

AMA Overview

Chapter 1 Water Management Approach

Chapter 2 Overview of Water Resources

Chapter 3 Water Use Characteristics



Preface

Section I of the Third Management Plan provides an overview of the Arizona Department of Water Resources' (Department) water management approach, a description of the physical conditions, hydrology, and water resources of the Tucson Active Management Area (AMA), and a detailed description of the characteristics of various water use sectors within the AMA. The physical water resources data presented in Chapter 2 and the historic water use and associated water use trends described in Chapter 3 provided the Department with important information from which it developed a baseline water budget. Information presented in this section was also used in developing water management programs which are presented in Section II and the future conditions and directions presented in Section III.

In Section I, the Department intends to provide the reader with a better understanding of the management approach, the water resources, and the water use characteristics of the Tucson AMA. Such an overview is necessary to better appreciate the reasoning, perspective, and methods being used by the Department as it continues to develop a long-term water management strategy, with particular emphasis on the third management period (2000 to 2010).

Water Management Approach



1.1 CHAPTER ORIENTATION

This chapter describes the goals, objectives, and contents of the Third Management Plan within the context of the Arizona Department of Water Resources (Department) and the Groundwater Code (Code). It also provides an overview of the Tucson Active Management Area (AMA). The following topics are discussed:

- Arizona Department of Water Resources' mission
- Overview of the Code and some of its key provisions
- A discussion of the safe-yield concept and other management goals
- An institutional overview of the Tucson AMA
- The principles, objectives, and contents of the Third Management Plan
- Emerging challenges for the Tucson AMA

1.2 THE ARIZONA DEPARTMENT OF WATER RESOURCES

The Department was created by the 1980 Groundwater Code to manage the water resources of Arizona. The Department administers state laws, explores methods of augmenting water supplies to meet future demands, and works to develop public policies that promote efficient use and equitable allocation of available water supplies. To secure long-term water supplies for Arizona, the Department oversees the use of surface water and groundwater in the state and represents the state's interests in interstate and federal issues. The mission of the Department is:

To ensure a long-term, sufficient and secure water supply for the state; to develop public policy which promotes efficient use and equitable distribution of water in an environmentally and economically sound manner; and, to promote the management of floodplains and dams to reduce loss of life and damage to property.

1.3 THE ARIZONA GROUNDWATER CODE

In 1980, Arizona made a commitment to the long-term management and conservation of its limited groundwater supplies through the passage of the Code, which is the cornerstone of Arizona's water management efforts. The goals of the Code are to eliminate severe groundwater overdraft in areas of the state where groundwater supplies have been rapidly diminishing and to provide the means for allocating Arizona's limited groundwater resources to most effectively meet the state's changing water needs.

The Code limits withdrawals of groundwater within AMAs to holders of groundwater rights, service area rights, and groundwater withdrawal permits, and to small domestic water users. Under the Code, water uses existing in 1980 were allowed to continue within the limits established under a new water rights system, and new uses were required to be consistent with the management plans and goals of the AMAs. Readers who are not familiar with the different types of groundwater rights established by the Code are encouraged to read the Glossary of Terms attached as a supplement to the management plan. The Code also contains provisions to limit groundwater use through conservation and the use of renewable water sources. The full text of the Code can be found on the following Web site: www.azleg.state.az.us

1.3.1 The Groundwater Problem

The Code was enacted in response to serious water level declines in the aquifers in the central and southern parts of the state. Groundwater overdraft in Arizona has resulted in the lowering of groundwater levels by as much as 600 feet in some locations. In some areas, groundwater depletion has made it economically infeasible to pump water, has caused the lowering and cracking of the land surface (subsidence), and has resulted in water quality problems due to the migration of contaminated water and general deterioration of

aquifer water quality with depth. Continued overdraft of groundwater supplies will exacerbate these problems.

In the Tucson AMA, groundwater is currently used at twice the rate it is replenished. Groundwater overdraft in the AMA has lowered water levels by up to 200 feet in Tucson Water's Central Wellfield. Subsidence has occurred in several areas of the AMA and is projected to increase if groundwater declines continue. Decreased well productivity has been observed in some areas because the most productive portions of the aquifers have been dewatered. The total volume of existing groundwater rights and withdrawal permits exceeds natural and incidental recharge by a factor of 2.8.

1.3.2 Provisions of the Groundwater Code

The regulatory provisions of the Code are focused primarily on areas of the state that have been designated as AMAs. These areas are located where competition for groundwater is most intense, primarily in the central and southern parts of the state. Statewide, there are provisions addressing well drilling, registration, and construction requirements; water adequacy requirements for new subdivisions; and limitations on transportation of groundwater across watershed boundaries.

Within AMAs, the Code established a new groundwater rights system strictly limits groundwater withdrawals; prohibits the development of new irrigated farmland; requires new subdivisions to have long-term, dependable supplies; and requires measuring and reporting of groundwater withdrawals. Management goals are established for each AMA, and a series of five management plans containing mandatory conservation requirements for industrial, municipal, and agricultural water users must be developed. Other programs within AMAs include conservation assistance, augmentation, and monitoring of the water supplies.

