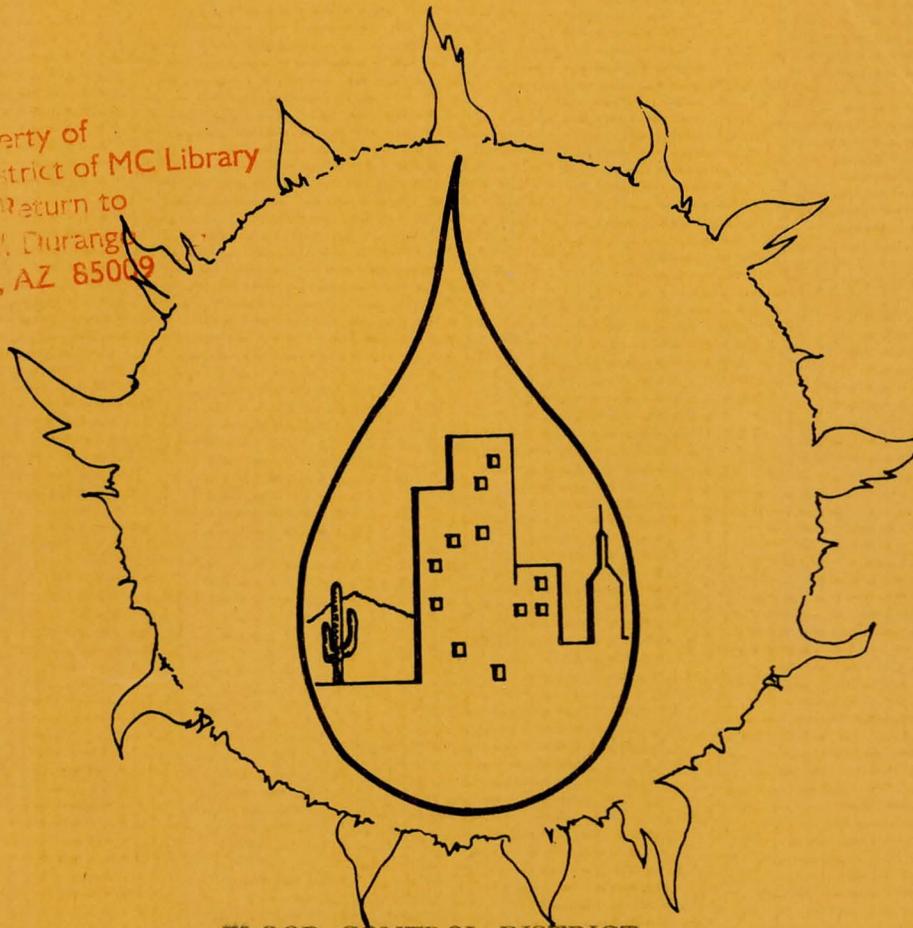


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**LOS ANGELES DISTRICT CORPS OF ENGINEERS
PHOENIX URBAN STUDY**

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- A Bibliography: Data and Report Sources
- B Comments on Plan of Study
- C Technical Report: Water and Wastewater
(Bound under separate cover)

GLOSSARY OF TERMS

The following terms and/or abbreviations are meant to reflect word meanings as they appear in the context of the main body of this Plan of Study report.

ACRE FOOT - The quantity of water required to cover one acre of land to a depth of one foot. Equivalent to 43,560 cubic feet or 326,000 gallons.

ADHS - Arizona Department of Health Services.

ADOT - Arizona Department of Transportation.

AQUIFER - A porous, water-bearing geologic formation. Generally restricted to materials capable of yielding an appreciable supply of water.

AWC - Arizona Water Commission.

BLM - U. S. Bureau of Land Management.

BOD - Biochemical oxygen demand. The amount of oxygen necessary for the decomposition of a material by microorganisms.

BOR - U.S. Bureau of Outdoor Recreation.

CC - Citizens Committee (organized for the Corps of Engineers "Phoenix Urban Study").

CFS - Cubic feet per second. A unit of measure of liquid past a given point, equal to one cubic foot in one second (also called second-foot).

CHLORINATION - To combine or treat with chlorine or a chlorine compound in order to destroy harmful microorganisms.

CHROMIUM (HEXAVALENT) - A lustrous metallic element used in alloy steels. Significant as a contaminant of drinking water as discussed in the U.S. Public Health Service Drinking Water Standards. Chromiums may be present in wastes from many industrial processes or discharged in chromium-treated cooling waters. The toxicity of chromium varies with the species, temperature, pH, its valence, and synergistic or antagonistic effects.

CONFLUENCE - The point at which a tributary converges or joins the main stream.

CONSUMPTIVE USAGE - See depletion.

CRITICAL GROUND WATER AREA - Any groundwater basin, or any designated subdivision thereof, not having sufficient groundwater to provide a reasonably safe supply for irrigation of the cultivated lands in the basin at the then current rates of withdrawal. (As defined in Arizona Revised Statutes, Section 45-301.)

DEPENDABLE SUPPLY - The estimated amount of water that can be depleted annually without lowering storage levels in either surface or groundwater reservoirs over a long period of time. As used in this report, the sum of surface water available for beneficial use, natural recharge, and basin import. (As defined by the Arizona Water Commission, Phase I Arizona State Water Plan, page 76.)

DEPLETION - The measure of the amount of water removed from the supply system for a use. Depletion is synonymous with the term consumptive use.

ELECTRODIALYSIS PROCESS - Dialysis in which electrodes of opposite charge are placed on either side of a membrane to accelerate diffusion. A process used to remove particulates from sewage effluent.

ENVIRONMENTAL QUALITY - The management, consideration, preservation, creation, restoration or improvement of the quality of certain natural and cultural resources and ecological systems. (As defined in Implementation of Principles and Standards, Engineering Regulation 1105-2-200.)

EPA - U.S. Environmental Protection Agency.

EPHEMERAL STREAM - A stream which flows only during and following a period of rainfall.

FLOCCULATION - A method of water treatment that forms aggregated or compound masses of particles. A chemical or flocculant, is added for producing flocculation of suspended particles.

FLOOD INSURANCE - Any insurance program designed to provide financial relief for damages incurred due to flooding.

FLOOD PLAIN - A belt of low, flat ground bordering a river or stream on one or both sides which is inundated when surface flows exceed the capacity of the natural channels.

FLOOD PROOFING - Consists of those adjustments, temporary or permanent, to a building or its contents, which are designed to keep water out or reduce effects due to inundation.

FLOOD WARNING - Any system of broadcasting an advance warning of possible flooding, to allow time to activate flood proofing devices or to evacuate a flood-prone area.

FLOODWAY - The portion of a flood plain required to carry and discharge the flood waters of a selected probability of occurrence storm with an insignificant (less than 1 foot) increase in flood-stage above that of normal conditions.

FLOODWAY FRINGE - The portion of a flood plain between the flood-way and the normal outline of the selected flood.

FLOWAGE EASEMENT - The acquired legal right to flood land owned by others.

FLUORIDIATION - The addition of fluorides (a salt of hydrofluoric acid) to the public water supply to reduce the incidence of tooth decay.

GEOCHEMISTRY - The study from the chemist's point of view of the chemical changes in the composition of the earth's crust.

GEOHYDROLOGY - The study from the hydrologist's viewpoint of the occurrence, circulation, distribution and properties of water in the earth's crust.

GPCPD - Gallons per capita per day.

HUD - U.S. Department of Housing & Urban Development.

INFILTRATION - (As applied to sewage collection systems.) The water entering a sewer system, including sewer service connections, from the ground, through such means as (but not limited to), defective pipes, pipe joints, connections and manhole walls.

INFLOW - (As applied to sewage collection systems.) The water discharged into a sewer system, including service connections from such sources as (but not limited to) roof leaders, cellar, yard and area drains from spring and swampy areas, manhole covers, cross connections from storm sewers and combined sewers, catch basins, storm waters, surface runoff, street wash waters or drainage.

INSTITUTIONAL ANALYSIS - For purposes of this study, determination of the capabilities of existing water resource management institutions in the study area, in order to effectively implement or permit the implementation of, alternative technical proposals developed. Institutions include (but are not limited to), organizations such as planning agencies, municipal water departments, irrigation districts, and all laws, processes, court decisions and relationships applicable to water resources.

MAG - Maricopa Association of Governments

MAG-TPO - Maricopa Association of Governments - Transportation and Planning Office.

NATIONAL ECONOMIC DEVELOPMENT (NED) - Increasing the value of the nation's outputs of goods and services and improving national economic efficiency (as defined in Principles and Standards E.R. 1105-2-200).

NON-POINT SOURCE - Generalized discharge of waste into a water system which cannot be located as to a specific source, (as outlined in Public Law 92-500). Examples are street runoff, leaching of fertilizers and pesticides from agriculture and animal wastes.

NON-CONSUMPTIVE USAGE - Water uses that do not reduce the water supply available for other purposes. The generation of hydro-electric power, fishing, boating and swimming are examples of water uses which in most instances do not reduce the available water to other uses.

OBERS - Bureau of Economic Analysis, U.S. Department of Commerce and the Economic Research Service, U.S. Department of Agriculture.

OCE - Office of the Chief of Engineers, U.S. Army Corps of Engineers.

100-YEAR FLOOD - That flood discharge which has a one percent chance of being equalled or exceeded in a given year.

OVERDRAFT - The amount by which pumpage of ground water exceeds the annual pumpage without permanent change in the storage in the ground water aquifer or basin.

PPM - Parts per million.

POINT SOURCE - Any discernible, confined and discrete conveyance, including (but not limited to) any pipe, ditch, channel, tunnel, conduit, well, fissure, container, rolling stock, or concentrated animal feeding operation, from which pollutants are or may be discharged.

RECHARGE - The water percolating to groundwater table, regardless of source.

RAC - Regional Advisory Committee (organized for the Maricopa Association of Governments citizen involvement program).

RIO SALADO PROJECT - A flood plain reclamation proposal for the Salt River bed and adjacent lands.

RIPARIAN - Living or located along a natural water course (stream or river) or lake.

SECTION 201 - The section in the Federal Water Pollution Control Act Amendments of 1972, (Public Law 92-500) that prescribes guidelines for the development and implementation of wastewater treatment facilities planning and construction.

SECTION 208 - The section in the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500) that prescribes guidelines for the development and implementation of areawide waste treatment management plans.

SECTION 303 - The section in the Federal Water Pollution Control Act Amendments of 1972, (Public Law 92-500) that prescribes guidelines for the development and implementation of basin wide waste treatment management plans.

SMSA - Standard Metropolitan Statistical Area.

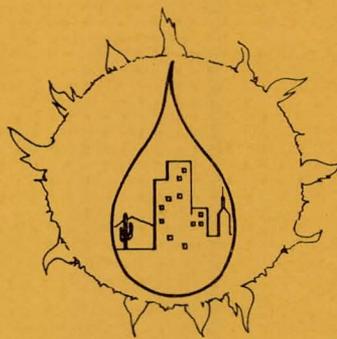
SPF - Standard Project Flood - The flood that may be expected from the most severe combination of meteorologic and hydrologic conditions that are considered reasonably characteristic of the region.

SUSPENDED SOLIDS - Solids which are not in true solution and which can be removed by filtration.

TC - Technical Committee/s) (for the Corps of Engineers' Phoenix Urban Study).

TDS - Total dissolved solids. The chemicals in true solution in water, usually expressed in milligrams per liter (mg/l) or parts per million (ppm).

WITHDRAWAL - The process of capturing or acquiring water either by diversion from a surface water source or by pumping from the ground-water basin (as defined by the Arizona Water Commission in Phase I of the State Water Plan, page 97).



Section I

JUSTIFICATION
FOR THE STUDY

A. Introduction

Water has probably been the single most important factor contributing to the phenomenal growth of the Phoenix metropolitan area. A century ago planners in the Salt River Valley were laying the groundwork to develop the limited water resources of the area so as to provide an adequate supply of water. In so doing they provided the single most feasible location for development of a large population center in the entire lower Colorado River Basin. However, the development which has resulted from the efforts of our predecessors in water resource planning has placed an even greater demand on available water resources. In some instances, the development is subject to flooding hazards which were not recognized at the time. In recognition of the need to extend and refine water resource planning, the U.S. Army Corps of Engineers has been requested to undertake the Phoenix Urban Study in cooperation with local authorities. This Plan of Study is the first step on the part of the Corps and local government to satisfy that request.

The purpose of this Plan of Study is to provide the necessary course of action for the development of a comprehensive water and water-related land resources development management plan that will be consistent with the comprehensive regional development plan for the Phoenix metropolitan area. This document is designed to be used by planners during the conduct of the study. Inasmuch as this document is a management tool, it may be changed from time to time as study plans are refined or revised.

The primary federal and local agencies participating in the Urban Study include the Environmental Protection Agency (EPA), the Maricopa Association of Governments (MAG), the Arizona Department of Health Services (ADHS), and Maricopa County. The Governor of the State of Arizona has designated MAG as the Public Law 92-500 Section 208 planning agency, and approval of this designation by EPA is currently pending. Preparation of this Plan of Study was coordinated with these and other federal, state and local agencies, special interest and citizen groups and the general public. The nature of the study dictates the continuous coordination with all agencies, groups and the general public. This document constitutes an inter-agency agreement by virtue of its approval by participating agencies.

B. Authority

This Urban Study was authorized by a resolution adopted July 31, 1973 by the Committee on Public Works of the United States Senate which states:

"That the Board of Engineers, created under the provisions of Section 3 of the River and Harbor Act approved June 13, 1902, be, and is hereby required to review with the Chief of Engineers pertinent reports pertaining to Maricopa County, Arizona, with a view to determining whether any modifications of the recommendations contained therein are advisable at the present time, with particular reference to providing a plan for the control, development, utilization, and conservation of water and related land resources of the Phoenix Metropolitan region, with due consideration for metropolitan planning activities in the area. Such study to include appropriate consideration of the needs for protection against floods, storm drainage improvement, wise use of flood plain lands, general recreation facilities, regional water supply, waste water management facilities, enhancement and conservation of fish and wildlife, and other allied measures for environmental enhancement and economic and human resource development to be harmonious components of comprehensive development plans for the metropolitan Phoenix region."

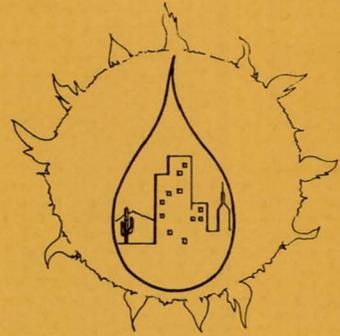
C. Program Objectives

The Corps, working in partnership with local and state government, will seek to develop a coordinated water resource management plan that will provide acceptable and implementable alternative solutions to water and water-related land resource problems in the area. Water resource plans formulated will be consistent with other urban programs and will be flexible to allow accommodation of changing social and economic conditions. Because this study will interface closely with water resource programs of other agencies, special attention will be devoted to insure this study does not duplicate the efforts of other agencies, but will serve as an extension and a coordination of these efforts. For example, the Soil Conservation Service's Buckhorn-Mesa Watershed Project or the Bureau of Reclamation's Central Arizona Project will not be restudied. Instead, the Corps will dovetail its Urban Study program with these and other federal, state and local planning efforts to address future and residual water resource problems which are not presently being studied.

The study will conform to the national objectives established by the Water Resources Council, Principles and Standards for Planning Water and Related Land Resources. These objectives require the formulation of a range of alternatives, one of which must optimize national economic development, and another of which will optimize the quality of the environment.

An early action water management plan as well as master plan for long range development will be formulated to provide options for growth by addressing problems and potentials associated with the following areas of concern:

- Flood damage reduction and flood plain management.
- Wastewater management.
- Conservation of storm and flood waters.
- Recreational planning related to water resource projects.
- Conservation of fish and wildlife resources.



Section II

STAGE 1 STUDY RESULTS

A. Stages of Plan Development

This study will be conducted over a 44 month period in three stages. This relatively short time frame is necessary for two reasons: First, to meet the requirements of Public Law 92-500 relating to water quality; and secondly, to keep the plan current in light of rapidly changing urban problems. Completion of the plan development stages by the dates listed below is contingent on receipt of full budget capabilities.

- Stage 1 - The Plan of Study. This stage is scheduled to be completed in November 1975 with the approval of this Plan of Study document by the Chief of Engineers. During this stage, the staff has identified the scope and objectives of the study as outlined in subsequent pages. These study objectives were aired during a public meeting held on 23 July 1975.
- Stage 2 - Development of Intermediate Plans. This stage is scheduled to be completed in September 1976. During Stage II, a more thorough analysis of the problems will be conducted and a preliminary range of solutions will be developed. These alternatives will be presented at a second public hearing in November 1976.
- Stage 3 - Development of Final Plans. This stage is scheduled to be completed in August 1978. During this final stage, implementable alternatives are selected and studied in sufficient detail to permit selection of the best plan. Any components of the plan to be recommended for construction by the Corps of Engineers will be identified and developed in sufficient detail to allow Congressional authorization. The final report of this study will be prepared and processed at the end of Stage 3.

PROPOSED MILESTONE DATES

- 1 23 Jul 75 Public Meeting.
- 2 Nov 75 Final Approval Plan of Study. Begin Stage II.
Receipt of approval from the Office of the Chief of Engineers (OCE) is sufficient authority to begin Stage II.
- 3 Not applicable.
- 4 Sep 76 Checkpoint I Conference. This conference with South Pacific Division (SPD) and OCE is to discuss the adequacy of alternative development. This meeting marks the end of Stage II and the beginning of Stage III.
- 5 Nov 76 Public Meeting. This meeting will be held to present the alternatives and select those requiring detailed study.
- 6 Nov 77 Checkpoint II Conference. This conference is held with SPD personnel to discuss and resolve plan formulation and study problems. It may be desirable to request representation from OCE.
- 7 Mar 78 Submit Draft of Final Study Report. A detailed description of this report is presented in Part 1 Chapter 5 of the Proposed Policies and Procedures for the Urban Studies Program published in the Federal Register, Vol. 39, No 130, dated 5 July 1974.
- 8 Apr 78 Complete Division Review of Draft. Division finishes review of draft report and submits written comments.
- 9 Jun 78 Final Public Meeting. This meeting is to be held after detailed studies but before report completion. Findings and recommendations will be included in the final document.
- 10 Jul 78 Submit Final Study Report. The final report is endorsed by the District to SPD.
- 11 Aug 78 Division Engineer Public Notice. The final report is endorsed by SPD to the Board of Engineers for Rivers and Harbors. The Division Engineer issues public notice.

B. Identification of the Study Area

1. Geographical Area

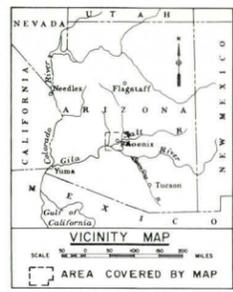
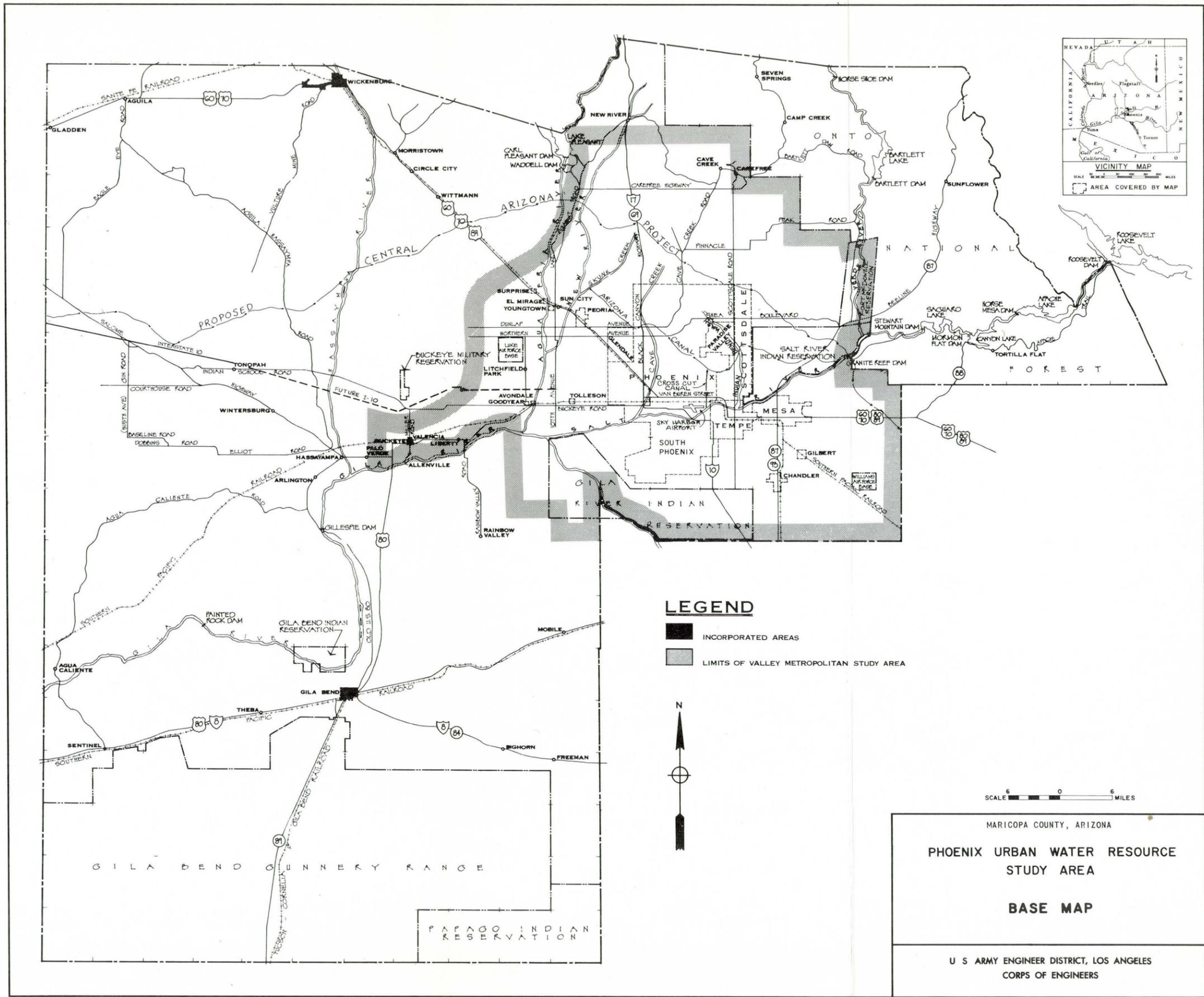
The boundary of the study area was selected so as to include those cities and communities that are presently within, or are expected in the next 50 years to be within the contiguous metropolitan area and whose water resource problems are inter-related. Plate 1 is a map of the Valley metropolitan study area which indicates the geographical limits of the Phoenix Urban Study.

The following factors and a multitude of other information was carefully assessed in order to establish each study area boundary.

The northerly and westerly study boundaries were selected based on the growth projections developed by individual communities and the Maricopa Association of Governments. These projections generally indicate urbanization will not exceed this study boundary within the temporal scope of this study (year 2020). Existing communities on the northwest which are now or are expected to become part of the contiguous urban area are included within the study boundary. The northeasterly study border follows the Tonto National Forest boundary to its intersection with the Maricopa County line. Because of existing land use plans, projected growth trends and planned land sales (on the National Forest) it was not deemed necessary to cross the Forest Service or county boundary lines. The county line serves as the south and southeasterly boundary. The study area extends to Palo Verde Road on the west to include the town of Buckeye. Though this area is predominantly agricultural, specific water resource problems exist that affect the urban area, and urban growth is expected to continue in this area as a result of various incentives, i.e. the availability of land and the future availability of transportation (Interstate 10 Freeway).

The area enclosed by the boundary is approximately 2,300 square miles. The five major cities in this area include Phoenix, Mesa, Scottsdale, Tempe and Glendale which together account for about 93 percent of Maricopa County's population. The metropolitan area is located in the south central part of Arizona and in the center of the Salt River Valley.

The United States censuses of 1960 and 1970 developed the concept and defined the boundaries of Standard Metropolitan Statistical Areas (SMSAs). These SMSAs are comprised of whole counties with a central city whose population is 50,000 or more, and where the entire area of the SMSA is economically or socially integrated. Maricopa County is one such SMSA. There is some rationale for adopting the limits of the SMSA as the boundary for this study, not only for the sake of consistency with other planning efforts but also because many of the water resource problems of the outlying



areas need to be addressed. Particular consideration was given to the possibility of including the towns of Wickenburg and Gila Bend. The Urban Study program, however, is intended to encompass urban areas only, and it was determined that the authority for this study precludes extending the study significantly beyond the geographical limits reflected in this Plan of Study. This is not intended to relegate the problems of these non-urban areas to a lesser priority, but only to identify the geographical bounds of the authority for this study.

2. Physical Characteristics

a. Topography and Drainage. The Salt River Valley is predominantly a flat desert alluvial valley ringed by rugged mountain ranges. Hills and buttes with steep gradients (10% slope or greater) rise as distinctive landmarks within the otherwise flat basin that encompasses the urban study area. The dominant mountains within the study area are South Mountain, the Phoenix Mountains and the McDowell Mountains. The mountain ranges around the perimeter of the study area include the following: the Sierra Estrella Mountains to the southwest; the White Tank Mountains on the west; to the north the Hieroglyphic and New River Mountains; the Superstition and Goldfield and Mazatzal Mountains to the northeast, rise sharply in some places to above 7,000 feet; the Santan and Sacaton Mountains are on the southeast and rise slightly above 3,000 feet. All of these ranges are virtually uninhabited.

The Salt and Agua Fria Rivers and their tributaries provide drainage for the northern and eastern mountain ranges. The Salt River has a drainage area of 16,040 square miles, and the Agua Fria basin drains a 2,340 square mile area. Within the study area tributaries of the two rivers include New River, Skunk Creek, Cave Creek, Indian Bend Wash, Verde River and innumerable washes and arroyos. The Salt and Agua Fria converge with the Gila River in the southwestern corner of the study area. Both the Salt and Agua Fria Rivers are ephemeral waterways that are dry year-round with the exception of periodic flooding or releases from the mountain reservoirs northeast of the Valley. Both the Salt and Agua Fria Rivers are tributaries of the Gila River, the largest drainage area tributary to the lower Colorado River.

Elevations above the mean sea level in the study area range from 910 feet at the confluence of the Agua Fria and Gila Rivers, to about 5,000 feet in the mountains north of Phoenix.

b. Climate. The climate in the study area is a warm, arid desert type climate with low annual rainfall and low relative humidity. Summers are usually long and hot, winters short and mild with gradual temperature transitions in the spring and fall

seasons. The mean annual temperature is 70 degrees, with daily average maximums and minimums of 66 and 37 degrees respectively during the winter, and 102 and 71 degrees respectively during the summer. The average annual precipitation for the entire drainage area is 11.4 inches, but in Phoenix it is only 7.2 inches annually. Rainfall amounts have varied from less than three inches in 1953 to almost 20 inches in 1905. Snow rarely falls on the desert floor and when it does it usually melts almost as soon as it hits the ground. A significant amount of the water in the reservoirs to the north and northeast of Phoenix is derived from melting snow from mountains north and northeast of the study area. Predicted values of spring runoff are based largely on the snow depth of elevations above 7,000 feet in the upper watershed of the Salt and Verde Rivers.

c. Vegetation and Wildlife. The vegetation of the Phoenix area falls mainly within the Sonoran Desert. This vegetation occupies the lowest, most arid areas and extends to altitudes of about 3,000 feet where the terrain is gentle, and about 4,500 feet on steep slopes. The natural plant life of the area can be classified into three types of communities: desert wash or riparian, desert outwash plain, and desert upland. These natural plant communities still exist on the perimeters of the urban area; on the steep slopes and mountain tops; and along arroyos, washes and major drainageways.

Urban development, irrigated agriculture, domestic grazing, and offroad vehicles have eliminated or altered much of the natural plant communities that historically occurred in the Phoenix area.

Agricultural crops, which consist of field and seed crops (cotton, milo, barley, sorghum and alfalfa), vegetables, fruit (citrus and grape) and nut crops account for most of the vegetation from the urbanized area west to the Buckeye-Avondale area. Remnants of citrus groves throughout the urban area suggest the expansion of the urbanized area into formerly productive agricultural lands.

The largest number and greatest diversity of desert fauna within the study area appear to occupy the desert wash and upland habitats north of Phoenix. Although desert wildlife species are adapted to very dry conditions, most species depend on some free water. The riverbeds attract and concentrate animal populations at various times depending on the availability of food, water and cover. Areas of intensive urban development and agricultural activity usually have a limited wildlife diversity and abundance, although some bird species flourish around agricultural areas.

d. Natural Resources. As previously stated, the study area includes natural vegetation and wildlife resources, as well as areas of undeveloped open space, all of which are considered important resources worthy of continued preservation and enhancement. Supplies of ground water, surface water and fertile land attracted settlers to this region and continue to serve as vital resources.

The vast archeological resources found within the study area, which help to document the vanished Hohokam Indian culture, can be classified as another of the region's "natural" resources.

Clean air is another attribute of the region. The atmospheric conditions in the study area are typified by clear skies and dry air. Unfortunately these atmospheric conditions tend to favor the development of temperature inversions. When combined with periods of weak winds or stagnant air, these inversions permit pollutants to accumulate in the Valley. Maricopa County has been identified by the State as an Air Quality Maintenance Area (AQMA) due to the fact that current air quality or projected growth rates indicate a potential for exceeding national ambient air quality standards within the next 10 years.

