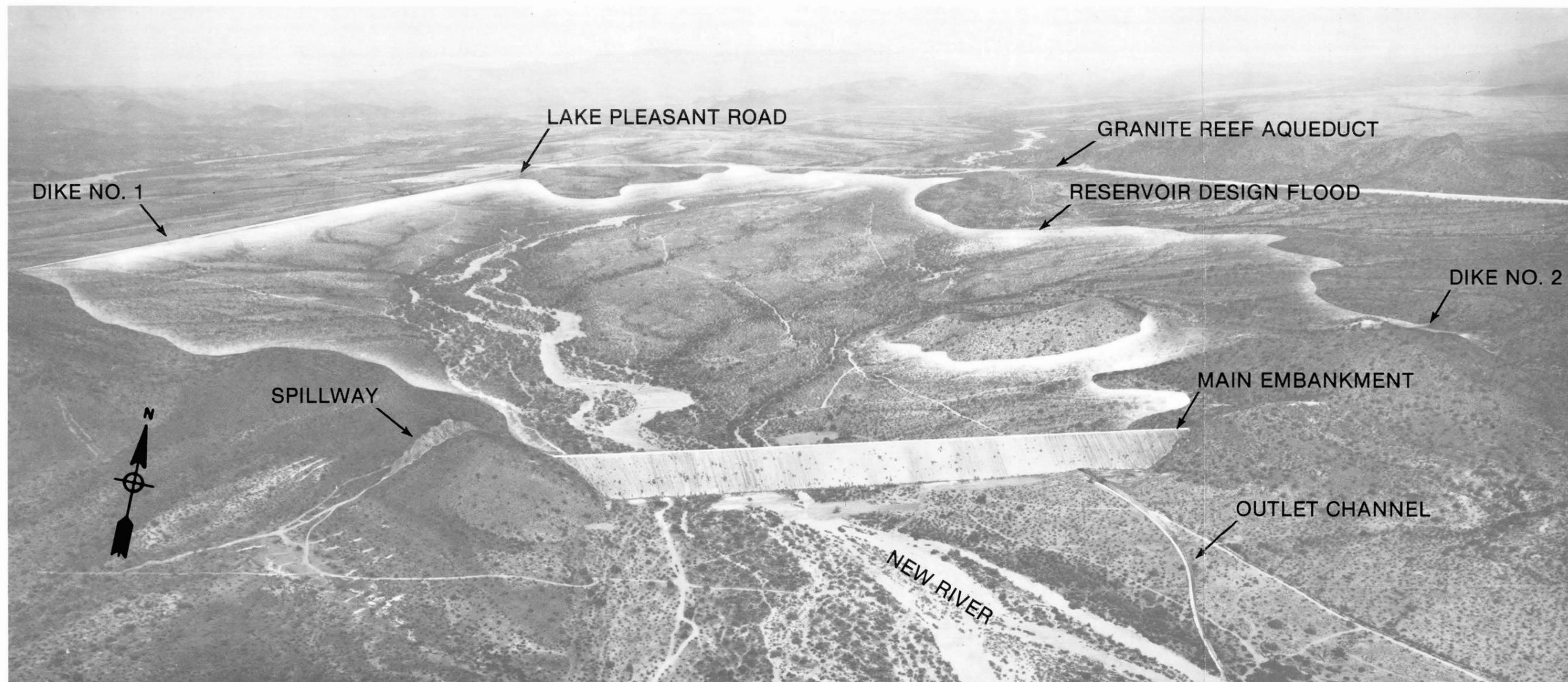
GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)

FLOOD CONTROL PLAN

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



New River Dam



PERTINENT DATA

Drainage Area	164 sq. mi.	Max. water Surface elevation	1481.1 ft., m.s.l.	Outlet Channel Base width	16.0 ft.	Storage Allocation below spillway crest	
Type of Dam-Compacted Earth Filled		Outlet Conduit Interior dimension	9.5H x 6.25W ft.	Side slope	2.5 H on 1V	Flood control (net)	38,600 ac. ft.
Main Embankment Crest elevation	1486.7 ft., m.s.l.	Length	433 ft.	Levee height	15.5 ft.-14.0 ft.	Sedimentation	4,920 ac. ft.
Maximum height above streambed	104 ft.	Inlet elevation	1389.25 ft., m.s.l.	Length	730.32 ft.	Standard Project Flood Total volume	49,300 ac. ft.
Crest length	2320 ft.	Outlet elevation	1386.31 ft., m.s.l.	Reservoir Area Spillway crest	1780 acres	Peak inflow	45,000 c.f.s.
Freeboard	5.6 ft.	Energy dissipator Length	60.98 ft.	Max. water surface	2900 acres	Peak outflow	2,665 c.f.s.
Spillway Crest elevation	1456.2 ft., m.s.l.	Width	31.0 ft.	Capacity (Gross) Spillway crest	43,520 ac. ft.	Probable Maximum Flood Total volume	105,000 ac. ft.
Crest length	75 ft.	Floor elevation	1372.0 ft., m.s.l.	Max. water surface	102,520 ac. ft.	Peak inflow	144,000 c.f.s.
		Wall height	22.0 ft.			Peak outflow	33,000 c.f.s.

1. Introduction

Purpose and Scope

1.01 The New River Dam Feature Design is primarily a technical document designed to provide the basis for preparation of plans and specifications. The report provides justification for general feature dimensioning, siting, selection of construction materials, and management of basin resources. It carries forth general concepts of the Phase I General Design Memorandum (GDM), which recommended construction of a dam, a dike, a spillway, and outlet works in the proximity of the West Wing Mountains on the New River and management of the flood plain between the New River damsite and the Skunk Creek confluence under flood plain management principles. The authorized Phoenix and Vicinity Flood Control Plan is shown on plate 1. The report specifically addresses a revised site selection for the dam, spillway, outlet works, and access road; the addition of another dike; and revised real estate requirements.

The Phase II Process

1.02 Major studies initiated under the Phase I GDM have been supplemented in the Phase II process to achieve feature design quality. Studies specifically included in the feature design are summarized in table 1.

FUNDAMENTAL DESIGN CONCLUSIONS

1.03 Phase II studies have led to the following fundamental design conclusions.

- a. The Phase II embankment site provides a more economical location than the Phase I site.
- b. Spillway site 2, in combination with Phase II embankment site 1, provides the most desirable downstream overflow pattern considering dam safety and real estate acquisition requirements.
- c. The outlet works, consisting of a concrete rectangular conduit, a concrete rectangular energy dissipator, and a trapezoidal outlet channel located along the east abutment, provide the safest and most economical design solution.
- d. An access road entering southeast of the damsite provides the most efficient all-weather access to project structures. This road also permits access on dedicated county roadways and by easement on State of Arizona lands.
- e. Additional real estate acquisition will be required over that considered in the Phase I GDM as a result of a revised and larger reservoir design flood volume and modified spillway overflow pattern.

Table 1. Summary of Phase II studies.

Discipline	Date Accomplished	Description	Reporting Document
Economics	Nov 1979	Revised urbanization projection	Phase II GDM
Hydrology	April 1980	Revised hydrology	Hydrology DM Part 2
Soils design	Dec 1979- Aug 1981	Field investigation, lab testing, analysis, feature design	Phase II GDM
Geology	Dec 1979- Aug 1981	Field investigation lab testing, analysis, feature design	Phase II GDM
Hydraulic design	Mar 1980- Jan 1981	Feature design, floodway delineation, spillway overflow	Phase II GDM
Cultural resources	Dec 1979- Jun 1981	Cultural resources investigation and analysis	Testing Program
General design studies	Mar 1980- Aug 1981	Cost optimization studies, site planning, structural design	Phase II GDM
Resource use plan	Mar 1980- Aug 1981	Resource analysis, land use studies, development of resource use objectives	Phase II GDM
Esthetic treatment and overlook analysis	Mar 1980- Aug 1981	Plant materials selection, treatment plan, site planning, and design	Phase II GDM

f. The final plan was developed without significant adverse environmental, social, or cultural impacts. Impacts have been mitigated or minimized by recovery or testing of significant cultural resources, reseeded and recontouring borrow areas, and topsoiling and seeding of the downstream faces of the embankment and dikes.

g. Design of the New River Dam was achieved within the framework of the overall Phoenix and vicinity project.

h. In spite of increased upstream urbanization projections and corresponding increase in reservoir design flood volume, the project controls the reservoir design flood without significant design changes or increase in cost.

i. Geotechnical investigations have confirmed that foundation materials can safely support all project structures. Sufficient materials are available onsite to meet requirements for embankment materials and slope protection. Contractor economic considerations may justify offsite slope protection sources in lieu of processed onsite materials.

CURRENT PLAN

(R)1.04 The project will control and reduce a reservoir design peak inflow of 45,000 cubic feet per second (ft^3/s) to a nondamaging outflow of 2665 ft^3/s ; control a design flood volume of 49,300 acre-feet at spillway crest; and contain a 100-year sediment allowance of 4920 acre feet. A probable maximum flood inflow of 144,000 ft^3/s will be reduced to a maximum spillway outflow of 29,850 ft^3/s and a maximum outlet works outflow of 3150 ft^3/s . Plate 2 shows the reservoir plan. Figure 1 shows an oblique perspective of the interaction of the major project features under reservoir design and probable maximum flow conditions. (R)

1.05 The New River Dam feature will consist of the following elements.

a. A zoned earthfill embankment 2320 feet long, with a maximum height above streambed of 104 feet, an upstream slope of 2.5 horizontal on 1 vertical, and a downstream slope of 2.0 horizontal on 1 vertical.

b. A zoned earthfill dike, 7464 feet long with a maximum height of 36 feet, an upstream slope of 2.5 horizontal on 1 vertical, and a downstream slope of 2 horizontal on 1 vertical.

c. An earthfill dike, 256 feet long with a maximum height of 9 feet, an upstream slope of 6 horizontal on 1 vertical, and a downstream slope of 2 horizontal on 1 vertical.

d. An outlet works, consisting of an unlined approach channel, a concrete inlet structure, an ungated concrete rectangular drainage conduit, a concrete rectangular energy dissipator, and a trapezoidal grouted-stone and earth-lined outlet channel.

e. A detached unlined spillway with a crest width of 75 feet, an overall length of 735 feet, sideslopes of 1 horizontal on 2 vertical, a 12-foot horizontal bench 30-feet above the spillway invert, and sideslopes of 3 horizontal on 4 vertical above the bench.

f. An access road consisting of 1.9 miles of 20-foot-wide graded earth roadway and 0.6 mile of 20-foot-wide paved roadway.

g. An overlook area consisting of a paved access road, an overbuilt section on dike 1 to be used as a viewing area, parking facilities, a project sign, and a shade structure.

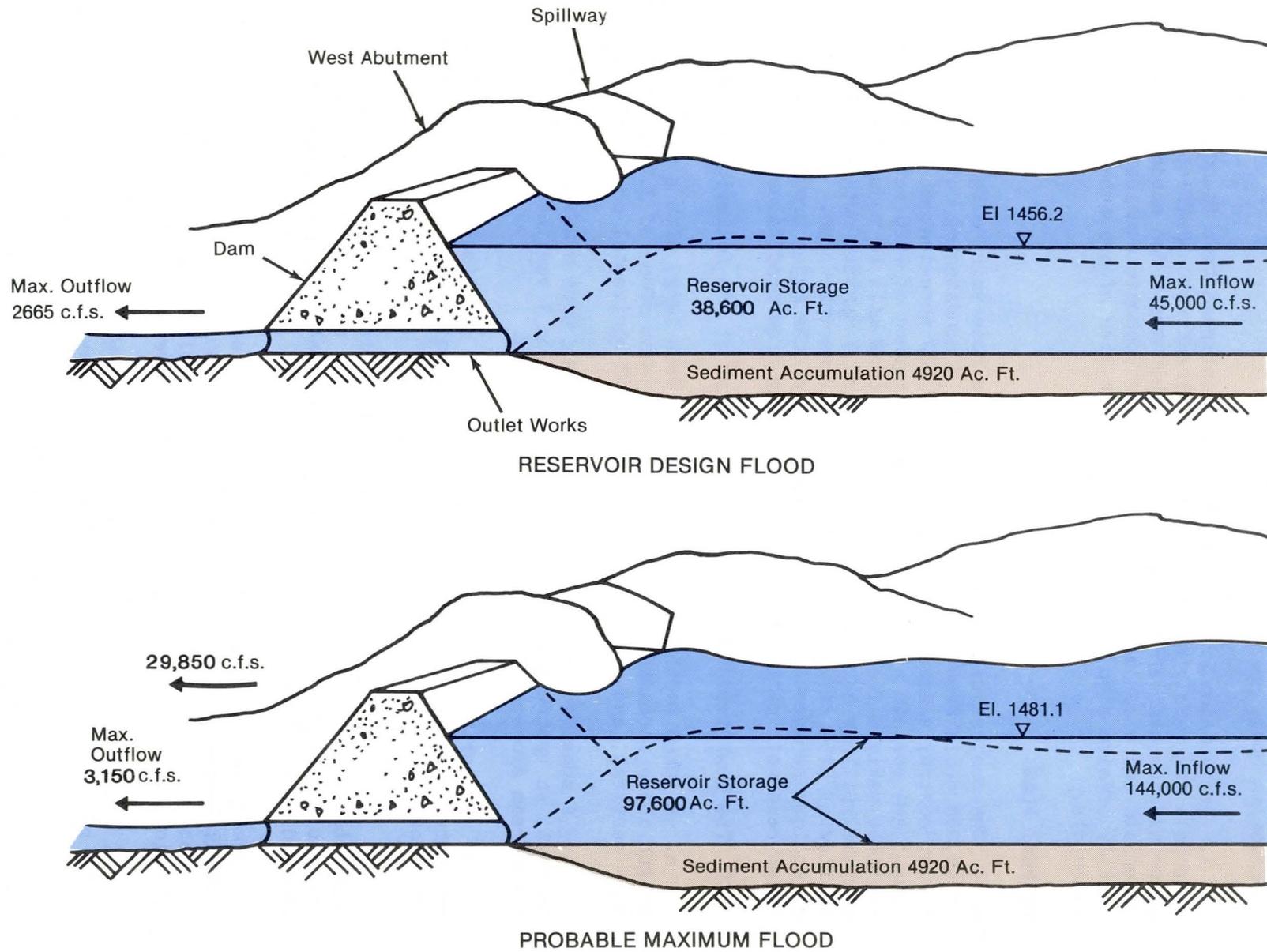
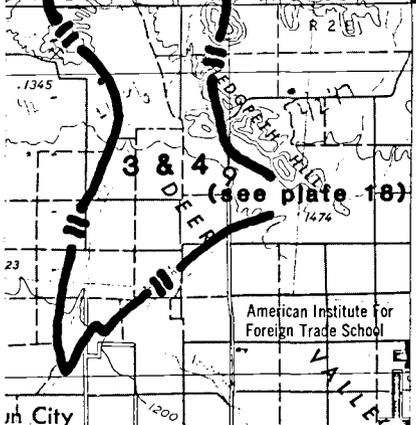
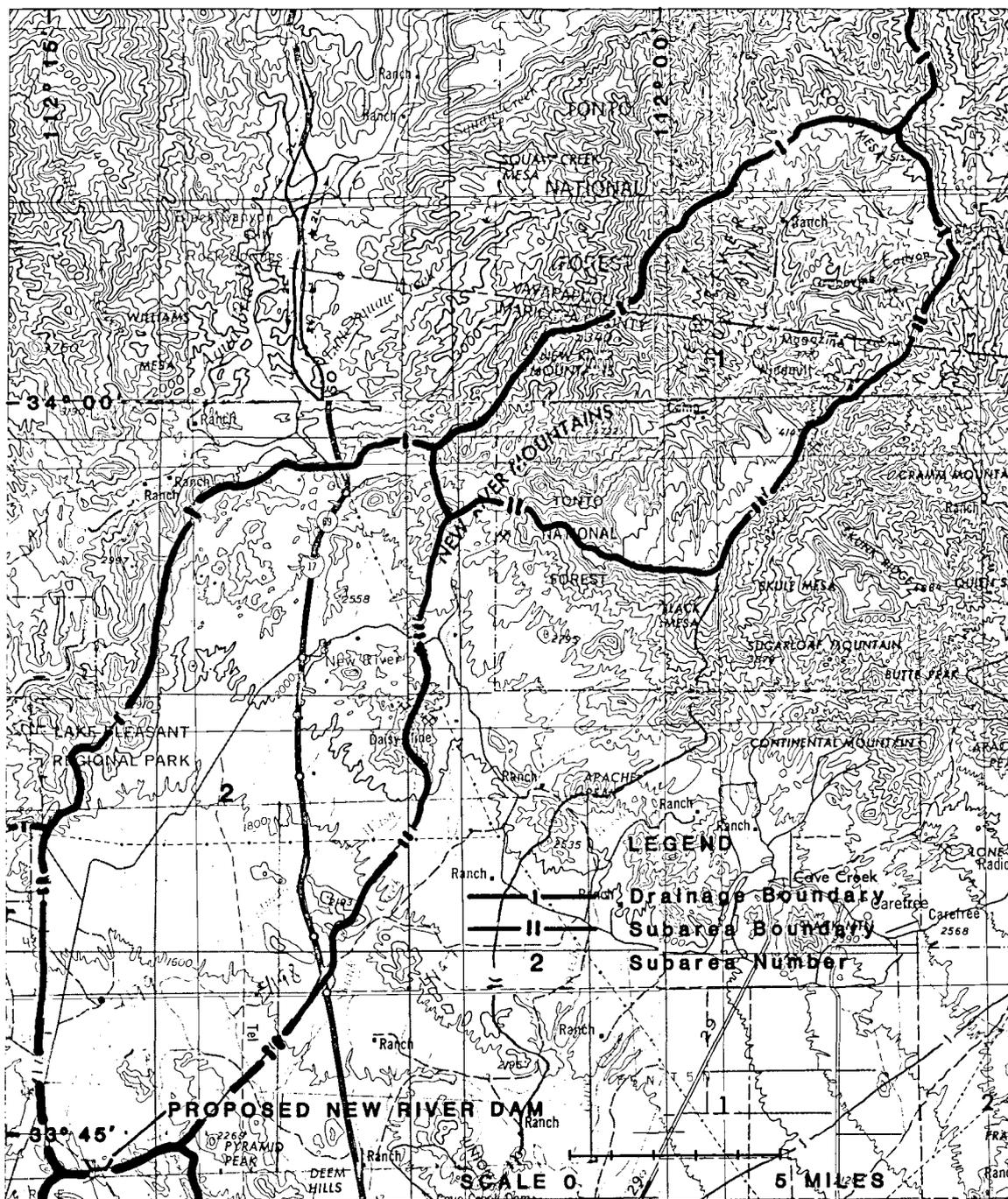