The Code also established Irrigation Non-Expansion Areas (INAs). Within these areas there can be no new irrigated land, and owners of large wells are required to meter their water use and file annual reports with the Department. Otherwise, groundwater management in INAs is not highly structured.

1.3.2.1 Creation of the Active Management Areas and Irrigation Non-Expansion Areas

Upon enactment of the Code, four AMAs were established: Phoenix, Tucson, Pinal, and Prescott. In 1994, the Santa Cruz AMA was created from the southeastern portion of the Tucson AMA to allow more focus on international issues and the unique hydrology of the area. Boundaries of the AMAs are based primarily on groundwater basin divides, but they take into account water use patterns as well.

The Code also established two INAs: Douglas and Joseph City. A third INA, Harquahala, was designated by the director in 1982. Figure 1-1 shows the location of the five AMAs and the three INAs. The Douglas INA is managed from the Tucson AMA office. Figure 1-2 shows the boundaries and major features of the Tucson AMA.

1.3.2.2 The Management Goals

For three of the AMAs, Prescott, Tucson, and Phoenix, the management goal to be reached by the year 2025 or earlier is safe-yield. The attainment of this goal is expected to occur incrementally over the five management periods. However, it is clear that from a supply-availability perspective the goal will be easier to attain in the early years while Colorado River supplies are in surplus. Maintaining the safe-yield goal beyond 2025 may become more and more difficult over time as demand increases due to municipal and industrial growth and renewable supply surpluses decrease.

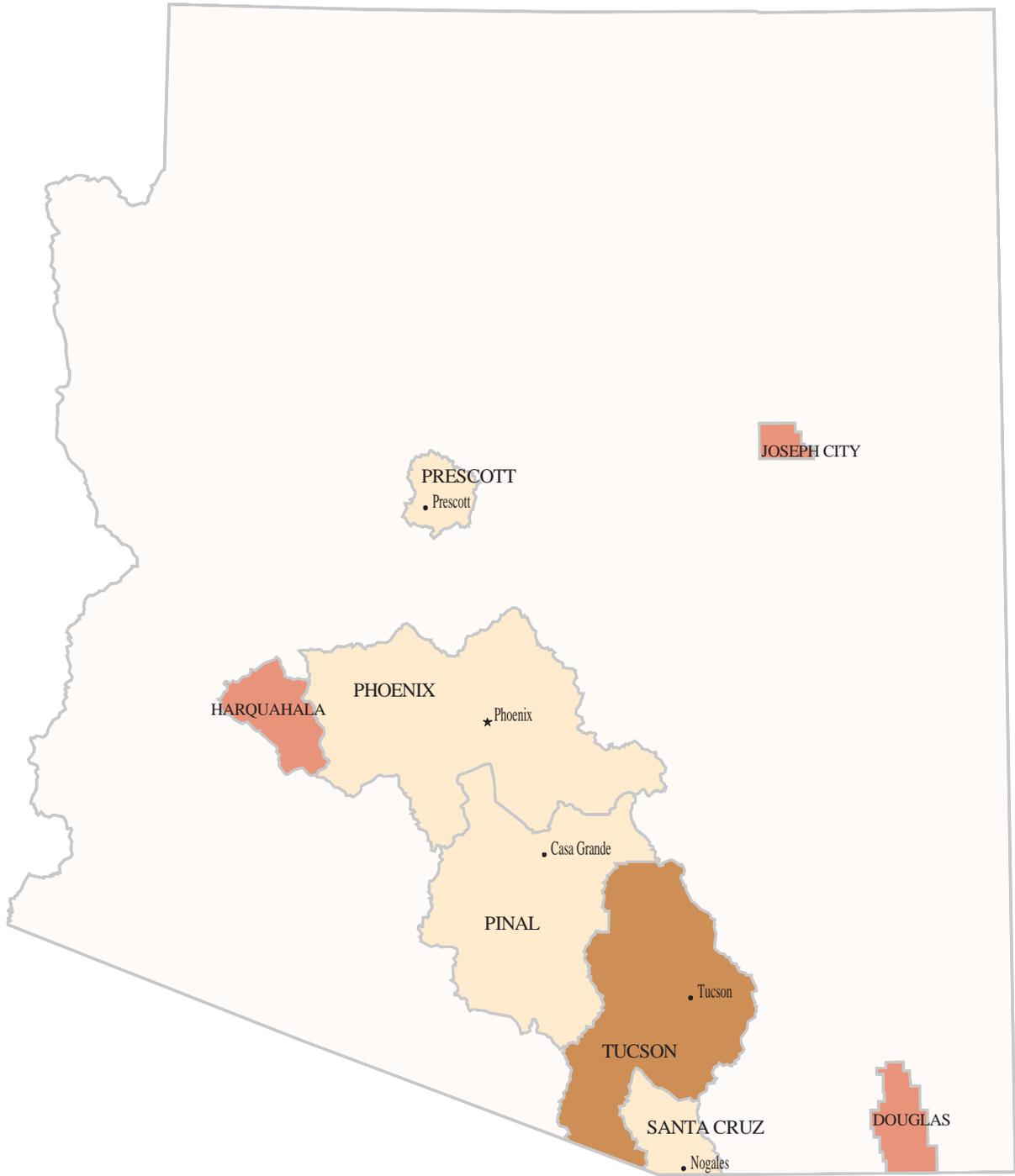
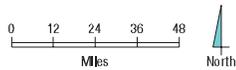