Natural resources whose exploitation would significantly impact the water use, land use or economy of the study area - either favorably or adversely, include sand and gravel, mica, miscellaneous clay and shale, and halite.

Sand and gravel occurs in recoverable concentrations in the Salt River channel. This resource may be limited in the future because of the vast quantities of aggregate materials used by the construction industry and the conflict with future recreational use (described later in the Plan of Study) planned for the Salt River channel.

Other significant mining activities include scrap mica, which is mined near Buckeye, and miscellaneous clay and shale used for manufacturing building bricks.

The nonmetallic mineral halite (common salt) has been discovered in wells located approximately 20 miles west of Phoenix. This resource has the potential of being exploited as a raw material for the chemical industry, or as in other areas of the country, underground salt caverns have been utilized as storage facilities because of the controlled climate conditions.

3. Socio Economic Profile

a. Population. Maricopa County, which coincides with the Phoenix Standard Metropolitan Statistical Area (SMSA), is one of the fastest growing areas in the United States, and one of the major centers of economic activities in the Southwest. It is one of the few metropolitan areas of the nation that has continued to grow in recent years. Arizona, as a whole, is the third fastest growing state in the nation, surpassed only by Florida and Hawaii.

The population of Maricopa County, of which about 93 percent is presently in the Phoenix metropolitan area, has increased from 187,000 in 1940 to 1,173,000 people in 1974, a 630 percent increase. This represents an annual growth rate of 5.6 percent since 1940.

Contributing to the population growth are the migration to the west and the increasing importance of manufacturing and industrial operations in the area. Two major military air bases, Luke Air Force Base and Williams Air Force Base, were developed during World War II and contributed to the growth rate by introducing thousands of servicemen to the area, many of whom returned following the war. Climate, job opportunities, nearby major recreational facilities and a strong retirement appeal have contributed to the population surge in the area. The advent of large scale air conditioning in the mid 1950's coincides with a surge in the growth rate, and has certainly been a big factor contributing to the appeal of the Phoenix area. To accommodate this growth, the metropolitan area has expanded outward, absorbing smaller neighboring communities.

The following table (Table 1) presents the population of the county and its five major cities for the years 1950, 1960, 1970 and 1974.

TABLE 1
POPULATION

<u>Year</u>	<u>Maricopa County</u>	<u>Phoenix</u>	<u>Glendale</u>	<u>Mesa</u>	<u>Scottsdale</u>	<u>Tempe</u>
1950	331,770	106,818	8,179	16,790	2,032	7,684
AGR*	7.18	15.19	6.74	7.24	17.31	12.47
1960	663,510	439,170	15,696	33,772	10,026	24,897
AGR*	3.85	2.85	8.72	6.41	21.07	9.82
1970	968,487	581,562	36,228	62,853	67,823	63,550
AGR*	4.91	6.76	15.74	7.99	4.21	11.44
1974	1,173,000	755,600	65,000	85,487	80,000	98,000

*Annual Growth Rate.

The Urban Study will utilize projections issued by the Arizona Department of Economic Security (DES). DES has been designated by the Bureau of the Census and the Governor of the State of Arizona as the official estimator for the state. Population estimates by DES maintain a "moderate" annual growth rate of 2.96 percent by the year 2000. This contrasts with the OBERS*, Series C predictions of 1,931,000 for the county by the year 2000, which amounts to an annual growth rate of 1.94 percent. Maricopa Association of Governments projects a population of 3,100,000 by the year 2000, which amounts to an annual increase of 3.95 percent. These and other county population projections are summarized in Table 2 and graphically illustrated in Figure 1.

-Racial Composition. The racial composition of Maricopa County in 1974 was 94.9 percent White, 3.3 percent Black and .64 percent of other ethnic origin according to a report by the Department of Economic Security. Of the "White" population, 14.6 percent are Spanish-American, the largest ethnic group in the metropolitan area. These racial distributions are essentially the same as reported in the 1970 census.

According to the Arizona Commission of Indian Affairs, 1975 Tribal Directory, population estimates for the three Indian reservations are as follows: Fort McDowell Indian Community, 340; Gila River Indian Community, 8,330; and Salt River Indian Community, 2,750 persons.

According to a 1975 consumer survey, "Inside Phoenix," communities within Phoenix where more than 25 percent of the area residents are members of racial groups include: South Phoenix, essentially that area south of the Salt River; the Inner City area; the Sky Harbor (Airport) area; and the area bordering the Maricopa and Black Canyon Freeways. Generally these same racially distinct areas have similar, distinct economic characteristics, that is a lower median income than the urban average.

-Education. According to the 1970 census, 39.9 percent of the total population over 25 years of age had less than a high school education; 60.1 percent were high school graduates; and 12.8 percent were college graduates. In the Phoenix SMSA the median education for Whites was 12.3 years; for Blacks, 9.6 years; and for Spanish-Americans, 8.8 years.

*U.S. Department of Commerce, Bureau of Economic Analysis and the U.S. Department of Agriculture, Economic Research Service.

TABLE 2
 SUMMARY COMPARISON OF POPULATION PROJECTIONS
 FOR MARICOPA COUNTY

	<u>OBERS SERIES E</u>	<u>OBERS SERIES C</u>	<u>OEPAID*</u>	<u>MAG</u>	<u>DES***</u>
1950	331,770			331,770	331,770
1960				663,510	663,510
1970	968,487			968,487	968,487
1975			1,233,364	1,373,730**	1,230,000
1980	1,288,700	1,328,000	1,545,473	1,752,896	1,478,000
1985	1,447,200		1,902,438	2,054,765	1,701,000
1990	1,625,100	1,664,100	2,345,213	2,391,998	1,923,000
1995			2,892,876	2,726,093	2,129,550
2000	1,886,400	1,930,900	3,579,791	3,099,813	2,325,600
2020	2,346,200	2,539,000			3,240,000

1950-1970 figures from U.S. Census Bureau.

* Source: Office of Economic Planning and Development's ATOM II Model, January, 1975.

** Maricopa County Planning Department, January, 1975, estimate is 1,297,000.

*** Source: Department of Economic Security (official estimator for Arizona) as of March 6, 1975.

MARICOPA COUNTY POPULATION GROWTH AND COMPARATIVE FORECASTS

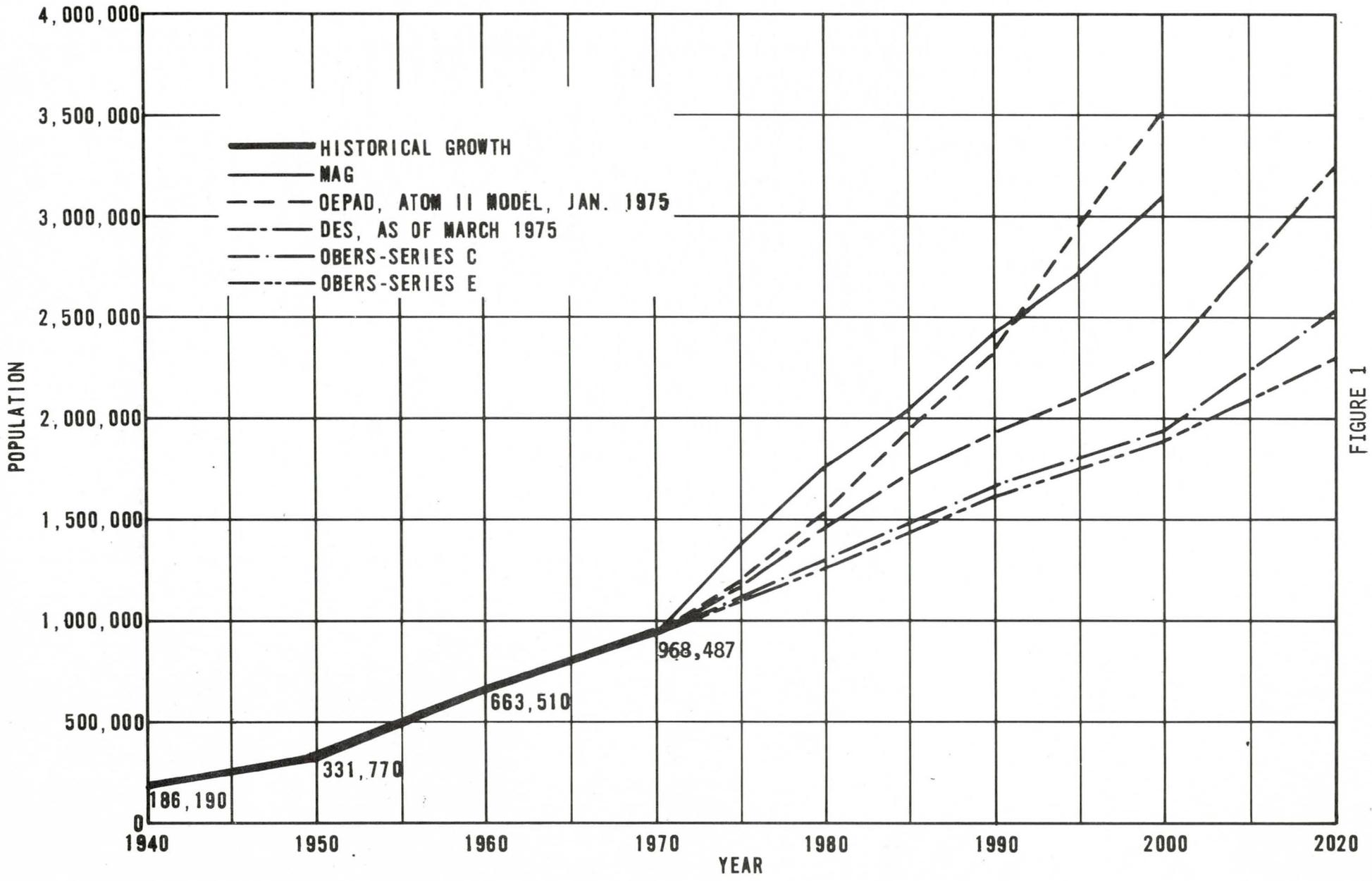


FIGURE 1

-Age. Although the average median age for Maricopa County was estimated at 26.7 years in 1970, this average masks an incredible diversity of age groups spread geographically throughout the metropolitan area. For example, the median age in the Sun City development area is 65.3 years, whereas in the Sky Harbor (Airport) district near the inner city, the median age is only 18.4 years, according to a 1974 consumer survey.

b. Employment. The county's employment picture has been shifting from one of agriculture to one of non-agriculture during the last decade. The county's warm and dry climate led to an influx of tourists and retirees, which play major roles in creating employment in the trades and service industries. About half of the current employment in the county is in these industries. The manufacturing industries, especially in electronics, has been growing at a rapid rate because of the county's climate as well as its central location in the southwest. Employment in government accounts for about 17 percent of the total employment, since Phoenix contains most of the state offices as well as extensive Federal facilities.

Construction activities have boomed during the last decade because of the influx of residents and visitors, but the industry is currently suffering from a serious lag as a result of economic conditions. Agriculture, although it plays a minor role in employment, plays a major part in the economy of the county. The county is the largest producer of agricultural products in the state and in 1972 ranked fifth in the United States in dollar value of agricultural output. However, agricultural production is expected to further decline in the future if the current trend continues wherein the urban demand for land and water outbids the agricultural demand. Mining industries also provide a minor role in employment, although sand and gravel operations in the county produce more than one-third of the production for the state. Employment by major categories for Maricopa County for 1964 and 1974 is given in the following table.

TABLE 3

EMPLOYMENT TRENDS IN MARICOPA COUNTY

<u>Type of Employment</u>	<u>Actual number 1964*</u>	<u>Estimated number 1974**</u>	<u>% Increase 1964-1974</u>
Agricultural	19,300	13,200	-32
Non-agricultural	255,100	464,900	+82
Wage & salary	221,300	435,800	+97
Manufacturing	44,500	84,500	+90
Mining & Quarrying	100	400	+300
Contract construction	16,700	32,500	+95
Transportation, communications & public utilities	13,500	20,800	+54
Wholesale & retail trade	56,900	112,200	+97
Finance, insurance & real estate	14,900	31,200	+109
Services & miscellaneous	35,800	77,000	+115
Government	38,900	77,200	+98
Other***	33,800	40,800	+21

*Source: Arizona Department of Economic Security

**Source: Corps of Engineers projection based on OBERS population and Arizona Department of Economic Planning & Development participation rates.

***Includes self-employed and unpaid workers

c. Income. Over 60 percent of the households in metropolitan Phoenix earned in excess of \$10,000 in 1974, (an appreciable increase from the 54 percent in that income bracket in 1972). The median income in the study area in 1974 was \$11,960 according to an annual Valley consumer survey. The household income varies drastically by geographic location, ranging from the highest median income of roughly \$24,000 in Paradise Valley, to the lowest median family income of under \$5,000 in the inner city and Sky Harbor districts.

Other areas of concern within the urban study boundary include three Indian reservations. The 1970 Census reported the median family income on the Gila River Indian Reservation to be \$946. On the Fort McDowell and Salt River Reservations the 1970 median family income was \$4,780. For comparative purposes, the 1970 Census reported the median income of the total Phoenix SMSA to be \$9,856.

In 1969 about 11.9 percent of the County population was below the poverty level, a figure which compares with 10.7 percent nationally. The overall jump in median income can be attributed mostly to the accelerated cost of living in the region. The average cost of living for a family of four in 1973 was \$12,150; the 1974 cost of living was estimated to be \$13,970 - still below the national average of \$14,333, but a 15 percent increase over 1973 living costs. The Phoenix living costs are calculated annually by the Arizona State University Bureau of Business and Economic Research.

d. Housing. An October 1974 inventory of housing units indicated that 481,400 dwelling units were available in the metropolitan area. The overall occupancy rate for these units was 93 percent, but for the past few years vacancy rates for townhouses and large apartment complexes have been running excessively high, i.e. townhouses in October 1974 had a vacancy rate of approximately 16 percent. Considerable diversity exists in the type of housing available in the Phoenix area - 299,200 single family dwelling units, 104,500 multiple dwelling units, 26,900 townhouses and 50,800 mobile home pads. The median age for all homes in the Phoenix area last year was 11.8 years. According to the housing inventory survey, approximately 34 percent of the homes were less than 5 years old, 32 percent were between 6 and 15 years old, and 34 percent were more than 15 years old.

Housing conditions for the three Indian communities within the study area are being upgraded with the advent of community and government sponsored housing programs. But generally a much higher percentage of the housing on the reservations is considered substandard in comparison to general housing conditions for the Phoenix area. Studies made within the last five years by the Bureau of Indian Affairs indicate many dwellings on the Salt River and Gila River Indian communities were considered either in need of repair to bring the housing up to standard, or in such poor physical condition that replacement was required.

According to the 1970 Census, the median value of the 186 housing units on the Gila Reservation and the 217 Salt River Reservation homes was \$5,000. The 57 dwellings on the Fort McDowell Reservation were given a median value of \$12,100. The homes on the Salt and Gila reservations are situated in predominantly agricultural or undeveloped surroundings. The housing layout of the Fort McDowell Community is clustered. It should be noted that if constructed, the proposed Orme Dam (a portion of the Central Arizona Project) will inundate the present Ft. McDowell village site.

e. Land Use. The Phoenix metropolitan area's continual outward expansion during the last 20 years has absorbed smaller neighboring communities, thus forming an extensive contiguous urban area. This growth resulted in the rapid development of Scottsdale and Paradise Valley to the east, Tempe and Mesa to the southeast, Maryvale-Glendale area to the west, and the Sun City retirement community to the northwest of downtown Phoenix. The increased demand for land caused by the population growth has led to rising property values. Development near the urban core is being increasingly recycled to multiple unit buildings thereby forcing single family units to outlying areas where the cost of land is lower. The life style of the region leans toward single family dwellings on large lots, however, which complicates transportation and other services required in a large urban area.

This drift of land use away from the traditional pattern and toward a dense, urban use is a source of increasing concern among local governments and private organizations. People have come to Phoenix to enjoy its unique life style and they do not welcome the change to dense urbanization. These subtle social values must be kept in mind during this study.

Land ownership patterns will probably play a significant part in the future development pattern of the Phoenix urban area. The urban study area contains a considerable amount of Arizona State Trust Lands to the north and west of Phoenix that may be fully developed for urban use in the future according to the Arizona Land Department. In contrast, three Indian reservations on the eastern and southern perimeters of the study area act, to some extent, as buffers to urban development. Development on the reservations is controlled by the tribal council of each tribal community. The tribal communities (particularly the Salt River Community because of its proximity to east Scottsdale) are interested in promoting the location of commercial and industrial parks, townhouse developments, and mobile home parks on a lease basis. Several of the aforementioned facilities presently exist on the reservations near the urban fringe. The Fort McDowell Reservation encompasses 24,680 acres northeast of Phoenix; the Salt River Reservation to the east has 49,300 acres; and the Gila River Indian Reservation has nearly 372,000 acres in Maricopa and Pinal Counties.

The Maricopa Association of Governments has assembled a Composite Land Use Plan which is essentially a trends extension plan. This plan is considered by MAG to be inadequate and will undergo extensive review by MAG during the course of their Comprehensive Land Use and Transportation Reevaluation Study described in more detail in Section II-D of this Plan of Study.

f. Transportation. Phoenix, the capitol city of Arizona, is one of the major centers of population and economic activity in the southwest. Highways, two railroads and 10 air carriers connect the area with the rest of the nation. Within the state there are 143 airports including the large commercial airports at Phoenix and Tucson.

The major transportation emphasis in the Phoenix area is the movement of people and goods by motor vehicle. Public transportation service and usage is limited in the urban area, but a long-range program to strengthen the urban bus system is underway. As outlined below Interstate freeway travel between Phoenix and other areas of the country is provided by Interstate Freeways 10 and 17.

Interstate 10, which provides a primary east-west link in the National System of Interstate and Defense Highways and is a major element in the Arizona State Highway network, is not yet completed. U.S. 80 provides the primary access route to the Phoenix region until the completion of the "missing link" of Interstate 10 into Phoenix. Direct access between Phoenix and Los Angeles will be provided upon completion of I-10. The southern portion of I-10 provides uninterrupted freeway travel between Phoenix, Tucson and points east. Tucson, located 100 miles southeast of Phoenix, is the second major city in Arizona. Interstate 17 connects Phoenix with Flagstaff, the State's northern population center (see Figure 2).

More than 100 transcontinental, interstate and intrastate truck lines and two major transcontinental buslines service the area via these interstate routes and the State highway network.

See Figure 2 for a general view of the interstate and state highways in Arizona.

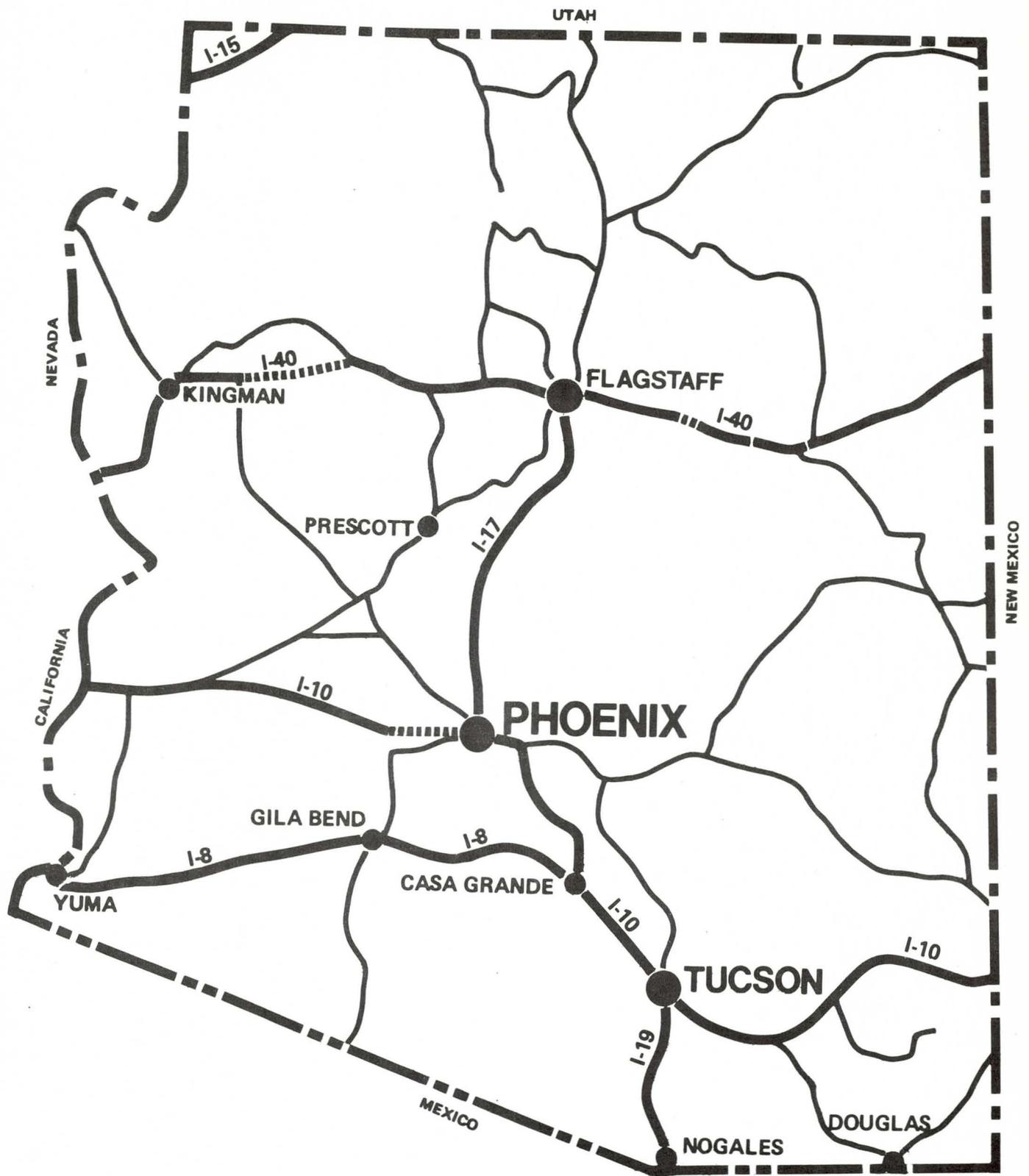


FIGURE 2
ARIZONA HIGHWAY SYSTEM

4. Water Resource Profile

a. Historical Development. Modern farming and large-scale urban and commercial development were not possible in the study area until the development of multi-purpose storage reservoirs and an extensive canal system. This water transport and storage system was necessary because of the alternating conditions of flood and drought that have periodically plagued settlers of the Salt River Valley. By harnessing the erratic flow of the rivers, and providing water storage for use during dry periods, this semi-arid environment was initially stabilized for agricultural development. To a great extent agricultural development has provided the economic base that is responsible for the urban development present in the area today. The development spawned by this surface water supply system grew to the extent that the water demand exceeded the supply of the system. As a result the ground water reservoir was gradually brought into large-scale use to supplement surface waters.

b. Flood Control Profile. Flooding problems within the study area generally fall within two categories, each associated with a particular seasonal precipitation. During the winter months, the precipitation within the area is typically wide-spread and low intensity. This precipitation may accumulate at higher elevations in the form of snow or it may flow off immediately, but in either case the volume of runoff from winter storms on large watersheds (i.e. the Salt and Gila Rivers) may be such that flooding occurs along these water courses. The relatively low intensity of the winter storms does not generally cause flooding problems along the intermediate size ephemeral streams (e.g. Cave Creek, New River) which are numerous throughout the area. On the other hand during the summer months, precipitation comes in the form of thunderstorms, with the characteristic high-intensity rainfall of short duration. These thunderstorms may cause flooding along the ephemeral streams but seldom produce enough volume to cause serious problems along the larger water courses. Some of the more extensive flood prone areas are shown on Plate 2. Plans to reduce flood damages are discussed later in this Plan of Study.

c. Water Supply Systems. The Salt and Verde Rivers furnish the main surface water supply for the Phoenix metropolitan area by means of four storage reservoirs on the Salt and two reservoirs on the Verde River. The Agua Fria River has one reservoir, Lake Pleasant, located 30 miles northwest of downtown Phoenix. (See Table 4, "Surface Water Reservoirs".)

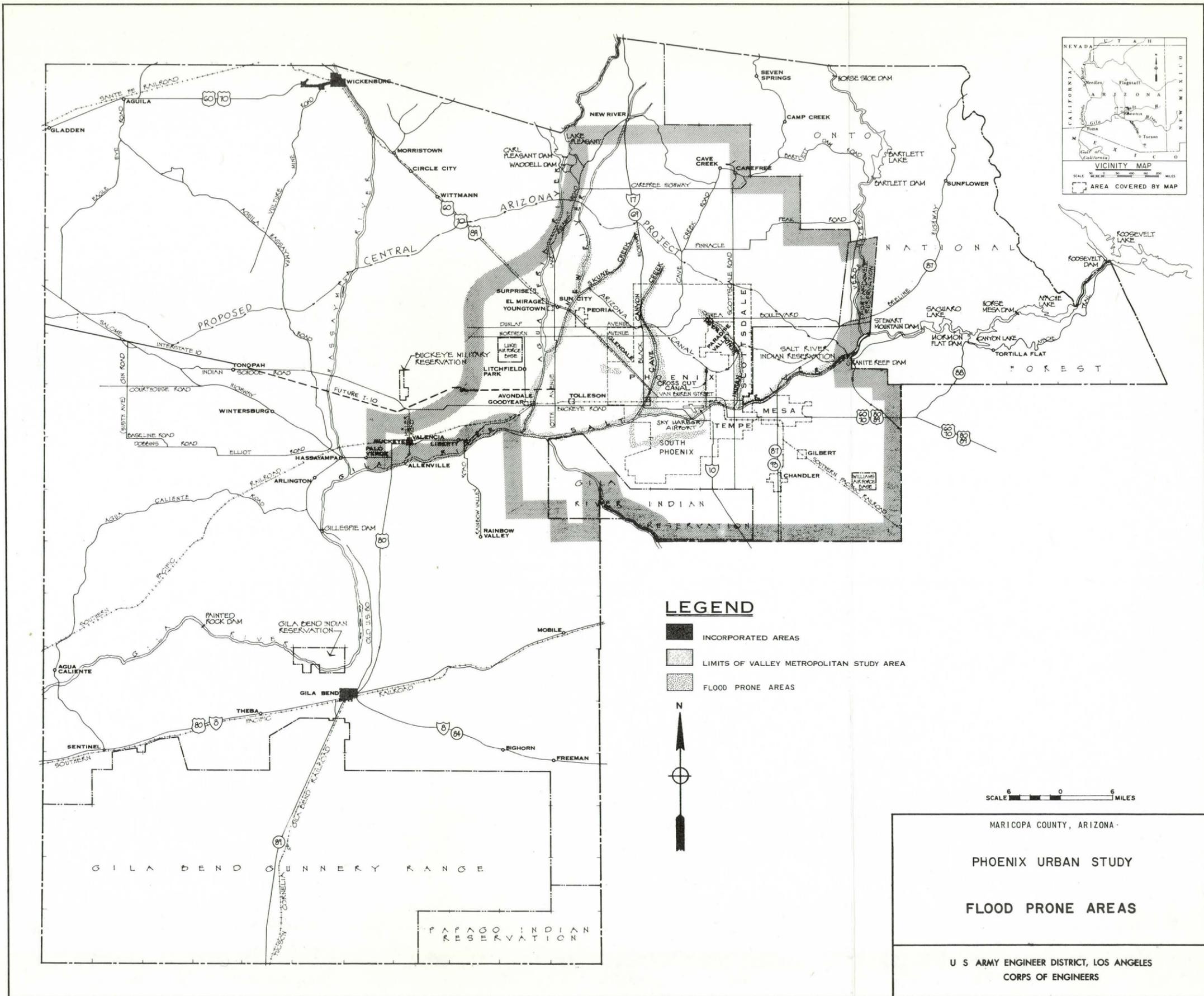


TABLE 4
SURFACE WATER RESERVOIRS

<u>Location</u>	<u>Storage Capacity (acre ft.)</u>	<u>Surface Area (acres)</u>	<u>Drainage Area (sq. miles)</u>	<u>Cumulative Total Drainage Area (sq. miles)</u>
<u>Salt River</u>				
Roosevelt Lake (1911)*	1,382,080	17,315	5,830	5,830
Apache Lake (1927)*	245,000	2,600	110	5,940
Canyon Lake (1927)*	58,000	950	160	6,100
Saguaro Lake (1930)*	70,000	1,264	120	6,220
<u>Verde River</u>				
Horseshoe Lake (1945)*	142,800	2,719	5,970	5,970
Bartlett Lake (1939)*	179,500	2,768	190	6,160
<u>Agua Fria River</u>				
Lake Pleasant	163,000	3,585	1,460	1,460
Total	2,240,380	31,201	13,840	13,840

*Completion Date

Source: Thiele, Heinrich, J., Present and Future Water Use and its Effects on Planning in Maricopa County, Arizona, 1965, Table 4

Table 5

EXISTING WATER TREATMENT PLANTS

Plant Name	Community Served	Capacity mgd	Age Years(A)	Life Years(B)
Verde	Phoenix	57(C)	13	62
Val Vista	Phoenix	60	0	75
	Mesa	20	0	75
Squaw Peak	Phoenix	110	11	64
Deer Valley	Phoenix	80	11	64
Papago	Tempe	40	2	73
	Buckeye	0.65(D)	9	66

(A) Age of latest addition

(B) Estimated to 75-year total life

(C) Treatment capacity 40 mgd
 Gallery & well capacity 20 "
 Total plant capacity 60 "
 Effective transmission capacity 57 "

(D) Electrodialysis plant to reduce total dissolved solids.

