

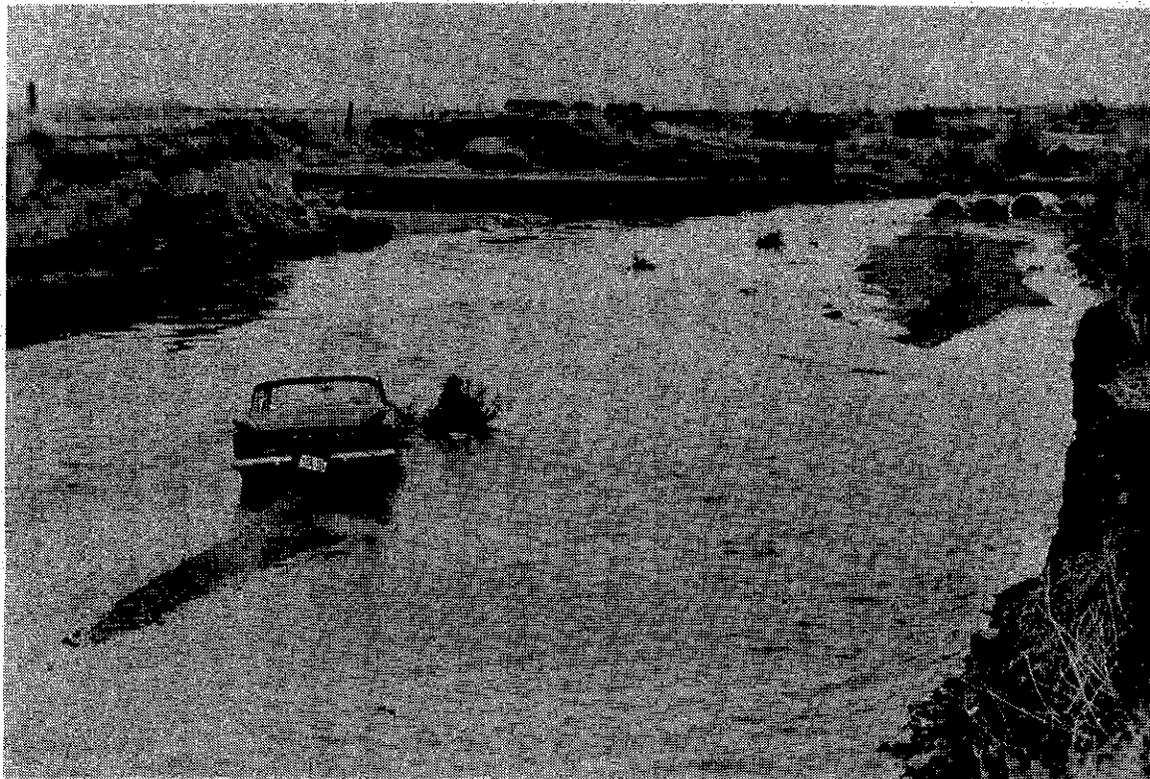
FLOOD HAZARD INFORMATION

CAVE CREEK

ARIZONA CANAL TO 19TH AVENUE

PHOENIX, ARIZONA

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PREPARED FOR
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
BY
CORPS OF ENGINEERS, U. S. ARMY
LOS ANGELES DISTRICT, CALIFORNIA

OCTOBER 1971

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CONTENTS

	Page
PREFACE	i
BACKGROUND INFORMATION	1
Settlement	1
The Stream and Its Valley	1
Developments on the Flood Plain	1
FLOOD SITUATION	3
Data Sources and Records	3
Flood Season and Flood Characteristics	3
Factors Affecting Flooding	3
Obstructions to floodflows	3
Flood damage reduction measures	6
PAST FLOODS	7
Summary of Historical Floods	7
Flood Records	7
Flood Descriptions	7
FUTURE FLOODS	9
Intermediate Regional Flood	9
Lesser Flood	9
Hazards of Large Floods	10
Flooded areas and flood damage	10
Obstructions	11
Velocities of flow	12
Future flood heights	12
GLOSSARY	14

PREFACE

The purpose of this report is to present information on the flood hazard along Cave Creek from the Arizona Canal to 19th Avenue. Cave Creek is in the northwest part of the City of Phoenix, Maricopa County, Arizona. Land in the flood plain has been primarily undeveloped in the past, but recently residential developments have begun to appear along the creek banks. Pressure for substantial development of remaining vacant flood plain land should increase in the future with the growth of the Phoenix area.

This report contains information on past floods, as well as large floods that reasonably can be expected to occur in the future. These future floods have been designated the Intermediate Regional Flood and the Lesser Flood.

This report was prepared at the request of the City of Phoenix and the Maricopa County Flood Control District under the continuing authority provided the Corps of Engineers in section 206 of the 1960 Flood Control Act (Public Law 86-645), as amended.

It is intended that this report be used by local agencies and other flood plain users in developing and using flood plain areas in such a way that flood hazards and future flood damages are minimized. The report also provides Maricopa County and the concerned communities a basis for further study and planning toward the optimum use and development of flood-prone areas through zoning and subdivision regulations, construction of flood control projects, or a combination of these and other approaches to reducing flood hazards and flood damage.

Recommendations or plans for solution of flood problems in the study area are not included in this report. Neither does this report extend any Federal authority over zoning or other regulation of flood plain use. Methods to minimize flood damage in flood-prone areas, but still permit their optimum use and development, are introduced in a Corps of Engineers publication entitled "Guidelines for Reducing Flood Damages."^(a)

The assistance and cooperation of the City of Phoenix, the Maricopa County Flood Control District, the Arizona State Highway Department, the Arizona Republic newspaper, and individuals who directly or indirectly aided in the preparation of this report are gratefully acknowledged.

Maricopa County, through the office of the Maricopa County Flood Control District, will make the information in this report available to all interested agencies and individuals. Copies of the report and information on its use are available from that office. The Los Angeles District of the Corps of Engineers will, upon request, provide technical assistance to Federal, State, and local agencies in the interpretation and use of data presented herein, and will provide other available related flood data.

(a) Available upon request.

BACKGROUND INFORMATION

SETTLEMENT

The study area of Cave Creek is in the northwest part of the City of Phoenix, Arizona. Phoenix had a population of about 107,000 in 1950, 439,000 in 1960, and 582,000 in 1970. Flat developable land in the flood plain of Cave Creek has come under increasing demand for urbanization, and the demand will continue in the future.

THE STREAM AND ITS VALLEY

Cave Creek, under conditions existing in August 1971, drains an area of about 252 square miles upstream of the Arizona Canal. The creek originates in the mountains north of Phoenix (see plate 1) and flows generally in a southwest direction to the downstream limit of the study reach at the Arizona Canal. Ground elevations in the basin range from about 4,925 feet to about 1,230 feet. Natural vegetation, including native grasses, brush, and trees, exists at the higher elevations but is sparse at the lower elevations and in the study reach.

Climate in the study reach is arid subtropical, with temperatures frequently exceeding 100 degrees in the summer. The mean annual precipitation ranges from about 7.4 inches in downtown Phoenix and about 9.7 inches at the existing Cave Creek Dam to about 24 inches in the higher elevations of the basin. Mean annual rainfall averages about 14.5 inches over the entire basin.

DEVELOPMENTS ON THE FLOOD PLAIN

Developments on the flood plain in the study reach include agricultural, residential, commercial, and industrial uses. Agricultural uses include irrigated orchards and row crops; residential uses

include single-family homes and mobile homes; commercial uses are limited to some small neighborhood type businesses and a few gasoline stations; industrial uses include an industrial park near the Arizona Canal and gravel pit operations upstream from Sweetwater Avenue.

A planned Phoenix city park, Cave Creek Park, would introduce additional uses in the flood plain in the form of recreational facilities, including golf courses, horse trails, picnic areas, swimming pools, an archery range, adult and neighborhood recreation centers, and an outdoor amphitheater.

FLOOD SITUATION

DATA SOURCES AND RECORDS

Data sources and records include data from the United States Geological Survey stream gage (water-stage recorder) installed in 1957 about 0.7 mile upstream from the Arizona Canal, and the U.S.G.S. stream gage installed in 1958 about 5 miles upstream from the existing Cave Creek Dam. Information concerning the discharge of floods from 1905 to 1957 is based on unofficial estimates made by local interests, including water users associations.

FLOOD SEASON AND FLOOD CHARACTERISTICS

The flood season is generally during the months of July through October, although a major flood may occur in any month. Three types of storms produce rain in the Phoenix area: general winter storms, general summer storms, and local summer thunderstorms. Many of the destructive flash floods are produced by the local summer thunderstorms, which last about 3 hours or less.

FACTORS AFFECTING FLOODING

Obstructions to floodflows - Manmade obstructions to floodflows in the study reach include the Arizona Canal, the Thunderbird Road bridge, and the 19th Avenue bridge (see figures 1 through 3). Natural vegetation, including a few large trees, has an obstructive effect on floodflows as well. Water flowing outside the main channel would be slowed and obstructed by homes, walls, automobiles, streets, and other manmade objects, as well as by natural growth. Brush may be washed out and carried downstream to collect on bridges, thus creating a damming effect and raising the water surface. Debris may collect against a bridge until the load exceeds the structural capability and the bridge is destroyed. Floodflows may also be diverted around bridges, resulting in increased velocity of flow and causing damage to, or loss of, the bridge approaches.



