



PHOENIX
WATER
RESOURCES
PLAN
1985
EXECUTIVE
SUMMARY

Property of
Flood Control District of MC Library
Phoenix, AZ 85009

CITY OF PHOENIX
WATER AND WASTEWATER DEPARTMENT

A026.908

PHOENIX WATER RESOURCES PLAN - 1985

EXECUTIVE SUMMARY

CITY OF PHOENIX

WATER AND WASTEWATER DEPARTMENT

INTRODUCTION

For many years, the City of Phoenix has provided its citizens with an adequate supply of water. However, as population increases and the Arizona Groundwater Management Act is implemented, it will be difficult to provide an adequate supply of water to areas without Salt River Project water rights. It is essential that the City evaluate all aspects of water demand and available supplies at this time and develop a plan for meeting future needs.

The PHOENIX WATER RESOURCES PLAN - 1985 is the first step for assuring adequate future water resources. It provides a historical perspective, analyzes the present and recommends future actions. Included in the plan are supply and demand projections for the next 50 years. Because of the difficulty of accurately projecting the future and the impact of significant water conservation, as well as new source work currently underway, the plan will be updated annually.

THE PHOENIX WATER SYSTEM

The first water works system for the City of Phoenix was started by a private water company in 1888. To supply the system, there were two wells in what is now the downtown area. In 1906, the City purchased the system and made improvements with the addition of more wells and a pumping station.

From this beginning, the City of Phoenix water system has grown to encompass a service area of 454 square miles (Figure 1). Some water is still obtained from wells. However, the number has grown to over 100, and surface water from the Salt and Verde Rivers has replaced groundwater as the major source. In fact, surface water now supplies 66% of the City's water needs.

There are four treatment plants that vary in production capacity: Verde - 30 million gallons per day (MGD), Deer Valley - 120 MGD, Squaw Peak - 110 MGD, and Val Vista - 140 MGD. The water supplies available from all wells and treatment plants are 508 MGD.

Storage for treated water is provided by reservoirs that range in size from one to 40 million gallons. Combined, they provide a storage capacity of 388 million gallons.

The water distribution system transports water to customers through a network of 4,701 miles of pipe that vary from two to 108 inches in diameter.

During fiscal year 1983-84, the City of Phoenix water system supplied water to more than 941,189 people who used an average of 232 gallons of water per day. The total rainfall during that period was 9.17 inches which is above the 25 year average annual rainfall of 7.57 inches.