Note: Location of treatment plants are shown on Plate 3, Municipal Water and Wastewater Treatment Facilities.

Table 6 (Continued)

Community	Wells No.	Capacity in mgd		
		Wells	Treat. Plants	Total
Indian Reservations				
Salt River	2	6.0		6.0
Fort McDowell	1	0.1		0.1
Gila River	4	0.7		0.7
Luke Air Force Base	5	5.1		5.1
Williams Air Force Base	3	7.3		7.3

(A) electrodialysis plant capacity

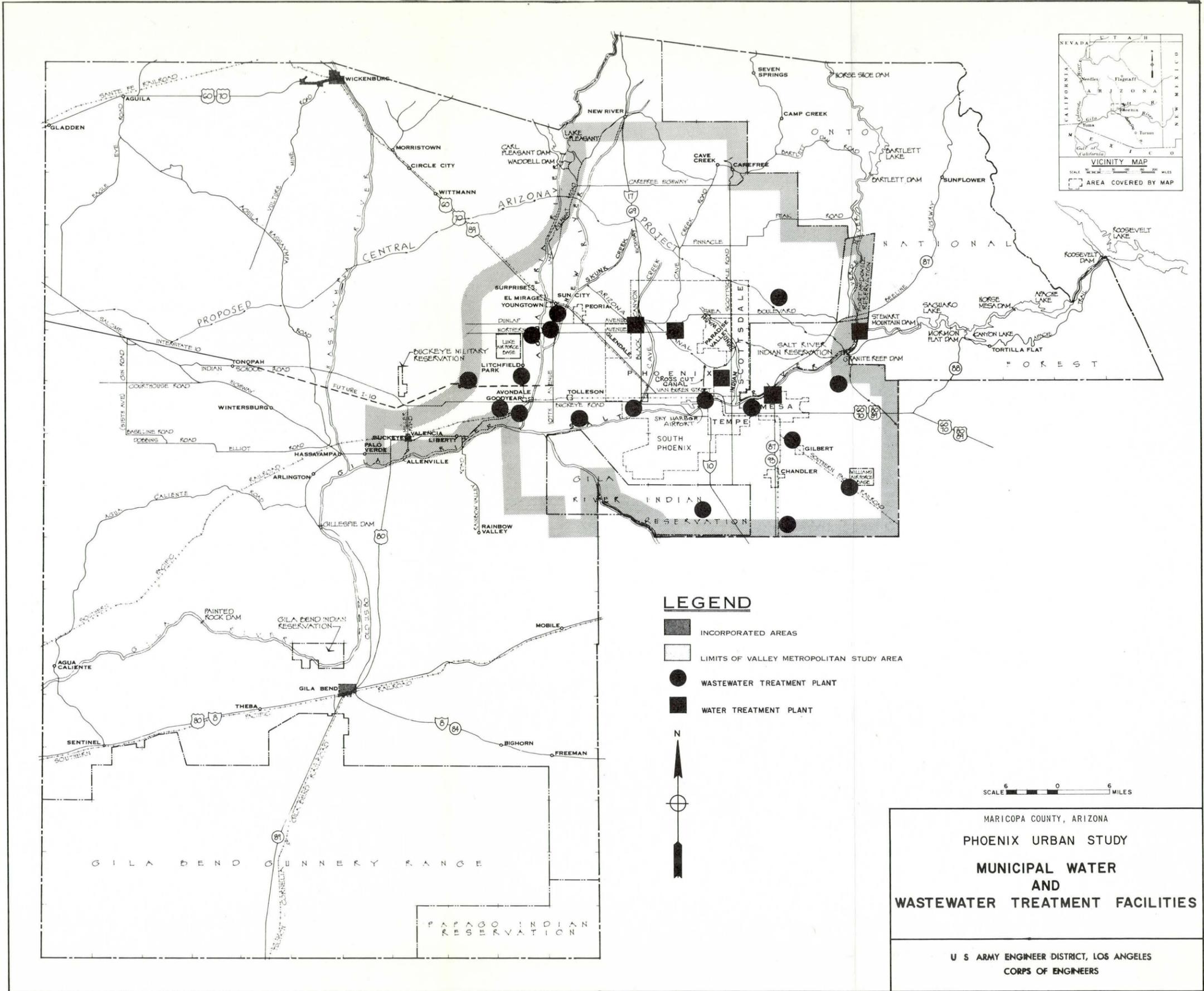
(B) private water company service

(C) on El Mirage system

Table 7

PLANNED PRODUCTION ADDITIONS

<u>Community</u>	<u>Units No.</u>	<u>Capacity mgd</u>
<u>Water Treatment Plants</u>		
Glendale	1	20.0
Tempe	1	20.0
<u>Wells</u>		
Buckeye	1	1.1
Carefree	2	1.7
Chandler	4	6.8
Glendale	5	7.2
Litchfield Park	4	6.0
Phoenix	3	4.5
Sun City	6	13.8
Luke Air Force Base	3	



LEGEND

- INCORPORATED AREAS
- LIMITS OF VALLEY METROPOLITAN STUDY AREA
- WASTEWATER TREATMENT PLANT
- WATER TREATMENT PLANT



SCALE 0 6 MILES

MARICOPA COUNTY, ARIZONA
PHOENIX URBAN STUDY
MUNICIPAL WATER AND WASTEWATER TREATMENT FACILITIES

U S ARMY ENGINEER DISTRICT, LOS ANGELES
 CORPS OF ENGINEERS

d. Wastewater Management Systems. The following section is largely excerpted from the Wastewater Facilities Inventory portion of the Technical Appendix, which is bound under separate cover from this Plan of Study. Refer to the Technical Appendix for a detailed description of wastewater management systems in the study area. See Plate 3 of this report for the location of the wastewater treatment facilities in the area.

The study area is divided into 27 service areas which range in size from 0.6 square miles for the Town of Guadalupe, to 431 square miles for the City of Phoenix. These service areas are listed in Table 8 of this report. The Cities of Glendale, Mesa, Phoenix, Tempe and Scottsdale together account for almost 60 percent of the service areas, with the Indian Communities taking half of the remaining area.

The existing treatment facilities can be divided into several groups. The first is the multi-city sewerage system which serves all or part of 9 cities and towns and has an existing capacity of 65 million gallons per day with an additional 5 million gallons per day on standby. A 30 million gallon per day addition to the 91st Avenue treatment plant is under construction and scheduled for completion by 1976. A 10 million gallon per day plant is proposed for the Reams Road area and is expected to begin construction before 1980. The City of Phoenix owns and operates the 40 mgd 23rd Avenue treatment plant. They also operate the multi-city sewerage system. In combination these plants presently treat about 85 percent of the study area's wastewater, with that total expected to increase to 90 percent by 1980.

The remaining plants in the study area range from the 100,000 gallon per day oxidation pond at the St. Johns School and Mission on the Gila River Indian Reservation to the 5 million gallon per day trickling filter in Mesa.

Table 9 of this report shows the wastewater treatment plants, their service areas, their estimated flow rates, and their projected waste loads for the year 1980. This table lists only the treatment plants that exceed 100,000 gallons per day. Approximately 50 smaller private and industrial pretreatment plants exist but are not listed. A more detailed description of individual treatment plants is given in Sections III-VI of Appendix C. In particular Table 1, Section VI, Appendix C describes the work necessary to bring individual plants into conformance with PL 92-500.

Table 8

PHOENIX URBAN STUDY
WASTEWATER SERVICE AREAS AND AGENCIES

<u>Name</u>	<u>Agency</u>	<u>Area Square Miles</u>
1. Avondale	City of	7
2. Buckeye	Town of	2
3. Carefree	Desert Foothills San. Dist.	3
4. Cave Creek	None	-
5. Chandler	City of	37
6. El Mirage	Town of	8
7. Fort McDowell Indian Community	Indian Health Service, H. E. W.	35
8. Fountain Hills	F. H. Sanitation Dist.	18
9. Gila River Indian Community	Indian Health Service, H. E. W.	152
10. Gilbert	Town of	54
11. Glendale	City of	59
12. Goodyear	Town of	5
13. Guadalupe	Town of	0.6
14. Litchfield Park	L. P. Service Co.	34
15. Luke AFB	U. S. A.	7
16. Mesa	City of	132
17. Paradise Valley	Town of	15
18. Peoria	City of	17
19. Phoenix	City of	431
20. Salt River Indian Community	Indian Health Service, H. E. W.	72

Table 8 (Continued)

<u>Name</u>	<u>Agency</u>	<u>Area Square Miles</u>
21. Scottsdale	City of	113
22. Sun City	S. C. Water & Sewer Co.	14
23. Surprise	Town of	1.8
24. Tempe	City of	37
25. Tolleson	City of	12
26. Williams AFB	U. S. A.	5
27. Youngtown	Town of	1.6

Table 9

1980 WASTEWATER TREATMENT PLANTS
ESTIMATED FLOW RATES AND WASTE LOADS

WWTP	Tributary Service Areas	% Connected	Unit Flow Rates		Flow Rates				Ann. Avg. Wasteloads***			
			gpcpd		Annual Average		Peak Hour		Suspended Solids		BOD	
			Ann. Avg.	Peak Hr.	L*	S*	L*	S*	L*	S*	L*	S*
Phoenix 91st & 23rd Avenue	El Mirage	100	100	250	.6	.4	1.5	1.0	.6	.4	.5	.3
	Gilbert	100	100	250	.4	.7	1.0	1.7	.4	.7	.3	.6
	Glendale	88	80	200	7.0	5.7	17.6	14.4	7.0	5.7	5.8	4.8
	Guadalupe	100	100	250	N.A.	0	N.A.	.1	N.A.	0	N.A.	0
	Luke AFB	100	100	250	.6	.2	1.5	.5	.6	.2	.5	.2
	Mesa**	98	85	187	7.5	8.1	16.5	17.8	7.5	8.1	6.3	6.8
	Paradise Valley	100	90	225	1.1	1.0	2.8	2.5	1.1	1.0	.9	.8
	Peoria	100	100	250	1.6	1.4	4.0	3.5	1.6	1.4	1.3	1.1
	Phoenix	80	110	176	87.1	76.0	139.4	121.7	87.1	76.0	72.6	63.3
	Scottsdale	84	90	198	8.5	7.4	18.8	16.3	8.5	7.4	7.1	6.2
	Sun City	100	70	175	3.8	2.5	9.5	6.2	3.8	2.5	3.2	2.1
	Surprise	100	100	250	.6	.3	1.5	.8	.6	.3	.5	.3
	Tempe	85	90	198	10.3	10.0	22.7	22.0	10.3	10.0	8.6	8.3
	Youngtown	100	100	250	.3	.2	.8	.5	.3	.2	.3	.2
	Plant Totals				129.4	113.9	237.6	209.0	129.4	113.9	107.9	95.0
Proposed Reams Road	Avondale	100	100	250	1.2	.6	3.0	1.5	1.2	.6	1.0	.5
	Goodyear	100	100	250	.5	.3	1.3	.8	.5	.3	.4	.3
	Litchfield Park	100	100	250	3.3	.5	8.3	1.2	3.3	.5	2.8	.4
	Plant Totals				5.0	1.4	12.6	3.5	5.0	1.4	4.2	1.2
Buckeye	Buckeye	100	100	250	1.2	-	2.9	-	1.2	-	1.0	-
Carefree	Carefree	100	100	250	.2	0	.5	.1	.2	0	.2	0
Chandler	Chandler	95	85	213	2.6	2.0	6.5	5.0	2.6	2.0	2.2	1.7
Fountain Hills	Fountain Hills	100	100	250	.5	.2	1.3	.5	.5	.2	.4	.2
St. Johns School & Mission	Gila River Indian Community	50	100	250	.1	0	.3	.1	.1	0	.1	0
Mesa	Mesa**	-	-	-	5.0	5.0	11.0	11.0	5.0	5.0	4.2	4.2
Tolleson	Tolleson	100	70	175	.8	.5	2.1	1.3	.8	.5	.7	.4
Williams AFB	Williams AFB	100	100	250	.6	.3	1.4	.7	.6	.3	.5	.3
No Plant	Cave Creek	0	100	250	0	0	0	0	0	0	0	0
	Fort McDowell Indian Community	0	100	250	0	0	0	0	0	0	0	0
	Salt River Indian Community	0	100	250	0	0	0	0	0	0	0	0

* L-Local Planning Agency

S-State Planning Agency (DES)

** 5 mgd of computed Mesa flow is assumed diverted to Mesa Plant

*** Unit Loads BOD: 200 ppm all communities, SS: 240 ppm all communities

e. Recreation Facilities. Within Maricopa County there currently exists a tremendous variety of water-based recreation. Despite this variety of facilities, as the population and available leisure time increases, the demand for all types of recreation facilities will increase. A more thorough discussion of this deficiency is presented later in this report in the description of existing water resource problems dealing with water-related recreation.

The following is a brief profile of the many types of facilities, whether public or private, that exist in the vicinity of the study area.

There is a total of 30,000 acres of surface area on the seven lakes of the Salt, Verde, and Agua Fria Rivers. There is an additional 300 acres behind Painted Rock Dam. Facilities at these lakes provide for boating, skiing, fishing, camping, swimming, hiking and picnicing. The Gila River Indian Community has built Thunderbird Lake and designed it especially for speedboat races. It is a large oval course complete with ground stands and facilities for the spectators.

Big Surf, located in Tempe, is another unusual water based recreation facility. This privately owned facility is open during the summer months and operates by charging an admission fee. As its name implies, the facility consists of a large pond with a wave generating machine, capable of making a wave suitable for surfing.

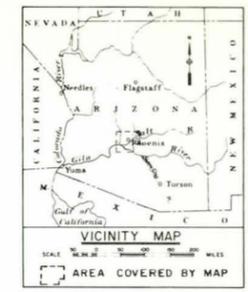
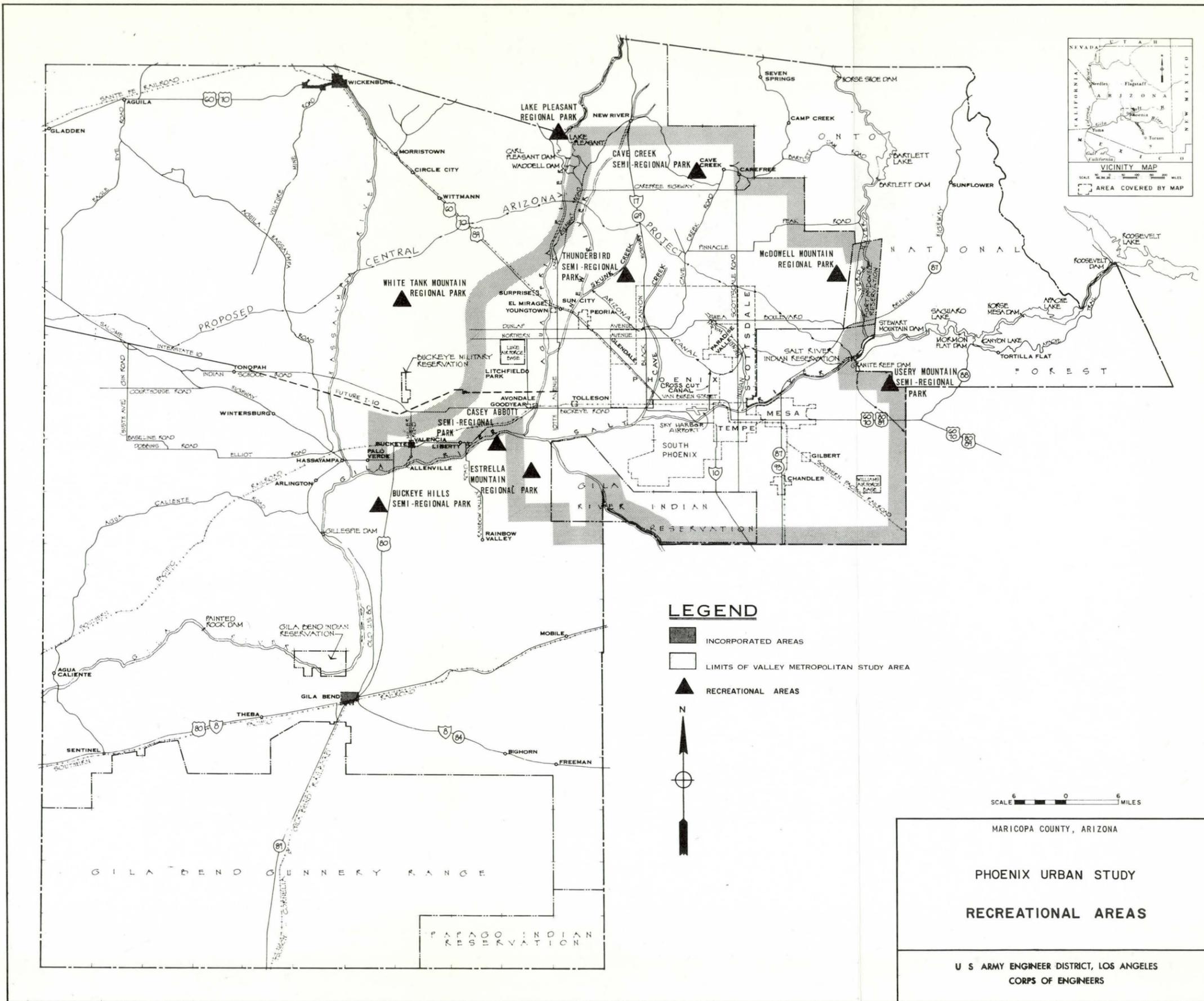
One of the most popular summertime sports is tubing. This activity attracts thousands of people to the Salt and Verde Rivers every summer weekend. The formula for tubing is very simple. Start by gathering together a large group of friends, then collect a lot of inner tubes, (preferably from big truck tires), insure an abundant supply of wine, beer and sodas, pack a lunch, drive to the river and float down. The float trip can be designed to last any number of hours up to a full day.

Another popular weekend activity is going to parks. Those like Indian Bend Wash and Encanto Park which have man-made lakes receive special attention during the summer. These parks provide for canoeing, paddle-boating and fishing.

Several housing developments have built man-made lakes which serve as localized water-based recreation. Notable examples are Sun City and The Lakes in Tempe. These developments provide lake-front properties, complete with sail boating, canoeing and fishing.

The warm Phoenix climate promotes swimming and therefore Phoenix has more swimming pools than most areas of the nation. These include private, school, park, community and residential pools.

Non-water oriented recreation such as golf, baseball, picnicing and so on requires a large amount of water in order to maintain the facilities.



C. Description of Existing Problems

1. Sociological and Natural Resource Problems

An awareness of the sociological and natural resource problems within the study area is vital to approaching the interrelated regional water resource problems. In discussing urban problems, it is important to note that when Phoenix was a smaller, more adolescent community, there existed a lag-time between negative situations in the national economy and their effect on this area. This no longer holds true as evidenced by the present slow-down in the regional economy. For purposes of this section, the adverse effects of this economic downturn - high unemployment, declining tourist trade, high housing vacancy rates, etc. - are considered to be temporary problems, rather than long-term regional concerns. These and other temporary problems must be considered in the latter phases of the urban study, and are beyond the scope of this Plan of Study. Long-term concerns over such problems as population growth, land use and transportation are discussed in the following paragraphs.

a. Population Growth. Unlike many other urban areas in the country which have either stabilized regional growth or are experiencing declines in population, the Phoenix region continues to experience a period of rapid expansion.* Phoenix is faced with controlling and managing population growth, while maintaining the physical form and social life that has lured people to the Valley.

Providing adequate housing types, services, employment, education and mobility for all the population, 33 percent of whom have moved into the county in the last five years, is a major problem which faces local and regional government.

The cost of providing services such as water, storm and sanitary sewers, gas, electricity, telephones and solid waste disposal, is becoming increasingly costly and may rise to a level which is unacceptable to the average resident. If this happens, densities must be increased thus altering to some extent the life style of the Phoenix region.

Not all area residents have the resources to take advantage of the dispersed Phoenix lifestyle which attracts so many. Nearly one-fifth of the county's population (approximately 18.3 percent) are members of minority groups - Mexican-Americans, Indians and Blacks, each group with somewhat different cultural wants and needs.

*New York City, Los Angeles, Chicago, Philadelphia and Detroit are examples of cities which have experienced sharp declines in population, while the Phoenix, Miami-Fort Lauderdale and Tampa, Florida areas have experienced a high net in-migration, according to Census Bureau data for 1970-73.

Another stratum of the population with distinct needs (and problems) is that of the retirement community. Over the past five years the number of households with retired heads has increased 40 percent from 67,000 to 94,000; their size, special requirements and relatively fixed income separate them into a somewhat unique segment of the population.

All of these strata of the population must be considered as a whole in considering the extent to which the population can expand before the quality of available water, air and energy decline below an acceptable or tolerable level.

The rapidly expanding population of the area has strained some of the resources of the area to the point that these factors may become growth-limiting. Water, energy and air quality fall into this category. Water related problems are discussed more thoroughly in later sections of this Plan of Study.

Arizona as a whole is an importer of energy. Analysis of energy sources reveals that for 1972, energy was provided by hydroelectricity (3%), coal (21%), petroleum (36%), and natural gas (40%). The heavy reliance upon petroleum and natural gas, coupled with the limited availability of these fuels for the past several years, suggests that more energy problems are in store.

As was mentioned in an earlier section, deteriorating air quality is a source of increasing concern in the study area. Current air quality and projected growth rates indicate a potential for exceeding national standards within a ten year period. While efforts are being made by the State of Arizona and Maricopa County to control air pollution before it reaches a critical stage, the solution is not yet known. Current growth projections, however, point to serious air-quality problems in the future.

b. Land Use/Urban Form. The future physical form of the study area is a topic of concern to citizens and area planners (see Appendix A, "Available Data & Report Sources" for listing of urban form and land use related reports).

The central portion of the study area depicts the leap-frog development that has occurred in the Phoenix metropolitan area. Numerous small pockets of urban development indicate that placement of residential plots is greatly influenced by land economics, rather than a planned growth policy. This is particularly true in the predominantly agricultural areas to the west and southeast of Phoenix. The undeveloped natural areas to the north are also jeopardized by rapid urban expansion. Protection (or planned utilization) of agricultural lands and open space in the study area is just one example of a land use problem yet to be thoroughly resolved. Other areas of land use concern include (but are not limited to): 1) the effective utilization of the valuable sand and

gravel resources along the area's ephemeral waterways; 2) the retention of natural topographic features and areas of scenic, geological, historic or archeological interest that enhance the character of the area; 3) preservation of the visual environment through landscaping, sign policies; 4) proper management and control of development in flood prone area, etc.

As discussed in Section III - Study Effort Allocation, a detailed environmental assessment and evaluation will be made to determine the interaction between the natural environment and each alternative plan developed during the study. This environmental assessment will be one portion of the total impact assessment and evaluation process.

c. Transportation. In prototype, decisions regarding population and land use are fundamental to the basic patterns and demands for transportation. Transportation systems should thus be designed to serve these basic factors, but as outlined in the preceding paragraphs, the problems of managing population and land use have not been adequately solved. The area's urban transportation problem then is to some extent a result of other urban problems, i.e., rampant increase in urban population and land consumption.

In 1970, Phoenix had a larger number of autos per household and a much smaller percentage of work trips by transit than other cities of similar size and makeup. (Cities compared were Atlanta, Dallas, Denver, Houston, San Diego, Albuquerque and Sacramento.)

As the Phoenix region expands in size, the need for efficient methods of transportation increases. The existing growth patterns indicate that the area will continue to expand in a dispersed low density pattern, requiring the construction of many miles of new streets to serve the urban demand. The tendency to increase personal use of the private automobile, however, creates certain other regional problems. For example: deterioration of air quality due to increased use of the private auto, combined with increased trip lengths; costs of expanding freeway and arterial systems due to increasing labor and material costs; impracticability of mass transit because of the region's low density.

2. Water Resource Problems

Key to the water resource problems within the study area are the arid nature of the environment and the phenomenal increase in population. The inter-relationship of these two factors has generated several water resource problems.

During the preparation of this Plan of Study initial contact with key individuals and agencies as well as a review of existing literature delineated several problem areas.

The following paragraphs present the results of this work:

a. Flood Damages. Flood damages and drainage problems are critical in varying degrees along water courses throughout the study area. Several of the most urgent problem areas are being addressed by studies underway by the Corps of Engineers, the Soil Conservation Service or other agencies. The following flood hazard areas fall within this category:

-Gila Floodway Area - Portions of the area bounded by the cities of Tempe and Mesa on the north, Interstate 10 on the west, Queen Creek on the east and the Gila River on the south are being rapidly urbanized. The area is poorly drained and poses flooding problems. This problem is the subject of a study by the Corps of Engineers.

-Queen Creek-Chandler Heights Area. Damages to agriculture and other developments in the Queen Creek area have occurred. The problem is under study by the Soil Conservation Service and the Arizona Water Commission.

-Buckhorn-Mesa Watershed. This area in the western portion of the study area has suffered flood damages in recent years. The Soil Conservation Service has developed plans to reduce these damages.

Current planning related to these problems is discussed later in this Plan of Study. Other flood hazard areas exist which have not been addressed in a thorough flood control study, or which have been addressed only in part and appear to require further analysis.

-Glendale-Maryvale. No defined channels exist in this area. Flooding results from sheet flow and ponding behind obstructions. The Santa Fe railroad, which passes through the area, creates an impediment to the flow of surface waters. The two openings at the trestles and a few drains in the railroad embankment are not of sufficient size to prevent flood waters from ponding against the railroad tracks and flooding adjacent business property in the area. South of the tracks, runoff flows southwestward toward the Grand Canal where ponding occurs, thereby flooding adjacent homes. In the past, sufficient flood flows have entered the Grand Canal thereby causing overtopping of the canal at the upstream sides of weirs and bridges and at low places in the bank fill, which resulted in flooding south of the canal.

Glendale has a long history of flooding. The 1963 flood was apparently the most damaging flood of record, and caused ponding along the north side of the railroad tracks to a depth of 2 to 3 feet. Almost all businesses along a six mile reach were flooded. In Maryvale, water ponded along the Grand Canal resulting in flooding to a depth up to 3 feet in a concentrated residential area. Damages from this flood amounted to \$2,900,000 in the Glendale-Maryvale area. This would be equivalent to approximately \$4,900,000 in terms of today's dollars. There is not sufficient data available to determine the frequency of this flood.

-South Phoenix. A number of small washes that originate in the South Mountains have caused flooding problems in the South Phoenix area. These washes are well defined in the upstream reaches but have been obliterated by development in the lower reaches. No estimates are available on flood frequency in this area, but damages from past floods have been relatively minor. However, the potential for flooding exists, especially because of urban expansion in this area.

Several problem areas, as outlined by the City of Phoenix flood-plain engineer, include the following:

- Runoff from two washes causes flood problems in a 4.5 to 5 square mile area (at the intersection of 7th Street and Mineral Roads). Several abandoned gravel pits collect some of the runoff from these washes.
- During periods of heavy runoff many secondary river channels along the south bank of the Salt River cause flooding and ponding problems, (one problem area exists in a residential area near 43rd Avenue and Burgess Lane).
- Ponding also occurs south of the Highline Canal between 48th and 24th streets.

Other specific problem areas will be studied during the course of the study.

-Salt River. The Salt River is controlled by six water conservation reservoirs constructed on the Verde and Salt Rivers. These reservoirs have greatly reduced the peak flows along the Salt River, however they are operated with water conservation as the primary objective. Accordingly, they are filled to capacity at every opportunity, and in this condition provide negligible flood protection. Several damaging flood flows have occurred. The 1965-66 flood with a peak discharge of 67,000 cubic feet per second at Granite Reef Dam caused damages to business and residential properties, feed lots, sand and gravel operations, street crossings, bridges, agricultural properties, irrigation works and utilities. Fourteen of the 17 street crossings were washed out.

The Sky Harbor Airport, the main airport in Phoenix sustained considerable damages when 2,600 feet of the runway was inundated. Considerable damages occurred to a number of sewage oxidation ponds resulting in the discharging of raw sewage into the river; however, no real threat to human health occurred. The total damages along the Salt River from this flood amounted to about \$5,800,000 measured in 1966 dollars, or \$9,315,000 in 1975 dollars.

In 1973, with an extensive snowpack condition in the higher mountains, the Salt River experienced a continuous flow condition from 21 February through 29 May (except for 7 days), with a maximum flow at Granite Reef Dam of 22,000 cubic feet per second. This flow caused damages to sand and gravel mining operations and several street crossings and resulted in the closing of several crossings. No estimate of monetary damages from this event is available.

The Bureau of Reclamation is authorized to construct the proposed Orme Dam as a multiple purpose feature of the Central Arizona Project. The dam, to be located near the confluence of the Salt and Verde Rivers, is expected to have a reservoir capacity of about 1,600,000 acre feet, of which 950,000 acre feet will be reserved for flood control storage. However, the release from the dam as well as runoff originating below the dam, particularly from flood flows resulting from local thunderstorms, are expected to cause serious flood problems. The Bureau of Reclamation is also analyzing alternative means of providing flood control on the Salt River to determine in fact whether Orme Dam is the best solution to the flood problems. Regardless of the conclusion that is reached by the Bureau, residual flooding problems will remain on the Salt River following the completion of Central Arizona Project construction.