Figure 1. Project Feature Interaction Under Design Conditions.



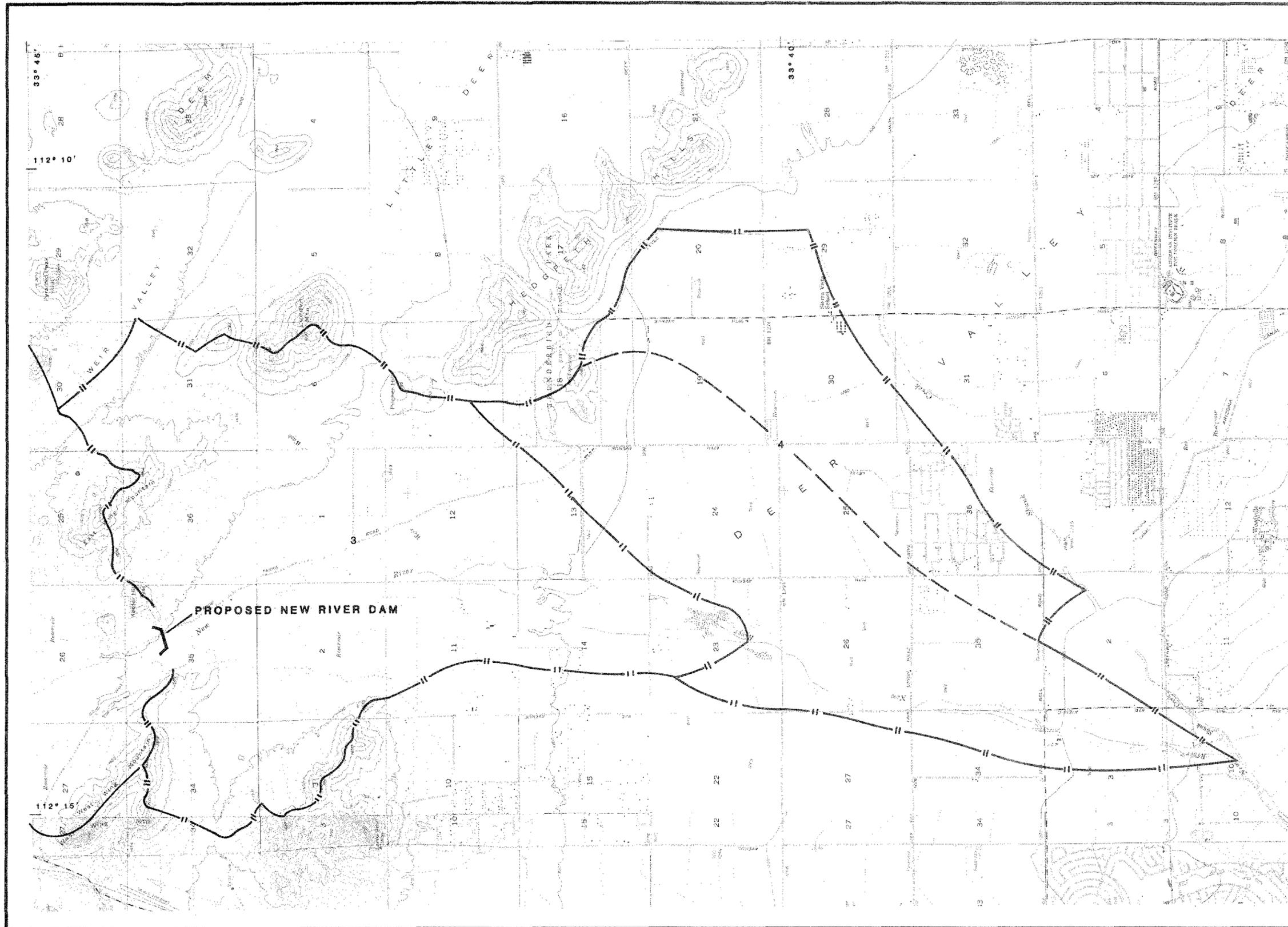
DATUM IS MEAN SEA LEVEL

GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)

NEW RIVER DAM

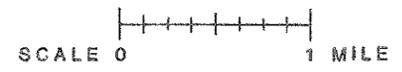
**SUBAREA BOUNDARIES
ABOVE NEW RIVER DAM**

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



LEGEND

- — — — — Natural Drainage Boundary
- || — || — Subarea Boundary
- 2 Subarea Number



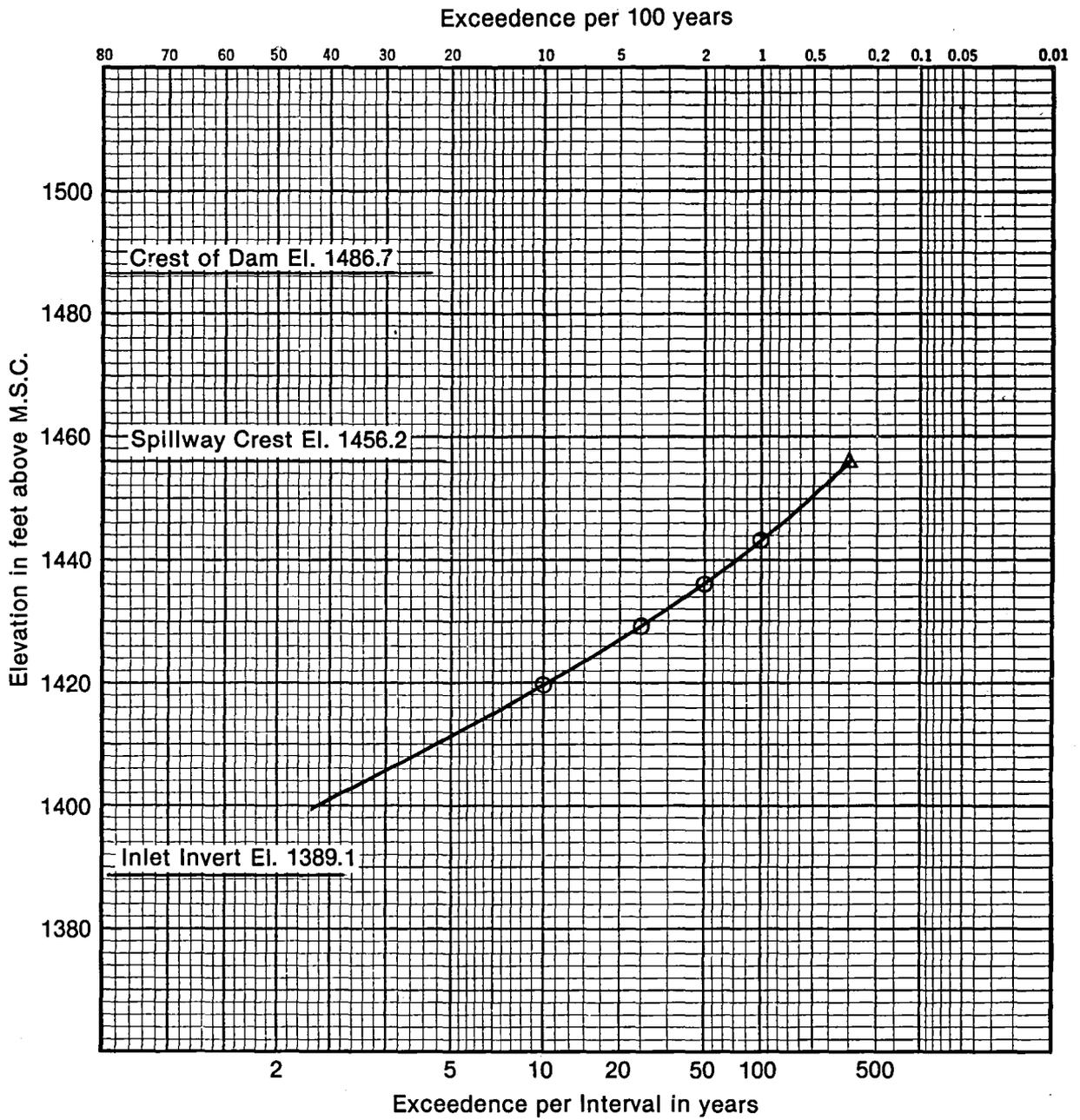
DATUM IS MEAN SEA LEVEL

GILA RIVER BASIN
PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)

NEW RIVER

**SUBAREA BOUNDARIES
BELOW NEW RIVER DAM**

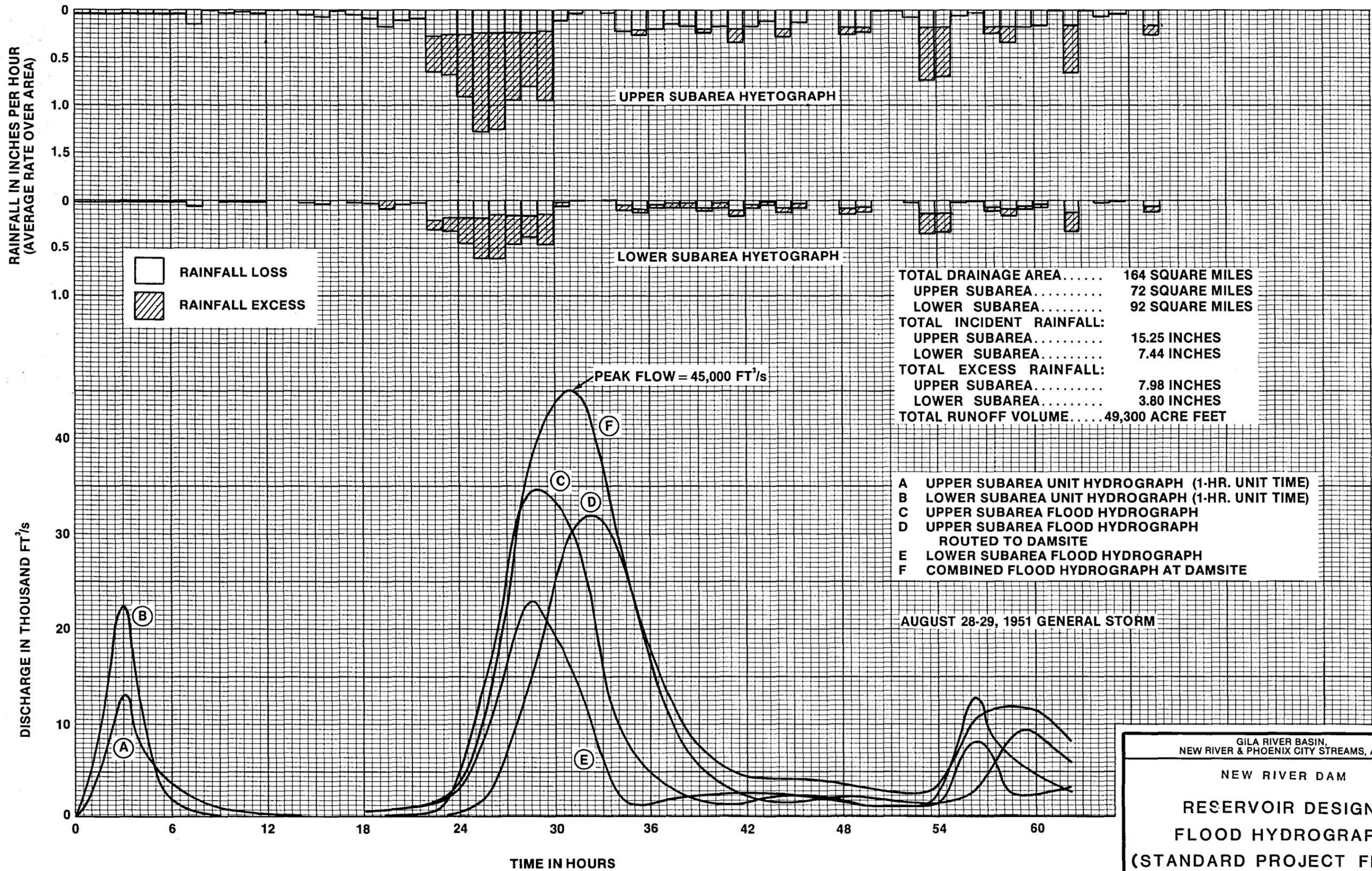
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