CITY OF PHOENIX WATER SYSTEM

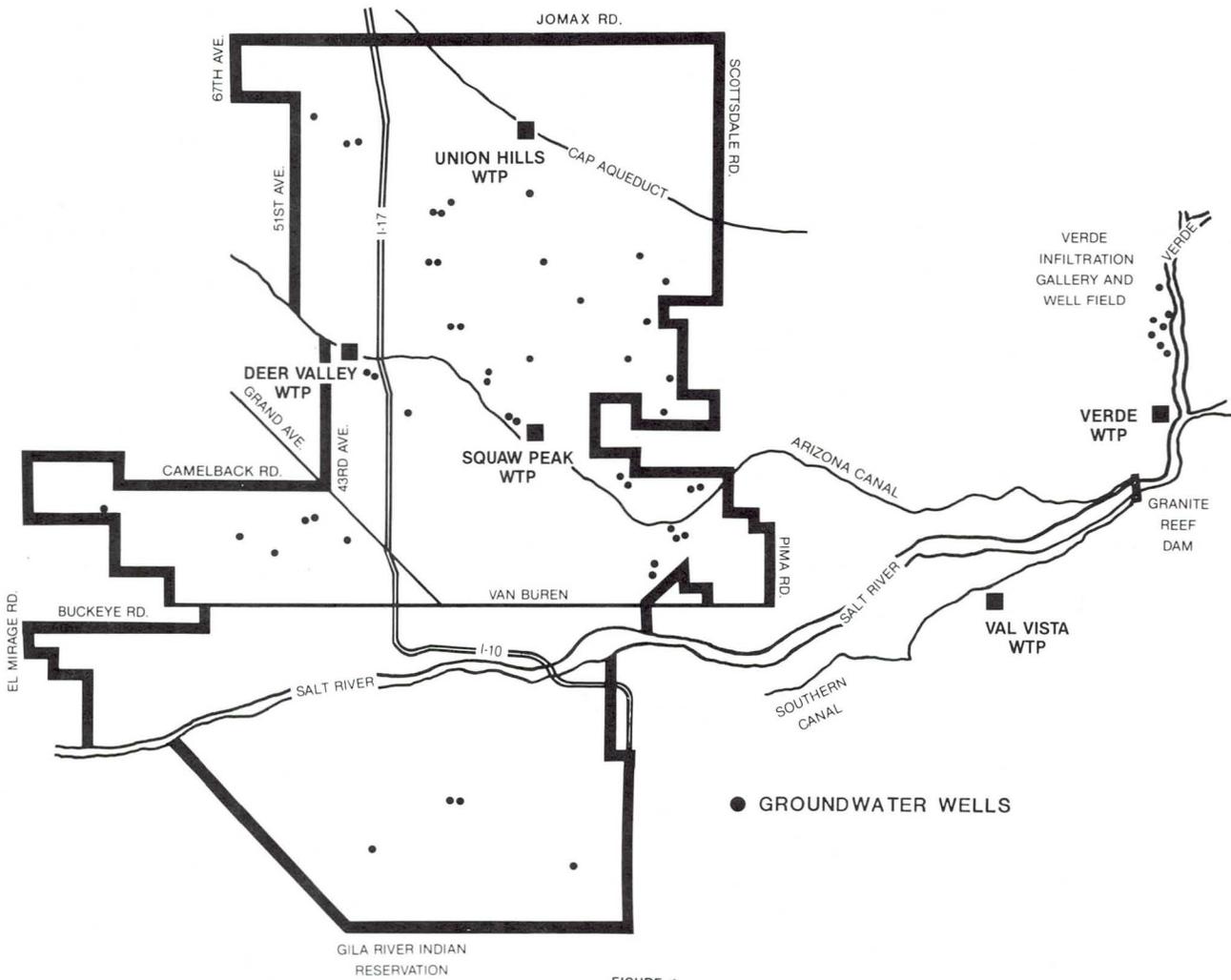


FIGURE 1

FUTURE DEMAND

Estimates of future water demand for the Phoenix Water Service Planning Area (Figure 2) are derived from population projections and historical water use. The population projections used in this plan assume slower growth in On-Project areas, and faster growth in Off-Project and Non-Member areas.

<u>Population Projections</u>					
<u>Trends Forecasts</u>					
	<u>1985</u>	<u>1990</u>	<u>1995</u>	<u>2000</u>	<u>2035</u>
On-Project	623,500	655,600	695,400	727,400	872,100
Non-Member	37,500	62,400	83,000	100,100	120,200
Off-Project	327,100	418,900	488,000	704,000	925,100
 Total	 988,100	 1,136,900	 1,266,400	 1,431,500	 1,917,400

Average water consumption used in the plan is 267 gallons per capita per day (gpcpd) before conservation. This was the consumption level used by the Department of Arizona Water Resources (DWR) to determine conservation goals (as required by the Groundwater Management Act) for the Phoenix Water Service Area.

The influence of weather on consumption is hard to quantify. Since both temperature and precipitation impact water use to some degree, they are accounted for by projecting a minimum, average and maximum demand. Minimum assumes a wet, cool year; average uses projects an average of historical weather conditions, and maximum assumes hotter and drier years than normal.

The plan uses average demand for comparison to available supplies and as the determinant in quantifying the need for additional supplies.

<u>Water Demand Projections</u>					
<u>(Acre-Feet/Year)</u>					
<u>On-Project</u>					
	<u>1985</u>	<u>1990</u>	<u>1995</u>	<u>2000</u>	<u>2035</u>
Maximum	208,100	215,700	228,800	239,400	287,000
Average	183,500	190,200	201,700	211,000	253,000
Minimum	154,700	160,400	170,200	178,000	213,400
 <u>Off-Project & Non-Member</u>					
Maximum	121,800	160,000	190,700	234,300	342,400
Average	100,300	129,500	153,100	188,300	279,000
Minimum	82,700	106,500	125,600	154,500	229,400
 <u>Total</u>					
Maximum	329,900	375,700	419,600	473,700	629,400
Average	283,800	319,700	354,800	399,300	532,000
Minimum	237,400	266,900	266,900	332,500	442,800