FIGURE 1 - Arizona Canal at Cave Creek showing overflow spillway (looking south)

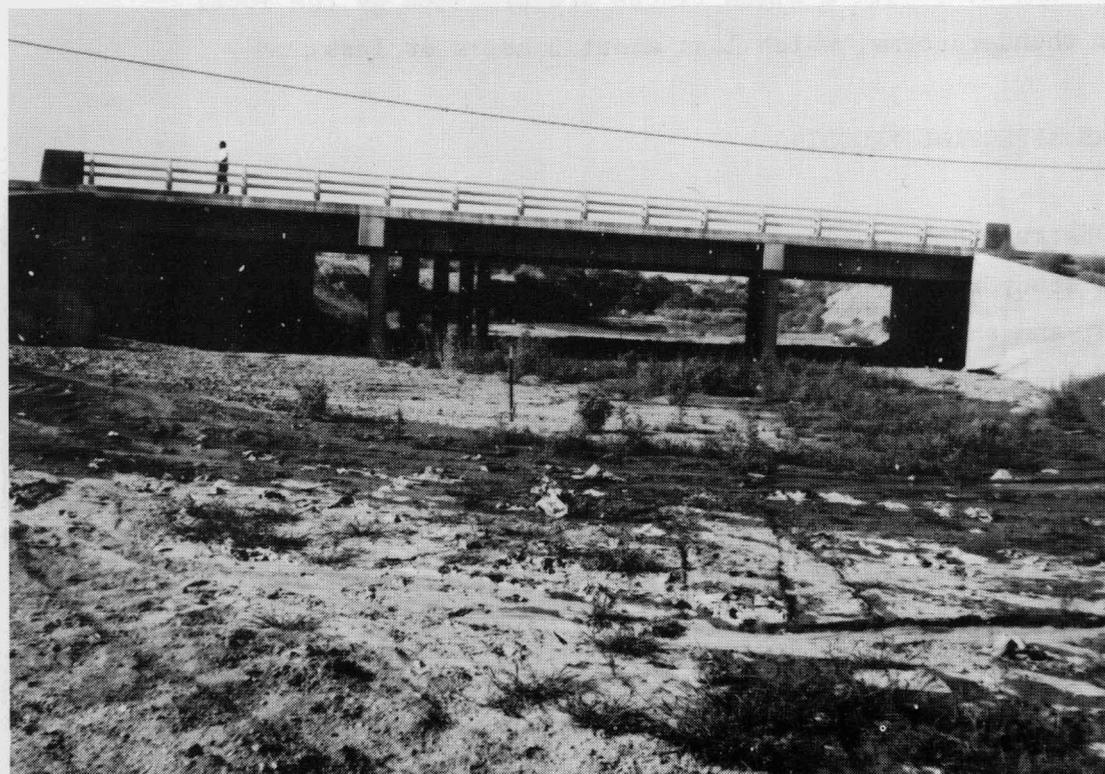


FIGURE 2 - Thunderbird Road bridge (looking upstream)



FIGURE 3 - 19th Avenue bridge (looking upstream)

In general, obstructions restrict floodflows and cause overbank flows, unpredictable areas of flooding, destruction of, or damage to, bridges, and increased velocity of flow immediately downstream from the obstructions.

Flood damage reduction measures - No Federal flood control projects exist in the study reach. However, the City of Phoenix is undertaking a combined project of an improved earth channel in conjunction with a sanitary land fill from Thunderbird Road to 19th Avenue. When completed, the proposed channel will have a minimum base width of 100 feet and a minimum depth of 10 feet. The proposed cross section is trapezoidal in shape with a maximum top width of 200 feet. Since the target completion date for the channel is June 1972, it is assumed to be completed for this report. Future plans call for Cave Creek Park, shown on plate 2, to be extended to the Arizona Canal.

The Arizona Canal, (see figure 1) can safely intercept floodflows of about 600 cubic feet per second, if the canal happens to be empty when the flood occurs. The nature of flash floods precludes the use of the Arizona Canal as an effective flood control measure because a flood could occur before the canal could be emptied.

The existing Cave Creek Dam located upstream of the study reach is utilized for flood control. Since its construction in 1923, it has retarded upstream floodflows in Cave Creek. There are no records of the dam being overtopped by floodflows since its construction.

The Corps of Engineers has an authorized dam and channel system to be constructed in the future on Cave Creek downstream from the existing Cave Creek Dam. This system of flood control structures will intercept major floodflows originating upstream from the structures, themselves. However, the area from the proposed Corps project downstream to the Arizona Canal will still be drained by Cave Creek. A reanalysis of the study area after the Corps project is constructed is recommended to determine what flood hazard would exist at that time.

PAST FLOODS

SUMMARY OF HISTORICAL FLOODS

A summary of historical floods on Cave Creek between the Arizona Canal and 19th Avenue includes several large floods. Major floods are known to have occurred in February 1905 and August 1921, both before the construction of the existing Cave Creek Dam in March 1923. Minor Floods occurred in September 1916, November 1919, January 1922, and August 1943.

FLOOD RECORDS

Flood records were obtained from records of the stream gages along Cave Creek, previously mentioned in this report. Unofficial estimates of past floods came from accounts and records of local officials, newspapers, water users associations, the Maricopa County Flood Control District, and the United States Geological Survey.

FLOOD DESCRIPTIONS

The flood of August 1943 was the largest flood since the completion of the existing Cave Creek Dam. Floodwater crossed the Arizona Canal and the Grand Canal, flooded the Arizona Capitol Building, and flowed on to the Salt River. The peak discharge for this flood was estimated to be 9,000 cubic feet per second at the stream gage just upstream of Peoria Avenue.

The largest flood recorded by the stream gage, which was installed in 1957 upstream from Peoria Avenue, occurred on December 19, 1967. The peak discharge from this flood was estimated to be 4,080 cubic feet per second, and the maximum depth of water at the gage was recorded as 4.3 feet. Figure 4 shows floodflows at Peoria Avenue just downstream of the stream gage several hours prior to the peak flow on December 19, 1967.



FIGURE 4 - Flow in Cave Creek at Peoria Avenue (looking upstream, December 1967)

FUTURE FLOODS

Although floods of the same magnitude as those that have occurred in the past could recur in the future, discussion of the future floods in this report is limited primarily to those that have been designated as the Intermediate Regional and Lesser Floods.

The Intermediate Regional Flood would be larger and would occur less frequently than the Lesser Flood, and both of these floods would be greater than any known to have occurred since construction of the existing Cave Creek Dam. Determination of the two floods for this report was based on hydrologic computations (correlation of records of Cave Creek and similar drainage basins) and consideration of pertinent meteorologic and physiographic conditions.

INTERMEDIATE REGIONAL FLOOD

The Intermediate Regional Flood is one that could occur about once in 100 years on the average, although it may occur in any year or more than once in one year. The peak flow of such a flood was developed as explained in the preceding paragraph. The peak discharge developed for use as the Intermediate Regional Flood in this report is 21,000 cubic feet per second on Cave Creek at the Arizona Canal.

LESSER FLOOD

The Lesser Flood used in this report is one that could occur about once in 50 years on the average, although it may occur in any year or more than once in one year. The peak discharge developed for the Lesser Flood on Cave Creek at the Arizona Canal for use in this report is 13,000 cubic feet per second.

HAZARDS OF LARGE FLOODS

The amount and extent of damage caused by any flood depends on the topography of the area flooded, depth and duration of flooding, velocity of flow, and developments on the flood plain. An Intermediate Regional or Lesser Flood on Cave Creek would result in inundation of residential, commercial, agricultural, recreational, and industrial sections of the study area.

Deep floodwater flowing at a high velocity and carrying floating debris would create conditions hazardous to persons and vehicles attempting to cross flooded areas. In general, floodwater 3 or more feet deep and flowing at a velocity of 3 or more feet per second could sweep a person off his feet, thus creating definite dangers of injury or drowning. Rapidly rising and swiftly flowing floodwater may trap persons in homes that are ultimately destroyed or in vehicles that are ultimately submerged. Decaying flood-deposited garbage or other organic materials could create health hazards. Isolation of areas by floodwater could create hazards in terms of medical, fire, or law enforcement emergencies.

Flooded areas and flood damages - Areas that would be flooded by the Intermediate Regional Flood are shown on plate 2, which is also an index map to plates 3 through 9. Areas that would be flooded by the Intermediate Regional and Lesser Floods are shown in detail on plates 3 through 9. These areas include residential, industrial, agricultural, and recreational sections and the associated streets, roads, and public utilities in the study area. Plates 10 through 12 show water surface profiles of the Intermediate Regional and Lesser Floods. Depth of flow above the streambed can be estimated from these profiles. Typical cross sections of the flood plain at selected locations, with the water surface elevations plotted, are shown on plate 13. Limits of overflow indicated on plates 2 through 9 may vary from actual locations on the ground due to map scale, deposition, erosion, or inaccuracy of original topographic maps.

The improved earth channel downstream from 19th Avenue has a sharp bend (radius less than 1,200 feet) of over 90 degrees curvature. This sharp curve could cause an erosion problem on the north and west bank of the channel in the vicinity of the bend. Since the channel is part of the sanitary land fill project, decaying garbage and other refuse could be dislodged and floated downstream, creating a possible health hazard.