GILA RIVER BASIN,
NEW RIVER & PHOENIX CITY STREAMS, AZ

**NEW RIVER DAM
ELEVATION-FREQUENCY CURVE**

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

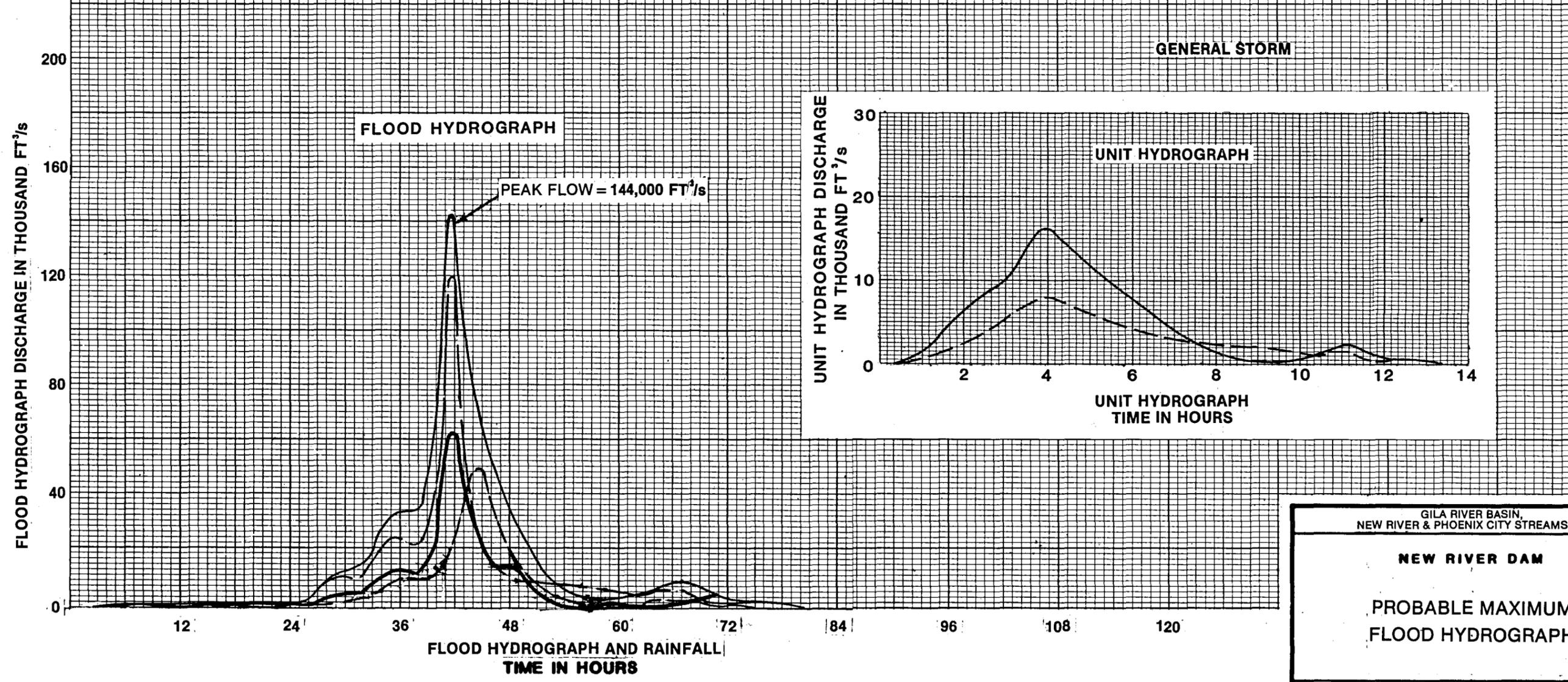
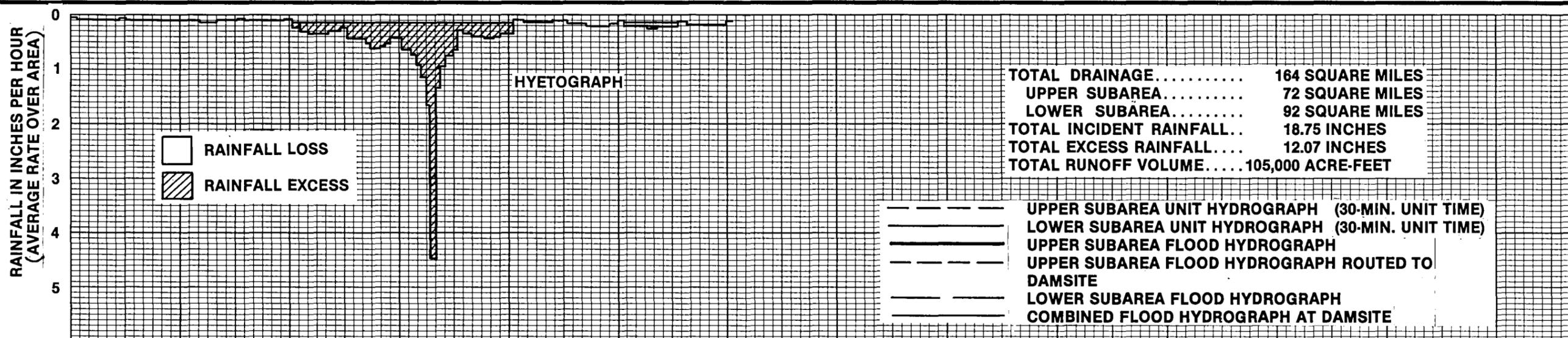


GILA RIVER BASIN,
 NEW RIVER & PHOENIX CITY STREAMS, AZ.

NEW RIVER DAM

RESERVOIR DESIGN
 FLOOD HYDROGRAPH
 (STANDARD PROJECT FLOOD)

US ARMY CORPS OF ENGINEERS
 LOS ANGELES DISTRICT



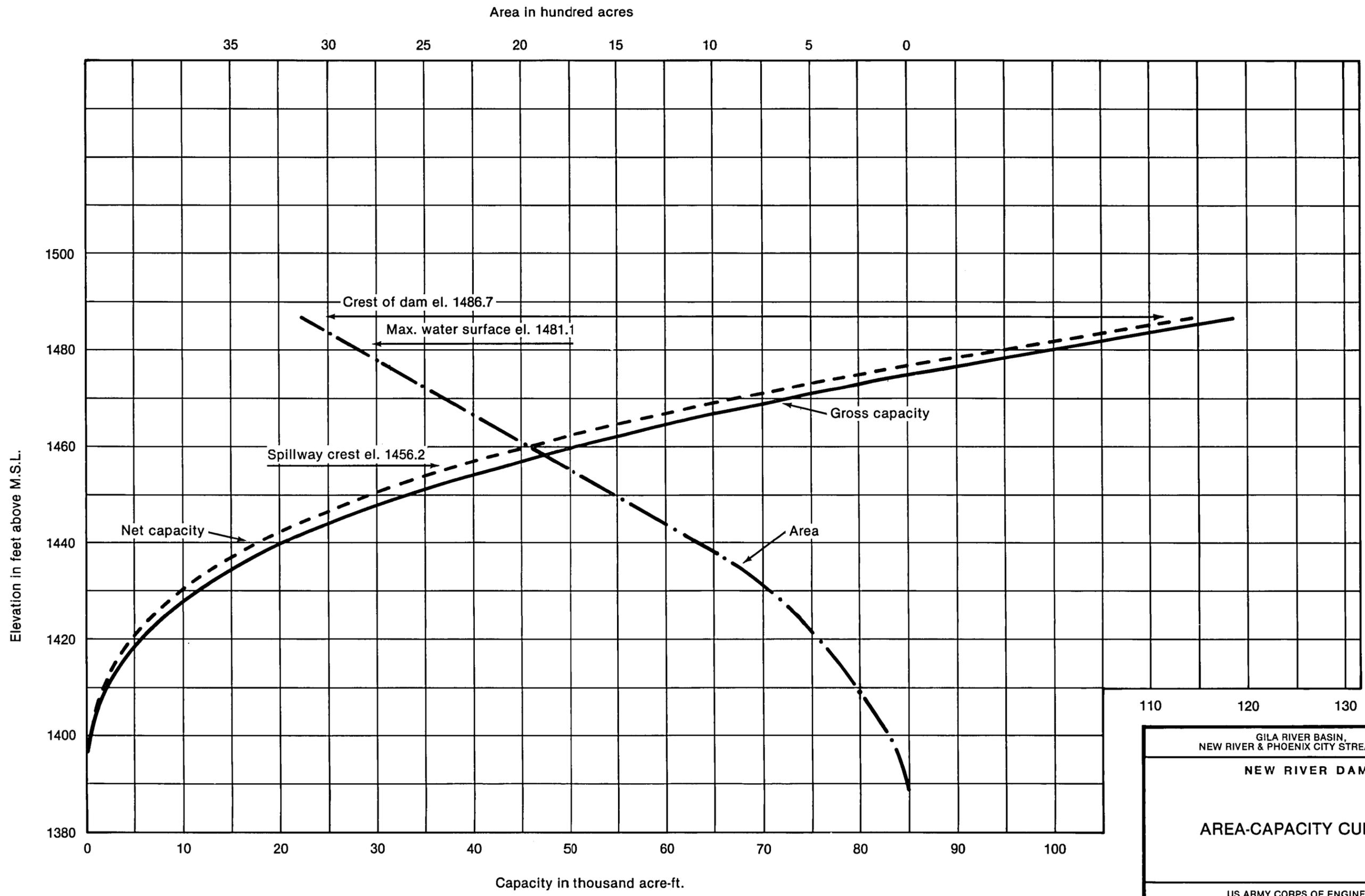
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GILA RIVER BASIN,
NEW RIVER & PHOENIX CITY STREAMS, AZ

NEW RIVER DAM

PROBABLE MAXIMUM
FLOOD HYDROGRAPH

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



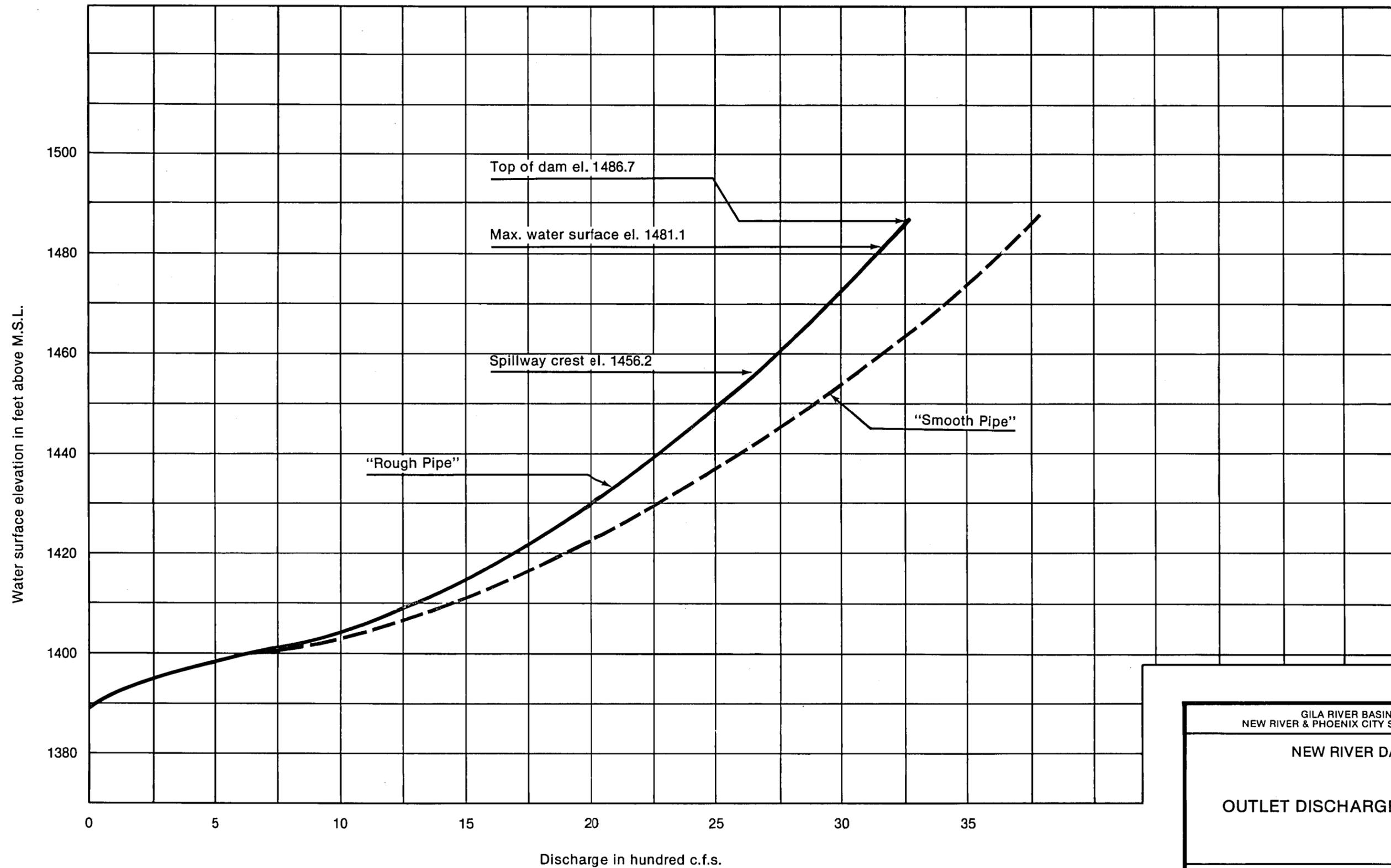
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GILA RIVER BASIN,
NEW RIVER & PHOENIX CITY STREAMS, AZ