Future Water Service Area

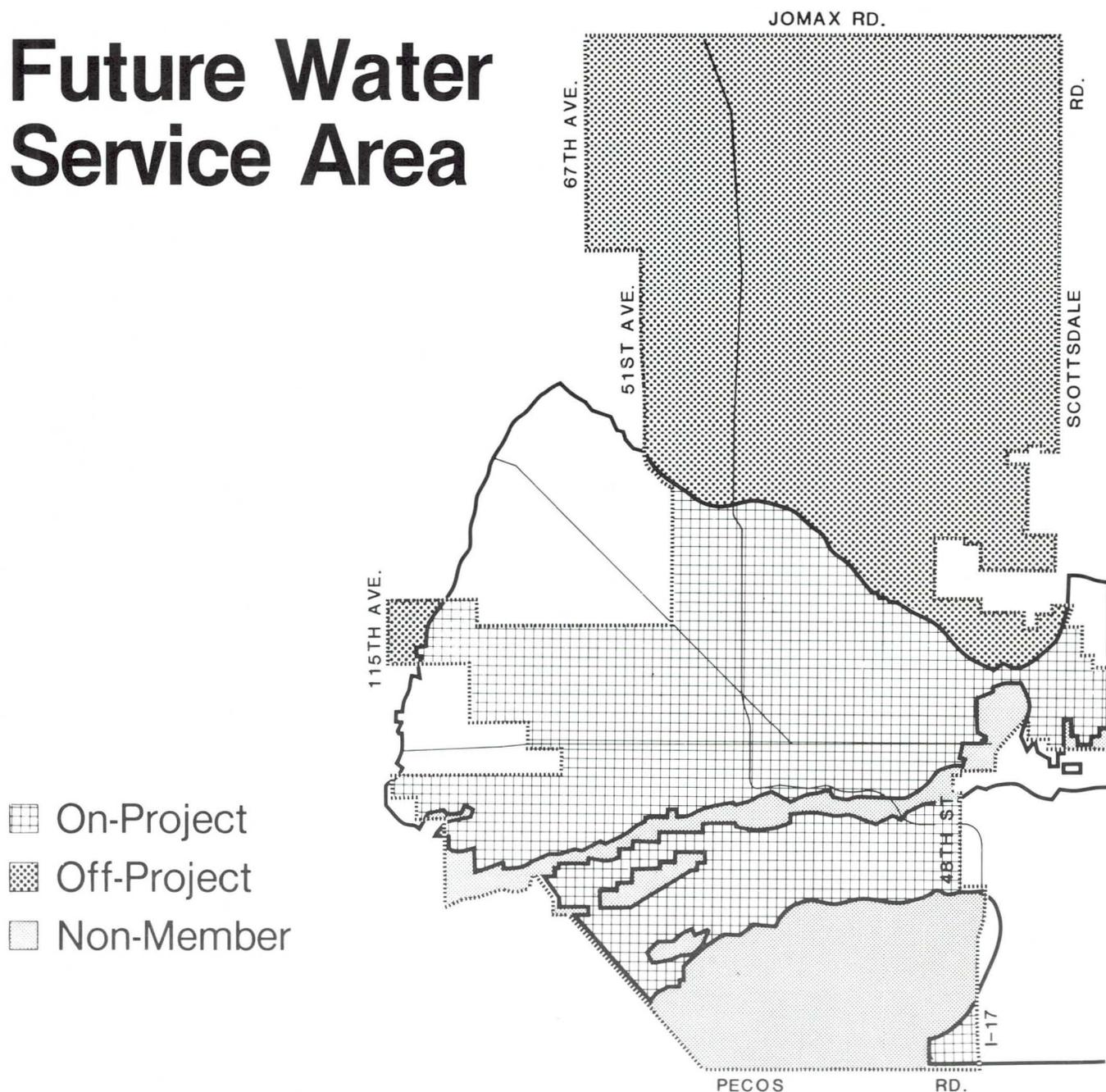


FIGURE 2

CONSERVATION

Water conservation programs are normally grouped in five categories: metering, education, pricing, regulation, leak detection and repair. Phoenix has programs in all five areas. These programs have kept demand from rising to even higher levels and have resulted in reductions of more than 6% from 1980 levels.

In coming years, a combination of pricing structures, regulatory measures and conservation education will be the backbone of the City of Phoenix water conservation program.

It is projected that a 20% reduction in per capita water consumption can be achieved by the year 2000 and maintained through 2035.

SUPPLIES

Supply projections are divided into two groups: supplies for those areas with Salt River Project water rights (On-Project) and those without (Off-Project and Non-Member). From a standpoint of accounting for water supplies, these areas are separate systems with separate sources. There are, however, interconnections between the two for operation of the water distribution system.