In either the Intermediate Regional or Lesser Flood, the under-crossings for Thunderbird Road, Cactus Road, and Peoria Avenue under the Black Canyon Highway may become inundated with floodwaters. The pumping facilities for these sump areas could become overtaxed in a major flood, resulting in floodwaters flowing out onto the lands west of the Black Canyon Highway. This possibility was not investigated in detail in this report because the Black Canyon Highway is the western limit of the study area.

Flooded areas shown on the flooded area plates reflect only lands subject to flooding from Cave Creek and the overflow of its channel under current conditions. Local runoff and ponding areas are not shown. The overflow area due to the tributary entering Cave Creek at Sweetwater Avenue is not shown. Until the proposed Corps Cave Creek projects are constructed, this report should be utilized as a guide for planning, zoning, and development.

Obstructions - Obstructions to floodflows include the Arizona Canal, the Thunderbird Road bridge, and the 19th Avenue bridge. Profiles on plates 10 through 12 show streambed, roadway, and floodwater surface elevations at these bridges. The backwater effect of these obstructions can be seen on the profiles. Floodflows striking and overtopping the embankments at the ends of these bridges could erode the roadway approaches. The possibility of this happening at the Thunderbird Road bridge is increased because the bridge is built on a 30-degree skew. According to the plans of the 19th Avenue bridge, no piling exists below the footings for the piers supporting this bridge. Further investigation reveals

that the tops of the 2-foot thick footings are at streambed grade and that a concrete apron has been installed between these footings and for a short distance upstream and downstream to stop erosion around the pier footings. It is not within the scope of this report to ascertain the structural adequacy of the foundations for the 19th Avenue bridge; however, the possibility of erosion under the foundation would exist in a major flood.

The Arizona Canal, the downstream limit of this study, provides a major obstruction to flows in Cave Creek. Floodflows have overtopped and broken through the canal several times in the past during floods of smaller magnitudes than those of the Intermediate Regional and Lesser Floods. Therefore, during the floods studied in this report, it can be reasonably assumed that floodflows would overtop or break through the Arizona Canal. The analysis of flooding conditions south of the Arizona Canal due to floodflows overtopping or breaking through the Arizona Canal has not been undertaken as a part of this study.

Velocities of flow - Average velocities of flow in the channel of Cave Creek in the study reach would range from 7 to 14 feet per second for the Lesser Flood. Average overbank velocities during the Lesser Flood would range from 1 to 3 feet per second. During the Intermediate Regional Flood, average channel velocities would range from 8 to 16 feet per second, and average overbank velocities would range from 1 to 4 feet per second. Water flowing at about 2 feet per second or less would deposit silt and debris.

Future flood heights - The levels that the Intermediate Regional and Lesser Floods would reach at the stream gage upstream from Peoria Avenue are indicated in figure 5.

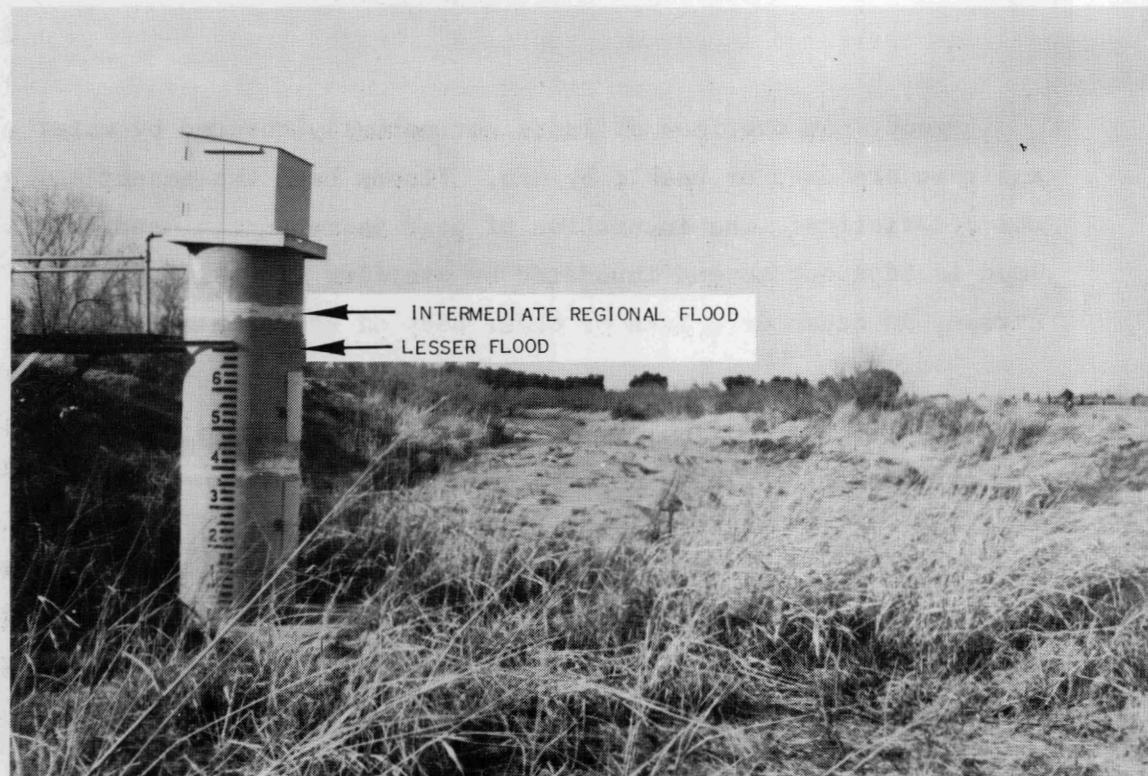


FIGURE 5 - Future flood heights at streamgaging station
on north side of Peoria Avenue

GLOSSARY

Flood. An overflow of lands not normally covered by water and that are used or usable by man. Floods have two essential characteristics: the inundation of land is temporary; and the land is adjacent to and inundated by overflow from a river or a stream, an ocean or a lake or other body of standing water.

Normally, a "flood" is considered as any temporary rise in streamflow or stage (not the ponding of surface water) that results in significant adverse effects in the vicinity. Adverse effects may include damages from overflow of land areas, temporary backwater effects in sewers and local drainage channels, creation of unsanitary conditions or other unfavorable situations by deposition of materials in stream channels during flood recessions, rise of ground water coincident with increased streamflow, and other problems.

Flood Crest. The maximum stage or elevation reached by the waters of a flood at a given location.

Flood Peak. The maximum instantaneous discharge of a flood at a given location. It usually occurs at or near the time of the flood crest.

Flood Plain. The relatively flat areas or lowlands adjoining the channel of a river, a stream, or a watercourse, an ocean, or a lake or other body of standing water that have been or may be covered by floodwater.

Flood Profile. A graph showing the relationship of water surface elevation to location, the latter generally expressed as distance above mouth for a stream of water flowing in an open channel. It is generally drawn to show surface elevation for the crest of a specific flood, but may be prepared for conditions at a given time or stage.

Flood Stage. The stage or elevation at which overflow of the natural banks of a stream or body of water begins in the reach or area in which the elevation is measured.

Floodway. The channel of the stream and that part of the flood plain that would be used to carry floodflows.

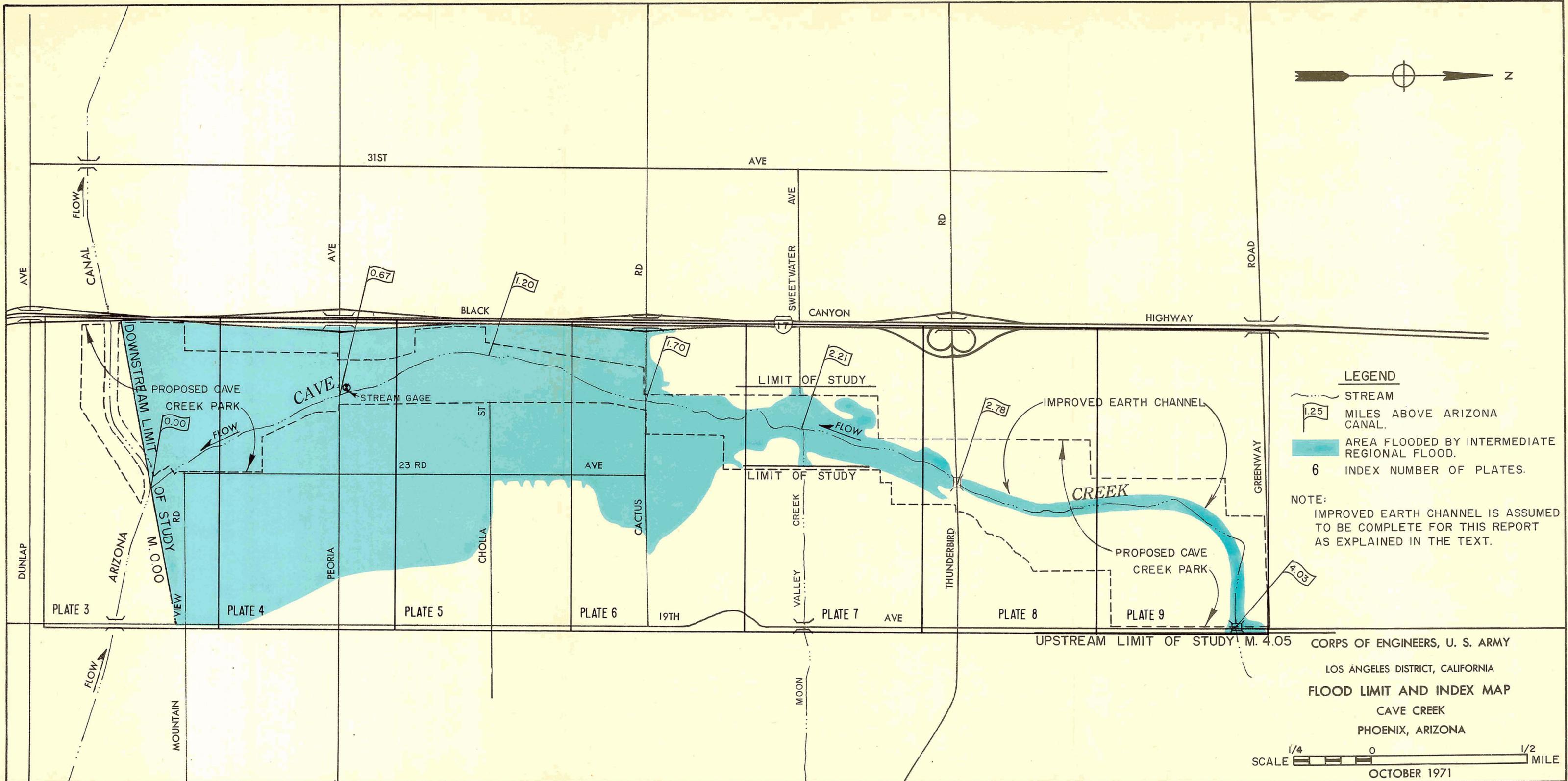
General Summer Storm. In late summer or early fall, tropical storms originating along the Mexican Pacific coast or the Gulf of Mexico can reach the Phoenix area, producing the general summer storm that is characterized by heavy precipitation over large areas.