NEW RIVER DAM

AREA-CAPACITY CURVES

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

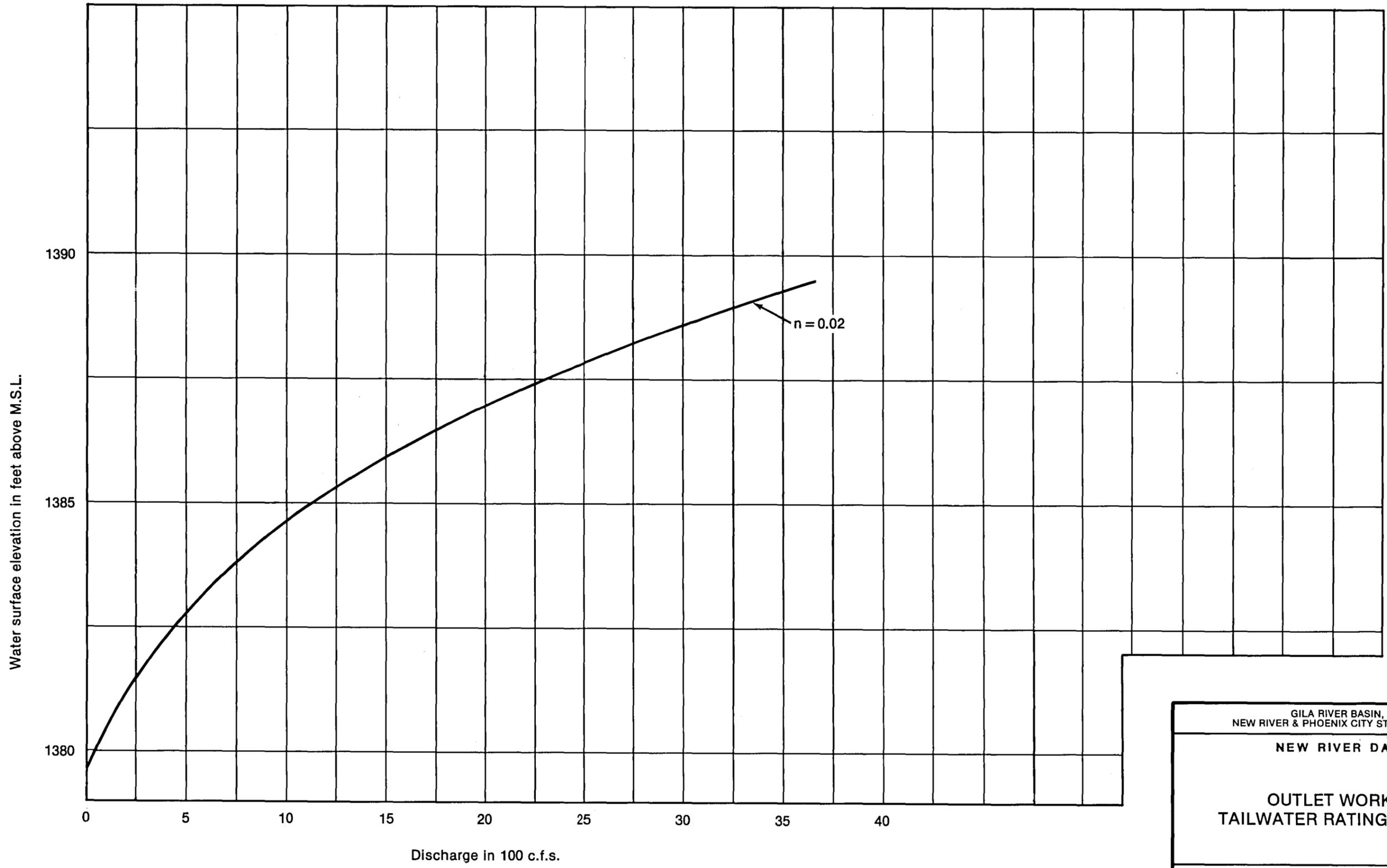


GILA RIVER BASIN,
 NEW RIVER & PHOENIX CITY STREAMS, AZ

NEW RIVER DAM

OUTLET DISCHARGE CURVES

US ARMY CORPS OF ENGINEERS
 LOS ANGELES DISTRICT

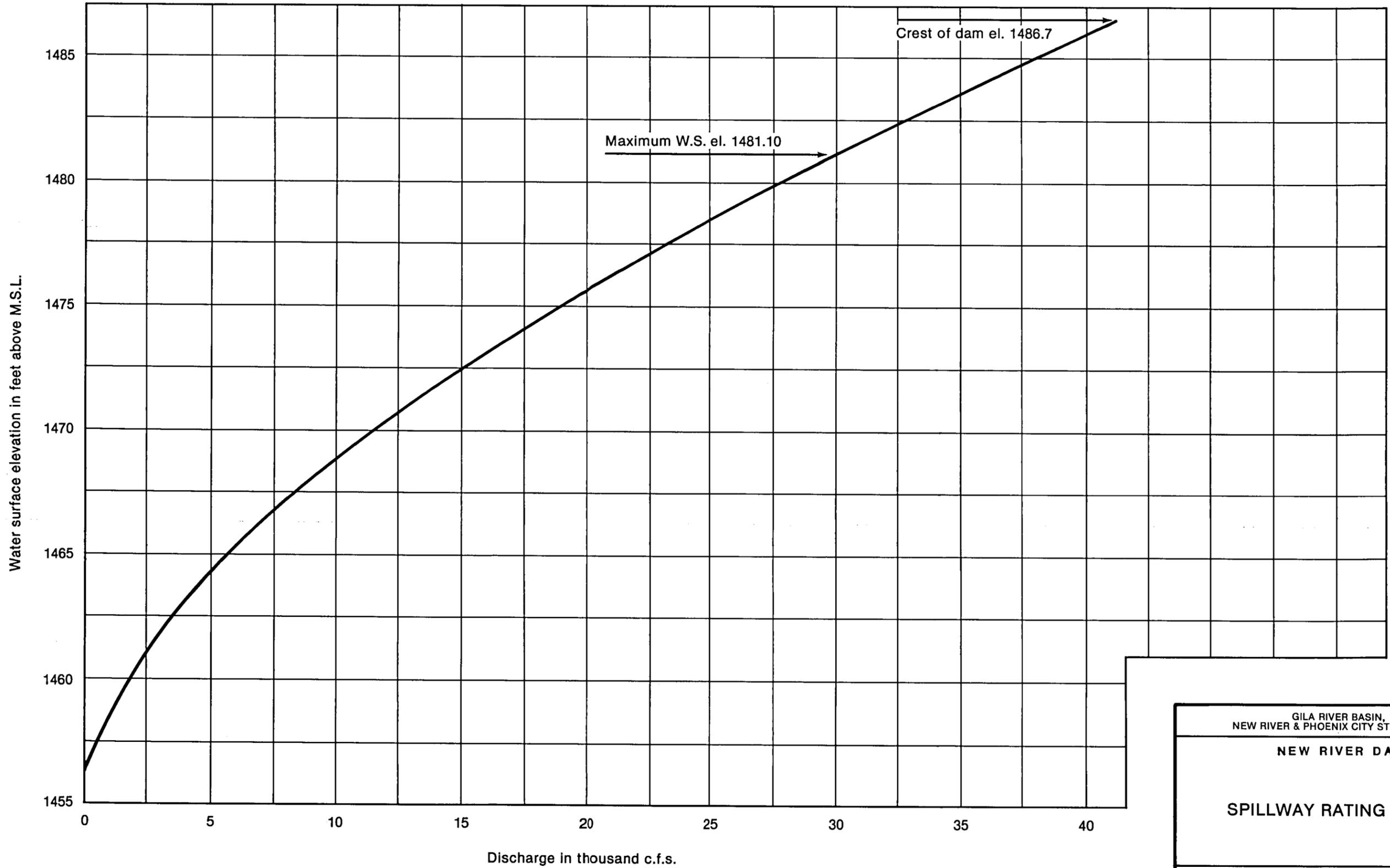


GILA RIVER BASIN,
 NEW RIVER & PHOENIX CITY STREAMS, AZ

NEW RIVER DAM

OUTLET WORKS
 TAILWATER RATING CURVE

US ARMY CORPS OF ENGINEERS
 LOS ANGELES DISTRICT

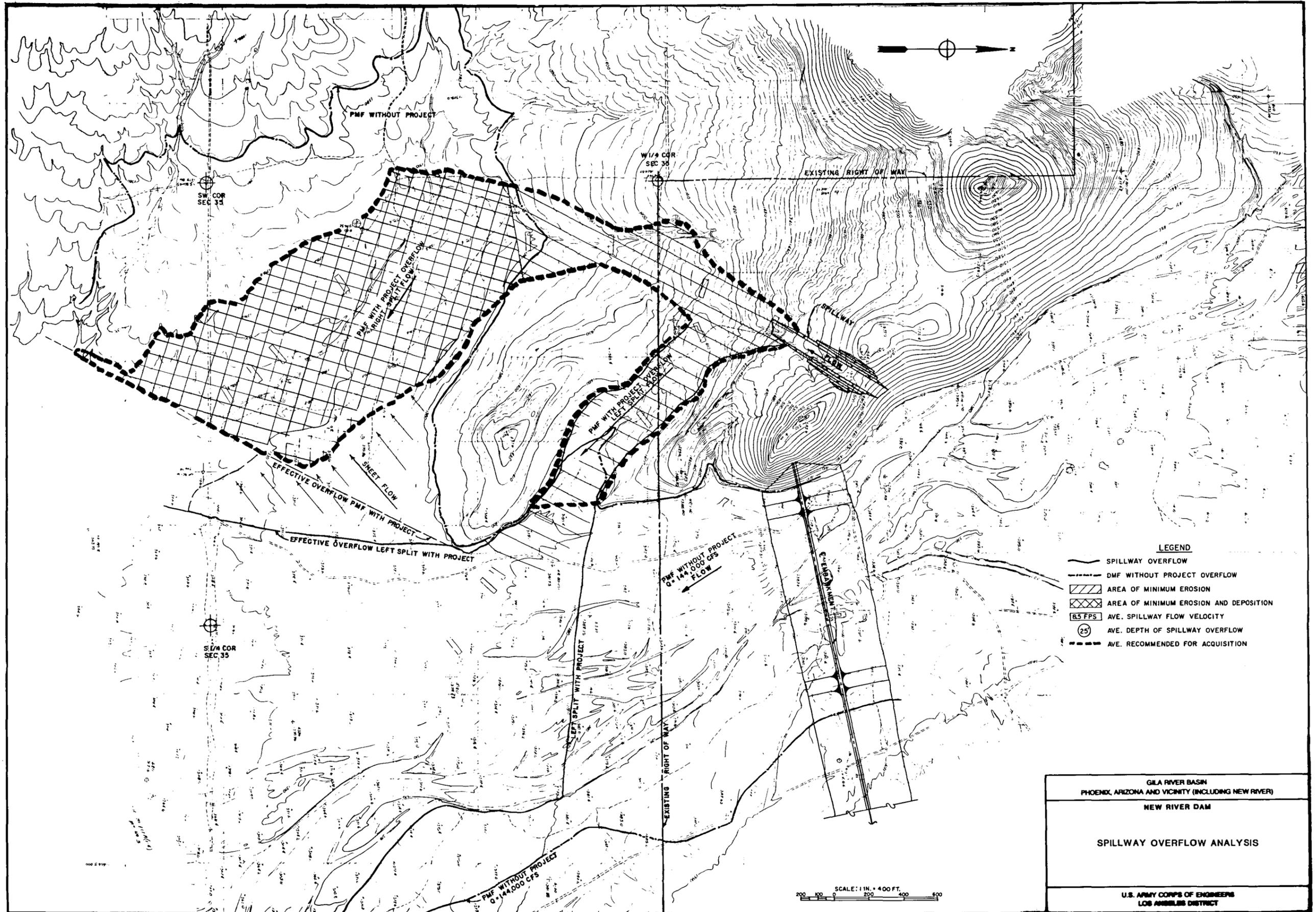


GILA RIVER BASIN,
 NEW RIVER & PHOENIX CITY STREAMS, AZ

NEW RIVER DAM

SPILLWAY RATING CURVE

US ARMY CORPS OF ENGINEERS
 LOS ANGELES DISTRICT



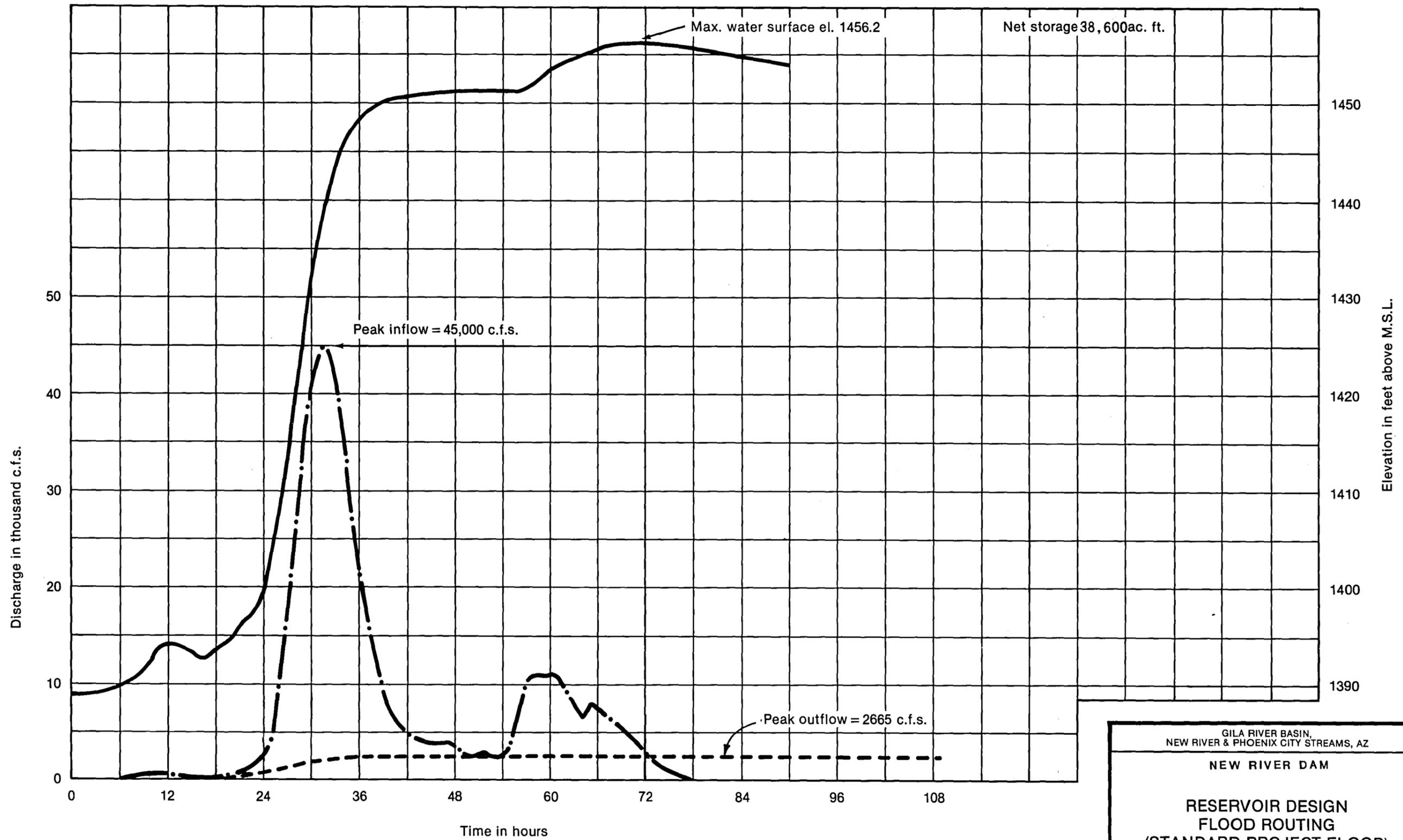
- LEGEND**
- SPILLWAY OVERFLOW
 - - - DMF WITHOUT PROJECT OVERFLOW
 - ▨ AREA OF MINIMUM EROSION
 - ▩ AREA OF MINIMUM EROSION AND DEPOSITION
 - 6.5 FPS AVE. SPILLWAY FLOW VELOCITY
 - 25' AVE. DEPTH OF SPILLWAY OVERFLOW
 - - - AVE. RECOMMENDED FOR ACQUISITION