On-Project - Water for On-Project areas consists of surface water and groundwater. Surface water comes from reservoirs constructed on the Salt and Verde Rivers and operated by the Salt River Project. It is supplied to the City through the Arizona and Southern Canals. The amount of Salt River Project water available for municipal use is expected to increase as agricultural land is retired.

Groundwater is obtained for wells operated by the Salt River Project and the City of Phoenix. Withdrawal of groundwater is regulated by the Groundwater Management Act which requires "safe yield" by the year 2025. "Safe yield" means water cannot be withdrawn at a rate that exceeds natural replenishment. In order to accomplish this, the plan assumes a uniform decrease from current well production levels to an average of zero by the year 2025.

Off-Project and Non-Member - Water for Off-Project lands is composed of wells and gatewater. Off-Project groundwater use now averages over 64,000 acre-feet per year, but is projected to decrease to an average of zero by year 2025 to comply with the Groundwater Management Act. Gatewater is stored behind Phoenix' spillway gates at Horseshoe Dam and is being used when available to provide for rapid growth in Off-Project and Non-Member areas. The Central Arizona Project (CAP) will serve these lands beginning in 1986, adding an additional 113,882 acre-feet of water per year.

SUPPLY AND DEMAND WITH CONSERVATION

Figures 3 and 4 show annual average supply and demand. Both charts assume that the DWR 6% conservation requirement will be met by 1987 and an increased level of 20% will be achieved by 2000. On-Project projections indicate that some small amount of additional supplies or conservation may be needed by 2015.

Figure 4 indicates that demand Off-Project will not exceed supply until around the year 2000 with current supplies and proposed conservation.

PROPOSED NEW SUPPLIES AND SYSTEM OPTIMIZATION

In addition to water conservation activities, there are seven steps that are proposed to meet Off-Project and Non-Member average demand. These vary in type and cost and will likely change as system expansions and new supplies are analyzed in more detail. The following proposed actions assume that Phoenix will use 10,000 acre-feet of gatewater per year and will reduce average annual groundwater pumping in excess of intentional recharge to 0 in 2025.

1. Recharge of treated CAP water in late 1986 if ongoing pilot test is successful. This is not considered a source for meeting average demands but will be used to supplement groundwater in times of above average demands or below average surface water supplies.
2. Production of treated wastewater effluent by 1990 using the Bouwer process for exchange with the Roosevelt Irrigation District (RID) and SRP if necessary legislation and agreements are concluded. Production would start at 10,000 AF/yr. at the 23rd Avenue Plant and increase to 44,000 AF/yr. by 2015. Deliveries beyond 24,000 AF/YR require direct introduction into SRP laterals and canals.
3. Utilization of water from additional water conservation space in Cliff Dam by 1997.
4. Treatment of wastewater effluent for potable use by the year 2000.
5. Utilization of treated 23rd Avenue wastewater effluent in the Southwest Industrial Reserve as demand for the RID/SRP exchange water decreases and industrial demand increases. This plan shows delivery of 4,000 AF/yr. beginning in 2010 and expanding to 25,000 AF/yr. by 2035.