In addition, local interests, through the leadership exhibited by the Valley Forward Association and the Maricopa Association of Governments, have developed an overall conceptual development plan, known as the Rio Salado Project, which is expected to restore life to a 40-mile reach of the Salt River from Granite Reef Dam to the Agua Fria River. The Rio Salado Project envisions a gradual change in function of the Salt River bed from vacant land and sand and gravel mining operations, to water-oriented recreation. In conjunction with this change in function of the riverbed, adjacent land uses will change to maximize the potentials of this new major regional asset in the heart of the Phoenix metropolitan area. The Rio Salado sponsoring groups believe flood control must be established as a precondition for the implementation of a significant part of the Project.

-Upper Indian Bend Wash. Flood problems exist along Indian Bend Wash upstream from the Arizona Canal. The lower reach of Indian Bend Wash from the Arizona Canal downstream to the Salt River, has been studied and a flood control project has been authorized for construction. This project is discussed in detail in the General

Design Memorandum - Phase I - Plan Formulation, dated October 1973 and in the General Design Memorandum - Phase II - Project Design, dated September 1975 for Indian Bend Wash. Flooding in the upper reach results from sheet flows causing damages to residential, public and agricultural properties as well as damages to parks and recreational areas, streets, roads, bridges and utilities.

The June 1972 flood, with a peak discharge of 14,500 cubic feet per second at the Camelback Country Club in Paradise Valley, caused damages amounting to nearly \$500,000 along the upper reach of Indian Bend Wash. The discharge corresponds to a recurrence interval of about 80 years under present conditions. The Central Arizona Project (CAP) proposes to construct Granite Reef Aqueduct to transport water from the Colorado River to the central part of Arizona. This aqueduct, which will run in a northwest-southeast direction, will cross the Indian Bend Wash drainage area about 7 miles north of the proposed inlet for the lower reach near Indian Bend Road. In conjunction with this aqueduct, the Bureau of Reclamation has under construction a detention dike to protect the aqueduct and to serve as a detention basin for the flood flows of the watershed above the aqueduct. When completed this dike will effectively control a great portion of the drainage area; however, residual flow downstream of the dike and from the Phoenix Mountains is expected to cause flood problems in the area. Future development, however, is expected to increase the runoff from the watershed to a considerable degree. An idea of the future flood threat is gained through the analysis of predicted flood magnitude presented in Table 10.

TABLE 10

INDIAN BEND WASH FLOOD FREQUENCIES
(Shea Blvd. crossing, figures in cfs*)

<u>Frequency of Occurrence</u>	<u>Present Conditions</u>	<u>Present Conditions With CAP</u>	<u>Future Conditions With CAP</u>
SPF**	33,000	27,000	46,000
100 year flood	17,000	13,000	21,000
50 " "	11,000	8,500	15,000
25 " "	6,900	5,400	9,600
10 " "	2,900	2,700	5,500

*cubic feet per second

**standard project flood

-Cave Creek Downstream from the Arizona Canal. The plan formulated for the authorized New River and Phoenix City Streams Project proposes the construction of the Cave Buttes Dam and the Arizona Canal Diversion Channel. The construction of these two units would prevent a substantial portion of the flood damages along Cave Creek. However, runoff originating below the diversion channel would result in flooding to the business and government center of downtown Phoenix, and large residential areas, commercial and shopping centers. Economic analysis made for the New River and Phoenix City Streams Project indicates that an estimated \$8,395,000 in equivalent annual damages (3 $\frac{1}{4}$ percent-100 years) would be prevented by the project along Cave Creek downstream from the Arizona Canal. However, along this same reach equivalent annual damages amounting to \$1,145,000 would still remain after construction of the authorized project.

Table 11 illustrates the flood situation at various points with and without construction of the Cave Buttes Dam and the Diversion Canal under existing conditions of development.

TABLE 11

CAVE CREEK DISCHARGE FREQUENCIES
(Flow Magnitude in Cubic Feet Per Second)

<u>Frequency</u>	<u>Without Project</u>	<u>With Project Cave Buttes Dam & Diversion Channel</u>
<u>Cave Creek just below Arizona Canal</u>		
SPF*	50,000	18,000
100 year flood	26,000	0
50 year flood	14,000	0
25 year flood	7,000	0
10 year flood	2,400	0
<u>Cave Creek at Salt River</u>		
SPF*	36,000	21,000
100 year flood	22,000	14,000
50 year flood	13,000	9,900
25 year flood	7,800	6,500

*standard project flood

-Cross Cut Canal. In response to a request by Maricopa County, flooding problems along the old Cross Cut Canal and the surrounding Arcadia neighborhood in Phoenix will be included in the flood control portion of the study. Specific information on flood problems along this stretch of canal is not available at this time, but will be generated during Phase 2 of this study.

b. Water Supply. The Arizona State Water Commission has provided estimates of the water supply and water usage for the Salt River Valley Basin. This basin area corresponds to natural hydrological divides, rather than political boundaries. However, the basin closely matches the Urban Study area. The basin encompasses most of the 2300 square miles within the study area, plus a substantial fringe of undeveloped area to the northwest (the lower Hassayampa Plain) and a portion of Pinal County to the southeast.

The following tables (Tables 12 and 13) summarize the Salt River Basin's water supply and water usage for "normalized" 1970 conditions. Two periods, with extremely different surface water supplies and correspondingly different groundwater pumpage rates, were used to determine "normalized conditions" for 1970. Table 12 indicates that the estimated annual water supply for the basin is 931,000 acre feet, while Table 13 shows the estimated annual water usage as 1,563,000 acre feet. This leaves a total expected annual overdraft of 632,000 acre feet as shown in Table 14.

Because the current normalized depletion rate is close to 2/3 of a million acre feet per year and because the groundwater table has been continually dropping since the early 1940's, the residents of the area are concerned about the total water supply available in the groundwater basins of the Salt River Valley. The Arizona Water Commission has estimated that 65 million acre feet of water has been pumped from these groundwater basins since the first wells were installed about the turn of the century. The Commission has also estimated that 154 million acre feet of groundwater remain in storage between the current water table elevation and an elevation of 1200 feet below the land surface. Inadequate records exist to define the groundwater basins below a depth of 1200 feet, however, there is a potential for substantial amounts of water below that depth.

The current depletion rate in the Salt River Valley is causing the groundwater table to decline by more than 10 feet a year in some areas. The Central Arizona Project is intended to reduce groundwater overdraft. The Urban Study will consider water supply in the context of conserving floodwaters to recharge the groundwater supply. The following is an excerpt from the Final Environmental Statement on the Central Arizona Project, dated 1972:

"During the initial years of CAP delivery, almost all agricultural areas using CAP water will experience water level increases, with some areas meeting their entire water requirements with CAP water. But as the CAP supply decreases in these areas the deficit will have to be met with groundwater and this trend will reverse. By the year 2000 probably all areas using CAP water will be reexperiencing groundwater declines...The overall application of Colorado River water in the service area will not totally eliminate long-term groundwater overdraft or water level declines. It will, however, significantly retard the rate of withdrawal and declines, especially during the earlier years following the completion of the project."

TABLE 12

DEPENDABLE WATER SUPPLY
FOR THE SALT RIVER VALLEY BASIN
(1000 Acre Feet)

Surface Water Diverted	
Granite Reef Dam	839
Buckeye Canal	40
Arlington Canal	15
Lake Pleasant	32
Natural Groundwater recharge	<u>5</u>
Total	931

TABLE 13

ESTIMATED ANNUAL WATER USAGE
NORMALIZED TO 1970 CONDITIONS
FOR THE SALT RIVER VALLEY BASIN
(1000 Acre Feet)

Basin Export	15
Agricultural	
Withdrawal*	2306
Recharge*	949
Net Use	1357
Municipal and Industrial	
Withdrawal	310
Recharge	119
Net Use	191
Total	
Withdrawal	2631
Recharge	1068
Net Use	1563

* See Glossary of Terms for contextual definition(s).

TABLE 14

ESTIMATED ANNUAL WATER DEPLETION
NORMALIZED TO 1970 CONDITIONS
FOR THE SALT RIVER VALLEY BASIN
(1000 Acre Feet)

Total Consumptive Usage*	1563
Total Dependable Supply*	931
Total Annual Overdraft*	632

It should be noted that the figures used for the total available ground water supply disregard water quality. Some underground water is not useable for agricultural or municipal purposes due to high mineralization or presence of toxic substances such as chromium or excessive amounts of other substances such as fluorides or nitrates.

In the course of identifying water supply problems, one possible means of increasing the surface water supply was identified. As a water conservation measure, a study will be made to consider the advisability of diverting flood flows from the New River drainage basin into the Agua Fria River basin for storage in Lake Pleasant reservoir.

The impacts of diverting flood flows will require an in-depth evaluation to determine the effects on environmental, economic, **social and** institutional values in both the New River and Agua Fria River drainage basins.

* See Glossary of Terms for contextual definition(s).

c. Wastewater Management. The identification of problems in the area of wastewater management has proven to be more difficult than in other areas to be addressed in this study. The problems stem from three key considerations: 1) An existing cooperative arrangement for wastewater collection and treatment only meets the needs of part of the study area; 2) there is insufficient information to determine whether or not there is a better alternative to the continued expansion of this cooperative arrangement; and 3) the requirements of the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500) have not been met.

The cooperative arrangement for wastewater collection and treatment was brought about by a recognition in the 1950s that these services could most efficiently be provided on a joint-use or regional basis, rather than an individual basis. The single most important criterion applied to wastewater treatment at that time was cost-effectiveness, and regional treatment plants met this criterion. By the end of the 1950s two joint-use wastewater treatment facilities had been constructed. One served the Cities of Avondale and Goodyear, and the other served the Cities of Glendale and Phoenix. Since that time the 5 million gallon a day treatment facility built by Glendale and Phoenix has been expanded to a 65 million gallon a day multi-city system which serves the Cities of Phoenix, Glendale, Scottsdale, Mesa, Tempe, Paradise Valley, Youngtown, Peoria, and Sun City.

The need for a single agency to operate and maintain this multi-city system was met by designating Phoenix, the major user, as the managing agency. Also, the need for the planning and coordination of the future of this system was filled in 1967 with the formation of the Maricopa Association of Governments and its Public Works Committee. A 30 million gallon a day expansion is being built now and another is planned for 1980 to provide additional capacity for these cities already serviced. This expansion could also provide new service to El Mirage, Surprise, Tolleson, Gilbert, Chandler, Guadalupe, Luke Air Force Base and Williams Air Force Base.

The multi-city system is an efficient, cost effective system. It was conceived, constructed and brought into operation as a regional planning product before the current federal statutes dictated regional planning. One of its most appealing features is that all of it was planned and constructed without incurring the expense of a separate regional agency. However, many of the cities and towns within the study area still need to be incorporated within this regional plan.

As was previously mentioned, there is insufficient data available to determine whether there are better alternatives to future expansion of the multi-city system. Certainly some consideration has been given to alternatives, however these alternatives should be developed in light of the latest technology, described and documented, and

presented to the proper authority (MAG Public Works Committee and Regional Council in this case) for their consideration and decision.

The multi-city system was planned before the Federal Water Pollution Control Act Amendments of 1972 were passed, and as might be expected, the plans for the system do not completely address the rather comprehensive scope of the Amendments. Since PL 92-500 is the law of the land, the failure to be in compliance is a problem in itself. For each of the specific areas mentioned below, the application of this requirement to the study area has not been addressed:

1. Non-point sources of pollution (eg. contaminants carried from streets by rains).
2. Broader range of alternative solutions, including structural and non-structural solutions. Non-structural solutions include methods of reducing the need for wastewater treatment through pricing, education or regulation.
3. Public opinion must be sought and recognized.
4. A format program of annual updating of the regional plan, including certification by the Governor must be developed.
5. Alternatives must assess the environmental effects.
6. The effects of the alternative plans upon the groundwater quality must be assessed.

A study done by the Architect-Engineering firm of Ferguson, Morris and Associates has established that infiltration of storm water into the sewer system is not a problem in this area (refer to Appendix C). Further analysis is required for the inflow problem.

Because of the multi-city sewerage system's industrial requirements, the private plants which serve the commercial and industrial establishments have elected to discharge to seepage pits, leaching beds, evaporation ponds, or golf courses, rather than to the municipal sewerage systems. None discharge to water courses. The extent of the problem caused by these discharges, if any, is unknown.

In summary, wastewater management problems appear to exist in three general areas:

1. The multi-city sewer system needs to be brought up-to-date by considering the requirements of those cities not yet served.
2. Alternatives to future expansion of the multi-city system should be explored.
3. The unfulfilled requirements of PL 92-500, including: sewer inflow analysis, industrial waste disposal, and the evaluation of non-point sources of pollution, must be met.

d. Water Quality. The management of the quality of the water supply is one of the single most important problems of any community. Table 15 presents the existing water quality of the surface water as reported by the Salt River Project, and of the groundwater of three of the communities. In order to help identify problem areas, the last column presents the 1962 "Drinking Water Standards" as published by the U.S. Public Health Service.

The surface water supply passes all of the chemical water quality requirements. After removal of suspended solids and chlorination, this water meets all of the necessary health standards.

The chemical quality of the ground water supply varies throughout the area, with the specific problems identified in the following paragraphs.

In general, the suitability of groundwater for domestic use is indicated by the dissolved-solids content. The U.S. Public Health Service in 1962 recommended that water for drinking purposes should contain no more than 500 mg/l* of dissolved solids. However, the quality of groundwater from most of the project area cannot meet this recommendation. The groundwater in the northern part of the project area generally contains less than 500 mg/l of dissolved solids. In the southern part of Scottsdale and Paradise Valley, the northern part of Tempe, Mesa and Phoenix and the Gila River Indian Reservation, most of the wells yield water that contains from 500 to 1,000 mg/l of dissolved solids. Water in this concentration range is obtained from deposits that contain small amounts of gypsum (calcium sulfate) or other soluble salts and is used for domestic supply, especially where water of lesser concentration is not available. The main objection is bad taste due to dissolved gypsum and common table salt (sodium chloride). Much groundwater used successfully for irrigation is in this concentration range. In the southern part of Tempe, Mesa and Phoenix, as well as the Buckeye area, much of the groundwater contains from 1,000 to 3,000 mg/l of dissolved solids. Water in this concentration range is used successfully for irrigation of salt-tolerant crops grown on well-drained soil. However, it is usually demineralized or blended for municipal use. A small area along the Gila River yields water that contains more than 3,000 mg/l. Water of this concentration may be demineralized for municipal use. Use of this water for irrigation requires salt-tolerant crops, well-drained soil and addition of amendments to prevent accumulation of harmful salts in the soil.

In the general area of Buckeye, high concentrations of fluorides have been reported. Water in many of the wells contains 6 mg/l of fluorides. This is reduced to 2 or 3 mg/l by their electrolysis plant.

* mg/l - Milligrams per liter.

Table 15

CHEMICAL QUALITY COMPARISON
Values, except pH, as mg/L

Item	Groundwater			Surface Water(B)	USPHS Units(C)
	Scottsdale(A)	Glendale(A)	Sun City(B)		
Total Soluble Salts	666	425	314	505	500*
Total Hardness	125	160	216	203	***
Total Alkalinity	143		124		***
Calcium	25	30	56	52	***
Magnesium	15	25	13	17	***
Sodium	86	57	33	115	***
Carbonates	nil				***
Bicarbonates	173				***
Chlorides	241	100	58	165	250*
Sulfates	19	47	29	51	250*
Nitrates	3.3	26	20	2	45*
Fluorides	1.2	0.6	0.34		1.4**
Iron	nil	0.05	<0.05		0.3*
Hexavalent Chromium	0.04	0.03			0.05**
pH	8.05		8.1		

(A) Mean values for wells inside SRRD

(B) Average values

(C) 1962 "Drinking Water Standards" of the United States Public Health Service with criteria as:

* "...should not be present in a water supply in excess of listed concentrations where....other more suitable supplies are or can be made available."

** "The presence of the following substances in excess of the listed concentrations shall constitute grounds for rejection of the supply."

*** "no limit is set."

Note: The Urban Study will include consideration of EPA Interim Primary Drinking Water Standards which are now being finalized.

Based on the annual maximum daily air temperature, the optimum fluoride concentration is 0.7 mg/l. A fluoride concentration of more than 1.4 mg/l constitutes grounds for rejection of the water for public use. Other areas that are experiencing problems are: Avondale, Buckhorn (north of Mesa) and along the southern foothills of Phoenix.

In the northern part of Scottsdale, near the intersection of Scottsdale Road and Shea Boulevard, a hexavalent chromium problem exists.

In the New River area, an arsenic problem has been reported. However, it is confined to several wells found within an area of approximately one square mile.

Some well samples in the Carefree area have shown radioactive readings. One well registered 16 picocuries/liter* of beta radiation. The standards set the limit at 3 picocuries/liter.

Hardness is not a known health hazard and therefore no maximum standard has been set. However, for domestic water supplies with hardnesses greater than 150 mg/l, it is often desirable to use a water softening system to reduce pipe incrustation and soap consumption. As can be seen in Table 15, most of the water in the study area, including the surface water, is considered hard.

Problems with chlorides and sulfates exist along both the Salt and the Gila Rivers.

Nitrates in drinking water can cause cyanosis in infants. The source of nitrate in water in the Phoenix area is unknown, but it may be the nitrate fertilizers applied in the agricultural areas or naturally occurring organic material in the alluvial deposits. The current drinking water standards have a recommended limit of 45 mg/l of nitrate or 10 mg/l of nitrate-nitrogen. Many of the wells do not meet these standards, however, most of these can be blended to reduce the concentrations. The proposed new drinking water standards make the 10 mg/l of nitrate-nitrogen a mandatory, rather than recommended limit. Therefore, supplies which exceed this limit will be rejected for drinking purposes unless they can be blended or treated.

Water quality problems may be caused, to some extent, by agricultural activities within the study area. Dissolved solids contained in irrigation water remain in the soil after the water is lost to the atmosphere in the evapo-transpiration process. In time these solids are leached through the soil and are added to the groundwater. Similarly, fertilizers and pesticides may be introduced into the groundwater supply by the leaching action of the irrigation water. These pollutants become urban problems due to the high dependency of the urban area upon the groundwater for domestic uses.

* picocurie - A unit quantity of any radioactive nuclide in which 2.22 disintegrations occur per minute.

e. Water-Related Recreation. The increase in the demand for water-based recreation by the year 2000 is expected to be phenomenal. According to the 1969 City of Phoenix "Park and Recreation Plan", participation in outdoor recreation activities is expected to increase six-fold in the next 25 years. Of those outdoor activities now available, a wide variety involve water-based recreation.

Many of the outdoor recreational facilities now available to residents of the study area are over crowded. Although regional and semi-regional parks located within an hour's drive of Phoenix contain more than 113,000 acres, half of this land is not developable, and only slightly more than 5,000 acres have been developed for recreational use.

There are six recreational lakes within 50 miles of central Phoenix, of which four provide only limited access for swimmers. Because of the great demand for water sports, the Arizona Outdoor Recreation Coordinating Commission's state outdoor recreation plan, dated 1973, states that the acute lack of water near the major population centers of the state is one of the major recreation needs in Arizona.

Despite this high demand for water oriented recreation, the Arizona Outdoor Recreation Plan states that the greatest demand is for passive outdoor recreation (i.e., picnicking, sightseeing, attending outdoor events, pleasure walks, etc.). The second greatest demand is for active outdoor recreation (i.e. outdoor games and sports, golfing, bicycling, etc.). The Recreation Plan indicated that over half of the state-wide demand for recreation originates in Maricopa County.

Also on the increase is the demand for recreational trail systems. The Maricopa County Hiking and Riding Trails Committee has recommended construction of 700 miles of trails. Presently the county has about 100 miles of marked trails for hiking and equestrian use. Also, bicycling is rapidly becoming one of the nation's most popular outdoor activities. Locally mild climate and gentle topography add to the appeal of bicycling in this region. In order to meet this demand, about 220 miles of bicycle trails are needed; however, about 120 miles of trails are presently available.

Table 16 presents an overview of the percent of "needs" for facilities that have been met in 1970 for various types of recreational activities. Outdoor recreation needs are those facilities needed to satisfy demand for selected activities based on population ratio standards. The 1970 needs are compared with projected 1985 needs to indicate facility deficiencies.

TABLE 16
RECREATION NEEDS FOR MARICOPA COUNTY

	<u>Year</u>	
	<u>1970</u>	<u>1985</u>
Boating & Waterskiing	17%	11%
Golfing	69%	45%
Picnicking	34%	22%
Tennis Courts*	75%	49%
Multiple Use Courts*	56%	36%
Playing Fields*	100%	100%

*Based on inclusion of school facilities with public park facilities.

Note: Outdoor recreation needs are those facilities necessary to satisfy demand for selected activities based on population ratio standards.

Source: Arizona Outdoor Recreation Coordinating Commission's, "Arizona Outdoor Recreation Plan ", (1970).

An additional problem associated with water-based recreation is the failure of state and local government to financially support major public works which would provide water oriented recreation. The Corps of Engineers' flood control project for New River and Phoenix City Streams could provide four recreation lakes, yet water-based recreation has been deleted as a project purpose for lack of a local sponsor for water purchase. More recently, (April 29, 1975) the City of Phoenix attempted to pass a bond which would have allowed construction of a small portion of the Rio Salado project, however citizens turned down the issue.

f. Fish and Wildlife Habitat. Associated with the population growth in the study area has been the extensive subjugation of land for agricultural use and subsequent urbanization. This reduction of land has substantially reduced the land available for wildlife habitation. A discussion of diminishing habitat is contained in an Arizona Game and Fish document entitled "Survey of the Nesting Habitat of the White Wing Dove In Arizona". Of particular concern are those areas containing riparian type vegetation. Riparian vegetation has unique wildlife habitat value.

With growth in population, modification of surface hydrology and decline in groundwater depths, the amount of riparian wildlife habitat has been reduced thus affecting wildlife populations.

D. Current Planning and Related Data

Included in this section is a resume of planning activities by major study components that are currently underway or authorized within the study are by Federal, State and local agencies.

1. Flood Control

a. U.S. Army Corps of Engineers. The Corps has three authorized studies underway within the Phoenix Urban Study area. They are Indian Bend Wash, New River and Phoenix City Streams, and the Gila Floodway.

The Indian Bend Wash project, authorized by the Flood Control Act of 1965, was reformulated in 1973 at the request of local interest. The project provides 100-year flood protection along lower Indian Bend Wash from Indian Bend Road to the Salt River in the vicinity of Scottsdale and Tempe. It also provides 25 to 50 year flood protection along the Arizona Canal west of Indian Bend Wash from the inlet to 68th Street.

The following summarizes the status of Corps project reports on Indian Bend Wash, prior to final submittal of the Plan of Study:

-The project was reformulated in Design Memorandum No.1 (GDM-Phase I), dated October 1973. This document recommended an inlet channel, greenbelt floodway, side-channel system, outlet works and recreational development. In April 1974, the Office of the Chief of Engineers approved the project except for the side channels.

-The side-channels were the subject of a report titled Supplement to Design Memorandum No. 1, approved by OCE in May 1975, which authorized inclusion of the side-channel system as a component of the total project.

-Design Memorandum No 1 (GDM Phase II) and the Recreation Master Plan (Design Memo No. 2), were approved in September 1975.

The New River and Phoenix City Streams Project, as authorized by the Flood Control Act of 1965, would provide flood protection and associated recreation development to a large area of Phoenix.

-The General Design Memorandum, Phase I, Plan Formulation Report is undergoing interagency review and coordination. The proposed recommended plan combines structural and non-structural measures to control floods on Cave Creek, Skunk Creek, and the New and Agua Fria Rivers, through the construction of Cave Buttes, Adobe and New River Dams and the Arizona Canal diversion channel. The recommended plan proposes 19 miles of flowage easements along Skunk Creek and the New and Agua Fria Rivers in lieu of channelization.

The plan will also provide for recreational development at the dams, along the diversion channel, along Cave and Skunk Creeks, and along the New and Agua Fria Rivers.

-Dreamy Draw Dam, a feature of the authorized project, was completed in August 1973.

The Gila Floodway survey report study was authorized by the Flood Act of 1938, which directs the Secretary of the Army to "cause surveys for flood control of . . . Gila River and Tributaries, Arizona and New Mexico". The study of the Gila Floodway portion was initiated in 1973. This study is to determine the feasibility of providing structural and/or non-structural flood control measures for portions of the Tempe, Mesa and Chandler areas. The study is scheduled for completion in 1977.

In addition to the above, the Corps is developing (or has prepared) Flood Insurance Study reports for the cities of Mesa, Scottsdale, Phoenix and Tempe, and special floodway studies along the following streams: Salt River in the City of Mesa; Agua Fria River from Pinnacle Peak Road to the Salt River; New River from Pinnacle Peak Road to the Agua Fria River; Skunk Creek from Carefree Road to New River; Scatter Wash from the Black Canyon Freeway to Skunk Creek; and Arizona Canal from 67th Avenue to Skunk Creek. These studies are scheduled for completion in fiscal year 1976.

b. U.S. Bureau of Reclamation. The Bureau's major project which provides input to the Urban Study, is the construction of the multi-purpose Central Arizona Project (CAP). Very briefly, CAP will provide supplemental water from the Colorado River for established agricultural areas in Maricopa, Pinal and Pima Counties, as well as municipal and industrial water for the Phoenix and Tucson metropolitan areas.

The Bureau is preparing engineering plans and the environmental impact statement (EIS) for the proposed Orme Dam and Reservoir. Current plans call for the earth filled dam to be located downstream of the confluence of the Verde and Salt Rivers. The EIS (draft) is scheduled for release in January 1976. Other specific aspects of the Project are referenced in previous sections of this report dealing with water supply, recreation and flood control. The following paragraph outlines the status of the aqueduct and flood detention dikes which skirt the metropolitan area and are a major portion of the CAP.

The Bureau has initiated the construction of a 12-mile segment of the Granite Reef Aqueduct and the paralleling Paradise Valley Flood Detention Dike, just northeast of Phoenix and Scottsdale. The dikes extend from Cave Creek Road north of Phoenix, through Paradise Valley to the slope of the McDowell Mountains just west of 108th Street in northeast Scottsdale. The detention dikes are scheduled for completion in 1976. When completed, the dikes will intercept floodflows from about 120 square miles of watershed north of the aqueduct. This will provide protection from floods to the Granite Reef Aqueduct and reduce the storm flood flows in large areas of Paradise Valley, Scottsdale, and north Phoenix.

c. Soil Conservation Service. This agency currently has two flood control projects underway within the study area. They are the Guadalupe Watershed Project and the Buckhorn-Mesa Watershed Project.

The recently completed Guadalupe Flood Control Dam, located at the east base of the South Mountains, protect the town of Guadalupe and parts of Tempe and Phoenix from flooding.

The Buckhorn-Mesa Flood Control Project will consist of five dams plus the Roosevelt Water Conservation District Floodway. The dams and floodway will hold water coming off the Uesery Mountains northeast of Mesa and convey it west and northward to the Salt River. Construction of the project is scheduled to begin in 1975 with completion expected in 1980. Protection from 100-year floods will be provided to lands in the East Mesa area.

The Queen Creek-Chandler Heights flood control project is currently under study by the Soil Conservation Service and the Arizona Water Commission. This study addresses flood hazard areas along Queen Creek between the proposed site of the Central Arizona Project aqueduct and the Roosevelt Water Conservation District canal. The study is expected to be completed in late 1976.

d. City of Phoenix. Yost and Gardner Engineers have prepared a report for the City of Phoenix titled "Master Drainage Study Indian Bend Wash, April 1975". The report presents four alternative approaches for the handling of 100-year floods in the main channel of Indian Bend Wash within the city of Phoenix. Included is a study of a typical tributary channel with recommendations for its treatment. Information contained in this report will be considered in planning alternative measures for flood control along the Upper Indian Bend Wash in the Phoenix Urban Study.

e. Town of Paradise Valley. Paradise Valley recently completed a preliminary report, "Town of Paradise Valley Indian Bend Wash Improvements" April 8, 1975 by Coe & Van Lou Consulting Engineers, Inc. The report was prepared to provide a basis for design of a channel along the Indian Bend Wash through Paradise Valley which would control the flow from the 100-year storm and permit the recovery of some land areas now in the flood plain. Information contained in this and the other reports for the Indian Bend Wash previously discussed will be considered further in plan formulation of the Phoenix Urban Study.

f. Maricopa County Flood Control District. This agency, in cooperation with the Corps of Engineers, developed a five-phase flood control plan for the Phoenix metropolitan area to serve as a framework for all flood control works in the area. Pertinent information on these five phases is given in the following subparagraphs.

-Phase A - Indian Bend Wash from the Arizona Canal to the Salt River. Plan formulation on this phase has been completed and approved.

-Phase B - New River and Phoenix City Streams Plan formulation, general design memorandum awaiting approval. This recommended plan proposes, flowage easements along Skunk Creek and the New and Agua Fria Rivers.

-Phase C - Glendale-Maryvale area and South Phoenix - included in Phoenix Urban Study.