GILA RIVER BASIN
 PHOENIX, ARIZONA AND VICINITY (INCLUDING NEW RIVER)
 NEW RIVER DAM

SPILLWAY OVERFLOW ANALYSIS

U.S. ARMY CORPS OF ENGINEERS
 LOS ANGELES DISTRICT

SCALE: 1 IN. = 400 FT.
 200 0 200 400 600

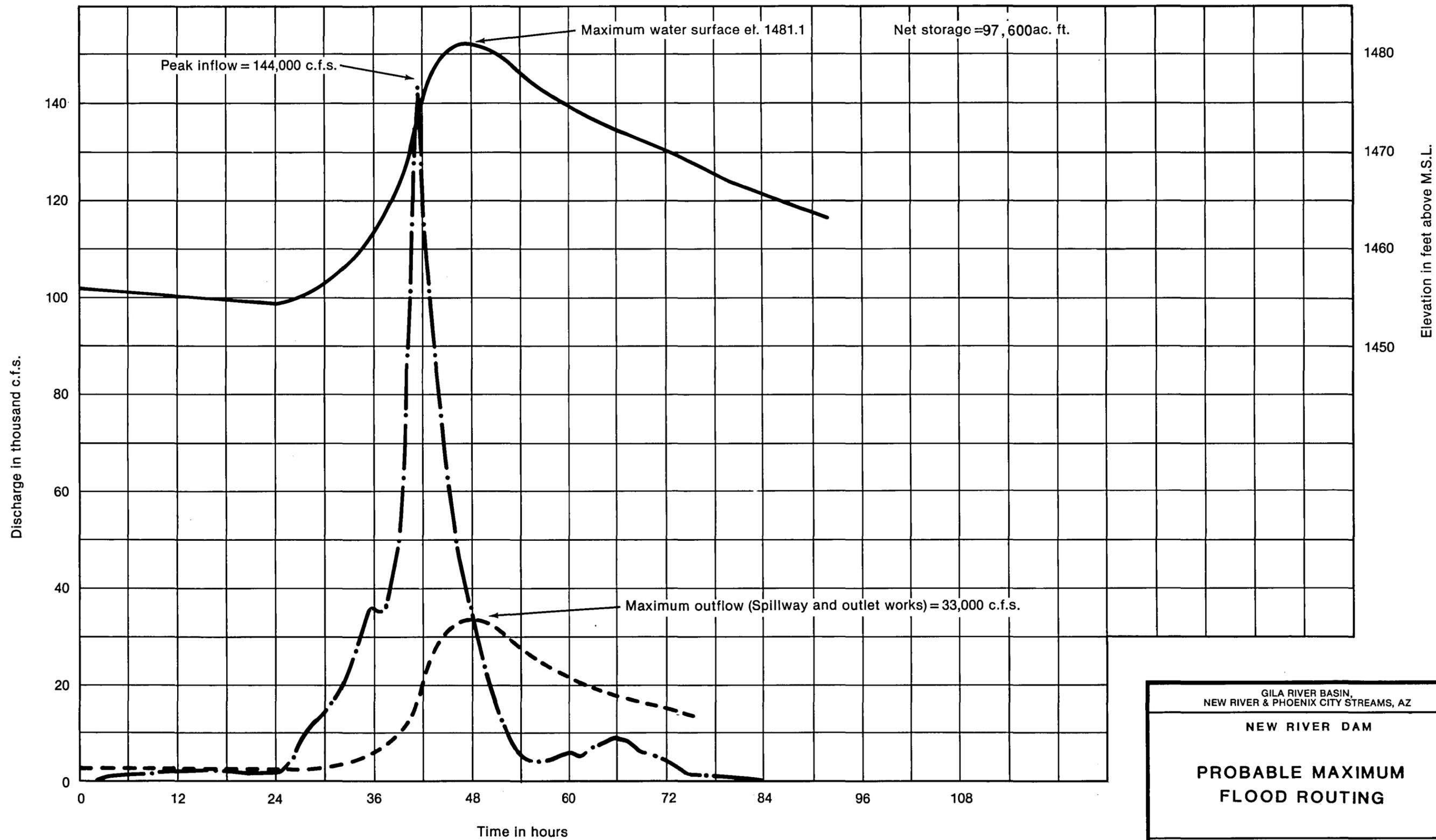


GILA RIVER BASIN,
 NEW RIVER & PHOENIX CITY STREAMS, AZ

NEW RIVER DAM

RESERVOIR DESIGN
 FLOOD ROUTING
 (STANDARD PROJECT FLOOD)

US ARMY CORPS OF ENGINEERS
 LOS ANGELES DISTRICT



GILA RIVER BASIN,
 NEW RIVER & PHOENIX CITY STREAMS, AZ

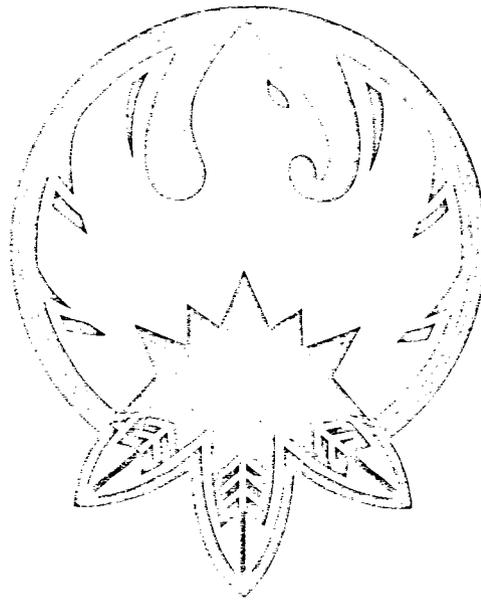
NEW RIVER DAM

**PROBABLE MAXIMUM
 FLOOD ROUTING**

US ARMY CORPS OF ENGINEERS
 LOS ANGELES DISTRICT

EXHIBIT A TO APPENDIX 3

**Amended Flood Plain Regulations for the Unincorporated Area
of Maricopa County, as adopted 17 October 1977**



AMENDED FLOODPLAIN REGULATION

FOR THE

UNINCORPORATED AREA

OF

MARICOPA COUNTY, ARIZONA

AS ADOPTED OCTOBER 17, 1977



FLOODPLAIN MANAGEMENT - THE CONCEPT OF THE TWO-DISTRICT FLOODPLAIN REGULATION

The "1975 Floodplain Regulation for the Unincorporated Area of Maricopa County", adopted by the Floodplain Board on July 14, 1975 and amended on October 17, 1977, is a two-district floodplain regulation. Its intent is to prevent the dangerous and expensive mis-use of floodplains in Maricopa County.

A "Regulatory Floodplain" as defined in the Regulation, is an area which has a 1% chance of flooding in any year. This means that it will be flooded, on the average, once every 100 years. For this reason, it is sometimes referred to as the "100-year floodplain." The amount of floodwater which would flood the Regulatory Floodplain is the "Regulatory Flood" or "100-year flood." This amount of water varies from floodplain to floodplain, and even from upstream to downstream within a floodplain, depending on such factors as the area of the watershed contributing water to the flood and the nature of the surface (sand, rock, grass, etc.).

The Regulatory Floodplain, then, is the area of concern in the County's Regulation. It was considered too restrictive to stop all development within the Regulatory Floodplain. However, development within the floodplain obstructs the flow of floodwater and raises the elevation of the Regulatory Flood. Recognizing this fact, it was decided that development would be allowed near the edge of the floodplain and toward the center of the floodplain until the cumulative effect was to raise the flood elevation by one foot. At that point, no further development would be allowed.

The areas on either side where development is allowed is called the Floodway Fringe District, and the area in the center where no development is allowed is called the Floodway District. Hence the term "two-district regulation."

Development within the Floodway Fringe District must be protected from the Regulatory Flood either by floodproofing or by elevating everything susceptible to flood damage so that it is above the flood elevation. Development within the Floodway District is restricted to uses which are not susceptible to severe or expensive flood damage, and which do not obstruct the flow of floodwater. These uses include many agricultural and recreational uses and certain types of industrial and commercial uses. The Indian Bend Wash Greenbelt, when complete, is an example of a Floodway District fully utilized for recreation. Other uses could include parking lots, drive-in theaters, circuses and other transient amusement enterprises, and sand and gravel operations.

The goal of the Floodplain Regulation is to reduce the loss of private and public property and to reduce the danger to human life during floods. This can be accomplished through impartial and uniform enforcement of the Regulation.

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1 1.0 STATUTORY AUTHORIZATION, FINDINGS OF FACT, PURPOSES AND SHORT TITLE

2 1.1 STATUTORY AUTHORIZATION

3 Section 45-2342 of the Arizona Revised Statutes delegates the
4 responsibility to local governing bodies to adopt regulations to
5 minimize flood losses. Therefore, the Board of Supervisors of Maricopa
6 County Arizona, in its capacity as Floodplain Board of the Unincorporated
7 Area of Maricopa County does ordain as follows:

8 1.2 FINDINGS OF FACT

9 1.21 Flood Losses Resulting from Periodic Inundation - The flood
10 hazard areas of Maricopa County, Arizona are subject to periodic
11 inundation which results in loss of life and property, health and
12 safety hazards, disruption of commerce and governmental services,
13 extraordinary public expenditures for flood protection and relief,
14 and impairment of the tax base all of which adversely affect the public
15 health, safety and general welfare.

16 1.22 General Causes of These Flood Losses - These flood losses
17 are caused by: (1) The cumulative effect of obstructions in floodplains
18 causing increases in flood heights and velocities. (2) The unpredictable
19 meander of streams on alluvial fans and in wide, shallow floodways.
20 (3) The occupancy of flood hazard areas by uses vulnerable to flood
21 damage or which create hazards to other lands which are inadequately
22 elevated or otherwise protected from flood damages.

23 1.23 Flood Insurance - The Federal Flood Insurance Program provides
24 previously unavailable flood insurance to property owners in flood-prone
25 areas. To qualify for the sale of federally-subsidized flood insurance
26 a community must adopt and enforce regulations for floodplain management.

27 1.3 STATEMENT OF PURPOSE

28 It is the purpose of this Regulation to promote and protect the
29 public health, peace, safety, comfort, convenience, and general welfare
30 of the citizens of the unincorporated area of Maricopa County; to
31 minimize flood damages and reduce the height and violence of floods which
32 are caused by obstructions restricting the capacity of the floodways; to

1 establish minimum flood protection elevations and flood damage prevention
2 requirements for uses, structures and facilities which are vulnerable
3 to flood damage; to prevent unwise encroachment and building development
4 within floodplain areas; to protect the life and property of citizens
5 who have settled in floodplain areas; to reduce the burden imposed on the
6 community, its governmental units and its citizens if such land is subject
7 to flood; to qualify the County for continued participation in the Federal
8 Flood Insurance Program; and to adopt and establish an official Floodplain
9 Regulation for Maricopa County, Arizona.

10 1.4 SHORT TITLE

11 This Regulation may be referred to as the Floodplain Regulation
12 for Maricopa County.

13 2.0 RULES

14 When not consistent with the context, words used in the present tense
15 include the future, words in the singular number include the plural and
16 words in the plural number include the singular unless specifically
17 defined below. Words or phrases used in the Regulation shall be interpreted
18 so as to give them the meaning they have in common usage and to give this
19 Regulation its most reasonable application; the word "building" includes
20 the word "structure", the word "shall" is mandatory and the word "may" is
21 permissive. Notwithstanding anything within this Regulation to the
22 contrary, nothing herein shall be construed as requiring written
23 authorization for, nor shall the Floodplain Board prohibit, those
24 exemptions set forth in Arizona Revised Statutes 45-2343(B).

25 3.0 DEFINITIONS

26 3.1 ALLOWED USE - a use of any part of the Regulatory Floodplain
27 specifically named in this Regulation for which no Floodplain Use Permit
28 is required.

29 3.2 APPURTENANT STRUCTURE - a structure which is on the same parcel
30 of property as the principal structure, and which is incidental to
31 the use of the principal structure.

32 3.3 AREA OF SHALLOW FLOODING - an area with flood depths from one to

1 three feet where a clearly defined channel does not exist, where the
2 path of flooding is unpredictable and indeterminate, and where velocity
3 flow may be evident. Such an area may be included within a Floodway
4 District or Floodway Fringe District or an Interim Delineation if it is
5 associated with a watercourse.

6 3.4 DEVELOPMENT - any man-made change to improved or unimproved
7 real property, including but not limited to buildings or other structures,
8 mining, dredging, filling, grading, paving, excavation or drilling
9 operations.

10 3.5 ENCROACHMENT - the advance or infringement of uses, growth, fill
11 or structures into the natural floodplain that impede the flow capacity
12 of the channel and floodplain of a watercourse.

13 3.6 FLOOD OR FLOOD WATERS - a temporary rise in water level that
14 results in inundation of lands not ordinarily covered by water.

15 3.7 FLOOD INSURANCE RATE MAP (FIRM) - an official map of a
16 community, on which the Federal Insurance Administration has delineated
17 both the Regulatory Floodplains and the risk premium zones applicable
18 to the community.

19 3.8 FLOOD INSURANCE STUDY - the official report provided by the
20 Federal Insurance Administration. The report contains flood profiles,
21 as well as the Flood Hazard Boundary-Floodway Map and Regulatory Flood
22 Elevations.

23 3.9 FLOODPLAIN REGULATIONS - the codes, ordinances and other
24 regulations relating to the use of land and construction within the
25 channel and floodplain areas, including zoning ordinances, subdivision
26 regulations, building codes, setback requirements, open area regulations,
27 this Regulation, and amendments to all of the foregoing, and similar
28 methods of control affecting the use and development of these areas.

29 3.10 FLOODPROOFING - any combination of structural and nonstructural
30 additions, changes, or adjustments to structures, including utility
31 and sanitary facilities, which would preclude the entry of water.