**SUPPLY AND DEMAND
On Project
Demand Reduced with More Conservation**

1,000 Acre Feet/Year

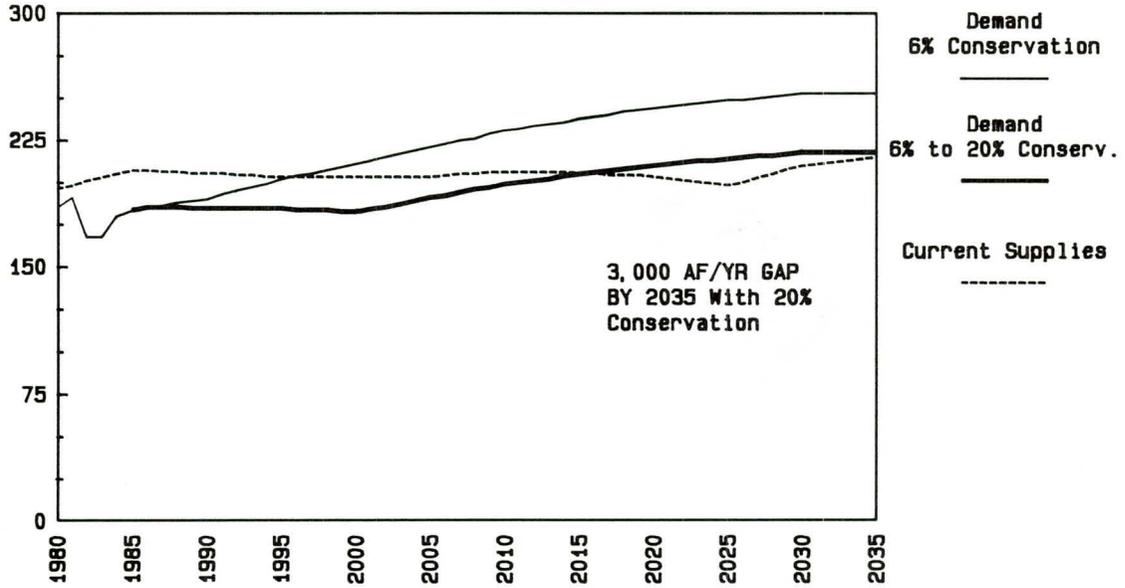


Figure 3

**SUPPLY AND DEMAND
Off Project and Non Member
Demand Reduced with More Conservation**

1,000 Acre Feet/Year

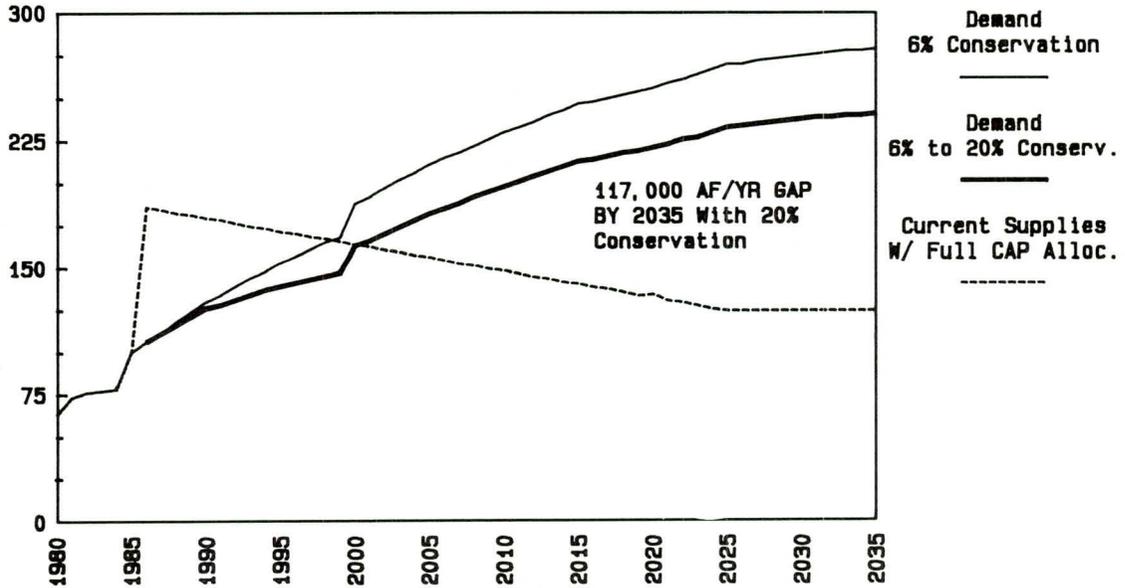


Figure 4

6. Remote treatment of effluent for turf use. This plan did not show utilization of this water until 2010 because of its relatively high cost. Needs for treated effluent in large new developments will very likely cause earlier use of this source as well as lower costs to the City of Phoenix.
7. Use of water derived from purchase of water rights by 2005.

To place all these proposed actions into perspective, Figure 5 shows current and proposed new water supplies for Off-Project and Non-Member lands. Figure 6 shows the relationship between supply and demand if all seven recommended actions are implemented, and the following table shows, by year, the source and quantity of water for Off-Project areas.

Off-Project and Non-Member Water Supplies

(Acre-Feet Per Year)

	<u>1985</u>	<u>1990</u>	<u>1995</u>	<u>2000</u>	<u>2035</u>
Gatewayer	37,000	10,000	10,000	10,000	10,000
Prod. Wells	49,000	43,000	37,000	31,000	0*
Exch. Wells	14,000	12,000	11,000	9,000	0*
CAP	0	113,882	113,882	113,882	113,882
RID/SRP Exch.	0	10,000	10,000	18,000	0
Water Rights	0	0	0	0	60,000
Cliff Dam	0	0	0	16,000	16,000
Eff. for Pot.	0	0	0	20,000	60,000
SW Ind. Res.	0	0	0	0	25,000
Eff. for Turf	0	0	0	0	3,000
Total	100,000	188,882	181,882	208,882	287,882

* Some pumping will occur to ensure well operation in emergency conditions.