General Winter Storm. Results from weather fronts passing through the Phoenix area in the winter months. It may last several days but is usually of low intensity. Because these fronts must first pass over the coastal mountains, much of their moisture is lost by the time they reach the Phoenix area.

Local Summer Thunderstorm. Commonly occurs in the months of July through October, although it could occur at any time of year. This type of storm covers comparatively small areas and usually is of high intensity rainfall. The duration is short, usually 3 hours or less.

Intermediate Regional Flood. A flood having an average frequency of occurrence of once in 100 years, although the flood may occur in any year or more than once in one year. It is based on statistical analyses of streamflow records available for the watershed and analyses of rainfall and runoff characteristics in the general region of the watershed.

Lesser Flood. A flood having an average frequency of occurrence of once in 50 years, although the flood may occur in any year or more than once in one year. Similar to the Intermediate Regional Flood, it is based on statistical analyses of streamflow records available for the watershed and analyses of rainfall and runoff characteristics in the general region of the watershed.



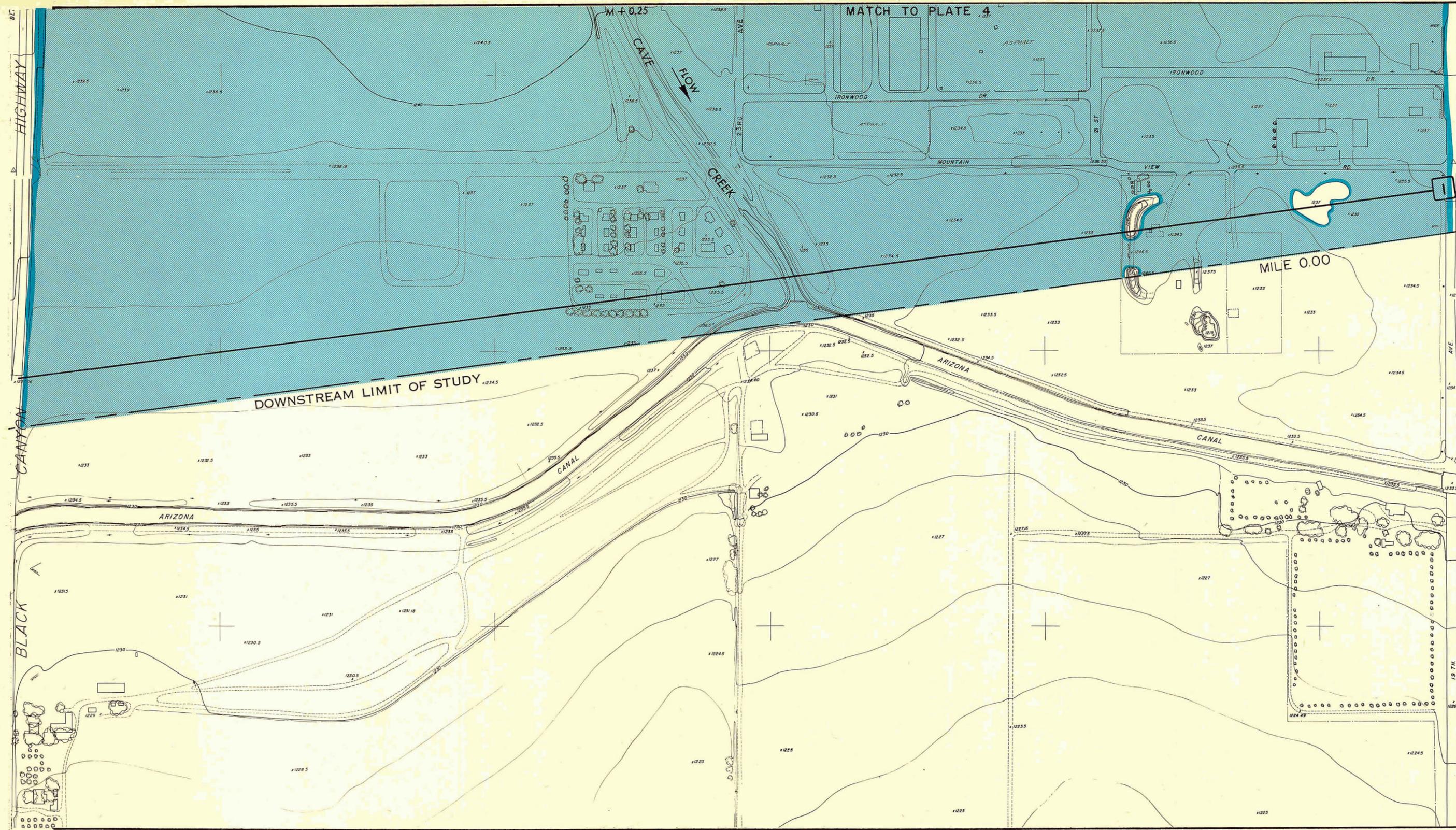
- LEGEND**
- STREAM
 - 1.25 MILES ABOVE ARIZONA CANAL.
 - AREA FLOODED BY INTERMEDIATE REGIONAL FLOOD.
 - 6 INDEX NUMBER OF PLATES.

NOTE:
 IMPROVED EARTH CHANNEL IS ASSUMED TO BE COMPLETE FOR THIS REPORT AS EXPLAINED IN THE TEXT.

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 LOS ANGELES DISTRICT, CALIFORNIA
FLOOD LIMIT AND INDEX MAP
 CAVE CREEK
 PHOENIX, ARIZONA

SCALE MILE

OCTOBER 1971



LEGEND:

OVERFLOW LIMITS

LESSER FLOOD

INTERMEDIATE REGIONAL FLOOD

M+ 2.50 --- MILES ABOVE ARIZONA CANAL

2 --- CROSS SECTION

400 --- GROUND ELEVATION IN FEET ABOVE MEAN SEA LEVEL

CONTOUR INTERVAL 2 FEET

NOTES:

LIMITS OF OVERFLOW INDICATED MAY VARY FROM ACTUAL LOCATIONS ON GROUND, AS EXPLAINED IN THE REPORT.

DATE OF TOPOGRAPHY OCTOBER 1967

BASE TOPOGRAPHIC MAPS FURNISHED BY CITY OF PHOENIX



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 LOS ANGELES DISTRICT, CALIFORNIA
FLOODED AREAS
 CAVE CREEK
 PHOENIX, ARIZONA

300 0 300
 SCALE --- FEET

OCTOBER 1971

MATCH TO PLATE 5



LEGEND:

OVERFLOW LIMITS

LESSER FLOOD

INTERMEDIATE REGIONAL FLOOD

M + 2.50 --- MILES ABOVE ARIZONA CANAL

2 --- CROSS SECTION

400 --- GROUND ELEVATION IN FEET ABOVE MEAN SEA LEVEL

CONTOUR INTERVAL 2 FEET

NOTES:

LIMITS OF OVERFLOW INDICATED MAY VARY FROM ACTUAL LOCATIONS ON GROUND, AS EXPLAINED IN THE REPORT.