32 Structural components shall have the capability of resisting hydrostatic

1 and hydrodynamic loads and the effect of buoyancy.

2 3.11 FLOODWAY DISTRICT - the channel of a watercourse or the
3 water body within the banks of a lake and that portion of the adjacent
4 land areas designated by the Floodplain Board as necessary to provide
5 for the passage or ponding of flood waters of any watercourse or lake
6 without allowing a rise of more than one(1) foot in the flood elevation
7 at the time of delineation.

8 3.12 FLOODWAY FRINGE DISTRICT - land outside the Floodway District and
9 lower than the Regulatory Flood Elevation along the watercourse.

10 3.13 HABITABLE FLOOR - any floor usable for residential purposes, which
11 includes working, sleeping, eating, cooking or recreation, or a
12 combination thereof. A floor usable only for storage purposes is not
13 a habitable floor.

14 3.14 INTERIM DELINEATION - a delineation of the Regulatory Floodplain
15 made from the most reliable source available for which a delineation
16 of the Floodway District is not available.

17 3.15 MOBILE HOME - a structure with a length of thirty three (33)
18 feet or more, transportable in one or more sections, which is built on
19 a permanent chassis and designed to be used with or without a permanent
20 foundation when connected to the required utilities.

21 3.16 OBSTRUCTION - any dam, wall, wharf, embankment, levee, dike, pile,
22 abutment, protection, excavation, channel rectification, bridge, conduit,
23 culvert, building, wire, fence, rock, gravel, refuse, fill, structure,
24 vegetation or other material in, along, across, or projecting into any
25 channel, watercourse, lake, or Regulatory Floodplain which may impede,
26 retard or change the direction of the flow of water, either in itself
27 or by catching or collecting debris carried by such water, or that is
28 placed where the flow of water might carry the same downstream to the
29 damage of life or property.

30 3.17 PERMITTED USE - a use of any part of the Regulatory Floodplain
31 specifically named in this Regulation for which application for an
32 receipt of a Floodplain Use Permit is required prior to commencement

1 of such use.

2 3.18 PERSON - any individual or his agent, firm, partnership, association,
3 corporation, or agent of the aforementioned groups, or the State or any
4 agency or political subdivision thereof.

5 3.19 PRINCIPAL STRUCTURE - the structure on a parcel of property with
6 the greatest value.

7 3.20 REACH - a longitudinal segment of a watercourse measured parallel
8 to the direction of flow.

9 3.21 RECREATION VEHICLE - any vehicle or structure which is: a) less
10 than thirty three (33) feet in length; b) transportable in one section
11 on its own chassis; and c) maintained in a readily transportable
12 condition at all times. This definition includes motorized and non-
13 motorized vehicles and structures.

14 3.22 REGULATORY FLOOD - the Regulatory Flood shall be the 100-year
15 flood as determined by criteria established by the Arizona Water
16 Commission.

17 3.23 REGULATORY FLOOD ELEVATION - the elevation of the Regulatory
18 Flood which determines the limits of the Regulatory Floodplain. Where
19 a Floodway District has been delineated, the higher of the natural or
20 encroached elevations shall apply.

21 3.24 REGULATORY FLOODPLAIN - that portion of the natural floodplain
22 that would be inundated by the Regulatory Flood. The Regulatory
23 Floodplain includes the Floodway District and the Floodway Fringe
24 District.

25 3.25 STRUCTURE - a walled and roofed building, including a gas or
26 liquid storage tank, that is principally above ground, as well as a
27 mobile home.

28 3.26 SUBSTANTIAL IMPROVEMENT - any repair, reconstruction, or
29 improvement of a structure, the cost of which equals or exceeds fifty
30 percent (50%) of the fair market value of the structure either: before
31 the improvement or repair is started; or if the structure has been
32 damaged and is being restored, before the damage occurred. For the

1 purposes of this definition "substantial improvement" is considered to
2 occur when the first alteration of any wall, ceiling, floor, or other
3 structural part of the building commences, whether or not that alteration
4 affects the external dimensions of the structure.

5 The term does not, however, include either: any project for
6 improvement of a structure to comply with existing state or local
7 health, sanitary, or safety code specifications which are solely
8 necessary to assure safe living conditions; or any alteration of a
9 structure listed on the National Register of Historic Places or a State
10 Inventory of Historic Places.

11 3.27 Watercourse - any lake, river, creek, stream, wash, arroyo,
12 channel or other body of water through which waters flow at least
13 periodically. The term may include specifically designated areas in
14 which flood damage may occur.

15 4.0 ADMINISTRATION

16 4.1 FLOODPLAIN ADMINISTRATOR

17 A Floodplain Administrator designated by the Floodplain Board shall
18 administer and enforce this Regulation. If he finds a violation of the
19 provisions of this Regulation, he shall notify the person responsible
20 for such violation, indicating the nature of the violation and ordering
21 the action necessary to correct it.

22 4.2 FLOODPLAIN USE PERMIT

23 4.21 A Floodplain Use Permit shall be obtained from the Floodplain
24 Administrator prior to the erection, addition, alteration or change of
25 use of any building, structure or land within a Regulatory Floodplain.
26 Application for this permit shall be made to the Floodplain Administrator.
27 Permits shall be issued when the provisions of this Regulation have been
28 complied with.

29 4.22 Provisions are hereby made for issuance of a blanket Floodplain
30 Use Permit for applicants who need to install or erect a number of similar
31 structures within the various floodplains over an extended period of time.
32 Such applicants shall submit typical plans for such structures. After

1 determining that such structures comply with the provisions of this
2 Regulation, the Floodplain Administrator, unless otherwise instructed
3 by the Floodplain Board, shall issue a blanket permit for installation
4 or erection of such structures to be valid for one calendar year.

5 4.3 CERTIFICATION OF COMPLIANCE FOR FLOODPLAIN USE

6 4.31 Prior to occupancy or use of any structures or areas in the
7 Regulatory Floodplain, except those uses exempted by this Regulation, a
8 Certificate of Compliance for Floodplain Use will be obtained from the
9 Floodplain Administrator.

10 4.32 Allowed Uses - The applicant shall submit information to the
11 Floodplain Administrator as required to comply with this Regulation.

12 4.33 Permitted Uses - The applicant shall provide certification
13 that the requirements of the Floodplain Use Permit have been complied with.

14 4.4 VARIANCES

15 4.41 Conditions for Issuance of a Variance.

16 a) Variances shall not be issued within any delineated Floodway
17 District, nor within a delineated Interim Floodplain where the depth
18 of flooding is greater than two (2) feet, if any increase in flood
19 levels during the Regulatory Flood would result.

20 b) Variances may be issued for new construction and substantial
21 improvements to be erected on a lot of one-half acre or less in size,
22 contiguous to two or more lots with existing structures constructed
23 below the Regulatory Flood Elevation.

24 c) Variances may be issued for a structure listed on the National
25 Register of Historic Places or a State Inventory of Historic Places
26 which is to be restored or reconstructed.

27 d) Variances may be granted only upon (1) a showing of good and
28 sufficient cause, (2) a determination that failure to grant the
29 variance would result in exceptional hardship to the applicant, and
30 (3) a determination that the granting of a variance will not result
31 in increased flood heights, additional threats to public safety,
32 extraordinary public expense, create nuisances, or cause fraud.

1 e) Variances shall only be issued upon a determination that the
2 variance is the minimum necessary, considering the flood hazard, to
3 afford relief.

4 f) The burden of proof for existence of the above conditions shall
5 be on the applicant.

6 4.42 Publication Notification of Variances

7 a) Upon issuance of a variance the Floodplain Board shall notify
8 the applicant in writing that (1) the issuance of the variance will
9 result in increased premium rates for flood insurance up to amounts
10 as high as \$25 per \$100 of insurance and (2) construction below the
11 Regulatory Flood Elevation will increase risks to life and property.

12 b) The successful applicant shall cause to be recorded with the
13 Maricopa County Recorder a statement that the property is subject to
14 flooding by a flood which has a one percent chance of being equalled
15 or exceeded in any year. This document shall include the depth of
16 flooding during a Regulatory Flood and shall be certified by the
17 Floodplain Administrator. If any permits are required pursuant to
18 granting of a variance, proof of such recordation shall be submitted
19 by the applicant to the agency which issues such a permit.

20 c) A record shall be maintained of all variance actions,
21 including justification for their issuance. This record shall be
22 included in the annual report to the Federal Insurance Administration.

23 4.5 COORDINATION

24 The Floodplain Board and the Floodplain Administrator shall
25 coordinate the provisions of this Regulation with all other interested
26 and affected political subdivisions and State agencies, as required by
27 ARS 45-2342.

28 5.0 DETERMINATION AND PUBLICATION OF FLOODPLAIN BOUNDARIES

29 5.1 MINIMUM AREA FOR FLOODPLAIN DELINEATION

30 All zones designated as A, A0, or A1 through A99 on the Flood
31 Insurance Rate Map for Maricopa County, Arizona shall, when adopted
32 by the Floodplain Board, provide the minimum area for floodplain

1 management under this Regulation.

2 5.2 OTHER DELINEATIONS

3 In areas not designated zones A, A0 or A1 through A99, where
4 development is imminent or ongoing, floodplain delineations shall be
5 adopted and administered under this Regulation. These delineations may
6 be obtained from any source, provided they are determined in accordance
7 with criteria established by the Arizona Water Commission, including
8 but not limited to (1) a developer of floodplain property, (2) a County
9 agency or (3) any agency which must delineate a floodplain as a result
10 of completion of a flood control structure.

11 5.21 Delineations in zones not designated A, A0 or A1 through A99
12 shall be submitted to the Floodplain Administrator and shall be subject
13 to review for technical adequacy. The Floodplain Administrator shall
14 forward all such delineations to the Floodplain Board with his
15 recommendation for approval or denial within 60 days of receipt of all
16 supporting information.

17 5.22 All delineations adopted by this procedure shall be submitted
18 to the Federal Insurance Administration with the Floodplain Board's
19 request that they be included on the Flood Insurance Rate Map for Maricopa
20 County, Arizona.

21 5.3 PUBLICATION OF FLOODPLAIN BOUNDARIES

22 All floodplain delineations adopted by the Floodplain Board,
23 including all A, A0 and A1 through A99 zones on the Flood Insurance
24 Rate Map for Maricopa County, Arizona, shall be shown on the official
25 County maps entitled "Zoning District Maps", which are hereby made a
26 part of this Regulation. Where available, the Floodway Districts and
27 Floodway Fringe Districts shall be so designated on these maps. Where
28 applicable, Interim Delineations and Areas of Shallow Flooding shall
29 be so designated on these maps.

30 5.4 DETERMINATIONS IN CASE OF DISPUTE

31 Where uncertainty exists, the boundary of any Regulatory Floodplain
32 with an Interim Delineation, Floodway District, Floodway Fringe District

1 or Area of Shallow Flooding shall be determined by the Floodplain
2 Administrator. The determination shall be made from the best technical
3 data available, and in all cases, the Regulatory Flood Elevation shall
4 be the governing factor.

5 6.0 FLOODWAY DISTRICT

6 6.1 ALLOWED USES

7 The uses specified in 6.11, 6.12, 6.13 and 6.14 below, having a low
8 flood damage potential and not obstructing flood flows shall be allowed
9 within the Floodway District to the extent that they are not prohibited
10 by any other regulation, code or ordinance and provided they do not
11 require structures, fill or storage of materials or equipment. No use
12 is allowed which shall adversely affect the capacity of the channels
13 or floodways of any tributary to the main stream, drainage ditch, or any
14 other drainage facility or system. Allowance of use does not preclude
15 the appropriate requirements for flood insurance.

16 6.11 Agricultural uses.

17 6.12 Industrial-commercial uses.

18 6.13 Private and public recreational uses.

19 6.14 Accessory residential uses such as lawns, gardens, parking
20 areas and play areas.

21 6.2 PERMITTED USES

22 The uses specified in 6.21 through 5.29 below may be permitted to
23 the extent that they do not require permanent structures, fill or other
24 obstructions to the flow of flood water in the Floodway District, and
25 provided that they do not adversely affect the capacity of the channels
26 or floodways of any tributary to the main stream, drainage ditch, or
27 any other drainage facility or system. These uses may be permitted
28 only upon application to the Floodplain Administrator and issuance of a
29 Floodplain Use Permit by the Floodplain Administrator as provided in
30 Section 4.0. Permits for these uses do not preclude the appropriate
31 requirement for flood insurance.

32 6.21 Appurtenant structures and uses accessory to open space or

1 uses controlled by a Floodplain Use Permit.

2 6.22 Circuses, carnivals, and similar transient amusement
3 enterprises.

4 6.23 Drive-in theaters, new and used car lots, roadside stands,
5 signs and billboards.

6 6.24 Extraction of sand, gravel, and other materials.

7 6.25 Marinas, boat rentals, docks, piers, wharves.

8 6.26 Railroads, streets, bridges, utility transmission lines,
9 and pipelines.

10 6.27 Storage yards for equipment, machinery, or materials.

11 6.28 Kennels and stables.

12 6.29 Recreational vehicles.

13 6.30 Other uses similar in nature to uses described in Section 6.1
14 or 6.2 which are consistent with the provisions set out in Section 1.3
15 of this Regulation.

16 7.0 FLOODWAY FRINGE DISTRICT

17 7.1 ALLOWED USES

18 The uses specified in 7.11 through 7.16 below shall be allowed
19 uses within the Floodway Fringe District to the extent that they are
20 not prohibited by any other regulation. The following standards for
21 new construction or substantial improvement to any structure is
22 required: (1) Anchoring to resist floatation, collapse, or lateral
23 movement; (2) Constructed with materials and utility equipment
24 resistant to flood damage. Allowance of a use does not preclude the
25 appropriate requirement for flood insurance.

26 7.11 Any use allowed in Section 6.1.

27 7.12 Any other use provided it is elevated above the Regulatory
28 Flood Elevation and a determination is made by the Floodplain
29 Administrator that the use will not unduly restrict the capacity of the
30 channels or floodways of tributaries to the main watercourse, drainage
31 ditches, or other drainage facilities or systems.

32 7.13 Structures or buildings, including dwellings, may be erected

1 or moved provided the lowest habitable floor is placed at least one (1)
2 foot above the Regulatory Flood Elevation. Land may be filled provided
3 that the top of such fill shall be at no point below the Regulatory
4 Flood Elevation for the particular area and shall extend at such elevation
5 at least twenty five (25) feet beyond the limits of any structure or
6 building erected or placed thereon. Bank protection, if approved by the
7 Floodplain Administrator, may be used in lieu of the twenty five (25)
8 feet of fill.

9 7.14 New and replacement water supply systems, provided that they
10 are designed to minimize or eliminate infiltration of flood waters into
11 the systems.

12 7.15 New and replacement sanitary sewage systems provided that
13 they are designed to minimize or eliminate infiltration of flood waters
14 into the systems and discharges from the systems into flood waters unless
15 otherwise allowed by a permit in conformance with the Federal Water
16 Pollution Control Act.