CURRENT AND NEW SUPPLIES Off-Project and Non-Member

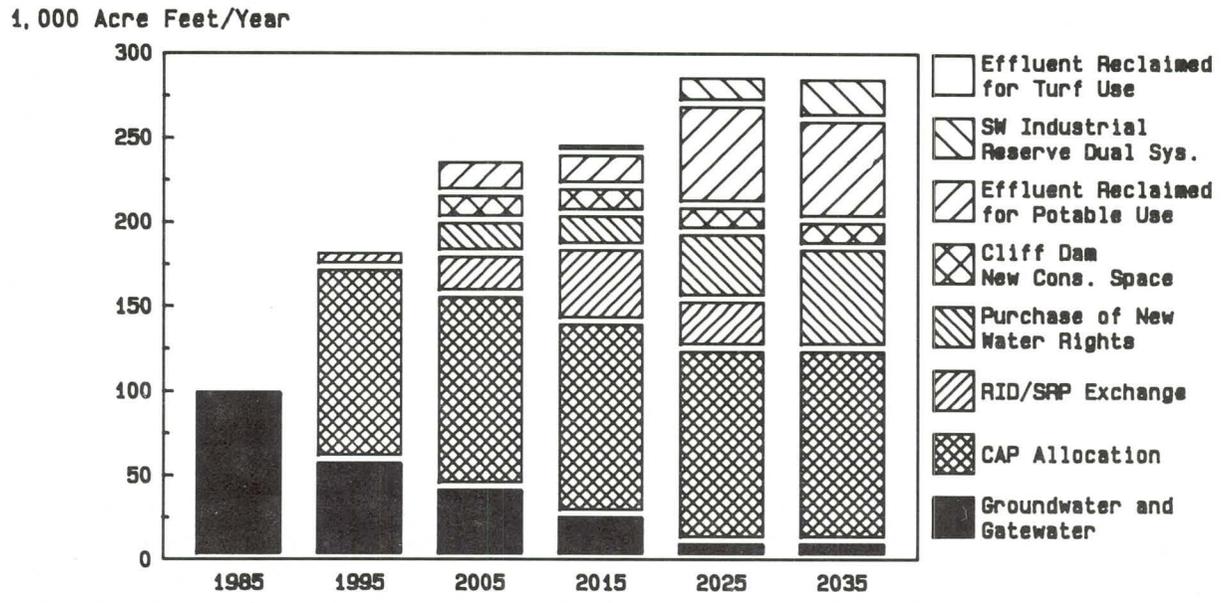


Figure 5

SUPPLY AND DEMAND Off Project and Non Member With Conservation and New Supplies

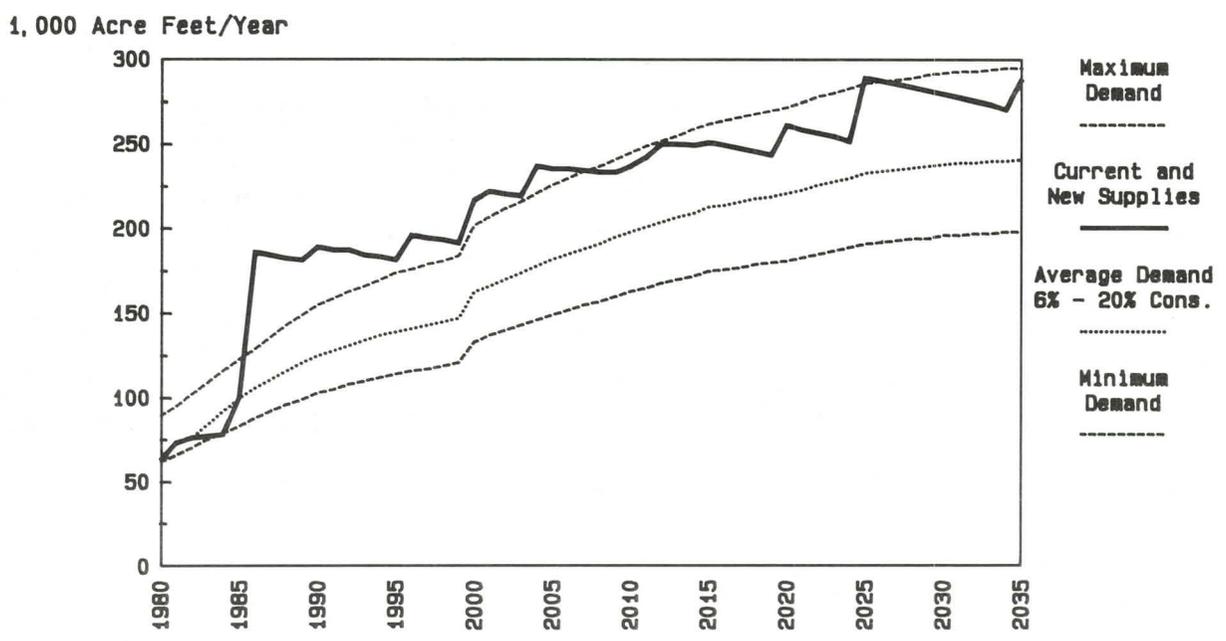


Figure 6

GOALS AND IMPLEMENTATION

The Mission and Goals for water resources form the basis for the recommended implementation program listed in the table following the goals.

Mission

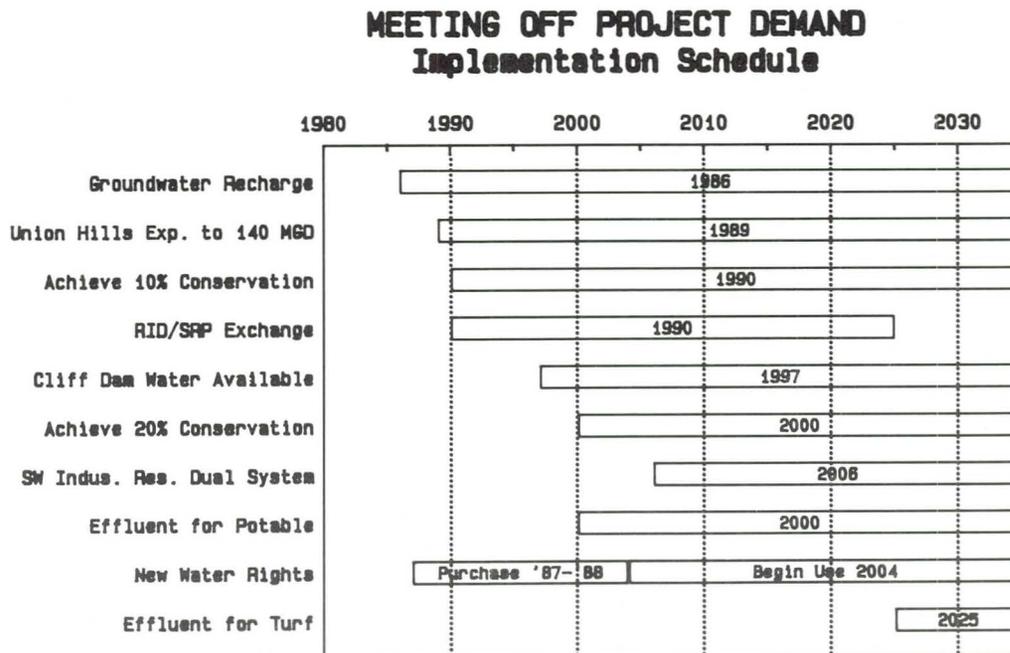
To provide a reliable supply of good quality water at the lowest reasonable cost to meet the future needs of the Phoenix water service planning area while balancing social, economic and environmental impacts of controlling water demand and expanding supplies.

Goals

1. To increase the yield, efficiency, and maintain adequate quality of existing water supplies.
2. To obtain new sources of adequate quality water to meet increased demand.
3. To minimize capital and operating costs in the provision of water service by managing the location, intensity and timing of growth.
4. To minimize water demand through effective conservation efforts.
5. To continue to operate the Phoenix water system as a financially self-supporting enterprise with the price of water based on the overall cost of maintaining an efficient and reliable water system.
6. To balance social, economic and environmental concerns in the acquisition, treatment and distribution of water resources.
7. To ensure public support for the financing and development of reliable water supplies of adequate quality.
8. To maintain an organizational commitment to improved quality, efficiency and use of modern technology in pursuit of water resource goals.

Implementation Schedule

The Implementation Schedule shows, by year, the actions needed to provide an adequate water supply for the Phoenix Water Service Area. Each step is classified into one of three areas: demand management/water conservation, system optimization, or new supplies. The schedule for implementing these actions is based on cost, time constraints, development needs, legal requirements, institutional restraints and ease of implementation. The schedule of major programs is summarized in the figure below.