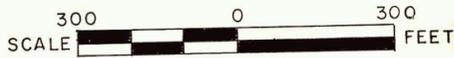
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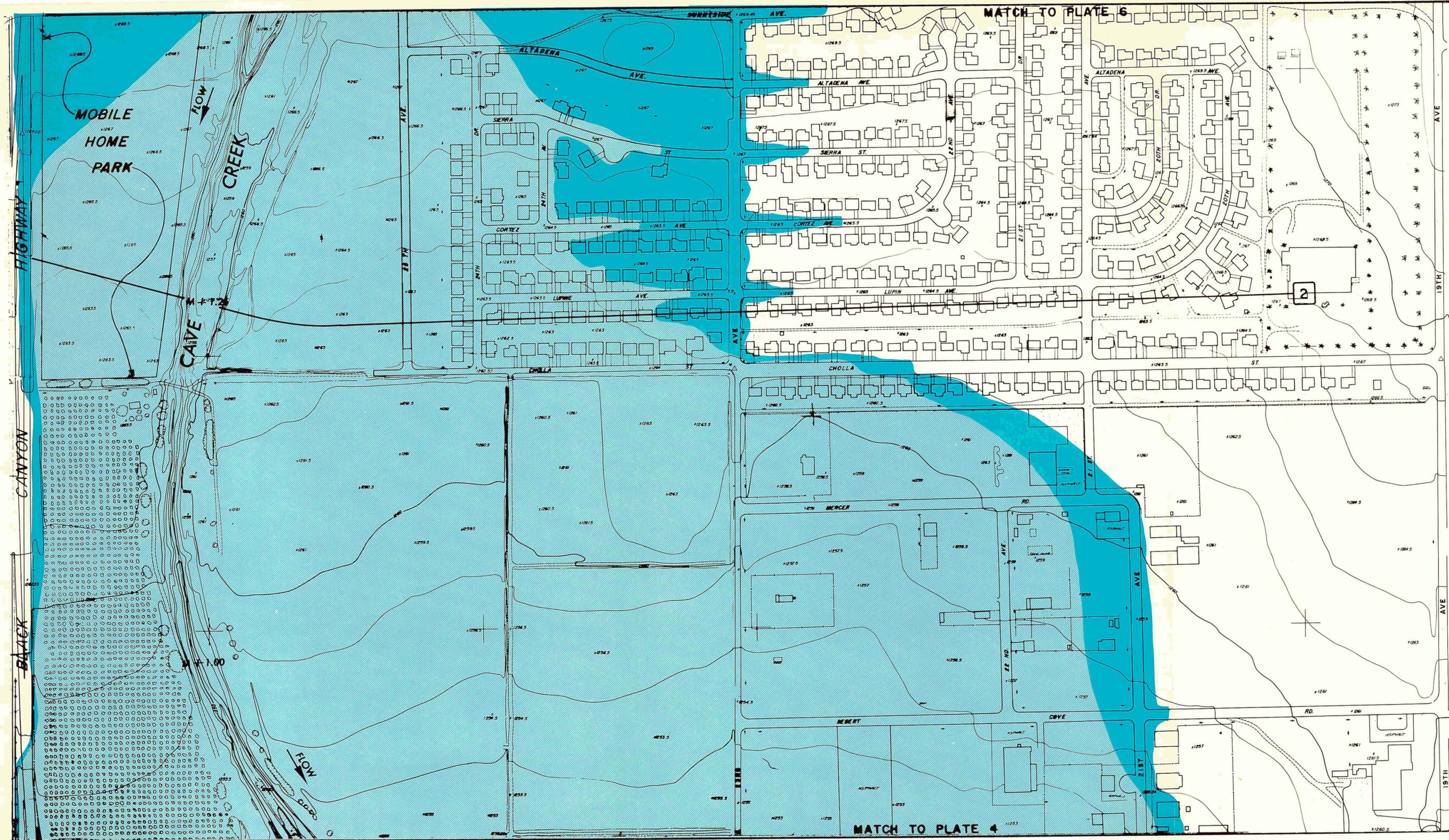
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LOS ANGELES DISTRICT, CALIFORNIA

FLOODED AREAS
CAVE CREEK
PHOENIX, ARIZONA

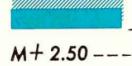
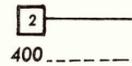


OCTOBER 1971

MATCH TO PLATE 3



LEGEND:

 OVERFLOW LIMITS
 LESSER FLOOD
 INTERMEDIATE REGIONAL FLOOD

M+ 2.50 --- MILES ABOVE ARIZONA CANAL
 CROSS SECTION
 400 --- GROUND ELEVATION IN FEET ABOVE MEAN SEA LEVEL
 CONTOUR INTERVAL 2 FEET

NOTES:

LIMITS OF OVERFLOW INDICATED MAY VARY FROM ACTUAL LOCATIONS ON GROUND, AS EXPLAINED IN THE REPORT.

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 LOS ANGELES DISTRICT, CALIFORNIA

FLOODED AREAS
 CAVE CREEK
 PHOENIX, ARIZONA

300 0 300
 SCALE --- FEET

OCTOBER 1971



LEGEND:

OVERFLOW LIMITS

LESSER FLOOD

INTERMEDIATE REGIONAL FLOOD

M+2.50 --- MILES ABOVE ARIZONA CANAL

2 --- CROSS SECTION

400 --- GROUND ELEVATION IN FEET ABOVE MEAN SEA LEVEL

CONTOUR INTERVAL 2 FEET

NOTES:

LIMITS OF OVERFLOW INDICATED MAY VARY FROM ACTUAL LOCATIONS ON GROUND, AS EXPLAINED IN THE REPORT.

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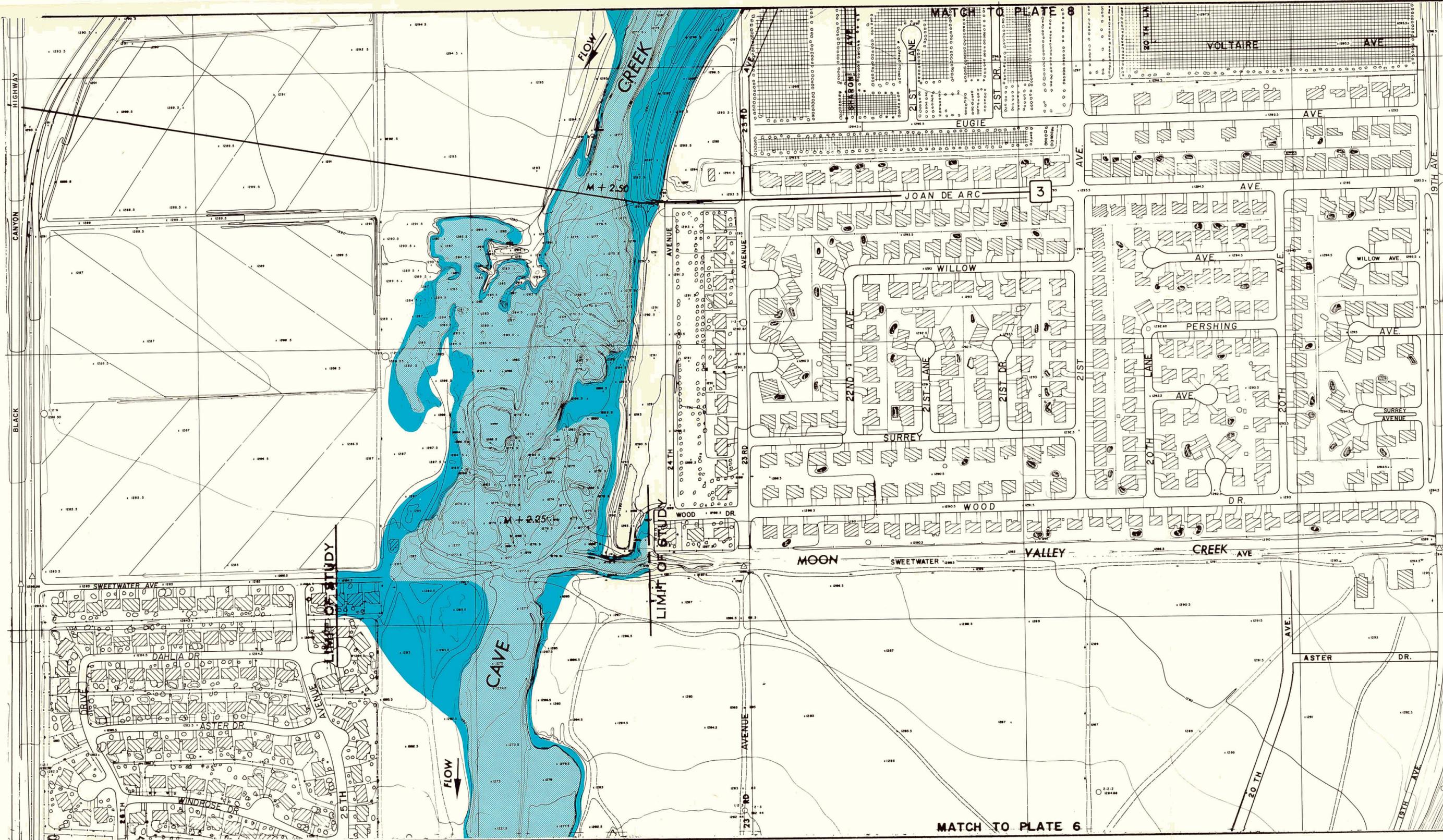


CORPS OF ENGINEERS, U. S. ARMY
 LOS ANGELES DISTRICT, CALIFORNIA

FLOODED AREAS
 CAVE CREEK
 PHOENIX, ARIZONA

SCALE 300 0 300 FEET

OCTOBER 1971



LEGEND:

INTERMEDIATE REGIONAL FLOOD
 LESSER FLOOD
 OVERFLOW LIMITS

M + 2.50 --- MILES ABOVE ARIZONA CANAL
 2 --- CROSS SECTION
 400 --- GROUND ELEVATION IN FEET ABOVE MEAN SEA LEVEL
 CONTOUR INTERVAL 2 FEET

NOTES:

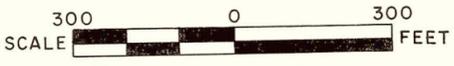
LIMITS OF OVERFLOW INDICATED MAY VARY FROM ACTUAL LOCATIONS ON GROUND, AS EXPLAINED IN THE REPORT.