17 7.16 Onsite waste disposal systems provided that they are located
18 in such a way as to avoid impairment to them or contamination from them
19 during flooding.

20 7.2 PERMITTED USES

21 The uses and structures specified in 7.21 and 7.22 below are
22 permitted within the Floodway Fringe District only upon issuance of a
23 Floodplain Use Permit by the Floodplain Administrator subject to the
24 following provisions. Permits for these uses do not preclude the
25 appropriate requirement for flood insurance.

26 7.21 Structures, except dwellings or any type of residence, if
27 adequately floodproofed or otherwise protected to a point above the
28 Regulatory Flood Elevation. The applicant shall provide a certification
29 by a registered professional engineer or architect that the flood-
30 proofing methods for any nonresidential structure meet the floodproofing
31 criteria as defined in Section 3.7 above. The Floodplain Administrator
32 will maintain a record of all certifications along with the permit

1 application.

2 7.22 Uses listed in Section 6.2 of this Regulation and other
3 similar uses which will not be subject to substantial flood damage
4 and which will not cause flood losses on other lands or to the public.
5 These may include uses which can be readily removed from flood hazard
6 areas during times of flood. The Floodplain Administrator may in the
7 Floodplain Use Permit allow such uses to be located at an elevation
8 below the Regulatory Flood Elevation.

9 8.0 FLOODPLAINS WITH INTERIM DELINEATIONS

10 8.1 ALLOWED USES

11 The uses specified in 8.11 and 8.12 below shall be allowed in
12 Floodplains with Interim Delineations to the extent that they are not
13 prohibited by any other ordinance or regulation. Allowance of a use
14 does not preclude the appropriate requirement for flood insurance.

15 8.11 Any use allowed in Section 6.1.

16 8.12 Any use allowed in Section 7.12 or 7.13 provided that the
17 Regulatory Flood Elevation is not more than two (2) feet above the
18 existing ground elevation, except that the lowest habitable floor shall
19 be at least two (2) feet above the Regulatory Flood Elevation, and
20 nonresidential floors and all fill shall be at least one (1) foot above
21 the Regulatory Flood Elevation, or nonresidential floors shall be
22 floodproofed to an elevation at least one (1) foot above the Regulatory
23 Flood Elevation.

24 8.2 PERMITTED USES

25 The uses specified in 8.21 and 8.22 below and structures are
26 permitted within Floodplains with Interim Delineations only upon
27 issuance of a Floodplain Use Permit by the Floodplain Administrator
28 subject to the following provisions. Permits for these uses do not
29 preclude the appropriate requirements for flood insurance.

30 8.21 Any use or structure permitted in Section 7.21 provided
31 that the Regulatory Flood Elevation is not more than two (2) feet
32 above the existing ground elevation, except that nonresidential floors

1 and all fill shall be at least one (1) foot above the Regulatory Flood
2 Elevation, or nonresidential floors shall be floodproofed to an elevation
3 at least one (1) foot above the Regulatory Flood Elevation.

4 8.22 Any use permitted or allowed in Section 6.0 or 7.0 provided
5 that the applicant submits an analysis of the Regulatory Floodplain
6 adequate to provide for delineation of the Floodway and Floodway
7 Fringe Districts and accurate profile as described in Section 4.0.
8 Such delineations shall be subject to review and acceptance by the
9 Floodplain Administrator.

10 9.0 AREAS OF SHALLOW FLOODING

11 In Areas of Shallow Flooding as designated on the Zoning District
12 Maps, all new structures or substantial improvements thereto shall have
13 the lowest habitable floor elevated above the crown of the nearest
14 street to or above the depth number specified on the Flood Insurance
15 Rate Map for Maricopa County, Arizona and all nonresidential structures
16 shall have the lowest floor elevated or shall be floodproofed to or
17 above the depth number specified on the Flood Insurance Rate Map for
18 Maricopa County, Arizona.

19 10.0 NONCONFORMING USES

20 10.1 DISCONTINUANCE OF NONCONFORMING USES

21 In the event that a nonconforming use of land, building or
22 structure is discontinued for a period of twelve (12) consecutive
23 months, any further use thereof shall be in conformity with the
24 provisions of this Regulation.

25 10.2 ALTERATION TO NONCONFORMING USES

26 Any alteration, addition, or repair to a nonconforming building
27 or structure which would result in increasing its flood damage
28 potential by fifty percent (50%) or more shall be floodproofed.

29 10.3 DESTRUCTION OF NONCONFORMING USES

30 In the event that any such nonconforming use of land, building, or
31 structure is destroyed by fire, explosion, flood, Act of God, or act of
32 the public enemy to the extent of fifty percent (50%) of its value,

1 according to the appraisal thereof by competent appraisers, then and
2 without further action by the Floodplain Board, the future use thereof
3 shall from and after the date of such destruction be subject to all of
4 the provisions of this Regulations.

5 11.0 VIOLATIONS

6 11.1 CIVIL REMEDIES

7 Every new structure, building, fill, excavation, or development
8 located or maintained within any floodplain in violation of this
9 Regulation, without written authorization from the Floodplain Board,
10 is a public nuisance per se and may be abated, prevented or restrained
11 by action of the State or any political subdivision thereof under the
12 provisions of Arizona Revised Statutes 45-2344.

13 11.2 CRIMINAL PENALTY

14 Every new structure, building, fill, excavation, or development
15 located or maintained within any floodplain in violation of this
16 Regulation, without written authorization from the Floodplain Board,
17 is a public nuisance per se and is a misdemeanor under the provisions
18 of Arizona Revised Statutes 13-602, notwithstanding that the civil
19 remedies provided under 11.1 are also being enforced.

20 12.0 APPEALS

21 12.1 INTERPRETATION OF DISPUTES

22 The Floodplain Administrator shall interpret in writing upon appeal
23 the terms of this Regulation when the meaning of any engineering related
24 word, phrase, or regulation is in doubt, when there is dispute between
25 the appellant and Floodplain Administrator or when the location of a
26 Floodway District or Floodway Fringe District boundary or the Regulatory
27 Flood Elevation is in doubt.

28 12.2 APPEAL BY AN AGGRIEVED PERSON

29 12.21 All floodplain delineations will be in effect notwithstanding
30 appeals by aggrieved persons. These aggrieved persons shall file
31 their appeal with the Floodplain Administrator.

32 12.22 Appeals of decisions of the Floodplain Administrator

1 may be made to the Floodplain Board not later than 30 days after
2 receipt of notice of the decision of the Floodplain Administrator

3 13.0 WARNING AND DISCLAIMER OF LIABILITY

4 The degree of flood protection required by this Regulation is
5 considered reasonable for regulatory purposes and is based on engineering
6 and scientific methods of study. Larger floods may occur on rare
7 occasions or the flood height may be increased by man-made or natural
8 causes, such as bridge openings restricted by debris. This Regulation
9 does not imply that areas outside Floodway Districts and Floodway
10 Fringe Districts or land uses permitted within such areas will be free
11 from flooding or flood damages. This Regulation shall not create
12 liability on the part of Maricopa County or any officer or employee
13 thereof for any flood damages that may result from reliance on this
14 Regulation or any administrative decision lawfully made thereunder.

15 14.0 SEVERABILITY

16 This Regulation and the various parts thereof are hereby declared
17 to be severable. Should any section of this Regulation be declared by
18 the courts to be unconstitutional or invalid, such decision shall not
19 affect the validity of the Regulation as a whole, or any portion
20 thereof other than the section so declared to be unconstitutional or
21 invalid.

22 15.0 EFFECTIVE DATE

23 This amended Regulation shall become effective on Oct 17, 1977.

24 Adopted by the Board of Supervisors of Maricopa County, Arizona this

25 17th day of October, 1977.

26 Bob Corbin
27 Bob Corbin, Chairman

28 ATTEST:

29 Emma L. Centwell
30 Clerk of the Board ASST CLERK

31

32

TWO DISTRICT FLOODPLAIN REGULATION

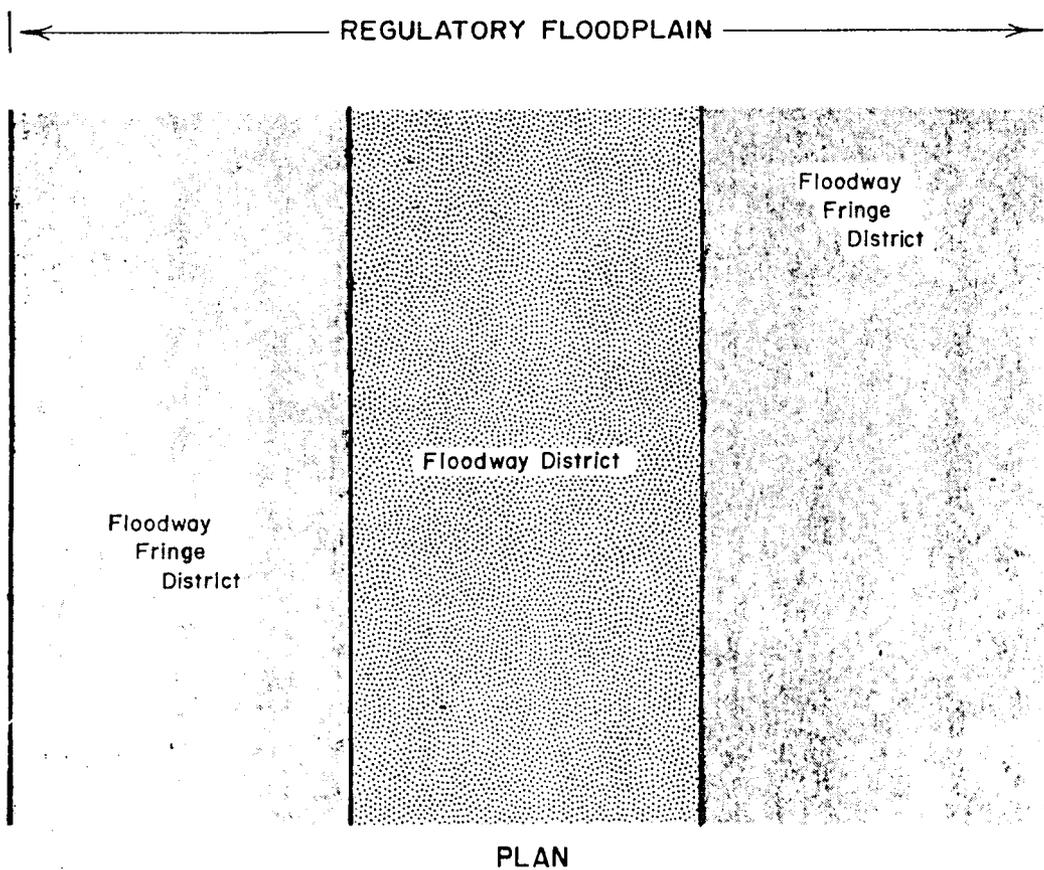
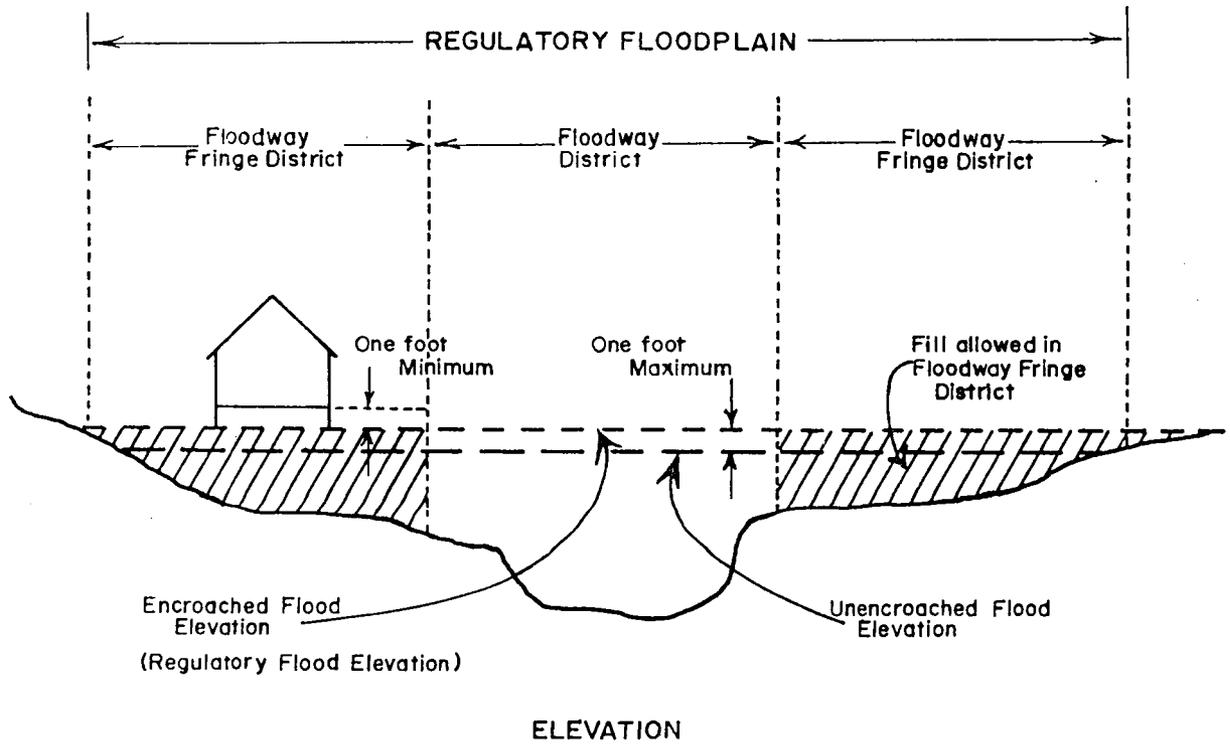
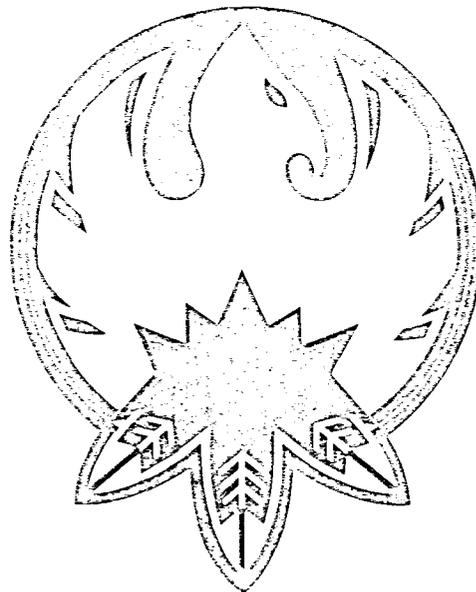


Figure No. 1 (Revised 10/77)

EXHIBIT B TO APPENDIX 3

**Code of Federal Regulation (Extract) Title 33 - Navigation Navigable Rivers,
Chapter II - Corps of Engineers, Department of the Army, Part 208,
Flood Control Regulations Maintenance and Operation of Flood Control Works**



CODE OF FEDERAL REGULATIONS (EXTRACT)

TITLE 33—NAVIGATION AND NAVIGABLE WATERS

Chapter II—Corps of Engineers, Department of the Army

PART 206—FLOOD CONTROL REGULATIONS

AUTHORITY: § 206.10 issued under Sec. 7,
58 Stat. 890; 33 U.S.C. 709.