	DEMAND MANAGEMENT/WATER CONSERVATION	SYSTEM OPTIMIZATION	NEW SUPPLIES
1985	<ul style="list-style-type: none"> * Complete a study to determine the costs and benefits of water conservation measures. * Continue education, water rate modifications and leak detection and repair programs. * Establish limitations on turf and improve control of water overflow onto the public right-of-way. 	<ul style="list-style-type: none"> * Complete a pilot study on groundwater recharge. 	<ul style="list-style-type: none"> * Continue to pursue a reallocation of CAP water for the area north of Jomax Road. * Study opportunities for locating plants to reclaim wastewater for use on turf or by industries. * Complete consulting studies of new supply opportunities. * Continue to pursue exchange of treated wastewater with the Roosevelt Irrigation District in exchange for SRP water to be used Off-Project.
1986	<ul style="list-style-type: none"> * Recommend ordinances restricting water use and establish water use audit teams for commercial and industrial customers. * Begin pilot tests of conservation programs recommended by the cost/benefit study. 	<ul style="list-style-type: none"> * Commence operation of Union Hills Water Treatment Plant and begin construction of CAP recharge project. * Evaluate participation in construction of the Salt River Project/Central Arizona Project interconnection. 	<ul style="list-style-type: none"> * Aggressively search for additional water supplies for purchase prior to 1990, and commence purchase when appropriate.

	DEMAND MANAGEMENT/WATER CONSERVATION	SYSTEM OPTIMIZATION	NEW SUPPLIES
1987	<p>* Propose ordinances restricting landscaping and modifying building codes.</p> <p>* Review the water rate structure to increase water conservation impacts.</p> <p>* Study grey water systems for residences and reuse technologies for industry.</p>	<p>* Begin design to expand the capacity of Union Hills Water Treatment Plant by 60 million gallons per day.</p>	<p>* Purchase water rights for not less than 20,000 acre-feet annual supply for anticipated use after 2005.</p>
1988	<p>* Implement recommendations of water conservation study to achieve a 10% reduction in per capita use from 1980 levels by 1990.</p>		<p>* Initiate purchase of additional rights to not less than 20,000 acre-feet per year of water for use after the year 2025.</p>
1990	<p>* Implement demand management programs necessary to achieve 15% reduction in per capita water use from 1980 levels by 1995.</p>	<p>* Complete construction and begin use of an additional 60 million gallons per day capacity at the Union Hills Water Treatment Plant for Off-Project and Non-Member use.</p>	<p>* Participate in financing of Cliff Dam for additional water supplies.</p>
1995	<p>* Implement demand management programs necessary to achieve 20% reduction in per capita water use from 1980 levels by 2000.</p>	<p>* Complete construction and begin use of an additional 40 million gallons per day capacity at the Deer Valley Water Treatment Plant for On-Project use.</p>	<p>* Commence construction of facilities at 91st Avenue Wastewater Treatment Plant to treat wastewater effluent to a level suitable for direct potable use.</p>

	DEMAND MANAGEMENT/WATER CONSERVATION	SYSTEM OPTIMIZATION	NEW SUPPLIES
2000	* Continue programs to maintain at least a 20% reduction from 1980 per capita water use levels.	* Complete construction and begin use of an additional 40 million gallons per day capacity at the Val Vista Water Treatment Plant for On-Project use.	* Begin delivery of treated wastewater effluent to industries in the Southwest Industrial Reserve.
2010	* Continue programs to maintain at least a 20% reduction from 1980 per capita water use levels.	* Design and construct the Western Canal Water Treatment Plant to meet increased On-Project demand.	* Initiate purchase of rights to not less than 20,000 acre-feet per year of water for use in 2035.

CONCLUSION

The various elements of this plan will need to work in harmony to assure adequate supplies of water to future generations. Conservation alone will not suffice if rapid growth continues. New resources cannot keep pace with a growing area if residents waste water, and projections show that water from the Central Arizona Project will not be sufficient.

In recognition of the many variables involved in projecting the future, this plan will be updated annually. Population, growth, weather, new supplies, conservation successes and implementation of the Groundwater Management Act may require revised projections. However, one fact remains, action must be taken if we are to meet the future demands of our community for assured supplies of water. The City of Phoenix has now taken its first comprehensive step in developing a plan to guide these actions.