DATE OF TOPOGRAPHY OCTOBER 1967

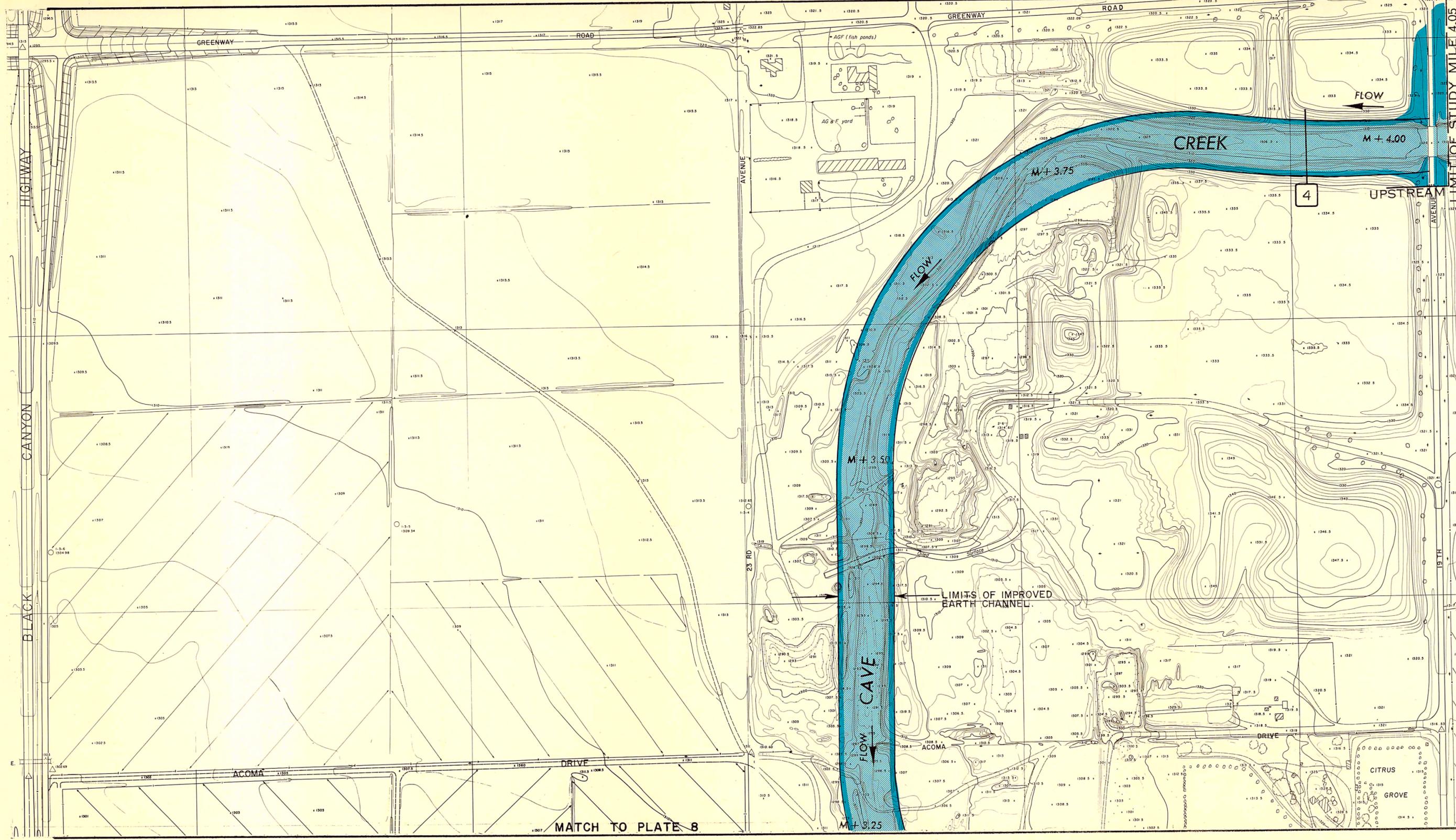
BASE TOPOGRAPHIC MAPS FURNISHED BY CITY OF PHOENIX



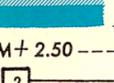
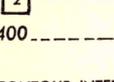
CORPS OF ENGINEERS, U. S. ARMY
 LOS ANGELES DISTRICT, CALIFORNIA
FLOODED AREAS
 CAVE CREEK
 PHOENIX, ARIZONA



OCTOBER 1971



LEGEND:

 OVERFLOW LIMITS
 LESSER FLOOD
 INTERMEDIATE REGIONAL FLOOD

M+2.50 --- MILES ABOVE ARIZONA CANAL
 --- CROSS SECTION
 400 --- GROUND ELEVATION IN FEET ABOVE MEAN SEA LEVEL
 CONTOUR INTERVAL 2 FEET

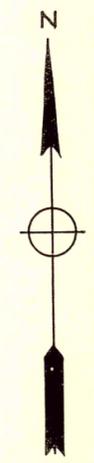
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DATE OF TOPOGRAPHY OCTOBER 1967

BASE TOPOGRAPHIC MAPS FURNISHED BY CITY OF PHOENIX

IMPROVED EARTH CHANNEL IS ASSUMED TO BE COMPLETE FOR THIS REPORT AS EXPLAINED IN THE TEXT.



CORPS OF ENGINEERS, U. S. ARMY
 LOS ANGELES DISTRICT, CALIFORNIA
 FLOODED AREAS
 CAVE CREEK
 PHOENIX, ARIZONA

300 0 300
 SCALE  FEET

OCTOBER 1971

MATCH TO PLATE 8

ELEVATION IN FEET ABOVE MEAN SEA LEVEL
DOWNSTREAM LIMIT OF STUDY & ARIZONA CHANNEL

1280
1260
1240
1220

0.5

1.0

1.5

MILES ABOVE THE ARIZONA CANAL

LEGEND
Intermediate Regional Flood. - - - - -
Lesser Flood. —————

Peoria Ave.

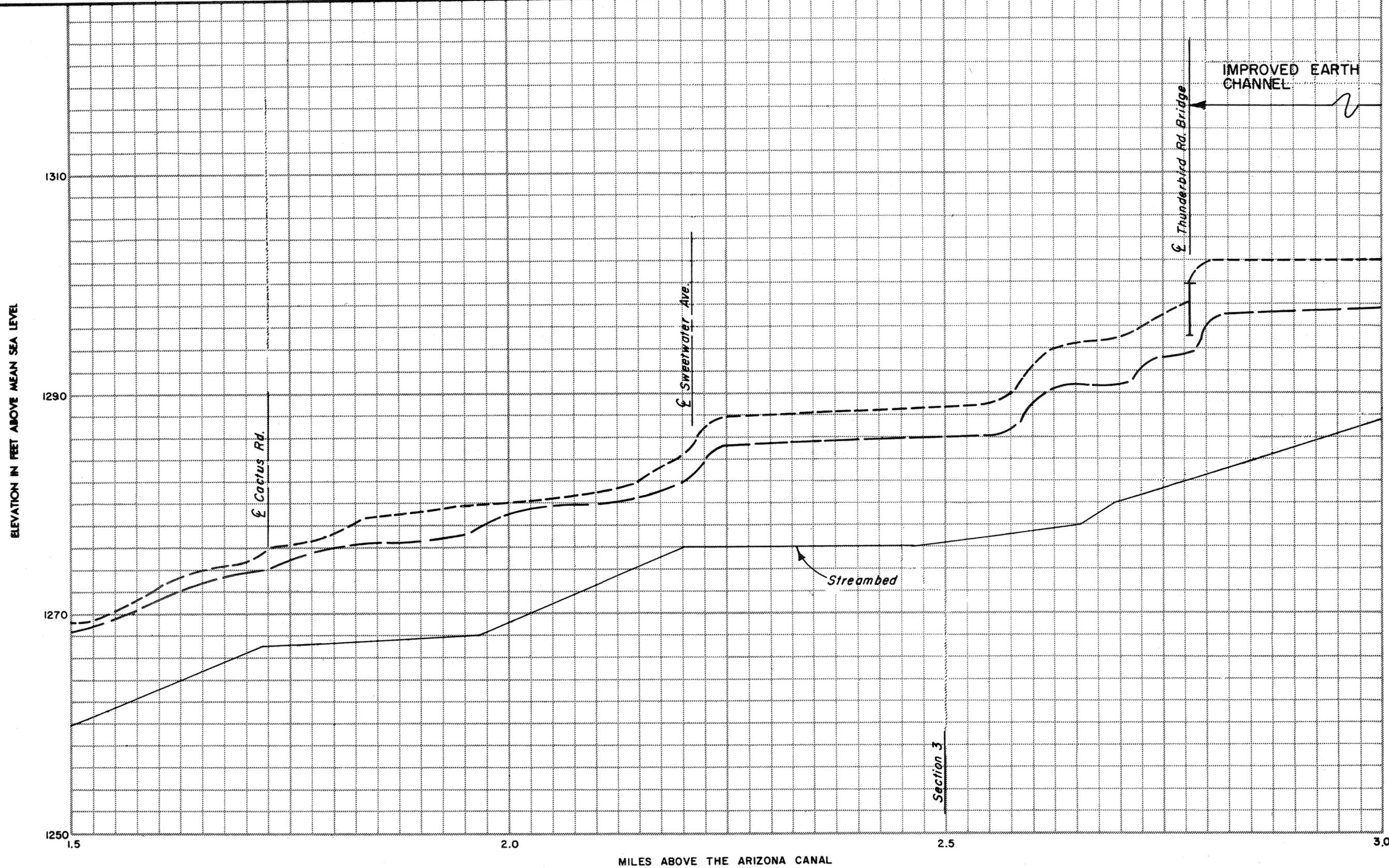
Cholla St.