-Phase D - Salt River from Granite Reef to the confluence with the Gila River - included in Phoenix Urban Study.

-Phase E - Indian Bend Wash north of the Arizona Canal - included in Phoenix Urban Study.

-In addition, the Flood Control District has requested that the old Cross Cut Canal and Arcadia area located in east Phoenix be included in the Urban Study.

2. Wastewater Management

Many institutions are involved in wastewater management planning within the study area. Some have broad responsibilities such as those of the Environmental Protection Agency, the Arizona Department of Health Services, and the Maricopa Association of Governments. Others, such as the local public works agencies, deal with the specific problems of individual cities.

On the federal level, the Environmental Protection Agency has the responsibility of overseeing the planning efforts necessary to respond to the requirements of Public Law 92-500. To help accomplish this EPA administers a program of grants which assist the planning and construction of waste management programs and facilities. Grant funds are available to support basin wide planning (Section 303), areawide planning (Section 208), facilities planning and construction (Section 201), and surface water quality monitoring (Section 106) programs.

The Arizona Department of Health Services administers both the basin wide planning and the water quality monitoring programs. Their 303 basin wide programs currently cover all of the State of Arizona, except for Pima and Maricopa Counties. These two counties have been designated as 208 planning areas and will provide both basin wide and areawide planning under the 208 program. Draft final reports are available for 303 studies along both the Salt and the Verde Rivers upstream of Maricopa County. Information from these 303 studies will be incorporated in the 208 study for Maricopa County. In addition to this work, the Department of Health Services reviews and approves areawide (208) and facilities (201) planning for the entire state. In the future, they will administer areawide planning programs for some areas outside of the currently designated 208 areas.

The Maricopa Association of Governments, as a designated 208 planning agency, has the overall areawide planning responsibility for all of Maricopa County. They will be assisted by the Urban Study Program of the Corps of Engineers in accomplishing this task. The Corps wastewater planning efforts will be limited to the area within the Phoenix Urban Study boundary, while MAG will concurrently accomplish required areawide wastewater management planning for the remaining rural portions of Maricopa County. The Corps' Urban Study and MAG's rural study will be closely coordinated. MAG responsibilities include: control and guidance of the entire program; adoption of a new county-wide land use plan; accomplishment of all 208 planning for those areas outside of the Corps' urban study area; active participation in the development, evaluation, and comparison of all alternatives; major roles in the public involvement and institutional analysis programs; and ultimate responsibility for the adoption and implementation of the final plans. In addition to this program, MAG has the responsibility of overseeing and coordinating all facility planning within the area.

In addition to the regional planning accomplished by EPA, the Arizona Department of Health Services, and MAG there exists a number of local agencies which have responsibility for community planning. These agencies, either with their own staffs or through consultants, perform the continuous planning which is necessary to provide for the collection and treatment facilities to meet the demands of their growing communities.

3. Water Supply

There are many agencies involved in planning to assure an abundant water supply for the Phoenix area. The major entities involved are: The Salt River Project, which provides water for municipal, industrial and agricultural uses from the impoundments on the Salt and Verde Rivers; municipal water districts; numerous private water companies, irrigation districts; the county water conservation district, the Arizona Department of Health; the Arizona Water Commission; the Arizona Land Department; the Maricopa County Health Department; the U.S. Geological Survey; and the U.S. Bureau of Reclamation. Current planning by the key agencies is described in the following paragraphs.

The U.S. Geological Survey has a considerable amount of data in reports and in their files on amounts of streamflow, water table elevations, direction of groundwater flow, quality of surface water and groundwater, etc. They are currently conducting data collection and area studies in the Phoenix area on streamflow quality, subsurface geohydrology, and geochemistry of groundwater. They also have an ongoing subsurface data collection program in the Phoenix area that includes collection of drill hole cuttings and water samples, delineation and evaluation of aquifers, distribution of chemical constituents in ground water and historic changes in groundwater quality.

The U.S. Bureau of Reclamation's Central Arizona Project is discussed previously in the flood control portion of this section. The two-fold purpose of the CAP is to provide water to be used in place of groundwater which is now being mined by agricultural, municipal and industrial users, and to provide water for future urban growth in Central Arizona.

The Arizona Water Commission is given the authority by the State Legislature to study and plan for the development, conservation and utilization of all waterways, groundwater and water resources in Arizona. In carrying out this responsibility, the Commission has published Phase I of the State Water Plan. This is an inventory report of the resources, current uses and associated problems of the waters of the State. Phase II of the plan will be an identification and description of alternative futures; when completed, Phase III will present an evaluation of potential water resource management plans for the State.

Aside from preparation of the State Water Plan, the Water Commission in cooperation with the U.S. Geological Survey, publishes an annual report on the groundwater in Arizona. The report deals with the question of groundwater availability and indicates trends in groundwater use.

The involvement of the Arizona Water Commission in water supply throughout the state is sufficiently comprehensive that water supply should be excluded from the Urban Study. The Urban Study will rely upon the water supply data available from the Water Commission, however, and will make every effort to formulate water resource alternatives which are compatible with the efforts and objectives of that agency.

The Arizona Department of Health and the Maricopa County Health Department both have considerable amounts of data on ground and surface water quality. This data has been collected by them over the years, and by the Salt River Project, the municipal water districts, the private water companies, and the irrigation districts. The County Health Department maintains an ongoing program of water quality monitoring and control and regulation of municipal water supplies.

Any applicant for the development of a new municipal water supply must satisfy the Arizona Water Commission that sufficient quantity exists to provide for the requirement for a minimum of 100 years. They must also secure the approval of the County Health Department regarding the quality.

All proposed new wells which are designed to provide water for agriculture must receive the approval of the Arizona Land Department. This area has been designated a "critical groundwater area"*. As such no new wells may be developed to irrigate any land which was not in agricultural production prior to the date of critical designation.

4. Recreation

Planning for recreation facilities is carried out at all levels of government. Most of the larger communities within the study have or are working on recreation master plans for their individual communities.

On a larger scale, the Maricopa County Parks and Recreation Department has the responsibility of planning and developing regional park and recreation facilities, including scenic drives, picnic and camping areas, hiking trails, and bike paths.

At the state level the State Parks Board and the Arizona Outdoor Recreation Coordinating Commission serve as the state planning and coordinating agencies in the area of recreation and park development.

The following Federal agencies are involved in recreational planning within the study area.

The National Park Service is contributing to the proposed Orme Dam recreation master plan. The Bureau of Reclamation is concerned with recreational planning as part of the Paradise Valley detention dikes. The Soil Conservation Service in conjunction with their proposed flood control facilities has included recreation as a project purpose. The Corps of Engineers is developing recreation master plans as part of their planning process for two post authorized flood control projects, New River and Phoenix City Streams and Indian Bend Wash. The Bureau of Outdoor Recreation assisted the Arizona Outdoor Recreation Coordinating Commission in developing the "Arizona Outdoor Recreation Plan". Under the provisions of the Land and Water Conservation Act (Public Law 88-578) BOR is authorized to provide financial assistance to the states, and through the states to local agencies for the acquisition and development of public outdoor resources. The Bureau of Land Management (BLM), as part of their management framework studies, does consider recreation resources. BLM is not actively involved in the development of recreational plans within the study area.

The Rio Salado Project on the Salt River is a unique concept which envisions transforming the dry, barren river bed into a multi-purpose greenbelt floodway as it passes through the metropolitan area. To date, planning has been primarily on the state and local level. Future planning will involve all levels from federal to local. Current state legislation (House Bill 2283, 1975) designates Maricopa County as the fiscal agent for the project. The county would receive and disburse all state funds for Rio Salado under this arrangement. On a federal level, the Corps of Engineers will be the lead agency by virtue of the recreation that will be explored in connection with flood control on the Salt River. The rejection by Phoenix citizens of a bond issue to undertake construction of Rio Salado will be taken into consideration as this planning proceeds. Planners at the local government have not viewed this as a rejection of the Rio Salado concept, but rather as a symptom of the economic recession existing at the time of the election.

5. Fish and Wildlife

An ongoing research effort funded by the Arizona Game and Fish Department is the Urban Lakes Program. The program is designed to determine the feasibility/desireability of fisheries within urban areas, but no data is currently available on the applicability of this program in the Phoenix area.

Extensive fish and wildlife studies for the proposed Orme Dam site are currently being conducted by the U.S. Fish and Wildlife Service, the State Game and Fish Department and Arizona State University. These agencies are studying terrestrial wildlife, waterfowl and raptor, and fish life for the project. Their work will be included in the environmental impact statement currently being prepared by the Bureau of Reclamation for proposed Orme Dam and reservoir.

6. Land Use Planning

Most cities, towns, Indian communities, the County and MAG have developed comprehensive plans for their particular jurisdiction. These plans include in varying degrees of detail, the following: population trends, socio-economic characteristics of the population, a breakdown of general existing and proposed future land use requirements, physical features of the area, a historical overview of development and public facilities (parks and recreation facilities, transportation, water, sewer, storm drainage, etc.).

In reviewing current land use planning, it is important to note a few of the federal and state laws which are the impetus behind many of the planning studies and documents generated by local municipalities, the county, Indian communities and MAG. Cooperation and coordination between these various political entities is largely voluntary. Much of the state legislation authorizing planning is fragmental and in many cases, does not specifically dictate controls for critical areas or large scale developments. Many of the state and federal land use planning guidelines are being revised to reflect changes in the state of the art with respect to planned development. Laws having considerable impact on local land use planning in floodplains are the National Flood Insurance Act of 1968 (Public Law 90-448) as amended, and the Flood Disaster Protection Act of 1973 (Public Law 93-234). The two primary purposes of these Acts, and the resultant Department of Housing and Urban Development Flood Insurance Program, are:

-To make federally subsidized flood insurance available to property owners.

-To encourage state and local governments to adopt sound floodplain management programs to reduce or eliminate future flood losses.

In return for flood insurance, the Acts require that local governments adopt and enforce certain land-use regulations applicable to residential, commercial and industrial construction in flood-hazard areas.

In compliance with these Federal laws, the Arizona Legislature passed into law a floodplain management act.* This act requires local governments to designate floodplains within their jurisdiction and control development within the delineated areas.

Another federal program that affects the metropolitan study area is the comprehensive planning funded by the Department of Housing and Urban Development. The Housing Act of 1954 authorized financing for the cost of acquisition, improvement and construction of sanitation and water facilities; parks, recreation facilities and open space; storm sewers; and public docks and non-federal river harbor improvements. The 1974 amendments to the Housing Act require that the HUD Comprehensive Planning Assistance Program (701) include a land use element as a basis for continued eligibility for 701 funds. This land use element is to provide a basic land use plan, which includes land use, population, and economic inventories and projections. Municipalities in the study which have completed, or currently have 701 planning studies underway include the following: Chandler, Glendale, Goodyear, Phoenix and Tempe all have planning underway; Mesa, Peoria, Scottsdale and Tolleson have completed 701 planning, but are in various stages of updating their plans. MAG has compiled a Composite Land Use Plan from these and other municipality plans, the county plan, and Indian community plans. MAG has requested HUD 701 funds to update this Composite Plan.

State legislation that has provided some cohesion to land use planning in Arizona is the Urban Environmental Management Act of 1973**. This Act provides cities and towns may plan for the development of the lands within their jurisdiction, zone the land, regulate subdivisions, zone and regulate airports and floodplain areas, and expend public funds to purchase open-space area. The Act does not specifically dictate controls for critical areas or large scale developments.

In response to the various mandates for regional planning (including the needed input for this Urban Study), MAG has developed plans to undertake a Comprehensive Land Use and Transportation Reevaluation Study. The Draft Study Design dated 23 July 1975, proposed a very comprehensive study in cooperation with the Federal Highway Administration, the Department of Housing and Urban Development, and the Urban Mass Transportation Administration.

*Arizona Revised Statutes, Sections 45-2341 through 45-2346 (House Bill 2010 1973).

**Arizona Revised Statutes, 9-461 through 9-467, and 11-935.01.

The schedule for this study indicates that by July 1977, a Regional Land Use and Transportation Plan will be adopted. The timing of this MAG study is viewed as a unique opportunity to incorporate the water resource planning potential of the Urban Study program into the local comprehensive planning process. By the same token, the comprehensive MAG plan will provide input for the Urban Study in the form of alternative futures, population projections and land use alternatives on a timely basis. The federal funds to be made available to MAG by either EPA or the Corps (see Figure 4 Supplement and Tables 20a-20f) will contribute to the comprehensive study to the extent of the needs for areawide wastewater management planning.

E. Statement of Planning Objectives

National planning objectives have been established by the United States Water Resource Council, and are discussed in detail in Principles and Standards for Planning Water and Related Land Resources, Federal Register, Volume 38, September 10, 1973. Briefly the two major objectives are; to enhance national economic development (NED) and to enhance the quality of the environment (EQ). Also, consideration should be given to regional development (RD) and social well-being (SWB) effects of water resource programs.

In order to assure that NED and EQ objectives are met, the "Principles and Standards" require that alternative plans be developed such that one emphasizes NED benefits, while the other emphasizes EQ benefits. There may be other alternatives with varying emphasis on the two objectives. The study will include assessments of economic, environmental and social impacts of the various alternative plans which are to be developed.

The major objective of the Urban Studies Program is to use the Corps of Engineers, working in partnership with local, state and federal agencies, to develop realistic plans which can help solve water and land related problems in the urban region for about the next 50 years.

The review of problems, issues and concerns has produced the following planning objectives for each of the study tasks.

1. Flood Control

The Urban Study will consider alternatives which reduce flood damages and protect people, property and productive lands from flood losses. Flood prone areas to be addressed by the Urban Study include the areas of Glendale-Maryvale, South Phoenix, along the Salt River, Upper Indian Bend Wash, Cave Creek downstream from the Arizona Canal, and along the Cross Cut Canal. Structural and non-structural alternatives will be considered to control or prevent damages to present and future urban development. Information regarding flood hazards and overflow areas which is developed in the course of flood damage assessments will be made available to local interests for their use. This may be in the form of floodplain information reports or special flood hazard reports. Urban Study funds will not be used to produce floodplain information reports otherwise. Where floodplain information is needed by local interests and is not otherwise available, these requirements will be submitted to other programs, such as the Corps' Floodplain Management Program or the Federal Insurance Agency's Flood Insurance Program.

The scope of the flood control planning will be to consider early action measures to be implemented within the next 10-15 years, and within an overall comprehensive program to satisfy the needs within the next 50 years.

2. Wastewater Management

The Urban Study will provide implementable wastewater management plans for the urban area that will be consistent with the 1977, 1983 and 1985 goals of Public Law 92-500, and with the guidelines and regulations of the Environmental Protection Agency and the Arizona State Department of Health.

EPA's planning objectives, as prescribed by Public Law 92-500, are to insure that by July 1977 all privately owned treatment plants are applying "the best practicable control" of point sources, and that all publicly owned treatment plants are producing effluent of secondary treatment quality; and that by July 1983 all treatment plants are providing treatment which will assure water of suitable quality for recreational uses and the protection and propagation of fish and wildlife.

The Arizona Department of Health Services' planning objectives are to insure that the 1977, 1983 and 1985 goals of PL 92-500 are achieved through the orderly development of basin wide (section 303), area-wide (section 208), and facility (section 201) plans.

The basin wide planning has as its objectives:

- the development and adoption of water quality standards, including a schedule for compliance, which will insure the timely accomplishment of the 1977, 1983 and 1985 goals.

- the identification of areas within the basin needing more stringent water quality standards than those set in the above paragraph, and the revision of those standards;

- the establishment of a priority ranking of those areas, taking into account the severity of the pollution and the uses to be made of those waters;

- the enforcement of controls over the disposition of all residual wastes;

- the provision of a continuing planning process which includes adequate authority for intergovernmental cooperation and for plan implementation.

The areawide planning has as its objectives:

- the identification of treatment works (through the evaluation of the full range of alternative plans) necessary to meet the point source and non-point source treatment needs of the area;

- the establishment of construction priorities and schedules for such treatment works;

- the establishment of necessary regulatory programs;
- the identification of implementing agencies;
- the identification of the costs and impacts of carrying out the plan and the provision of measures to finance it;
- the development of a process for identification and quantification of non-point source of pollution including: agriculture, silviculture, gravel operations, construction activities, and urban storm run-off;
- the development of procedures for controlling these non-point sources including both structural and non-structural methods;
- the control and disposal of all residual wastes.

The facilities planning has as its objectives:

- the provision of the best practicable waste treatment technology over the life of the facility;
- the development of facilities which will allow for modifications at future dates to provide for the complete reclaiming or recycling of the wastewater;
- the construction of sewer systems which do not have excessive infiltration or inflow.

The wastewater management goal of the Phoenix Urban Study is to provide areawide waste management planning as prescribed by section 208, consistent with existing facilities and current planning efforts. To achieve this, the study will adopt as its objectives the objectives outlined above for areawide (section 208) planning. These objectives will be treated within the context of the overall program as outlined by sections 303, 208 and 201, and will therefore involve some overlap. The base year 1980 is established for the wastewater management aspects of this study. All waste treatment facilities scheduled for construction before that year (see Section III, Appendix C) will be considered as existing unless the proponent local government specifically requests that this facility be addressed in the Urban Study. There are no such requests anticipated at the present time.

3. Water Conservation

A general overview of water supply problems and current planning efforts of various agencies was given in previous sections of this Plan of Study. As has been stated throughout this report, the Corps assumes the authorized Central Arizona Project to be "in being" and reiterates the fact that study efforts concerning municipal and industrial water supply will pertain to residual problems only. These planning efforts in the water supply area generally appear to be adequate, but the potential for further increasing water supplies through the conservation of flood waters has not been explored to date. Accordingly, the water supply objectives for this Urban Study are established to insure that flood waters are conserved for future use to the maximum extent feasible.

4. Recreation

The study will provide for optimum recreation development at proposed water resource projects.

5. Fish and Wildlife Enhancement

The study will identify fish and wildlife development opportunities at proposed or existing water resource projects.

6. Summary of Planning Objectives

In summary, five planning objectives have been established for the Phoenix Urban Study.

-Flood Damage Reduction: Develop flood plain management alternatives which will reduce flood damages and protect people and property in specific flood prone areas.

-Wastewater Management: Develop an areawide wastewater management plan as prescribed by Section 208, Public Law 92-500, consistent with facilities and current planning efforts.

-Water Conservation: Develop plans which insure the conservation of flood water for future use and water quality enhancement to the maximum extent feasible.

-Recreation: Provide plans for optimum recreational development at proposed water resource projects.

-Fish and Wildlife Enhancement: Identify fish and wildlife development opportunities at proposed or existing water resource projects.

F. Public Involvement

1. General

The Phoenix Urban Water Resource Study will include a comprehensive public involvement effort fully integrated with the planning process. As this public involvement program is developed and implemented, several philosophical considerations will be recognized.

The fundamental purpose of the study is to benefit the general public. The solutions to water resource problems which result from this study must conform to the desires and best interests of the general public. The purpose of the public involvement program will not be to "sell" the public on programs that are contrary to their desires, but rather to determine what these desires are and to develop solutions accordingly.

The success of this study will be measured by; one, the development of acceptable solutions to water resource problems; and two, getting the solutions implemented.

Of these two tasks, the latter will probably be the more difficult. The effectiveness of the public involvement program will largely determine whether or not the solutions are supported strongly enough to be implemented. The importance of public involvement cannot be overemphasized.

2. Definition and Identification of Publics

For the purpose of this Plan of Study, the term "public" will be used to describe any entity other than the Corps and MAG staffs directly involved in the study. The public in this sense can be identified as several groups to illustrate the broad sense of this definition.

a. Governmental Sector. This group includes elected officials and agency representatives at the federal, state and local levels. It would also include public utility companies, irrigation districts, special purpose governments such as flood control districts, and Indian Tribal governments.

b. Special Interest Groups. Included in this group would be special interest organizations (such as environmental organizations, recreation clubs and home owners' associations), general interest groups (such as Lions, Rotary, Kiwanis), professional associations (such as American Institute of Architects), educational institutions, industrial and business organizations, Chambers of Commerce and labor unions.

c. General Public. This would include everyone that might be affected by the study. Of particular interest, however, are

property owners that would be directly affected by courses of action contemplated by the study, and sensitive ethnic or economic groups.

3. Objectives

The objective of the public involvement program is to provide a continuous, two-way communication process which will:

- Promote full understanding of the manner and means by which water resources problems and needs are investigated and solutions are proposed.
- Keep the public fully informed regarding the status and progress of studies and the results and implications of planning activities.
- Actively solicit from the public their opinions and perceptions of problems, issues, concerns, and needs, and their preferences regarding resource use and alternative development or managerial strategies, and any other information and assistance relevant to the planning process.

Using the public involvement program as a vehicle for discussion of community desires and purposes will allow the opportunity to obtain information concerning the acceptability of alternative plans. Thus the possibilities and difficulties of implementing alternative plans can be effectively explored by utilizing the involved public as a sounding board for the alternatives which are generated.

4. Public Involvement Program

To meet the objectives of the public involvement program, various activities will be conducted as appropriate to the three Urban Study plan development stages, (see page 4, Stages of Plan Development). Rather than being a fixed program, the public involvement scheme outlined below is rather flexible, and will be monitored for effectiveness as the study progresses. Considerable effort will be given to the type and timing of the interaction so as to achieve optimum citizen involvement.

a. Public Meetings. Three public meetings are planned during the study. An initial public meeting was held in July 1975; one will be held in November 1976, near the completion of Stage II; and a final meeting in June 1978, near the end of the study. These meetings are aimed at reaching the general public.

b. Public Workshops. A number of workshops will be conducted during the study. Like the public meeting, they are intended to give the general public an opportunity to learn of the study and to

respond. Unlike the public meeting, the workshops will permit informal discussion, and will be directed at a particular group of citizens who are more interested in the effects of the various alternatives. An example might be the possible location of a wastewater treatment facility in a particular community.

c. Technical Committee. This group (described in more detail in part H.) represents the primary means of obtaining advice from the governmental and technical sector of the public.

d. Citizens Committee. A continuous dialogue with special interest groups and other influential community leaders will be established through this committee.

e. Opinion Polls. Recognizing the difficulty in generating public interest in a study such as this, especially in the early stages, at least one and possibly two inventories of public opinion (attitude survey) will be made. The purpose of the first one would be to establish early in the study what the desires and priorities of the general public are concerning water resource problems. The second inventory, if needed, would be intended to come near the end of Stage II, and would assist in evaluating public reaction to various alternatives. These inventories would be conducted by outside personnel with expertise in conducting this type of activity.

f. Brochures. At least three brochures will be printed for distribution at the public meetings and for general information concerning the study. These brochures will roughly coincide with the end of each of the three stages.

g. Newsletters. A newsletter will be published quarterly and mailed to members of both technical groups as well as other interested individuals.

h. Speakers. Speakers will be made available to civic and professional organizations and education institutions.

i. Media. Representatives of the news media will be among those asked to participate on the Citizens Committee. Television specials (public service announcements) will be utilized in later stages of the study. As a general rule, every effort will be made to solicit the interest of the media and to keep them fully advised on the course of the study.

G. Institutional Considerations

1. General

The planning process to be followed in the Phoenix Urban Study has been designed to provide a flexible approach to water resource planning in the area. Consideration of water resource management alternatives necessitates a study of responsible institutions. For the purpose of this study, institutions include not only organizations, such as planning agencies, municipal water departments, irrigation districts, etc., but also laws, processes and relationships that are applicable to water resources. The following paragraphs will outline the institutional analysis that will be made as a part of the Phoenix Urban Study.

The ultimate objective of the institutional study is to insure that the technical water resource alternatives are implementable. To accomplish this, consideration must be given to the legal constraints, local customs and capacities of the various organizations which will implement the water resource alternatives developed by the study.

Heavy reliance is expected upon consultant services under contract to the Corps. The legal counsel and experience of water resource agencies will be used to the maximum. Every effort will be made to extract the necessary data from available information to avoid the imposition of this workload on the agencies involved. An attempt will be made to identify institutional trends among agencies with similar responsibilities in order to avoid duplication of information.

2. Steps in Institutional Studies Plan

The plan for institutional studies will consist of four basic steps:

- Data collection
- Data analysis
- Impact analysis
- Institutional arrangements

a. Data Collection. During the data collection step, the institutional study will compile individual synopses on the agencies with water resource responsibilities. It will also compile a description of legal constraints, wide-spread policy, local customs, interagency contracts and commitments, and other pertinent information of a similar nature.

A large portion of this effort will be devoted to assembling data on water resource agencies. The first task will be to assemble a list of water resource agencies within the study area. Then, for each agency, the following information will be gathered,

emphasizing those aspects pertinent to water resources where the agency may have other responsibilities:

- Scope of authority and jurisdiction
- Brief history of the agency
- Budget and financial information
- Internal organization structure including present and future manpower levels
- Coordinating mechanisms present
- Legal or administrative constraints
- Major ongoing programs
- Names of key personnel

b. Data Analysis. During the data analysis step, the institutional study will identify and evaluate institutional conditions as either opportunities or constraints which must be considered in the development of alternative water resource plans. These factors are examined in the light of the potential impact which the various alternatives would have on existing institutions in the study area. To a limited extent this phase will also utilize interviews with key officials to obtain information which cannot be obtained through the data collection process. The data previously collected will be analyzed, expanded and specific emphasis will be placed on the following key factors related to agencies:

- Any proposed or planned changes in authority or organization
- Budget projections
- Current policies and proposed changes thereof
- Financial constraints
- Interrelationships among existing agencies
- Factors which define the ability or inability of individual agencies to adapt to regional plans, such as flexibility in altering geographical boundaries, authority to acquire real estate through negotiation or condemnation.
- Obstacles to institutional change such as strong support for home rule, a large number of local governments or the absence of enabling legislation.
- Any overlap or conflict among agencies.

The data analysis step will coincide with the end of Stage 2 (Development of Intermediate Plans).

c. Impact Analysis. During the impact analysis step, the conditions discovered during the previous two steps will be applied against the technical water resource alternatives. The initial data base will be used to evaluate the impacts of technical alternatives on institutions, and vice versa. Then, as these water resource alternatives are refined from a technical standpoint, the institutional realities will be considered and will also influence the refinements. This third step will be a continuous process of interaction between water resource planners and the institutional analysts.

Accomplishment of the impact analysis objectives will require:

- Examination of the requirements for construction, operation, maintenance, surveillance, monitoring, and enforcement to determine whether existing authority is sufficient to enable implementation.

- Examination of the planning and coordination mechanisms of existing agencies to discover if they encourage implementation of the proposed water resource alternatives.

- Determination of the financing requirements of the water resource alternatives to see if they can be met by existing authorities.

- Determination of other effects the proposed alternatives might have upon existing institutions.

- Determine any institutional requirements of water resource alternatives which cannot be met under present conditions.

d. Institutional Arrangements. During the final step in the institutional study each water resource alternative still considered technically and environmentally feasible will be specifically addressed from an institutional point of view. Current guidelines for a Corps urban study require that two implementation (institutional) alternatives be developed for each water resource alternative. In general terms it is planned that one of these institutional alternatives will maximize the use of existing institutions without changes; and that the other will optimize the implementation efficiency even though this may require institutional changes. The results of this final step will be presented in the final report of the Phoenix Urban Water Resources Study and will consider for each alternative:

- Statutory considerations
- Financial and budgetary limitations
- Administrative factors
- Legal authorities
- Geographic jurisdiction
- Interagency relationships
- Attitudes of agencies involved

3. Preliminary Institutional Analysis

An initial assessment of the number of institutions and their functional areas has been made. This analysis was the basis for the formation of the Technical Committee membership as described in paragraph H2. Analysis of that Committee membership reveals that 38 different agencies are expected to be involved in the institutional analysis process, with interests in the functional areas as indicated in paragraph H2.

The institutional analysis will also look at institutions which are not agencies, but other forms of institutions such as laws, court decisions, contracts, etc. While the number of institutions in this category has yet to be determined there appear to be approximately 20-25 such institutions which will be pertinent to the Urban Study.

H. Study Management

The District Engineer has been charged by virtue of Congressional resolution with the final authority for the administration and management of the study. He will rely upon several committees and his staff to discharge these responsibilities. Depicted in Figure 3 is the structure through which the study will be conducted, with the various responsibilities as outlined below.

1. Executive Committee

-General. The Executive Committee will be formed to provide the overall direction to the study. The District Engineer will make every effort to adhere to the decisions of the Executive Committee.

-Responsibilities. The responsibilities of the Executive Committee will be to:

Establish the scope of the study within the bounds of Federal regulations.

Periodically review the methods and direction of the Study to insure conformance with the established scope, and provide direction to the District Engineer in this regard.

-Membership. The Executive Committee will consist of the following members:

US Army Corps of Engineers, Los Angeles District
Maricopa Association of Governments
Environmental Protection Agency
Arizona State Legislature
Salt River Project
Arizona Water Commission
Arizona Department of Health Services
Maricopa County Board of Supervisors
Arizona Land Department
Two citizens

The Executive Committee will be chaired by the elected official appointed by the Maricopa Association of Governments. The membership as constituted above is expected to provide adequate representation to agencies who will be regulating or implementing water resource plans which will have direct impact on the urban area, both at the staff level and at the elected official level. This representation will be balanced by the non-technical point of view of citizens and by the lengthy experience in local water problems afforded by the staff of the Salt River Project (a municipality under Arizona statutes).