§ 206.10 *Local flood protection works; maintenance and operation of structures and facilities*—(a) *General.* (1) The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits.

(2) The State, political subdivision thereof, or other responsible local agency, which furnished assurance that it will maintain and operate flood control works in accordance with regulations prescribed by the Secretary of the Army, as required by law, shall appoint a permanent committee consisting of or headed by an official hereinafter called the "Superintendent," who shall be responsible for the development and maintenance of, and directly in charge of, an organization responsible for the efficient operation and maintenance of all of the structures and facilities during flood periods and for continuous inspection and maintenance of the project works during periods of low water, all without cost to the United States.

(3) A reserve supply of materials needed during a flood emergency shall be kept on hand at all times.

(4) No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted upon the rights-of-way for the protective facilities.

(5) No improvement shall be passed over, under, or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the District Engineer of the Department of the Army or his authorized representative that such improvement, excavation, construction, or alteration will not adversely affect the functioning of the protective facilities. Such improvements or alterations as may be found to be desirable and permissible under the above determination shall be constructed in accordance with standard engineering practice. Advice regarding the effect of proposed improvements or alterations on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice shall be obtained from the District Engineer or, if otherwise obtained, shall be submitted for his approval. Drawings or prints showing such improvements or alterations as finally constructed shall be furnished the District Engineer after completion of the work.

(6) It shall be the duty of the Superintendent to submit a semiannual report to the District Engineer covering inspection, maintenance, and operation of the protective works.

(7) The District Engineer or his authorized representatives shall have ac-

cess at all times to all portions of the protective works.

(8) Maintenance measures or repairs which the District Engineer deems necessary shall be promptly taken or made.

(9) Appropriate measures shall be taken by local authorities to insure that the activities of all local organizations operating public or private facilities connected with the protective works are coordinated with those of the Superintendent's organization during flood periods.

(10) The Department of the Army will furnish local interests with an Operation and Maintenance Manual for each completed project, or separate useful part thereof, to assist them in carrying out their obligations under this part.

(b) *Levees*—(1) *Maintenance.* The Superintendent shall provide at all times such maintenance as may be required to insure serviceability of the structures in time of flood. Measures shall be taken to promote the growth of sod, exterminate burrowing animals, and to provide for routine mowing of the grass and weeds, removal of wild growth and drift deposits, and repair of damage caused by erosion or other forces. Where practicable, measures shall be taken to retard bank erosion by planting of willows or other suitable growth on areas riverward of the levees. Periodic inspections shall be made by the Superintendent to insure that the above maintenance measures are being effectively carried out and, further, to be certain that:

(i) No unusual settlement, sloughing, or material loss of grade or levee cross section has taken place;

(ii) No caving has occurred on either the land side or the river side of the levee which might affect the stability of the levee section;

(iii) No seepage, saturated areas, or sand boils are occurring;

(iv) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged;

(v) Drains through the levees and gates on said drains are in good working condition;

(vi) No revetment work or riprap has been displaced, washed out, or removed;

(vii) No action is being taken, such as burning grass and weeds during inappropriate seasons, which will retard or destroy the growth of sod;

(viii) Access roads to and on the levee are being properly maintained;

(ix) Cattle guards and gates are in good condition;

(x) Crown of levee is shaped so as to drain readily, and roadway thereon, if any, is well shaped and maintained;

(xi) There is no unauthorized grazing or vehicular traffic on the levees;

(xii) Encroachments are not being made on the levee right-of-way which might endanger the structure or hinder its proper and efficient functioning during times of emergency.

Such inspections shall be made immediately prior to the beginning of the flood season; immediately following each major high water period, and otherwise at intervals not exceeding 90 days; and such intermediate times as may be necessary to insure the best possible care of the levee. Immediate steps will be taken to correct dangerous conditions disclosed by such inspections. Regular maintenance repair measures shall be accom-

plished during the appropriate season as scheduled by the Superintendent.

(2) *Operation.* During flood periods the levee shall be patrolled continuously to locate possible sand boils or unusual wetness of the landward slope and to be certain that:

(i) There are no indications of slides or sloughs developing;

(ii) Wave wash or scouring action is not occurring;

(iii) No low reaches of levee exist which may be overtopped;

(iv) No other conditions exist which might endanger the structure.

Appropriate advance measures will be taken to insure the availability of adequate labor and materials to meet all contingencies. Immediate steps will be taken to control any condition which endangers the levee and to repair the damaged section.

(c) *Flood walls*—(1) *Maintenance.* Periodic inspections shall be made by the Superintendent to be certain that:

(i) No seepage, saturated areas, or sand boils are occurring;

(ii) No undue settlement has occurred which affects the stability of the wall or its water tightness;

(iii) No trees exist, the roots of which might extend under the wall and offer accelerated seepage paths;

(iv) The concrete has not undergone cracking, chipping, or breaking to an extent which might affect the stability of the wall or its water tightness;

(v) There are no encroachments upon the right-of-way which might endanger the structure or hinder its functioning in time of flood;

(vi) Care is being exercised to prevent accumulation of trash and debris adjacent to walls, and to insure that no fires are being built near them;

(vii) No bank caving conditions exist riverward of the wall which might endanger its stability;

(viii) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged.

Such inspections shall be made immediately prior to the beginning of the flood season, immediately following each major high water period, and otherwise at intervals not exceeding 90 days. Measures to eliminate encroachments and effect repairs found necessary by such inspections shall be undertaken immediately. All repairs shall be accomplished by methods acceptable in standard engineering practice.

(2) *Operation.* Continuous patrol of the wall shall be maintained during flood periods to locate possible leakage at monolith joints or seepage underneath the wall. Floating plant or boats will not be allowed to lie against or tie up to the wall. Should it become necessary during a flood emergency to pass anchor cables over the wall, adequate measures shall be taken to protect the concrete and construction joints. Immediate steps shall be taken to correct any condition which endangers the stability of the wall.

(d) *Drainage structures*—(1) *Maintenance.* Adequate measures shall be taken to insure that inlet and outlet channels are kept open and that trash, drift, or debris is not allowed to accumulate near drainage structures. Flap gates and manually operated gates and valves on drainage structures shall be examined, oiled, and trial operated at least once

CODE OF FEDERAL REGULATIONS (EXTRACT)

every 90 days. Where drainage structures are provided with stop log or other emergency closures, the condition of the equipment and its housing shall be inspected regularly and a trial installation of the emergency closure shall be made at least once each year. Periodic inspections shall be made by the Superintendent to be certain that:

(i) Pipes, gates, operating mechanism, riprap, and headwalls are in good condition;

(ii) Inlet and outlet channels are open;

(iii) Care is being exercised to prevent the accumulation of trash and debris near the structures and that no fires are being built near bituminous coated pipes;

(iv) Erosion is not occurring adjacent to the structure which might endanger its water tightness or stability.

Immediate steps will be taken to repair damage, replace missing or broken parts, or remedy adverse conditions disclosed by such inspections.

(2) *Operation.* Whenever high water conditions impend, all gates will be inspected a short time before water reaches the invert of the pipe and any object which might prevent closure of the gate shall be removed. Automatic gates shall be closely observed until it has been ascertained that they are securely closed. Manually operated gates and valves shall be closed as necessary to prevent inflow of flood water. All drainage structures in levees shall be inspected frequently during floods to ascertain whether seepage is taking place along the lines of their contact with the embankment. Immediate steps shall be taken to correct any adverse condition.

(e) *Closure structures—(1) Maintenance.* Closure structures for traffic openings shall be inspected by the Superintendent every 90 days to be certain that:

(i) No parts are missing;

(ii) Metal parts are adequately covered with paint;

(iii) All movable parts are in satisfactory working order;

(iv) Proper closure can be made promptly when necessary;

(v) Sufficient materials are on hand for the erection of sand bag closures and that the location of such materials will be readily accessible in times of emergency.

Tools and parts shall not be removed for other use. Trial erections of one or more closure structures shall be made once each year, alternating the structures chosen so that each gate will be erected at least once in each 3-year period. Trial erection of all closure structures shall be made whenever a change is made in key operating personnel. Where railroad operation makes trial erection of a closure structure infeasible, rigorous inspection and drill of operating personnel may be substituted therefor. Trial erection of sand bag closures is not required. Closure materials will be carefully checked prior to and following flood periods, and damaged or missing parts shall be repaired or replaced immediately.

(2) *Operation.* Erection of each movable closure shall be started in sufficient time to permit completion before flood waters reach the top of the structure sill. Information regarding the proper method of erecting each individual closure structure, together with an estimate

of the time required by an experienced crew to complete its erection will be given in the Operation and Maintenance Manual which will be furnished local interests upon completion of the project. Closure structures will be inspected frequently during flood periods to ascertain that no undue leakage is occurring and that drains provided to care for ordinary leakage are functioning properly. Boats or floating plant shall not be allowed to tie up to closure structures or to discharge passengers or cargo over them.

(f) *Pumping plants—(1) Maintenance.* Pumping plants shall be inspected by the Superintendent at intervals not to exceed 30 days during flood seasons and 90 days during off-flood seasons to insure that all equipment is in order for instant use. At regular intervals, proper measures shall be taken to provide for cleaning plant, buildings, and equipment, repainting as necessary, and lubricating all machinery. Adequate supplies of lubricants for all types of machines, fuel for gasoline or diesel powered equipment, and flash lights or lanterns for emergency lighting shall be kept on hand at all times. Telephone service shall be maintained at pumping plants. All equipment, including switch gear, transformers, motors, pumps, valves, and gates shall be trial operated and checked at least once every 90 days. Megger tests of all insulation shall be made whenever wiring has been subjected to undue dampness and otherwise at intervals not to exceed one year. A record shall be kept showing the results of such tests. Wiring disclosed to be in an unsatisfactory condition by such tests shall be brought to a satisfactory condition or shall be promptly replaced. Diesel and gasoline engines shall be started at such intervals and allowed to run for such length of time as may be necessary to insure their serviceability in times of emergency. Only skilled electricians and mechanics shall be employed on tests and repairs. Operating personnel for the plant shall be present during tests. Any equipment removed from the station for repair or replacement shall be returned or replaced as soon as practicable and shall be trial operated after reinstallation. Repairs requiring removal of equipment from the plant shall be made during off-flood seasons insofar as practicable.

(2) *Operation.* Competent operators shall be on duty at pumping plants whenever it appears that necessity for pump operation is imminent. The operator shall thoroughly inspect, trial operate, and place in readiness all plant equipment. The operator shall be familiar with the equipment manufacturers' instructions and drawings and with the "Operating Instructions" for each station. The equipment shall be operated in accordance with the above-mentioned "Operating Instructions" and care shall be exercised that proper lubrication is being supplied all equipment, and that no overheating, undue vibration or noise is occurring. Immediately upon final recession of flood waters, the pumping station shall be thoroughly cleaned, pump house sumps flushed, and equipment thoroughly inspected, oiled and greased. A record or log of pumping plant operation shall be kept for each station, a copy of which shall be furnished the District Engineer following each flood.

(g) *Channels and floodways—(1) Maintenance.* Periodic inspections of improved channels and floodways shall be made by the Superintendent to be certain that:

(i) The channel or floodway is clear of debris, weeds, and wild growth;

(ii) The channel or floodway is not being restricted by the depositing of waste materials, building of unauthorized structures or other encroachments;

(iii) The capacity of the channel or floodway is not being reduced by the formation of shoals;

(iv) Banks are not being damaged by rain or wave wash, and that no sloughing of banks has occurred;

(v) Riprap sections and deflection dikes and walls are in good condition;

(vi) Approach and egress channels adjacent to the improved channel or floodway are sufficiently clear of obstructions and debris to permit proper functioning of the project works.

Such inspections shall be made prior to the beginning of the flood season and otherwise at intervals not to exceed 90 days. Immediate steps will be taken to remedy any adverse conditions disclosed by such inspections. Measures will be taken by the Superintendent to promote the growth of grass on bank slopes and earth deflection dikes. The Superintendent shall provide for periodic repair and cleaning of debris basins, check dams, and related structures as may be necessary.

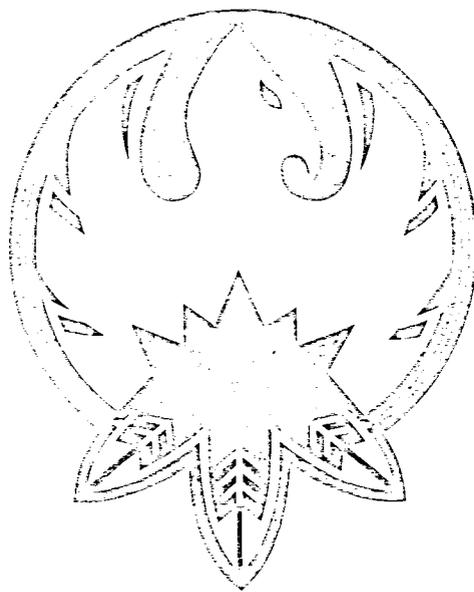
(2) *Operation.* Both banks of the channel shall be patrolled during periods of high water, and measures shall be taken to protect those reaches being attacked by the current or by wave wash. Appropriate measures shall be taken to prevent the formation of jams of ice or debris. Large objects which become lodged against the bank shall be removed. The improved channel or floodway shall be thoroughly inspected immediately following each major high water period. As soon as practicable thereafter, all snags and other debris shall be removed and all damage to banks, riprap, deflection dikes and walls, drainage outlets, or other flood control structures repaired.

(h) *Miscellaneous facilities—(1) Maintenance.* Miscellaneous structures and facilities constructed as a part of the protective works and other structures and facilities which function as a part of, or affect the efficient functioning of the protective works, shall be periodically inspected by the Superintendent and appropriate maintenance measures taken. Damaged or unserviceable parts shall be repaired or replaced without delay. Areas used for ponding in connection with pumping plants or for temporary storage of interior run-off during flood periods shall not be allowed to become filled with silt, debris, or dumped material. The Superintendent shall take proper steps to prevent restriction of bridge openings and, where practicable, shall provide for temporary raising during floods of bridges which restrict channel capacities during high flows.

(2) *Operation.* Miscellaneous facilities shall be operated to prevent or reduce flooding during periods of high water. Those facilities constructed as a part of the protective works shall not be used for purposes other than flood protection without approval of the District Engineer unless designed therefor. (Sec. 3, 49 Stat. 1571, as amended; 33 U.S.C. 701C) (19 F.R. 9999, Aug. 17, 1944; 9 F.R. 10203, Aug. 22, 1944)

APPENDIX 4

Coordination With Other Agencies



Appendix 4

No responses were received from other agencies.