Streambed

Section 1

Section 2

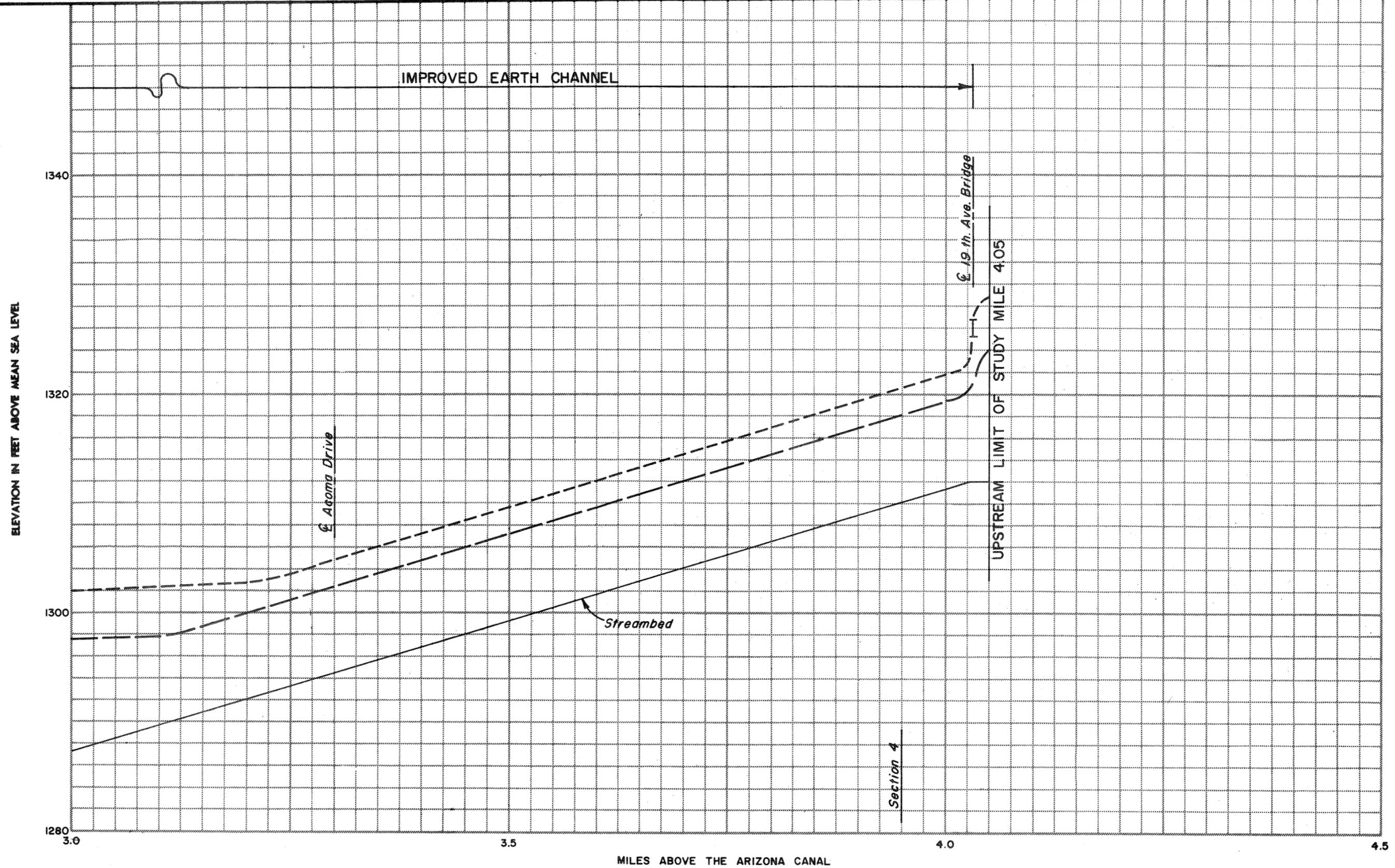
CORPS OF ENGINEERS, U. S. ARMY
LOS ANGELES DISTRICT, CALIFORNIA
FLOOD PROFILES
CAVE CREEK
PHOENIX, ARIZONA
OCTOBER 1971



LEGEND
 Intermediate Regional Flood. - - - - -
 Lesser Flood. ————

NOTE:
 IMPROVED EARTH CHANNEL IS ASSUMED TO BE COMPLETED FOR THIS REPORT AS EXPLAINED IN THE TEXT.