2. Technical Committee

The Technical Committee will be composed of representatives primarily of various government agencies. Members will be selected by the Corps and MAG staffs so as to provide adequate technical expertise for the areas of concern. This committee will probably not call its entire membership together at any single time, but rather will be a more informal committee with continuous interaction between its members. Committee members will meet in subcommittee groups by task topics. The State Hydrologist will be asked to serve as the chairman of the Water Conservation Sub-Committee, and the Chairman of the Maricopa Association of Governments Public Works Committee will be asked to serve as the Chairman of the Wastewater Sub-Committee. Other chairmen have not yet been identified.

A preliminary list of the Committee membership is as follows:

<u>Agency & Member</u>	<u>Sub Committees*</u>				
	<u>FC</u>	<u>WW</u>	<u>RE</u>	<u>WC</u>	<u>FW</u>
Federal Agencies					
Corps of Engineers	x	x	x	x	x
Bureau of Land Management					
Ralph Corn			x		x
Bureau of Reclamation					
Keith Pinkerton	x			x	x
Fish & Wildlife Service					
Ron McKinstry			x		x
Bureau of Outdoor Recreation					
Ted Dingman			x		x
Housing & Urban Development					
Bob Hart	x				
Geologic Survey					
Ed Davidson	x			x	
Environmental Protection Agency					
Dave Howecamp		x		x	x
Soil Conservation Service					
Ron Clark	x				
Department of Agriculture					
Dr Herman Bouwer		x		x	
Bureau of Indian Affairs					
Harold Roberson	x	x	x	x	x
Indian Communities					
Salt River Indian Community					
Roger Evans	x	x	x	x	x
Gila River Indian Community					
Z. Simpson Cox	x	x	x	x	x
Ft. McDowell Indian Community					
Sam Hilliard	x	x	x	x	x
State Agencies					
Water Commission					
Larry Linser	x	x	x	x	
Az. Resource Information System					
Carl Winikka		x			
Land Department					
Joe Melling	x				
Dept of Health Services					
Ed Swanson		x			
Dept of Parks & Recreation					
Chuck Eatherly			x		x
Outdoor Recreation Coordinating Committee - Roland Sharrer			x		x
University of Arizona					
Dr. Gray Wilson				x	

<u>Agency & Member</u>	Sub Committee*				
	<u>FC</u>	<u>WW</u>	<u>RE</u>	<u>WC</u>	<u>FW</u>
Arizona State University					
Dr. Mel Marcus	x		x	x	x
Dept of Game & Fish					
John Carr			x	x	x
Office of Economic Planning & Development - Beverly Brown	x	x			
County Agencies					
Health Dept					
Joe Weinstein		x			
Flood Control District					
Herb Donald	x				
Parks & Recreation Dept.					
Bob Milne			x		x
Planning Dept					
Phil Bloom			x		x
Municipalities					
Chandler					
Bruce Knutson	x	x	x		
Glendale					
Harold Goodman	x	x	x		
Goodyear					
Ernie Kleinschmidt	x	x	x		
Mesa					
Charles Luster	x	x	x	x	
Phoenix					
Jim Attebury	x			x	
Scottsdale					
Don Raby	x	x			
Tempe					
Grover Serenbetz	x	x	x	x	
Maricopa Association of Governments					
Ken Driggs	x	x	x	x	x
Art Auerbach		x			x
Gene Jones		x			
Salt River Project					
Don Weisner	x			x	
Hohokam RC&D					
Ken Fooks	x	x	x	x	x

*Sub Committees: FC - Flood Control
 WW - Wastewater
 RE - Recreation
 WC - Water Conservation
 FW - Fish & Wildlife

3. Citizens Committee

-General. The Citizens Committee will be formed to provide a forum of individuals with interests in the subjects to be addressed by the study. The Committee will select its own chairman and establish its own schedule of meetings. The initial membership is outlined below. Additions to the membership of the Committee will be determined by the Committee itself.

-Responsibilities. It is intended that the Citizens Committee carry out the following responsibilities:

-Reviewing all aspects of the study on a periodic basis, and advising the Executive Committee or the Study Manager as appropriate.

-Presenting to the Executive Committee and the Study Manager information concerning their own perceptions of problems and solutions.

-Advising on best methods of establishing a two-way information exchange with the general public.

-Taking an active role in assessment of alternative solutions to the water resource problems as these solutions are developed in the course of the study.

-Membership. Initially the following organizations will be requested to appoint a representative to the Citizens Advisory Committee:

American Institute of Planners
American Institute of Architects
American Society of Civil Engineers - Phoenix Branch
Arizona Conservation Council
Arizona Outdoors Writers Association
Arizona Public Health Association
Arizona Wildlife Federation
Audubon Society
Friends of the Earth
League of Women Voters
Phoenix Chamber of Commerce
Sierra Club - Grand Canyon Chapter
Valley Forward Association
Gila River Indian Community
Fort McDowell Indian Community
Salt River Indian Community
Farmers associations
Homeowners associations

4. Study Team

The Corps Staff assigned full time to the study initially will consist of the following team:

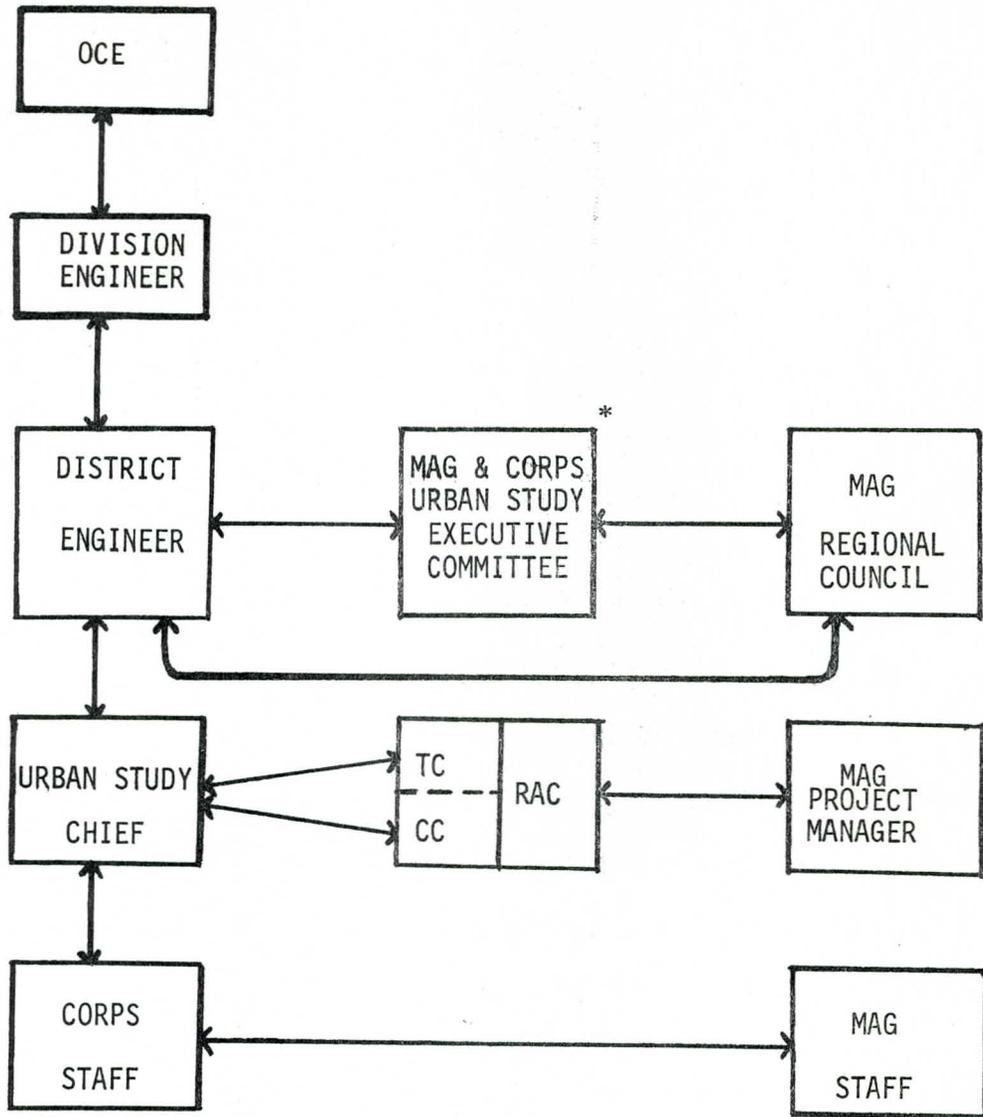
Study Manager
Water Resource Planner
Civil Engineer, Sanitary
Impact Assessment Specialist
Technical Writer
Secretary

This staff will be supplemented by:

Other Corps of Engineers personnel as required
The staffs of other government agencies
Other agencies and firms under contract

FIGURE 3

STUDY MANAGEMENT STRUCTURE



* Other MAG Involvement

CC -Citizens Committee

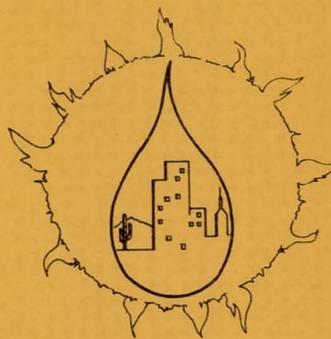
TC -Technical Committee

MAG-Maricopa Association of Governments

CORPS-U.S. Army Corps of Engineers

OCE -Office of the Chief of Engineers

RAC -Regional Advisory Committee



Section III

STUDY EFFORT ALLOCATION

A. Major Work Items

The total study effort is broken down into five major work items: 1) flood damage reduction, 2) wastewater management, and 3) water conservation, 4) water-related recreation, and 5) fish and wild-life enhancement.

1. Effort Components. The major work items are broken down into effort components as follows:

- a. Preparation of the Plan of Study
- b. Problem identification
- c. Formulation of alternatives
- d. Impact assessment and evaluation
- e. Public involvement and institutional studies
- f. Study documentation and report preparation
- g. Study management

Each component of the process is discussed in the following paragraphs:

a. Preparation of the Plan of Study. This task involved the preparation of a public involvement program, the development of an institutional analysis methodology, preliminary identification of the needs in the area, identification of work tasks to perform the study, the assignment of these work tasks among the various agencies involved, and the preparation of detailed cost estimates and schedule for performing the study. Extensive agency coordination and limited public involvement activities were an integral part of this component.

b. Problem identification. This task will include evaluation of existing and projected conditions as perceived by Federal, State and local agencies and also by the public. This effort will provide the necessary data for the formulation of alternatives. The different elements in this task are described below:

-Inventory of existing data. This element comprises data gathering efforts, inventory of such data, and evaluations of existing conditions. Subject areas include physiographic features, population and employment conditions, socio-economic conditions, land use condition, existing institutional arrangements, existing water resource facilities, wastewater discharges, water quality condition, flood damages, water-related recreation, and environmental aspects including natural and mineral resources, fish and wildlife resources, unique biological, geological and botanical systems, and significant historic, architectural, esthetic, and archeological sites.

-Analysis of projected conditions. As a prerequisite to plan formulation, projections performed by local, state and federal agencies and by the public will be analyzed and evaluated for the following areas: socio-economic projections; land use requirements by major categories of residential, commercial, industrial, institutional, recreational and agricultural uses; projection of waste discharges and water quality needs; projection of flood damage control needs, projection of water related recreation of flood damage control needs, projection of water related recreation demands; and analysis of environmental enhancement needs.

c. Formulation of Alternatives. Following approval and completion of the Plan of Study, the remainder of the work program will be carried out in two stages. The first of these will provide another iteration through the planning process at a level of detail sufficient to identify problems, to develop alternative programs without detailed engineering or design, and to evaluate them in terms of impacts and costs. The emphasis in this stage will be given to 1) assuring that the plans address the water and related problems, issues and concerns and to 2) analyzing the relationships of these plans and issues in a way that will facilitate public decisions regarding the further development of plans. The second of these stages, the final stage, will provide subsequent iteration through the planning process to the presentation of final alternatives. Plans will be developed in greater detail in terms of specifying needs, objectives and alternative plans. During this stage, it is expected that the alternative plans to be considered will have been reduced to a more manageable number. These will be the alternatives to which detailed design and evaluation will be applied. An overview of alternatives which might be considered for each of the study purposes are discussed below:

-Flood damage reduction. The alternatives to reduce or prevent flood damages will include structural and non-structural measures or combinations thereof. The measures to be considered include specialized land use, zoning regulations, flood insurance and development of floodways, flood proofing, levees, channel improvements, evacuation, detention storage, reservoir regulation and diversions and flood warning systems.

-Wastewater management and water quality. The alternative plans for wastewater management will include: regulation, control and treatment of both point and non-point sources of pollution. Treatment facilities studied will encompass biological systems, physical-chemical processes, land disposal and land treatment. Trade-off between system storage and treatment facility size will be studied. Regulations to be studied will include pretreatment requirements, on-site control of specific pollutants, and on-site retention of storm water run-off.

The alternative plans for wastewater quality parallel the wastewater management plans. In addition, watershed management and groundwater regulation will be considered. A predictive model that would include both groundwater quantity and quality parameters would be useful for this task.

-Water conservation. Alternatives that will permit maximum use of flood waters and urban storm runoff will be explored. Such alternatives will include optimization of existing and planned surface reservoir operating schedules. Also to be considered as an alternative will be the ground water basins, their size and characteristics, and methods of introducing surface flows into the ground water reservoirs.

-Water-related recreation. Alternative means of satisfying this need will be formulated within the framework of alternatives proposed for the other study purposes. Various measures to be investigated include: further development of existing recreation sites, utilization of flood plain land, development of new sites, evaluation and incorporation of the Rio Salado Project, and maintenance of water quality adequate for recreational use.

-Fish and wildlife enhancement. The preservation, management and improvement of the fish and wildlife resources are integral with comprehensive water resource planning. The study will analyze methods of relating enhancement of fish and wildlife resources to the resource being depleted or altered. Alternative methods will be explored which will optimize the development of urban lakes. Also alternative types of habitat will be studied as a way of supplementing diminishing riparian habitat.

d. Impact Assessment and Evaluation. The purpose of impact assessment is to identify and measure the changes expected to result from various alternative plans. Impacts are identified by comparing all the components of an alternative plan to the base condition of the area to determine the economic, social and environmental changes that are expected to occur with the plan. Impact assessment involves the following activities:

-Categorize the sources of impacts such as inputs, outputs and facilities.

-Identify impacts and trace impacts.

-Specify incidences of impacts, including spatial distribution and when they will occur.

-Measure impacts.

The purpose of impact evaluation is to determine how well the alternative plans achieve the planning objectives and how the plans affect other related problems. Evaluation provides the basis for trading off among the alternative plans and is contingent upon reflecting publicly held values to determine which are the beneficial and adverse aspects of each plan. Evaluation involves the following activities:

- Categorize impacts.
- Label National Economic Development and Environmental Quality plans.
- Determine the Federal interests.
- Apply other Federal evaluation criteria.
- Perform trade off analysis, in part through public involvement.
- Specify bases for next iteration.

e. Public Involvement and Institutional Studies. The public involvement effort involves the development, implementation and monitoring of the Public Involvement program.

The institutional studies analysis is composed of three major task areas as follows:

- Establishment of an institutional data base.
- Analysis and evaluation of institutional capabilities versus the requirements of an alternative plan.
- Presentation of workable alternative institutional arrangements as part of the implementation program.

f. Study Documentation and Report Preparation. The Urban Studies Program Study Report will consist of a Summary Report with Appendices and ancillary documents required to accompany the Study Report. The Summary Report will be a well illustrated document written for non-technical readers and will be essentially a summary of the plan formulation. The primary appendices will consist of:

- Background Information Appendix
- Plan Formulation Appendix
- Comments Appendix

The Background Information Appendix will provide a discussion of the existing regional profile and the desired future conditions and identification of the specific problems, issues, needs and concerns to which solutions may be addressed.

The Plan Formulation Appendix will address significant regional problems, concerns, issues and planning objectives and formulate alternative urban water resource plans. This appendix will also contain implementation arrangements, a comparison of final alternative plans and their impact. Throughout the text, all decisions reached will be fully discussed. It will summarize the specialty appendices, which will include Design and Cost, Impact Assessment and Evaluation, Institutional Analysis and Public Involvement appendices.

The Comment Appendix will document the views of interested parties based on their review of the draft Study Report.

The Ancillary documents that will be prepared will include:

- Documents prepared during the course of a study for public use at public meetings.

- Documents prepared for internal review by higher authority.

- Documents prepared for coordination and review prior to study completion such as the revised draft environmental impact statement for any aspects of the plan which the District Engineer may recommend for Congressional authorization.

It is also planned that a separate ancillary document will be produced, detailing the Areawide Waste Treatment Management Plan, as required by Section 208, Public Law 92-500. This document will be transmitted by the Maricopa Association of Governments to the Governor of Arizona, who will certify it and forward it to the Administrator of the Environmental Protection Agency for approval.

g. Study Management. This task will involve the management of the overall study effort to insure the efficient conduct and a timely completion of the study. The following functions will be considered to be included in the management task:

- Monitoring the progress of the study to insure adherence to the established schedule.

- Programming the funds required to accomplish the study, and monitoring the expenditure of funds.

-Making necessary arrangements for administrative support for the study, such as office space, transportation, office equipment, etc.

-Selecting and negotiating with architect-engineer firms for technical work to be accomplished by contract.

-Taking necessary personnel actions, such as job establishment, leave request approval, eligible and qualified personnel for promotion, etc.

-Making necessary coordination with other District offices and with other agencies and individuals.

-Reviewing all products of the study to insure the quality thereof, and to insure conformance with criteria and guidance set forth by regulations and the District.

-Preparing correspondence and routine documents.

B. Schedule of Work Tasks

The Phoenix Urban Study, including preparation of the final report, is scheduled for completion 35 months after the approval of the Plan of Study. Figure 4 is a work sequence diagram illustrating the schedule to be followed in accomplishing the remaining part of the study.

The proposed task schedules and cost breakdowns for the wastewater management portion of the Urban Study are shown on the Figure 4 Supplement. Because of the cost sharing requirements related to wastewater management, a greater degree of detail is presented for this function than for the other four study functions.

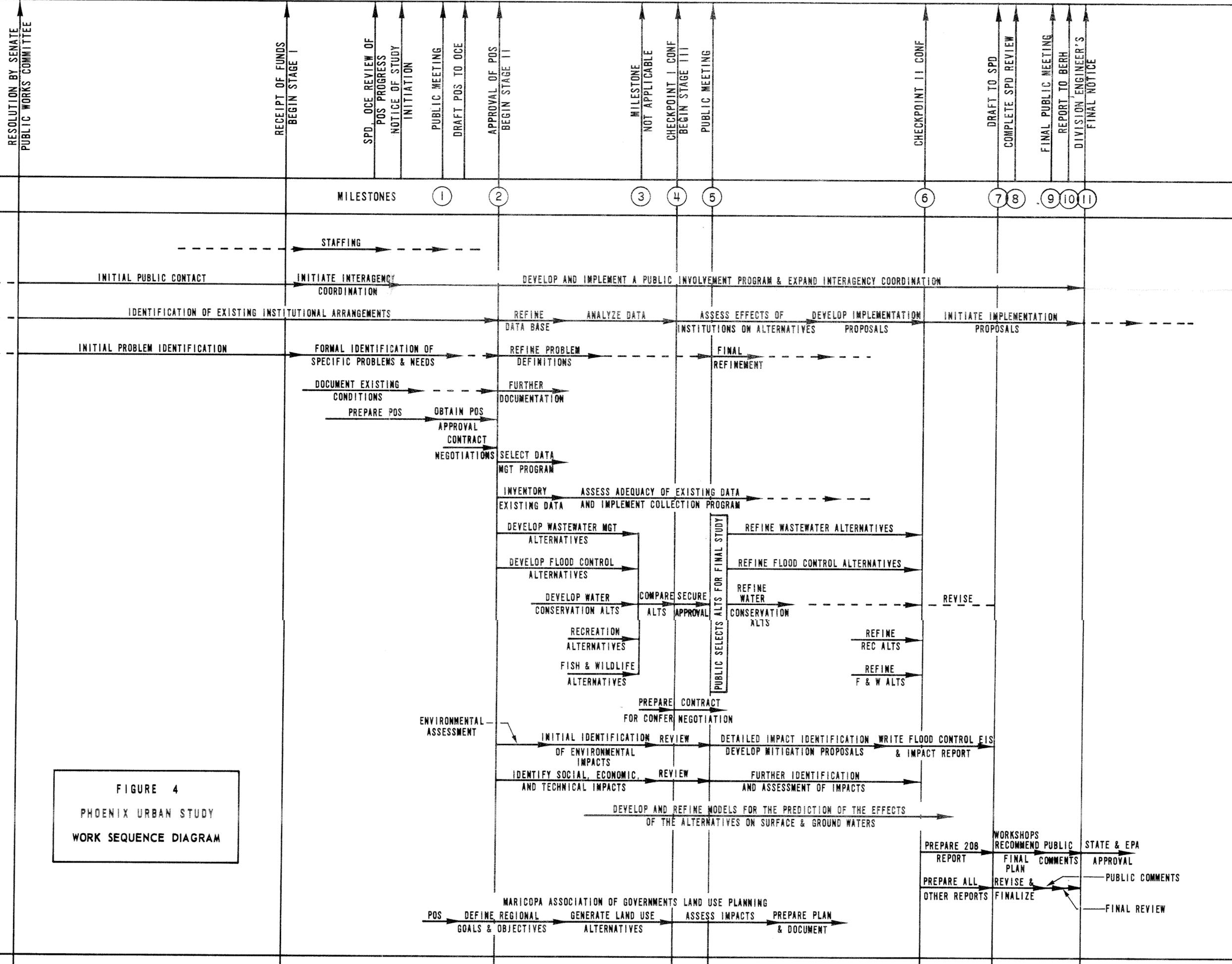
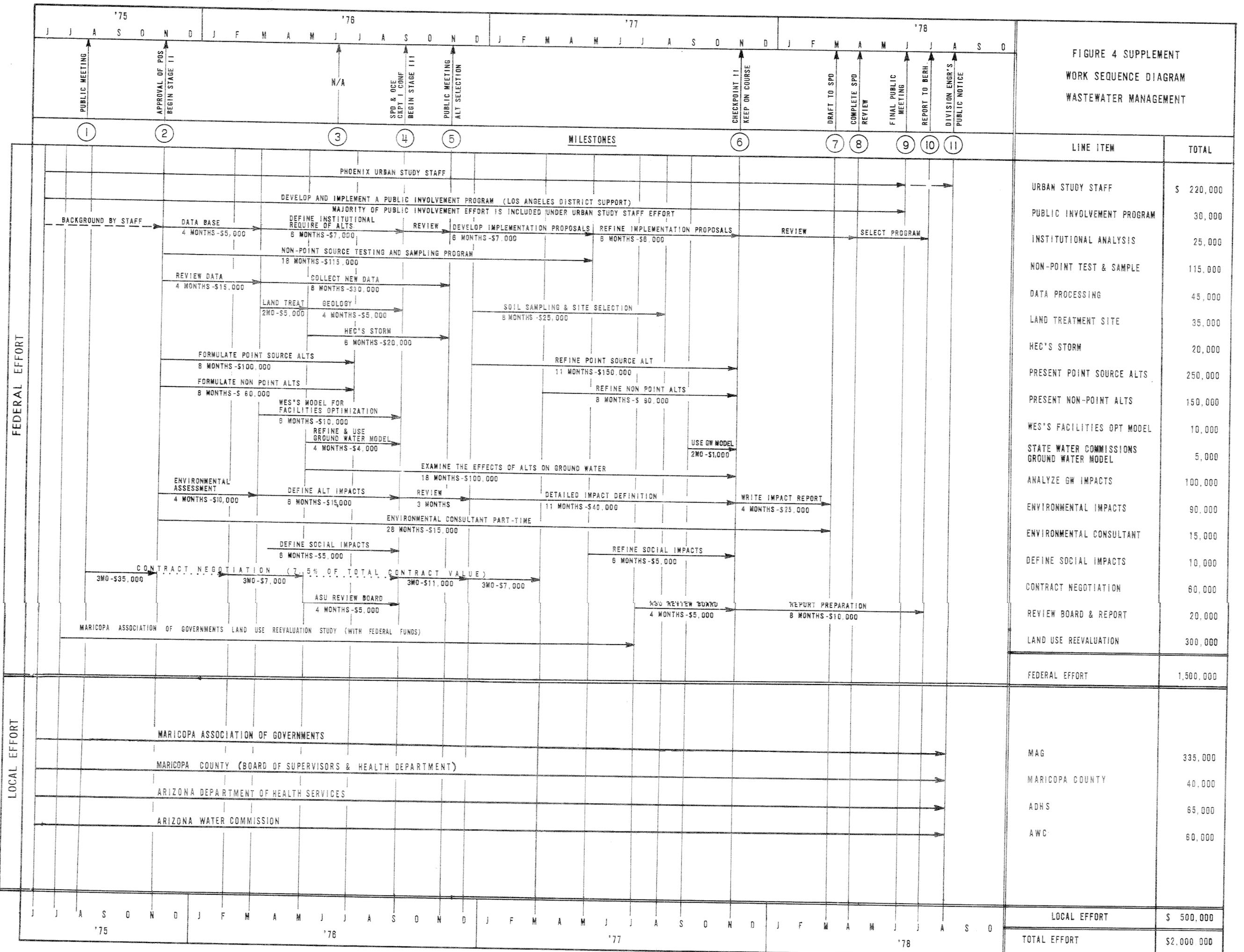


FIGURE 4
 PHOENIX URBAN STUDY
 WORK SEQUENCE DIAGRAM

FIGURE 4 SUPPLEMENT
WORK SEQUENCE DIAGRAM
WASTEWATER MANAGEMENT



See Appendix B for minor cost revisions

C. Study Costs

The total cost of the Phoenix Urban Study is estimated to be \$3,900,000. This estimate reflects Federal efforts amounting to \$3,300,000 and non-Federal efforts totalling \$600,000. Manpower and other costs (primarily for consultant contracts) were estimated for each major work item. A value of \$3,000 per man-month was used for all work efforts. The total study cost estimate allows for contingencies, and administration overhead in accomplishing the necessary work.

The cost estimate for the wastewater management item of the study totals \$2,000,000. Of this total, \$500,000 is non-Federal and represents the combined efforts of the four local participating agencies. (See table 19b and tables 20 thru 20f for details).

The Urban Study will elect to use consultants to provide expertise unavailable within the Corps, specifically for wastewater management planning or other task areas where the Corps is unable to provide in-house training in a timely fashion.

Summaries of the study costs are presented in the following tables:

Table 17 lists the costs by major work items and effort components.

Table 18 summarizes Federal and non-Federal funds by major work items.

Table 19 summarizes total Federal and non-Federal funds by effort component.

Table 19a thru 19e list Federal and non-Federal funds by effort component for each major work item, (i.e. flood control, wastewater management, water conservation, recreation, fish and wildlife).

Tables 20 and Tables 20a thru 20f delineate wastewater management costs as required by OCE.