CORPS OF ENGINEERS, U. S. ARMY
LOS ANGELES DISTRICT, CALIFORNIA
FLOOD PROFILES
CAVE CREEK
PHOENIX, ARIZONA
OCTOBER 1971



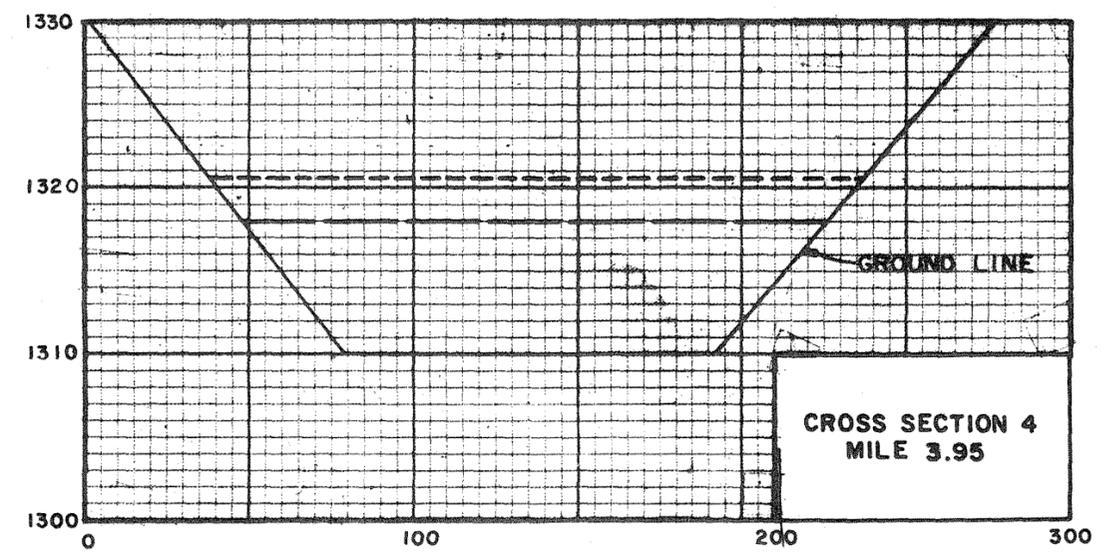
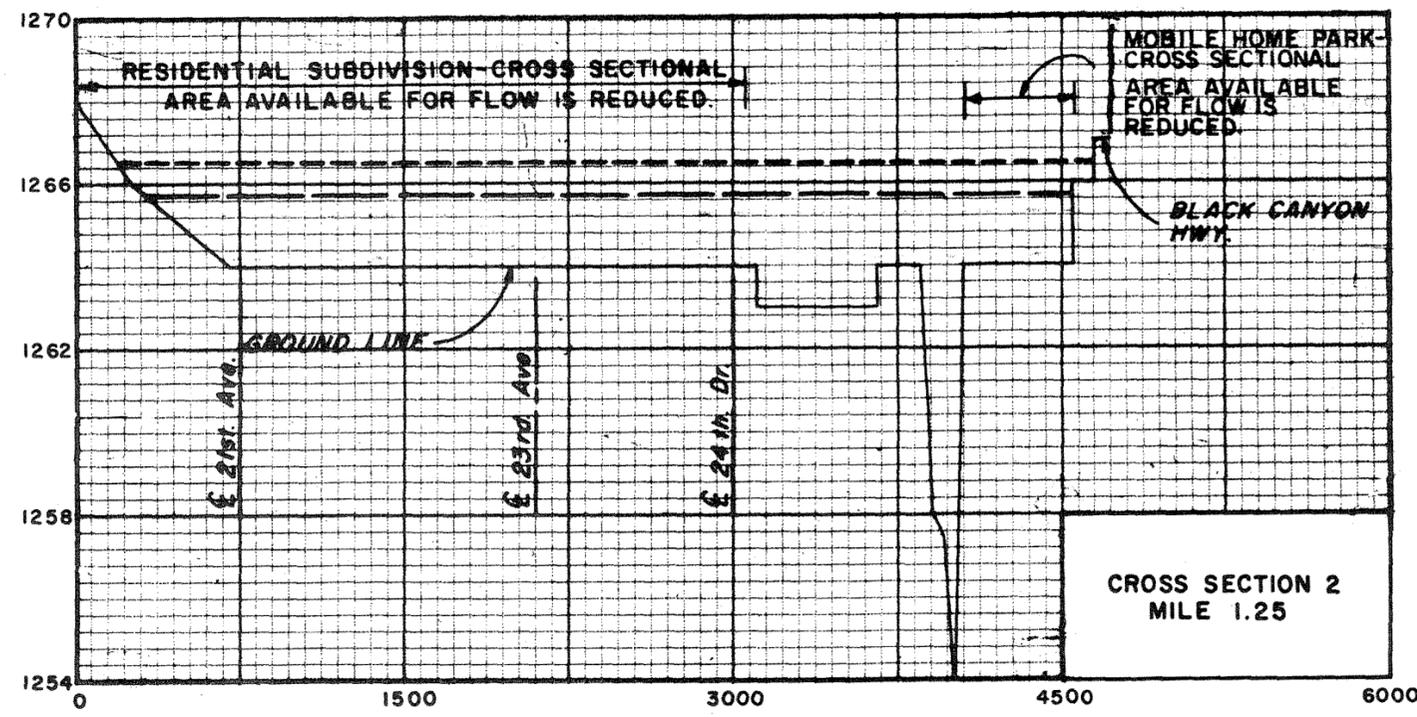
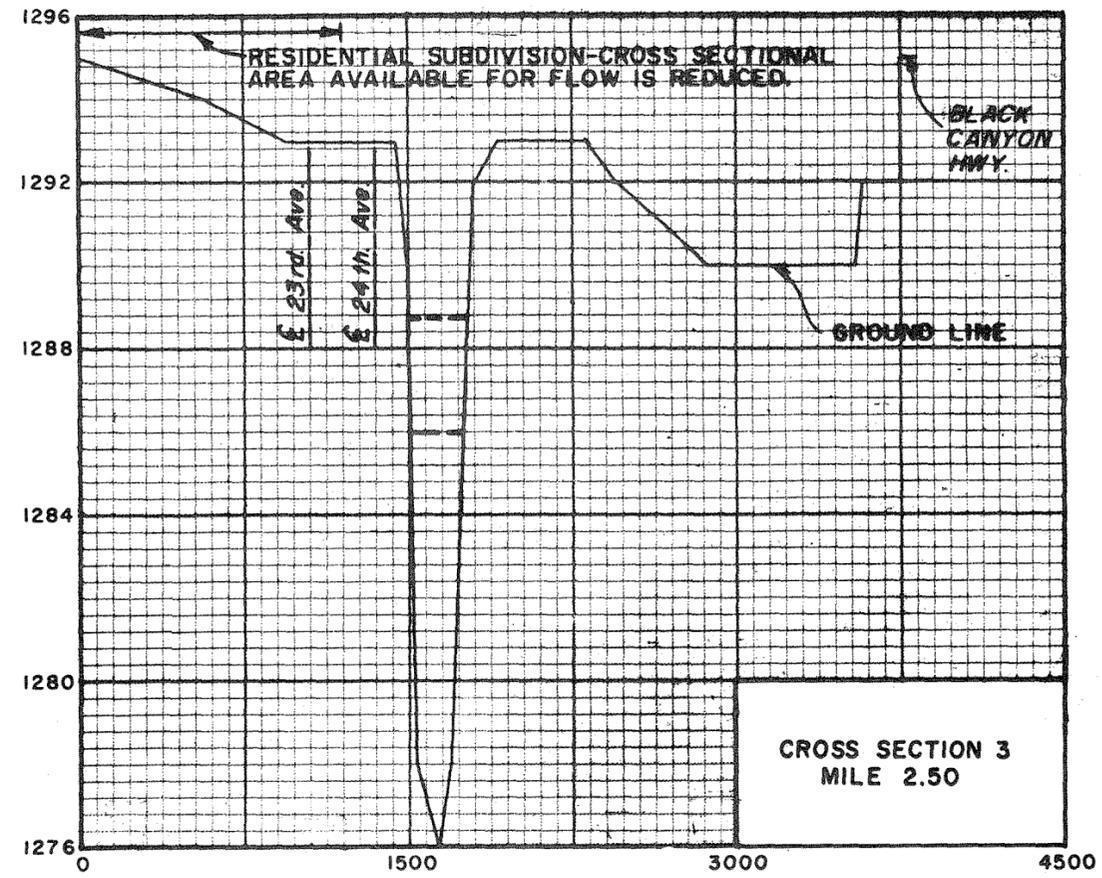
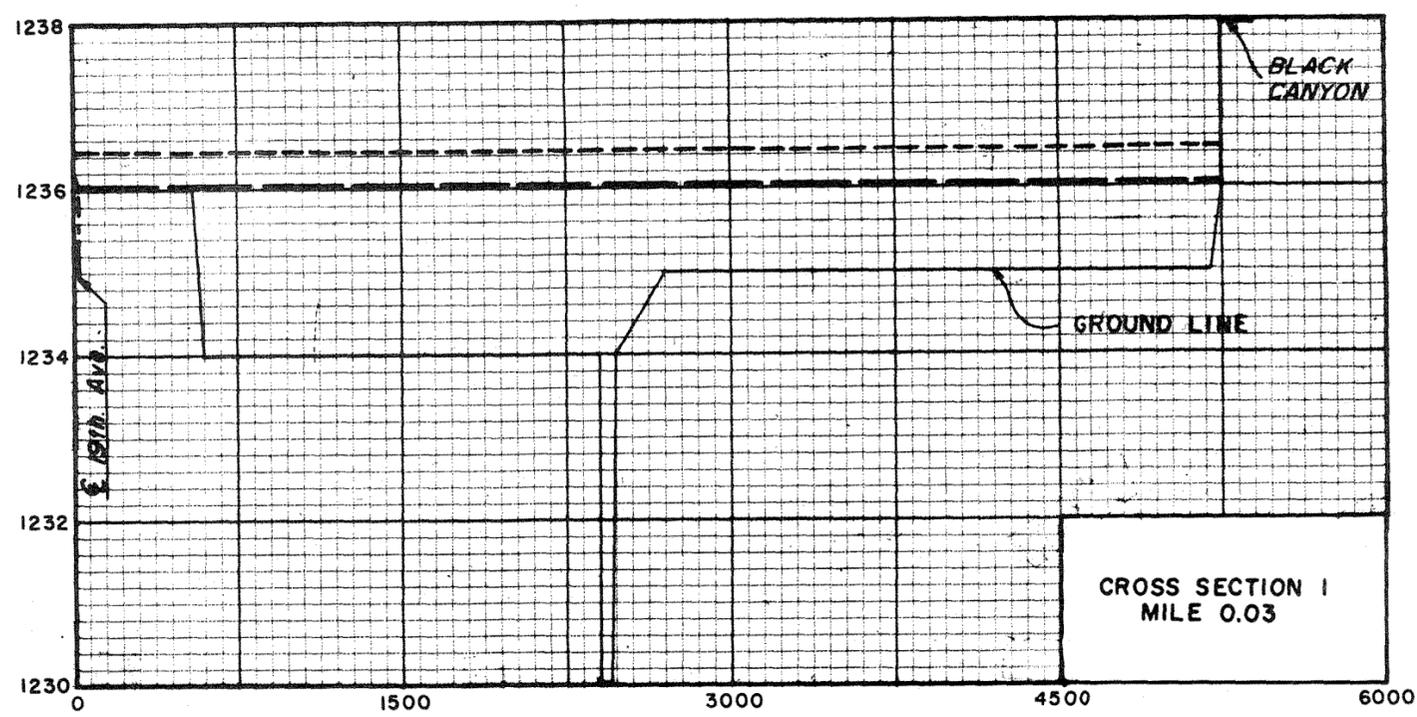
LEGEND

- Intermediate Regional Flood. -----
- Lesser Flood. _____

NOTE:
 IMPROVED EARTH CHANNEL IS ASSUMED TO BE COMPLETED FOR THIS REPORT AS EXPLAINED IN THE TEXT.

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 LOS ANGELES DISTRICT, CALIFORNIA
 FLOOD PROFILES
 CAVE CREEK
 PHOENIX, ARIZONA
 OCTOBER 1971

ELEVATION IN FEET ABOVE MEAN SEA LEVEL



LEGEND
 Intermediate Regional Flood. - - - - -
 Lesser Flood. - - - - -

NOTES:
 1. HORIZONTAL DISTANCE IN FEET.
 2. SECTIONS TAKEN LOOKING DOWNSTREAM.
 3. CROSS SECTION 4 REFLECTS SPECIFICATIONS FOR COMPLETED EARTH CHANNEL.

CORPS OF ENGINEERS, U. S. ARMY
 LOS ANGELES DISTRICT, CALIFORNIA
CROSS SECTIONS
 CAVE CREEK
 PHOENIX, ARIZONA
 OCTOBER 1971