See Appendix B for
minor cost revisions

TABLE 17
(Federal Register Table 2-1)
TOTAL STUDY COSTS BY MAJOR WORK ITEM AND EFFORT COMPONENT
(In Thousands of Dollars)

<u>EFFORT COMPONENTS</u>	<u>Wastewater Management</u>	<u>Flood Control</u>	<u>Water-Related Recreation</u>	<u>Water Conservation</u>	<u>Fish and Wildlife</u>	<u>TOTAL</u>
1. Plan of Study Preparation	34	41	11	13	7	106
2. Plan Formulation/Preparation						
a. Problem Identification	207	213	31	17	11	479
b. Formulation of Alternatives	540	290	57	74	16	977
c. Impact Assessment/Evaluation	554	428	79	30	16	1107
d. Public Involvement and Institutional Studies	445	120	53	25	22	665
3. Study Documentation and Report Preparation	110	142	43	21	18	334
4. Study Management	110	66	26	20	10	232
TOTAL FOR WORK ITEM	2000	1300	300	200	100	3900

TABLE 18
(Federal Register Table 2-2)
FEDERAL AND NON-FEDERAL EFFORTS BY MAJOR WORK ITEM
(In Thousands of Dollars)

<u>Major Work Items</u>	<u>Federal</u>		<u>Non-Federal</u>		<u>Total For Major Work Items</u>	
	Man-Years	Cost	Man-Years	Cost	Man-Years	Cost
Wastewater Management	41.5	1500	13.9	500	55.5	2000
Flood Control	34.8	1255	1.2	45	36.0	1300
Water-Related Recreation	7.6	275	0.7	25	8.3	300
Fish & Wildlife	2.4	86	0.3	14	2.7	100
Water Conservation	5.1	184	0.4	16	5.5	200
	<hr/>		<hr/>		<hr/>	
Totals	91.4	3300	16.6	600	108.0	3900

TABLE 19
(Federal Register Table 2-3)
FEDERAL AND NON-FEDERAL EFFORTS
(Cost in Thousands of Dollars)

<u>Effort Component</u>	<u>Federal</u>		<u>Non-Federal</u>		<u>Total For Effort Component</u>	
	<u>Man-Years</u>	<u>Cost</u>	<u>Man-Years</u>	<u>Cost</u>	<u>Man-Years</u>	<u>Cost</u>
1. Preparation of a Plan of Study	2.5	87	0.5	19	3.0	106
2. Plan Formulation & Evaluation						
a. Problem Identification	11.8	425	1.5	54	13.3	479
b. Formulation of Alternatives	24.2	877	2.8	100	27.0	977
c. Impact Assessment & Evaluation	25.9	938	4.7	169	30.6	1107
d. Public Involvement & Institutional Studies	12.3	443	6.1	222	18.4	665
3. Study Documentation & Report Preparation	9.3	334	0.0	0	9.3	334
4. Study Management	5.4	196	1.0	36	6.4	232
Total for Effort	91.4	3300	16.6	600	108.0	3900

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TABLE 19a
(Federal Register Table 2-3a)
WORK ITEM: FLOOD CONTROL

FEDERAL AND NON-FEDERAL EFFORTS
(Cost in Thousands of Dollars)

Effort Component	Federal		Non-Federal		Total For Effort Component	
	Man-Years	Cost	Man-Years	Cost	Man-Years	Cost
1. Preparation of a Plan of Study	1.0	34	0.2	7	1.2	41
2. Plan Formulation & Evaluation						
a. Problem Identification	5.7	206	0.2	7	5.9	213
56 b. Formulation of Alternatives	7.9	284	0.2	6	8.1	290
c. Impact Assessment & Evaluation	11.6	420	0.2	8	11.8	428
d. Public Involvement & Institutional Studies	3.0	109	0.3	11	3.3	120
3. Study Documentation & Report Preparation	3.9	142	0.0	0	3.9	142
4. Study Management	1.7	60	0.1	6	1.8	66
Total for Effort	34.8	1255	1.2	45	36.0	1300

TABLE 19b
(Federal Register Table 2-3b)
WORK ITEM: WASTEWATER MANAGEMENT

FEDERAL AND NON-FEDERAL EFFORTS
(Cost in Thousands of Dollars)

<u>Effort Component</u>	<u>Federal</u>		<u>Non-Federal</u>		<u>Total For Effort Component</u>	
	<u>Man-Years</u>	<u>Cost</u>	<u>Man-Years</u>	<u>Cost</u>	<u>Man-Years</u>	<u>Cost</u>
1. Preparation of a Plan of Study	0.8	28	0.2	6	1.0	34
2. Plan Formulation & Evaluation						
a. Problem Identification	4.6	167	1.1	40	5.7	207
b. Formulation of Alternatives	12.7	460	2.2	80	14.9	540
96 c. Impact Assessment & Evaluation	11.4	410	4.0	144	15.4	554
d. Public Involvement & Institutional Studies	6.8	245	5.5	200	12.4	445
3. Study Documentation & Report Preparation	3.0	110	0.0	0	3.0	110
4. Study Management	2.2	80	0.8	30	3.0	110
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
Total for Effort	41.5	1500	13.9	500	55.4	2000

TABLE 19c
(Federal Register Table 2-3c)
WORK ITEM: WATER CONSERVATION

FEDERAL AND NON-FEDERAL EFFORTS
(Cost In Thousands of Dollars)

Effort Component	Federal		Non-Federal		Total for Effort Component	
	Man-Years	Cost	Man-Years	Cost	Man-Years	Cost
1. Preparation of a Plan of Study	0.3	11	0.0	2	0.3	13
2. Plan Formulation & Evaluation						
a. Problem Identification	0.4	14	0.1	3	0.5	17
b. Formulation of Alternatives	1.9	70	0.1	4	2.0	74
76 c. Impact Assessment & Evaluation	0.7	27	0.1	3	0.8	30
d. Public Involvement & Institutional Studies	0.6	20	0.1	5	0.7	25
3. Study Documentation & Report Preparation	0.6	21	0.0	0	0.6	21
4. Study Management	0.6	20	0.0	0	0.6	20
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
Total For Effort	5.1	183	0.4	17	5.5	200

TABLE 19d
(Federal Register Table 2-3d)
WORK ITEM: WATER AND RELATED LAND RECREATION

FEDERAL AND NON-FEDERAL EFFORTS
(Cost in Thousands of Dollars)

<u>Effort Component</u>	<u>Federal</u>		<u>Non-Federal</u>		<u>Total For Effort Component</u>	
	Man-Years	Cost	Man-Years	Cost	Man-Years	Cost
1. Preparation of a Plan of Study	0.3	9	0.0	2	0.3	11
2. Plan Formulation & Evaluation						
a. Problem Identification	0.8	28	0.1	3	0.9	31
b. Formulation of Alternatives	1.4	51	0.2	6	1.6	57
c. Impact Assessment & Evaluation	1.9	70	0.3	9	2.2	79
d. Public Involvement & Institutional Studies	1.3	48	0.1	5	1.4	53
3. Study Documentation & Report Preparation	1.2	43	0.0	0	1.2	43
4. Study Management	0.7	26	0.0	0	0.7	26
Total For Effort	7.6	275	0.7	25	8.3	300

TABLE 19e
(Federal Register Table 2-3e)
WORK ITEM: FISH AND WILDLIFE

FEDERAL AND NON-FEDERAL EFFORTS
(Cost in Thousands of Dollars)

Effort Component	Federal		Non-Federal		Total For Effort Component	
	Man-Years	Cost	Man-Years	Cost	Man-Years	Cost
1. Preparation of a Plan of Study	0.1	5	0.1	2	0.2	7
2. Plan Formulation & Evaluation						
a. Problem Identification	0.3	10	0.0	1	0.3	11
b. Formulation of Alternatives	0.3	11	0.1	5	0.4	16
c. Impact Assessment & Evaluation	0.3	11	0.1	5	0.4	16
d. Public Involvement & Institutional Studies	0.6	21	0.0	1	0.6	22
3. Study Documentation & Report Preparation	0.5	18	0.0	0	0.5	18
4. Study Management	0.3	10	0.0	0	0.3	10
Total For Effort	2.4	86	0.3	14	2.7	100

AGENCY ABBREVIATIONS

These agency abbreviations are used on study cost tables 2-4 and 20 through 20f.

CE	US Army Corps of Engineers
EPA	Environmental Protection Agency
AWC	Arizona Water Commission
ADHS	Arizona Department of Health Services
MAG	Maricopa Association of Governments
MC	Maricopa County

TABLE 20
(Federal Register Table 2-4)

FEDERAL AND NON-FEDERAL EFFORT (SUMMARY) WASTEWATER MANAGEMENT
(Cost in Thousands of Dollars)

	Federal		Non-Federal		Total	
	Man-Years	Cost	Man-Years	Cost	Man-Years	Cost
A. Public Involvement Program	6.2	225	2.1	75	8.3	300
B. Data collection & projection for economics, water quality, environmental and land use	17.9	645	4.4	160	22.3	805
C. Development of alternative basin and areawide plans	8.3	300	2.0	70	10.3	370
D. Evaluation, comparison & selection of areawide plans	5.5	200	2.0	70	7.5	270
E. Implementation arrangements, including institutions needed for managing, financing, planning, construction and maintenance	.6	20	3.4	125	4.0	145
F. Report preparation	3.0	110	0.0	0	3.0	110
Totals	41.5	1500	13.9	500	55.4	2000

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TABLE 20a
(Federal Register Table 2-4a)
FEDERAL AND NON-FEDERAL EFFORT PUBLIC INVOLVEMENT PROGRAM

<u>Work Element/Description</u>	<u>Responsible Agency</u>	<u>Cost</u>		<u>Completion Date</u>
		<u>Man-Yrs</u>	<u>\$1000</u>	
1. Develop a public involvement program plan	CE	0.55	20.0	8/78
	MAG (NF)	0.88	31.8	
2. Compilation of mailing list of individuals and operations	CE	0.28	10.0	
	MC (NF)	0.04	1.5	
	ADHS (NF)	0.02	0.8	
3. Arrangements for meeting places	CE	0.28	10.0	
	MAG (NF)	0.06	2.4	
4. Personnel to conduct workshops	CE	0.83	30.0	9/76 to 11/76 & 4/78 to 6/78
	MAG (NF)	0.17	6.0	
	MC (NF)	0.08	3.0	
	ADHS (NF)	0.08	3.0	
	AWC (NF)	0.05	1.5	
5. Personnel to do work with news media	CE	0.55	20.0	
	MAG (NF)	0.03	1.0	
6. Preparation of public announcements	CE	0.55	20.0	
	MAG (NF)	0.38	13.8	
	AWC (NF)	0.04	1.5	
7. Preparation of brochures, newsletters, etc.	CE	0.55	20.0	
	MAG (NF)	0.04	1.5	
	MC (NF)	0.04	1.5	
	ADHS (NF)	0.04	1.5	
8. Develop Plan of Study	CE	0.80	28.0	11/75 (completed)
	MAG (NF)	0.14	5.2	11/75 (completed)
	MC (NF)	0.02	0.8	11/75 (completed)
9. Land Use Re-evaluation Study's Public Involvement Program	MAG	1.80	65.0	7/77
TOTAL:		8.3	300	
Federal		6.2	225	
Non-Federal		2.1	75	

TABLE 20b
(Federal Register Table 2-4b)
FEDERAL AND NON-FEDERAL EFFORT, DATA COLLECTION AND PROJECTION

<u>Work Element/Description</u>	<u>Responsible Agency</u>	<u>Cost</u>		<u>Completion Date</u>	
		<u>Man-Yrs</u>	<u>\$1000</u>		
1. Historical & projected population & economic data on a county basis:	CE	0.37	13.5	5/76	
	MAG (NF)	0.08	2.7		
	a. Urban and rural population	MAG	0.55	20.0	11/76
	b. Industrial employment by 2 & 3 digit SIC	MAG	0.27	10.0	10/76
	c. Agricultural crop acreage & type of crop	MAG	0.19	7.0	11/76
d. Compare with OBERS projection	CE	0.01	0.5	9/77	
2. Historical & projected water use and facilities on a county basis	CE	0.32	11.5	3/76	
	MAG (NF)	0.08	3.0	2/76	
	MC (NF)	0.02	0.8	3/76	
	ADHS (NF)	0.04	1.5	3/76	
	AWC (NF)	0.42	15.0	3/76	
	a. Municipal				
	b. Industrial by census industrial section				
c. Irrigation					
d. Review and adjust					
3. Historical and projected waste sources and facilities showing flow rate, constituents and concentrations	CE	4.43	160.0	7/76	
	MAG (NF)	0.15	5.3	12/76	
	MC (NF)	0.12	4.5	12/76	
	a. Public and municipal				
	b. Industrial				
	c. Irrigation return flows				
	d. . . .				
	e. Urban and rural storm runoff				
	f. Sanitary landfills				

TABLE 20b (Continued)

<u>Work Element/Description</u>	<u>Responsible Agency</u>	<u>Man-Yrs</u>	<u>Cost \$1000</u>	<u>Completion Date</u>
g. Open dumps				
h. Field collection and analysis of water quality data where none available	CE	3.19	115.0	5/77
4. Existing and projected land use plans	CE	0.14	5.0	8/77
a. Adopted land use plans	CE	0.51	18.5	7/77
b. Best estimate where none exists	MAG	4.16	150.0	7/77
5. Surface water quality data:	MC (NF)	0.04	1.5	7/77
a. Description of data needed	ADHS (NF)	0.66	24.0	7/77
b. Prepare map showing monitoring stations	AWC (NF)	0.08	3.0	7/77
c. List water quality parameters monitored				
d. Inventory existing violators				
e. Identify, locate & obtain additional data				
6. Stream Standards:	MAG (NF)	0.07	2.7	1/77
a. Description of existing standards	ADHS (NF)	0.42	15.0	1/77
b. Identification of inadequacies, if any	AWC (NF)	0.08	3.0	1/77
c. Tentative revised standards by stream reach for all necessary parameters				
7. Water rights criteria or constraints that may affect design of upstream treatment systems	CE	0.53	19.0	9/76
	MAG (NF)	0.02	0.8	9/76

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TABLE 20b (continued)
(Federal Register Table 2-4b)

<u>Work Element/Description</u>	<u>Responsible Agency</u>	<u>Cost</u>		<u>Completion Date</u>
		<u>Man-Yrs</u>	<u>\$1000</u>	
8. Groundwater quality and quantity	CE	0.42	15.0	5/76
	MAG (NF)	0.13	4.5	5/76
a. Availability by county and/or aquifer from existing sources with refinements where possible	MC (NF)	0.42	15.0	11/77
	ADHS (NF)	0.04	1.5	5/76
	AWC (NF)	0.42	15.0	11/77
b. Recommend areas which should be considered for groundwater recharge with treated wastewater				
9. Provide data on existing significant botanical, zoological, archeological, and historical basin features	CE	0.17	6.0	3/78
	MAG	1.25	45.0	3/77
10. Review, select & implement a data handling & storage program	CE	0.11	4.0	3/76
11. Data and inventory assessment				
a. Assess for validity	CE	0.14	5.0	4/77
b. Assess for coverage	CE	0.14	5.0	4/77
c. Determine gaps	CE	0.14	5.0	4/77
d. Prepare program for incremental data acquisition	CE	0.69	25.0	4/77
e. Provide a complete inventory of data sources	CE	0.04	1.5	4/77
12. Problem Identification	CE	0.05	2.0	2/77
	MAG (NF)	0.99	35.9	2/77
	ADHS (NF)	0.06	2.2	2/77
	AWC (NF)	0.08	3.0	2/77
TOTAL:		22.3	805	
Federal		17.9	645	
Non-Federal		4.4	160	

TABLE 20d
(Federal Register Table 2-4d)

FEDERAL AND NON-FEDERAL EFFORTS, EVALUATION, COMPARISON AND SELECTION OF BASIN AND AREAWIDE PLANS

<u>Work Element/Description</u>	<u>Responsible Agency</u>	<u>Cost</u>		<u>Completion Date</u>
		<u>Man-Yrs</u>	<u>\$1000</u>	
1. Assess beneficial & adverse impacts of alternative areawide and basin plans	CE	0.36	13.0	3/78
	MAG (NF)	0.83	30.0	3/78
	MC (NF)	0.04	1.5	11/77
	ADHS (NF)	0.08	3.0	11/77
	AWC (NF)	0.08	3.0	11/77
	a. Economic	CE	0.55	20.0
b. Environmental	CE	0.66	24.0	3/78
c. Social	CE	0.28	10.0	11/77
d. Water rights	CE	0.35	12.5	9/77
e. Institutional/financial capabilities	CE	0.35	12.5	11/77
f. Groundwater effects	CE	2.78	100.0	11/77
2. Compare performance of alternative plans	CE	0.14	5.0	3/78
	MAG (NF)	0.26	9.4	2/78
	ADHS (NF)	0.04	1.5	11/77
	AWC (NF)	0.04	1.5	11/77
3. Select areawide and basin plan	CE	0.08	3.0	3/78
	MAG (NF)	0.42	15.4	6/78
	MC (NF)	0.04	1.5	3/78
	ADHS (NF)	0.04	1.5	3/78
	AWC (NF)	0.04	1.5	3/78
TOTAL:		7.5	270	
Federal		5.5	200	
Non-Federal		2.0	70	

TABLE 20e
(Federal Register Table 2-4e)

FEDERAL AND NON-FEDERAL EFFORT, IMPLEMENTATION ARRANGEMENTS

<u>Work Element/Description</u>	<u>Responsible Agency</u>	<u>Cost</u>		<u>Completion Date</u>	
		<u>Man-Yrs</u>	<u>\$1000</u>		
1. Prepare construction schedule for each of the wastewater planning subareas to meet the highest priority short range basin goals	CE	0.08	3.0	11/77	
	MAG (NF)	0.19	6.9	11/77	
2. Develop & recommend appropriate institutional arrangements for:	CE	0.39	14.0	6/78	
	MAG (NF)	0.66	24.0	6/78	
	MC (NF)	0.10	3.8	6/78	
	a. Execution of advanced engineering & design construction	ADHS (NF)	0.12	4.5	6/78
	b. Operation & maintenance	AWC (NF)	0.12	4.5	6/78
c. Major replacements					
d. Continuing planning & management responsibility					
3. Develop & recommend financing & cost sharing arrangements	CE	0.08	3.0	11/77	
	MAG (NF)	1.17	42.3	11/77	
4. Planning committee adopt certifiable plan	MAG (NF)	0.80	28.8	8/78	
	MC (NF)	0.08	3.0	6/78	
	ADHS (NF)	0.06	2.2	6/78	
	AWC (NF)	0.08	3.0	6/78	
TOTAL:		4.0	145		
Federal		.6	20		
Non-Federal		3.4	125		

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TABLE 20d
(Federal Register Table 2-4d)

FEDERAL AND NON-FEDERAL EFFORTS, EVALUATION, COMPARISON AND SELECTION OF BASIN AND AREAWIDE PLANS

<u>Work Element/Description</u>	<u>Responsible Agency</u>	<u>Cost</u>		<u>Completion Date</u>
		<u>Man-Yrs</u>	<u>\$1000</u>	
1. Assess beneficial & adverse impacts of alternative areawide and basin plans	CE	0.36	13.0	3/78
	MAG (NF)	0.83	30.0	3/78
	MC (NF)	0.04	1.5	11/77
	ADHS (NF)	0.08	3.0	11/77
	AWC (NF)	0.08	3.0	11/77
	a. Economic	CE	0.55	20.0
b. Environmental	CE	0.66	24.0	3/78
c. Social	CE	0.28	10.0	11/77
d. Water rights	CE	0.35	12.5	9/77
e. Institutional/financial capabilities	CE	0.35	12.5	11/77
f. Groundwater effects	CE	2.78	100.0	11/77
2. Compare performance of alternative plans	CE	0.14	5.0	3/78
	MAG (NF)	0.26	9.4	2/78
	ADHS (NF)	0.04	1.5	11/77
	AWC (NF)	0.04	1.5	11/77
3. Select areawide and basin plan	CE	0.08	3.0	3/78
	MAG (NF)	0.42	15.4	6/78
	MC (NF)	0.04	1.5	3/78
	ADHS (NF)	0.04	1.5	3/78
	AWC (NF)	0.04	1.5	3/78
TOTAL:		7.5	270	
Federal		5.5	200	
Non-Federal		2.0	70	

TABLE 20e
(Federal Register Table 2-4e)

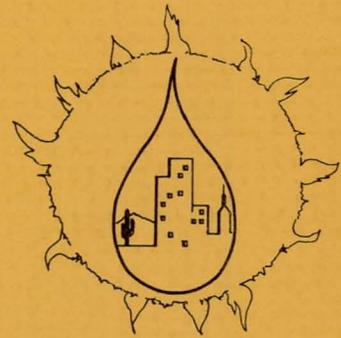
FEDERAL AND NON-FEDERAL EFFORT, IMPLEMENTATION ARRANGEMENTS

<u>Work Element/Description</u>	<u>Responsible Agency</u>	<u>Cost</u>		<u>Completion Date</u>	
		<u>Man-Yrs</u>	<u>\$1000</u>		
1. Prepare construction schedule for each of the wastewater planning subareas to meet the highest priority short range basin goals	CE	0.08	3.0	11/77	
	MAG (NF)	0.19	6.9	11/77	
2. Develop & recommend appropriate institutional arrangements for:	CE	0.39	14.0	6/78	
	MAG (NF)	0.66	24.0	6/78	
	MC (NF)	0.10	3.8	6/78	
	a. Execution of advanced engineering & design construction	ADHS (NF)	0.12	4.5	6/78
	b. Operation & maintenance	AWC (NF)	0.12	4.5	6/78
c. Major replacements					
d. Continuing planning & management responsibility					
3. Develop & recommend financing & cost sharing arrangements	CE	0.08	3.0	11/77	
	MAG (NF)	1.17	42.3	11/77	
4. Planning committee adopt certifiable plan	MAG (NF)	0.80	28.8	8/78	
	MC (NF)	0.08	3.0	6/78	
	ADHS (NF)	0.06	2.2	6/78	
	AWC (NF)	0.08	3.0	6/78	
TOTAL:		4.0	145		
Federal		.6	20		
Non-Federal		3.4	125		

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TABLE 20-f
(Federal Register Table 2-4f
FEDERAL AND NON-FEDERAL EFFORT, REPORT PREPARATION

<u>Work Element/Description</u>	<u>Responsible Agency</u>	<u>Cost</u>		<u>Completion Date</u>
		<u>Man-Yrs</u>	<u>\$1000</u>	
1. Report preparation	CE	2.6	95.0	
	MAG	0.1	5.0	7/77
a. Interim reports				
b. Final report	CE	0.3	10.0	7/78
	TOTAL:	3.0	110	
	Federal	3.0	110	
	Non-Federal	0.0	0	



Section IV

PLAN OF STUDY
COORDINATION

A. Stage I Public Involvement

This section documents the coordination and public involvement that has taken place during the preparation of the Plan of Study and shows the status of agency commitments to participate in the study.

The Stage I public involvement effort was designed to:

- obtain commitments to participate in the study from the relevant public;
- identify major issues and concerns of the public;
- obtain public inputs;
- develop a strategy for ongoing public involvement in the study;

Meetings or informal interviews have been held with the individuals listed on the following pages in order to:

- familiarize them with the Urban Study Program;
- identify and define problems and needs;
- obtain pertinent information and reports that might be useful for the Urban Study;
- identify studies completed or currently in progress that might have an impact on the study;
- develop a strategy for the public involvement program;
- describe existing institutional setting and identify agencies expected to play key roles in the study effort because of their authorities and planning capabilities.

1. Chronological Summary of Significant Coordination Efforts

A chronological list and summary of the more significant public involvement efforts is presented below.

8 June 1973

Maricopa County Board of Supervisors

Major Worthington appeared before the Board of Supervisors and made the first direct approach to them with the possibility of undertaking an Urban Study in the Phoenix area. The general Urban Study program was described. Based on this discussion, the Board of Supervisors requested authorization for the study through Senator Paul Fannin's office. This in turn resulted in funding the study for the Corps, and funds were made available in November 1974.

1 November 1974

Maricopa Association of Governments

Ken Driggs, Executive Director (staff coordinator)

This meeting was held to discuss the Urban Study, particularly the inclusion of wastewater management as a major component of the study. Mr. Driggs indicated that overall the study seemed well supported locally, in particular the flood control and Rio Salado study portions.

10 December 1974

Arizona Water Commission

Phil Briggs, Chief Hydrologist

During this meeting Mr. Briggs expressed two pertinent views: one, the natural water courses in Phoenix offer a valuable, untapped opportunity to recharge the diminishing groundwater resource with floodwaters; and two, no agency is presently making any plans to use this resource and the Corps is possibly in the best position to do so.

18 December 1974

Fish and Wildlife Service

Ron McKinstry, fisheries ichthyologist and Susan Monroe, wildlife biologist.

Both endorsed the general concept of the Urban Study and suggested wildlife might be benefited in the implementation of the Rio Salado Project on the Salt River, and in the Buckeye-Arlington area. They also suggested restoration of a higher groundwater table might lead to reestablishment of some vegetation types, and that any alteration of the effluent discharge from the 91st Avenue sewage treatment plant would be detrimental to wildlife.

18 December 1974

U.S. Department of Housing and Urban Development

Tom Dickey, Equal Opportunity Director

It was suggested during this meeting that the Urban Study might assist local HUD programs by providing more comprehensive flood plain information, and by addressing social problem areas within the City of Phoenix to provide recreation facilities.

19 December 1974

Flood Control District of Maricopa County.

Col. Herb Donald, general manager and Bill Jolly.

Col. Donald suggested, among other things, that the study address the possibility of providing a flood warning network for use with traffic management, evacuation plans, etc; expedite the implementation of Rio Salado; and that wastewater management be included as a study topic.

27 December 1974

Arizona Water Commission.

Wes Steiner, Executive Director and Larry Linser, Flood Control Chief.

Regarding the recharge of flood waters from Orme Dam, Mr. Steiner commented that this was an excellent idea and suggested the concept of the recharge project may be extended to the Cave Buttes, Adobe and New River Dam releases as well. Other portions of the flood water recharge proposal, including the controlling agency and special benefits were also discussed.

31 December 1974

City of Phoenix.

Jim Attebery, City Engineer.

Mr. Attebery urged the Corps to concentrate on the unsolved flood control problems, a multi-use study of the Salt River, and that groundwater recharge be thoroughly explored as part of the Urban Study.

3 January 1975

Salt River Project.

Reid Teeple, Deputy General Manager.

This meeting was held to discuss the proposal that Orme Dam flood control releases be compatible with a downstream recharge facility.

9 January 1975

Environmental Protection Agency and the Arizona Department of Health Services.

Dave Howecamp, Water Quality Branch Chief and Bob Follett, Director Water Quality Control Division, Department of Health Services.

This meeting was held to give EPA and the Department of Health an indication of possible wastewater studies the Corps might perform, i.e. 208 or 303 scope studies; and to determine what requirements for 208 planning that EPA will enforce.

29 January 1975

Maricopa Association of Governments.

Regional Council.

The options for the inclusion of wastewater management in the Urban Study program were explained to MAG's Regional Council. This resulted in a resolution by the Regional Council to request the Corps of Engineers to include wastewater management in the Urban Study, recognizing MAG's opportunity to review the proposed study at the conclusion of Phase 1.

3 February 1975

Maricopa Association of Governments.

Harold Goodman, Chairman of the Public Works Committee.

Mr. Goodman was informed that the Urban Study was about to begin preparation of the Plan of Study and was asked to identify individuals that he felt we should contact right away.

6 February 1975

City of Goodyear.

Charles Salem, Mayor.

Mayor Salem was requested to identify Goodyear's problems and needs for water resource planning.

11 February 1975

U.S. Geological Survey.

J.D. Camp and Ed Davidson.

This meeting was held to determine the data available from USGS on groundwater recharge. It was determined USGS has much available on the groundwater basin capacity, ground water quality and on existing water supplies.

26 February 1975

Maricopa Association of Governments.

Public Works Committee.

The meeting concerned itself with the issues of: the study area's boundaries, the Corps consultant selection process, the formulation of the study's technical group, the need for an infiltration/inflow analysis, the identification of areas which should be included in the flood control portion of the study, and the June 30th deadline for designation of MAG as the 208 planning agency in order to get 100 per cent funding from the Environmental Protection Agency.

26 February 1975

Maricopa Association of Governments.

Ken Driggs, Executive Director and Art Auerbach, MAG's Planning staff.

This meeting discussed the composition of the Executive Committee.

4 March 1975

Maricopa Association of Governments.

Art Auerbach, Ron Ross and Bill Robinett staff members, MAG Transportation and Planning Office.

This meeting concerned the application process for designation of MAG as the 208 planning agency for Maricopa County and MAG's plans for their Urban Form Study.

10 March 1975

State Land Department.

Joe Melling, Director Water Rights Division.

This meeting was held to discuss the Land Department's authority over the control of ground water in the Phoenix urban area, and to assess other information available that might be pertinent to the Urban Study. A copy of Arizona's ground water law was obtained.

13 March 1975

Phoenix Urban Study.

Technical Committee meeting.

Topics discussed at this meeting included the selection of consultants to help in producing the Plan of Study, Maricopa Association of Governments' application for designation as the area's 208 planning agency and companion application for the grant of funds. It was noted during this meeting that the consultants' contracts took one month longer to establish than was originally anticipated, thus delaying the Plan of Study review schedule.

18 March 1975

Environmental Protection Agency.

Joe Califf, Section 201 Coordinator.

The two 201 level planning and construction grants for the Phoenix area were discussed in a telephone conversation with Urban Study staff.

19 March 1975

Bureau of Indian Affairs.

John Artichoker, Area Director; Harold Roberson, Chief of the Land Operations Section; and Floyd Farrell, Soil Conservation Section.

This meeting was held to explain the Urban Study program, to obtain assistance in establishing contacts with the three Indian communities in the study area, and to learn some of the water resource problems on the Indian lands.

19 March 1975

Citizens' Advisory Board for the County Flood Control District. Major Worthington made a presentation to this group regarding the flood problem areas, the Rio Salado Project, and other specific topics to be included in the Phoenix Urban Study.

24 March 1975

Arizona State Department of Health Services.

Edwin Swanson, Water Quality Control Division.

The duties of the Executive Committee and the Technical Committee in providing guidance to the Urban Study were discussed in a telephone conversation with Mr. Swanson. Non-point source pollution, and the ground water quantity and quality were other topics discussed.

26 March 1975

City of Phoenix Water and Sewer Department.

Art Vondrick and Ed Braatelein, Director and Assistant Director.

These city officials suggested limiting the infiltration/inflow study to a preliminary problem identification level; and that the non-point source evaluation will require the development of extensive data, necessitating some type of sampling and testing program.

3 April 1975

Pima Indian Agency, Gila River Indian Reservation.
Kendall Cumming, Superintendent and Jack Moore, Chief of the
Land Department.

This meeting was held to coordinate the Urban Study efforts with the needs of the Gila River Indian Community. Other contacts were suggested (meetings were subsequently arranged) and specific concerns with regard to wastewater management, water rights and the status of the Corps Gila Floodway Study were discussed.

3 May 1975

MAG Transportation and Planning Committee.

At a special meeting of the Transportation and Planning Committee, the Phoenix Urban Study was described to community planners. The planners were able to describe several specific water resource problem areas where more information is needed, e.g. the lack of information (in terms understandable to non-engineers) regarding groundwater availability in proposed expansion areas.

22 May 1975

U.S. Geological Survey

Bob Laney, hydrologist and Larry Morris, Ferguson-Morris and Associates, architecture/engineering consultant.

Mr. Morris' firm is doing contracting work for the Urban Study and needed knowledge of the groundwater data that has been collected in the study area. Mr. Laney identified the existing programs and data that USGS has undertaken, and the groundwater quality data generated by other agencies, i.e. State Department of Health, the Salt River Project and the University of Arizona, Tucson.

23 July 1975

Summary; Urban Study Public Meeting

In order to obtain local news and data for conducting the Phoenix Urban Study, the first public meeting was held July 23, 1975 in the Maricopa County Board of Supervisors Auditorium. The meeting was sponsored jointly by the Maricopa Association of Governments, the County Board of Supervisors and the Corps of Engineers. (The Environmental Protection Agency was also asked to be a sponsor of the public meeting.) The procedures prescribed in EM 1120-2-101 "Survey Investigations and Reports General Procedures" were used in organizing and conducting the meeting.

Proceedings

Colonel John Foley, who conducted the meeting for the Corps of Engineers, opened with a general statement about the purpose of the Urban Study. Further introductory remarks were given by Charles Salem, Chairman of the MAG Regional Council, about the interface between the MAG Transportation and Land Use reevaluation study and the Corps Urban Study.

Bob Stark, Chairman of the Board of Supervisors discussed the initial request for the Phoenix Urban Study made by the Board in July 1973. He suggested these areas be included in the study: 1) delineation of flood plains not already designated; 2) a flood warning system; 3) a basis for standardization of storm water detention requirements among cities and towns; 4) integration of County recreation facilities into an overall recreation plan, including the Rio Salado Project. Maricopa County is designated as the fiscal agent to receive and dispense state appropriated funds for the Rio Salado Project.

The background, program objectives, authority and some of the constraints faced by the study were explained by Col Foley and Major Worthington, and illustrated with slides. At the conclusion of this presentation public comments and questions were aired.

QUESTIONS & COMMENTS

--The Spook Hill Dam project (a part of the Soil Conservation Services Buckhorn-Mesa Project) was criticized by an Apache Junction resident, who suggested this area should be included in the Urban Study.

--A Tolleson resident expounded on the health hazards he felt existed as a result of the sludge, pest and rodent problems along the Salt River south of Tolleson; he hoped this study could develop a program to alleviate this problem.

--John Bivens, planning director for the Arizona Department of Transportation, inquired as to the relationship between the Urban Study and the Section 208 wastewater management planning, and the status of the 208 funding. Mr. Bivens noted the absence of a representative from the Environmental Protection Agency, one of the Urban Study sponsoring organizations. He reiterated his concern over the fact that EPA had not fully participated in the meeting, program or in this environmentally oriented project.

--A specific proposal was made on how to recharge the groundwater, thereby lessening the water on regional flood plains.

--A representative of Citizens Concerned About the Project asked if the study participants would assume water to be a vital resource that should be in the public domain, or accept the fact that most of our surface supplies are controlled by non-public interests.

--The participation and/or representation in the Urban Study by the five area Indian tribes was questioned.

--Frank Welch, Executive Director of Citizens Concerned About the Project, requested the Urban Study look at such things as desalting the Salt River, the quantities of water available in the region and the population that can be supported with present resources.

--A letter read into the record from John Schaper, attorney for the Buckeye Irrigation and the Water Conservation Districts, requested the Corps study the serious flood problems that occur below the confluence of the Salt and Gila Rivers.

--Colonel Foley closed the meeting by reiterating that the Corps is still in the process of defining the urban problems and formulating the limits of the study, as witnessed by this introductory meeting.

--Robert Norton representing the Maricopa County Audobon Society, suggested that water for the Palo Verde Nuclear Generating Plant not be diverted from the Salt River channel (the desert riparian habitat along the Salt & Gila Rivers would be threatened by loss of sewage effluent to the nuclear plant).

--The extent of involvement in the Urban Study by citizens was questioned. Major Worthington responded to this query and explained the extensive citizen involvement program planned for the Study.

--Ed Swanson, Arizona Department of Health Services, (quoting a letter from James Goff, to Paul de Falco, EPA Regional Administrator,) stated "that the State certifies that the proposed (MAG) work plan should be approved by EPA, subject to the condition that the Plan of Study deal in more specific terms with water pollution problems attributed to all major land and water uses in the entire planning area."

2. Detailed List of Coordination

Most of the public coordination during Stage I was less formal, and took place during brief meetings, telephone conversations, or as a part of discussions at conferences or symposiums. The following is a list of individuals and organizations to whom the Phoenix Urban Study has been described, and with whom some discussion took place.

STAGE I PUBLIC INVOLVEMENT
INTERVIEWS & MEETINGS

<u>Agency - Federal</u>	<u>Individual(s) Contacted</u>
Soil Conservation Service	Dick Enz, Hydrologist Ron Clark, Economist
Fish & Wildlife Service	Ron McKinstry, Fisheries Ichthyologist Susan Monroe, Wildlife Biologist
Department of Labor	George Smith, Regional Director
Geological Survey	J. D. Camp Ed Davidson Bob Laney, Hydrologist
Department of Agriculture	Dr. Herman Bouwer, Director Water Conservation Laboratory
Forest Service	Joe Arnold
Bureau of Reclamation	Keith Pinkerton, Engineering Section Larry Morton Mike Thomas, Construction Section Cliff Pugh, Project Manger CAP Dave Creighton, Chief, Environmental Br
Federal Energy Admin Administration	James Russell, Director, Intergov. Rel. George Tweedy, State Liason Officer
Environmental Protection Agency	Dave Howecamp, Water Quality Br Ch Tom Jones, Water Quality Staff Pete Uribe, Jay Stewart, Sec. 208 Coordinator Joe Califf, Sec. 201 Coordinator
Department of Housing & Urban Development	Thomas Dickey, Equal Opportunity Dir Bob Hart, Civil Engineer Ernie Cofrances, Civil Engineer
House of Representatives	Hon. John Rhodes, Minority Leader
Spec. Asst. to President Ford	Hon. Fernando de Baca

Agency - Federal (Cont.)

Individual(s) Contacted

Bureau of Outdoor Recreation Orrin Beckwith, Asst. Regional Dir.
for Planning
Ted Dingman, Recreation Resource Spec.

National Park Service Ed Ballard, Chief, Br. of External
Assistance

Weather Bureau Robert Ingram, Chief Meteorologist

Bureau of Land Management Ralph Corn, Planning Coordinator

Bureau of Health Services,
Div. of Indian Health Fred Florshutz, Environmental Health
Joe Janick, District Engineer
Pat Crotty, Field Engineer, Gila River
Indian Community
Bill Engle, Field Engineer, Salt River
& Ft. McDowell Indian Community

Bureau of Indian Affairs John Artichoker, Phoenix Area Dir.
Harold Roberson, Chief, Land Operation
Floyd Farrell, Soil Conservation
Joy Morago, Ch, Farm Board &
Watermaster BIA
Dick Jeffries, Trust Protection
Larry Eastbund, Asst. Trust Protection
John McMakin, Land Operations

Agency - Indian Communities

Pima Indian Agency Kendall Cummings, Superintendent
Jack Moore, Chief, Land Department
Lee Thompson, Chief, Planning Dept.

Ft. McDowell Indian Agency Samuel Hilliard, Coordinator

Gila River Indian Agency Z. Simpson Cox, Attorney
Sam Thomas, Water Conservation
Committee (GRWCC)
Edison Evans, Vice Chairman GRWCC
Leonard Soke Sr., GRWCC Member
Harry Cruye Jr, GRWCC Member
Ivan Gazula, GRWCC Member
Arnold Juan, GRWCC Member & Gila
River Management Council
Harvey J. Allison, GRWCC Member

Salt River Indian Agency Larry Hanline, Coordinator
Roger Evans, Planning Department

<u>Agency - State</u>	<u>Individual(s) Contacted</u>
Water Commission	Wes Steiner, Executive Director Larry Linser, Flood Control Chief Phil Briggs, Hydrologist Robert Farrer, Spec. Proj. Engr. John Linkswiler, P.E. Tom Clark, Deputy Director
Dept. of Economic Security	William Mayo, Director Den Krasarage, Research Analyst Jack Kronfield, Senior Analyst
Health Department	
Environmental Health Serv.	Jim Goff, Director
Water Quality Control Div.	Robert Follett, Director
" "	Edwin Swanson, PE
Resources Information System	Carl Winikka, Project Director Don Lamb
Game & Fish Dept.	John Carr, Planning & Evaluation Br. Bob Wilber, Ch, Urban Lakes Planning
Land Dept	Joe Melling, Dir. Water Rights Div.
Parks & Recreation	Charles Eatherly, Chief Planner
Dept. of Transportation	Mason Toles, Environmental Planning
Office of Economic Planning & Development	Beverly Brown, Planner Dennis Thompson, Assoc. Planning Dir. Vicki Schukert, Planner Steven Scholl, Planner
Outdoor Recreation Coordinating Committee	Roland Sharrer, Director
State Climatologist	Dr. Robert Durrenberger
Az. Legislative Council	Fred Hellberg, Senior Analyst
Az. State Senate	Charles P. Thompson, Staff Coordinator
Az. House of Representatives	Burton Barr, Majority Leader

County Agencies

Individual(s) Contacted

Maricopa Association of Governments

Ken Driggs, Staff Coordinator
John DeBolske, Exec. Secretary
Tom Buick, Staff Program Manager
Art Auerbach, Chief Regional Planner
Ron Ross, Regional Planner
Gene Jones, Regional Planner
Bill Robinett, Regional Planner

Flood Control District

Col Herb Donald, General Manager

Health Department

Joe Weinstein, Ch, Environmental Health
Public Health Division
Harry Crohurst, Ch, Public Health Engrg
Ash Madhok, Field Engineer

Planning & Zoning Dept.

Phil Bloom, Chief, Planner
Floyd Burrier, Chief Cartographer

Parks & Recreation Dept.

Bob Milne, Director

Cities

Phoenix

Hon. Tim Barrow, Mayor
Jim Attebery, City Engineer
David Clymer, Deputy City Engr.
Reggie Schwartz, Design Engr.
Dave Burris, Floodplain Mgt. Engr.
Art Vondrick, Dir, Water & Sewer Dept
Ed Braatelein, Asst. Dir
Warner Leipprandt, Principal Planner,
Planning Devel. Div
Charles Theingart, Planner
Anthony Mason, Ch, Phoenix Planning
Commission

Chandler

Bruce Knutson, Dir., Public Works

Glendale

Harold Goodman, Dir, Engrg & Dev.
(Ch, Urban Study Technical Committee
& MAG Public Works Subcommittee)

Goodyear

Al Montgomery, Dir, Public Works
Ernie Kleinschmidt, City Manger
Charles Salem, Mayor
(Ch, MAG Regional Council)

Mesa

Charles Luster, Dir, Public Works
Dean Sloan, City Engineer

Agencies - City (Cont.)

Paradise Valley

Scottsdale

Tempe

Universities

University of Arizona

Arizona State University

Florida University

Other

American Public Works Assoc.

Salt River Project

Valley National Bank

Valley Forward Association

Construction Trade Unions

Assoc. General Contractors

Mardian Construction Co.

United Fund

Individual(s) Contacted

Tom Atkinson, Engineer

Dan Raby, City Engineer

Grover Serenbetz, Dir, Public Works

Dr. Gray Wilson, Arid Land Studies
Robin Clarke, Remote Sensing Center
David MouatMel Marcus, Dir, Environmental Studies
Paul Ruff, Prof., Civil Engineering
Lewis Hill, Ch, Civil Engineering Dept
Christy Turner, Prof. Business Dept
Don Wisgenda, Prof., Business Dept
Francis Larsen, Research & GrantsJim Heaney (concerning urban storm
runoff project)
Dr. Wayne Huber, " " "

Martin Manning, Dir of Research

Reid Teeples, Deputy Genl. Mgr.
Don Wisner, Exec. Engineer
Dick Juton
Ed Kirdar
Ted Wilson
Don Womack

Jim Mayer, Ch of the Board

Frank Bosh, Executive Director

Larry Dugan

Herman Chanen

Bill Worchester

Milt Lee

<u>Agency</u>	<u>Individual(s) Contacted</u>
Maricopa Audubon Society	Robert Witzeman, M.D.
Citizens Concerned About the Project	Frank Welsh
Arizona Conservation Council	Pat Overby

B. Agency Approval

Five key agencies have been identified as participants in the Phoenix Urban Study:

- Environmental Protection Agency
- Arizona Department of Health Services
- Arizona Water Commission
- Maricopa County
- Maricopa Association of Governments

Initial coordination has been completed with all of these agencies and informal agreements have been reached on their respective roles in the Urban Study. The principal areas of study effort for these five agencies are summarized in the following paragraphs. The areas of agreement are briefly described in terms of the substantive work, and copies of the letters concerning the Plan of Study as a whole are contained in Appendix B.

-U.S. Environmental Protection Agency. EPA is responsible for seeing that national waste treatment and water quality standards are attained. EPA will participate in review and guidance for the Phoenix Urban Study. EPA is also concerned with air quality, noise pollution, pesticide problems and implementation of the Safe Drinking Water Act of 1974.

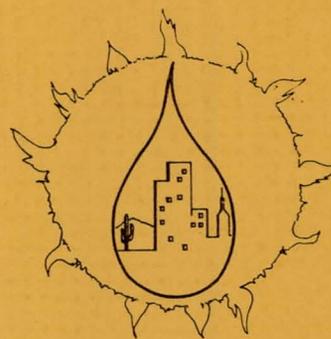
-Arizona Department of Health Services. The Health Department will participate in order to determine water quality and wastewater treatment parameters suitable for meeting the national goals enumerated within PL 92-500, as they are the state agency responsible for maintaining waste treatment and water quality standards. Their effort sharing in the wastewater element of the study will total \$65,000.

-Arizona Water Commission. The Commission is expected to contribute to the study by providing accumulated knowledge of groundwater levels, specifically by utilizing the ground water models prepared as part of the State Water Plan. This groundwater model will be used in studying effects of recharging the groundwater with floodwaters and with sewage effluent. Their assistance to the wastewater element will total \$60,000 worth of effort.

-Maricopa County. Official county approval and guidance for the Urban Study is issued by the County Board of Supervisors. Coordination and data collection will be carried on with various county agencies. For example, the County Health Department will provide assistance for the wastewater element, and the Flood Control District (an entity authorized by State Legislation), will assist in coordinating flood control aspects of the study.

See Appendix B for
minor cost revisions

-Maricopa Association of Governments. MAG will assist in the data gathering, and provide general review and guidance for the Urban Study. In particular, land use evaluation for projected urban population levels (to the year 2020) will be furnished by MAG staff. The MAG Public Works Committee will provide technical assistance in all areas of the study and will be particularly involved in the wastewater aspects. MAG's total contribution to the wastewater element will be \$635,000, of which \$300,000 will be Federally funded.



Appendix A

BIBLIOGRAPHY: DATA AND REPORT SOURCES

BIBLIOGRAPHY

AVAILABLE DATA & REPORT SOURCES

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Introduction

Maricopa County and the Phoenix metropolitan area have been the subject of numerous comprehensive and specialized planning studies, many of which are usable as reference and background information for the Urban Study. The bibliography contained within this Appendix is limited to listing pertinent references in major areas of concern, as complete identification of all report sources would be a massive work task irrelevant to the study. The bibliography is divided into 10 major report subject categories and a section on pertinent maps and aerial photography available for the study area.

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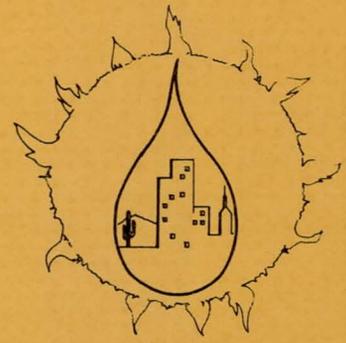
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Appendix B

COMMENTS
ON PLAN OF STUDY

APPENDIX B

Introduction

Five agencies have been requested to participate in this study with the Corps of Engineers.

Environmental Protection Agency
Arizona Department of Health Services
Arizona Water Commission
Maricopa County
Maricopa Association of Governments

These agencies were selected in anticipation that they will play the major roles in the enforcement and implementation of the water resource plans that emerge from this Urban Study. Although each of these agencies will be represented on the Executive Committee, there is no intent that the group of participating agencies and the Executive Committee be one and the same.

The comments of the five participating agencies on the draft Plan of Study dated August 1975, are contained in this appendix. The Plan of Study as presented herein has been revised based on the following and numerous other comments. Additionally, many comments were received on the Technical Appendix. Certain of those comments are bound in a separate section in the front of that document. Others, either have been or will be incorporated in the overall study program.

The formal comments of the Arizona Department of Health Services have revealed a funding constraint not identified in earlier coordination efforts. While that Department can provide the full support requested, their effort may not be identified as non-federal because these programs are currently funded with 75 percent federal dollars.

In response, MAG has indicated (by their letter dated 23 October 1975) their preference to increase their contribution so that the federal funds currently programmed for wastewater planning would not have to be reduced. A new program for monitoring of organic pollutants will be initiated at a total cost of \$78,000 over the study life. These funds are entirely local and will increase MAG's contribution from a total of \$635,000 to \$713,000.

This results in the following changes in the funding for the wastewater portion of the Phoenix Urban Study. These changes have not been made in the Plan of Study cost tables.

FEDERAL FUNDS

<u>Agency</u>	<u>Plan of Study</u>	<u>Revised</u>
Corps of Engineers	\$ 1,200,000	\$ 1,200,000
Maricopa Association of Governments (with Federal funds)	300,000	300,000
Arizona Department of Health Services (with Federal funds)	--	(49,000)*
	<hr/>	<hr/>
Total	\$ 1,500,000	\$ 1,500,000

NON-FEDERAL FUNDS

Maricopa Association of Governments	335,000	413,000
Maricopa County	40,000	40,000
Arizona Department of Health Services	65,000	(16,000)*
Arizona Water Commission	60,000	60,000
	<hr/>	<hr/>
Total	\$ 500,000	\$ 513,000

% Federal Plan of Study - 75%

% Federal Revised - 74.5%

* These funds, although contributing to the overall wastewater management effort, are not included in the cost sharing for the Phoenix Urban Study.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
100 CALIFORNIA STREET
SAN FRANCISCO, CALIFORNIA 94111

Major H. W. Worthington
Special Assistant to the District Engineer
United States Corps of Engineers
2721 North Central Avenue, Suite 800
Phoenix AZ 85004

OCT 10 1975

Dear Major Worthington:

This letter is in response to your letter of August 22, 1975, requesting EPA's review and comment on the Corps of Engineers (COE) Plan of Study (POS) for the Phoenix Urban Study. The following discussion expresses some of the concerns of this agency in regard to Section 208 of P.L. 92-500 planning in the Phoenix area.

As you know, the Governor of Arizona has designated the Maricopa Association of Governments (MAG) as the section 208 planning agency for Maricopa County. EPA Region IX has recommended to the Administrator of EPA in Washington, D.C., that the MAG designation be approved.

EPA is concerned that the objectives and goals of the Urban Study are consistent with and blend into the objectives and goals of the section 208 planning for Maricopa County to be conducted by MAG. Pursuant to the EPA/COE agreement (40 CFR 11 dated January 16, 1975), when the MAG designation is approved, the plans of study for the section 208 and the Urban Study should be reviewed to identify the additional planning needed to meet the section 208 requirements. The Urban Study would then be completed in accordance with provisions of the original plan as revised to include any additional section 208 requirements requested by the designated agency. Since the designation approval is expected very soon, it is imperative that both the COE and MAG begin immediately to insure non-duplication of effort and expenditures as well as attaining a common implementable plan for the entire 208 area.

Some specific comments on the content of the POS include the following:

- (1) The POS should link together the waste management problems of the area with the objectives of the study and the expenditure of funds to accomplish those objectives.
- (2) The text of the POS should be amended to indicate that the responsibility of EPA is not limited to assurance that national water quality and waste treatment standards are attained. EPA is concerned with other environmental issues.
- (3) While EPA approves in concept the general objectives of the POS, it is pointed out that EPA does not necessarily concur with some of the basic assumptions included in the POS such as the assumptions regarding Orme Dam and other aspects of the Central Arizona Project (CAP). In addition, any approval of the POS at this time does not indicate EPA's position on any proposed water project, or negate EPA's responsibility with respect to the Environmental Impact Statement (EIS) review process under Section 309 of the Clean Air Act.
- (4) EPA recommends that data and planning from other statutory planning efforts be incorporated into the wastewater management study.

It should be pointed out that any EPA participation regarding the COE Urban Study for Phoenix is contingent upon funding.

Sincerely,

Sheila M. Prindiville

for Paul De Falco, Jr.
Regional Administrator

cc: Ed Swanson, Arizona Department
of Health Services
John J. DeBolske, Secretary,
Maricopa Association of Governments



ARIZONA DEPARTMENT OF HEALTH SERVICES

Office of the Director

RAUL H. CASTRO, Governor

XXXXXXXXXXXXXXXXXXXXXXXXXXXX

Suzanne Dandoy, M.D., M.P.H.
Director

October 17, 1975

Mr. Will Worthington
U.S. Army, Corps of Engineers
2721 North Central Avenue
Room 1030
Phoenix, Arizona 85004

Dear Mr. Worthington:

This is in reply to your letter of August 22 requesting the Department of Health Services to review and comment on the preliminary Plan of Study for the Phoenix Urban Study. The Bureau of Water Quality Control staff has reviewed the document and discussed comments with your staff for incorporation in the Plan of Study.

We believe that the proposed study will be of great benefit to all agencies concerned with water resources management in the Phoenix metropolitan area. The Division of Environmental Health Services produces considerable data pursuant to various statutes and a U.S. Environmental Protection Agency (EPA) grant under Public Law 92-500 for a water pollution control program. Data from this program will be made available in usable form to the Corps of Engineers and other agencies involved in the study. We are committed by the EPA grant to coordinate Section 303(e) planning in areas designated for Section 208 planning, such as Maricopa County, and intend to provide staff services in terms of review, technical assistance, and cooperative services for the tasks indicated in your Plan of Study.

Our personnel will be able to fulfill the functions allocated to this Department as indicated in your Plan of Study. These personnel and supporting resources are funded by State appropriations fully matched with Federal funds, therefore, our services should not be regarded as a match for other funds supporting the study.

The Phoenix Urban Study should contribute to a better understanding and management of our natural resources in the Phoenix area. We are looking forward to actively participating in the program.

Sincerely,

Suzanne Dandoy, M.D., M.P.H.
Director

WILLIAM H. WHEELER
CHAIRMAN
PETER F. BIANCO
VICE CHAIRMAN
WESLEY E. STEINER
EXECUTIVE DIRECTOR
AND
STATE WATER ENGINEER
VIRGINIA FRONABARGER
SECRETARY



Arizona Water Commission

222 NORTH CENTRAL AVENUE, SUITE 800
Phoenix, Arizona 85004
TELEPHONE (602) 258-7561

MEMBERS
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MARSHALL HUMPHREY

October 6, 1975

General Foley
District Engineer
Department of the Army
Corps of Engineers
2721 North Central Avenue, Suite 800
Phoenix, Arizona 85004

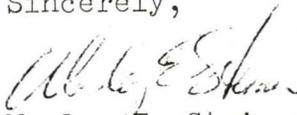
Dear General Foley:

As requested, we have reviewed the drafts of Plan of Study and Appendix C, for the Phoenix Urban Study.

Overall, the study appears to provide a means of accomplishing the necessary planning for federally mandated flood plain management, flood damage reduction and wastewater management programs. The Commission supports these efforts and feels the Plan of Study is adequate to accomplish these objectives. Other than to note that the proposed program for identification of non-point sources of pollution appears to duplicate ongoing work by the Arizona Department of Health Services, we have no substantive comments on the subject drafts.

The Commission staff has reviewed certain sections of the drafts in detail. Resulting detailed comments have been forwarded directly to the local Urban Study staff.

Sincerely,


Wesley E. Steiner
Executive Director

cc: Major H. W. Worthington

OFFICE OF THE BOARD OF SUPERVISORS

MARICOPA COUNTY

602 County Administration Bldg. 111 S. 3rd Avenue, Phoenix, Arizona 85003

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District 2

BOB CORBIN
District 3

BOB STARK
District 4

JOE EDDIE LOPEZ
District 5



September 11, 1975

Mr. W. W. Worthington
Los Angeles District, Corps of Engineers
2721 N. Central Avenue, Suite 800
Phoenix, Arizona 85004

RE: PHOENIX URBAN STUDY

Dear Mr. Worthington:

We appreciate the opportunity to comment on the Plan of Study for the Phoenix Urban Study. The Board of Supervisors supports the concepts and courses of action stated in the plan to provide for the development of a comprehensive water and water-related land resources development management plan that will be consistent with the comprehensive regional development plan for the Phoenix Metropolitan area.

The areas of concern to be considered in the Urban Study affect three agencies of Maricopa County, ie the County Health Department, the County Parks and Recreation Department, and the Flood Control District of Maricopa County. The following specific comments are submitted concerning the Plan of Study.

- a. In the area of wastewater management it is believed that in keeping with the "umbrella" connotation of this project, the study and report should include the merits of establishing a single wastewater management entity responsible for the delivery of sewerage services to all the community components of the project area as a unit. It is believed that such an entity could more effectively and economically reduce the number, magnitude, and complexity of growth problems and obstacles to orderly progress in the affected urban and rural areas.
- b. In the areas of recreational planning and conservation of fish and wildlife resources the concepts presented in the Plan of Study are endorsed.

- c. In the areas of flood damage reduction and floodplain management it is requested that the flooding and floodplain management problems associated with the Gila River from 91st Avenue to the western limits of the study area be included in the study.

The Board of Supervisors of Maricopa County agree to support the estimated effort allocated to it in Section III C of the Plan of Study. It is understood that this support will consist of technical assistance, review, and miscellaneous administrative and data services rather than a cash contribution.

The Board of Supervisors desires to cooperate with your office in the conduct of this study. Please feel free to call upon us whenever you feel we may be of assistance.

Cordially,

BOARD OF SUPERVISORS


Bob Stark, Chairman

mm



MARICOPA ASSOCIATION OF GOVERNMENTS
1820 WEST WASHINGTON PHOENIX, ARIZONA 85007 (602) 254-6308

September 24, 1975

Col. John B. Foley
District Engineer
Corps of Engineers
United States Army
300 North Los Angeles Street
Los Angeles, California 90053

Dear Col. Foley:

The MAG Regional Council, at its September 24, 1975 meeting, approved the Plan of Study for the Corps of Engineers Urban Studies program within the Phoenix area. We look forward to cooperating with the Corps of Engineers in this vital project. We are also anxious to have the Environmental Protection Agency 208 funding expedited so it can be an integral part of the Urban Study program.

The MAG local share of \$635,000 will be in the form of technical assistance review and administrative and data services rather than a cash contribution. This will provide a significant input at the staff level and MAG member agency level for the study process.

Please let us know if you have any questions regarding the MAG work program.

Cordially,

Mayor Charles Salem, Goodyear
Chairman, MAG Regional Council

cc: Will Worthington, Corps of
Engineers
George Clark, EPA,
San Francisco
Jim Goff, Arizona Department
of Health Services
Gene Jones, MAG-TPO



MARICOPA ASSOCIATION OF GOVERNMENTS
1820 WEST WASHINGTON PHOENIX, ARIZONA 85007 (602) 254-6308

October 23, 1975

Col. John V. Foley
District Engineer
Department of the Army
Los Angeles District, Corps of
Engineers
P.O. Box 2711
Los Angeles, California 90053

Dear Col. Foley:

Recent discussions with your staff concerning the Plan of Study for the Phoenix Urban Study revealed that the contribution to this study by the Arizona Department of Health Services (ADHS) can not be counted as non-Federal contribution. The State funds which support the personnel and resources of ADHS are fully matched with Federal funds.

Public Law 92-500 (Section 208) requires that after July 1, 1975 the Federal cost of developing an areawide waste treatment management planning process shall not exceed 75% of the total cost. The Plan of Study to which we responded by letter dated September 24, 1975, showed the following waste treatment study costs:

Federal	Corps of Engineers	\$1,200,000
	Maricopa Association of Governments (w/Federal funds)	<u>300,000</u>
	Total	\$1,500,000
Non-Federal	Maricopa Association of Governments	\$ 335,000
	Maricopa County	40,000
	ADHS	65,000
	Arizona Water Commission	<u>60,000</u>
	Total	\$ 500,000

Thus the Federal cost was shown not to exceed 75%. However, the recent statement by ADHS regarding the source of their funds necessitates either a reduction in the Federal program or an increase in the non-Federal program to insure the required balance is achieved.

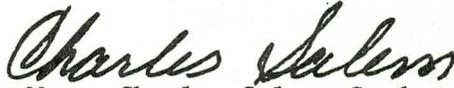
A Voluntary Association of Local Governments in Maricopa County

Col. John V. Foley
October 23, 1975
Page 2

We have reviewed the possible areas where MAG might make a meaningful increase in our contribution. It was concluded that a monitoring program of organic pollutants should be undertaken as a contribution to this study and the general public interest. The total cost of this will be at non-Federal expense and is estimated at \$78,000. This includes \$48,000 capital expenses and \$30,000 testing and operating expenses. This contribution, when added to our previous commitment of \$635,000, brings the total MAG local share to \$713,000.

Please let us know if you have any questions regarding the MAG work program.

Sincerely,

A handwritten signature in cursive script that reads "Charles Salem".

Mayor Charles Salem, Goodyear
Chairman, MAG Regional Council