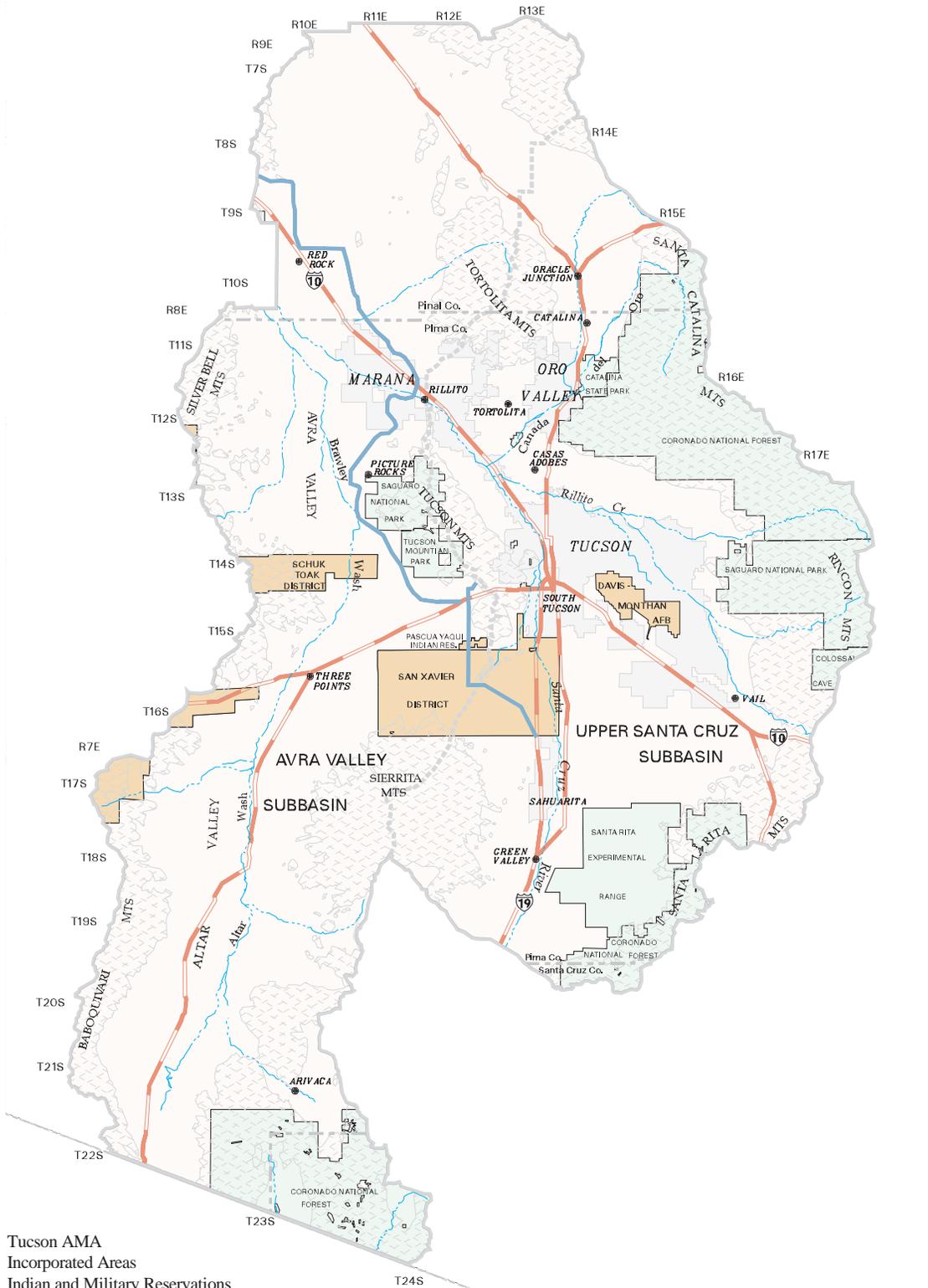
Figure 1- 1

Active Management Areas and Irrigation Non-Expansion Areas

- Tucson AMA
- AMAs
- INAs
- State Boundary

ORIGINAL SOURCE
Arizona Department of Water Resources
Geographic Information System

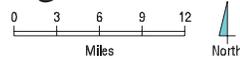




- Tucson AMA
- Incorporated Areas
- Indian and Military Reservations
- National Forest
- Hardrock
- Streets and Highways
- CAP Canal
- Subbasins
- Counties
- Rivers and Streams

Figure 1-2

Tucson Active Management Area



ORIGINAL SOURCE
Arizona Department of Water Resources
Geographic Information System

In order to address the unique hydrologic nature of the Santa Cruz AMA, the goal identified for that AMA is to maintain safe-yield and prevent local water tables from experiencing long-term declines. In the Pinal AMA, where a predominately agricultural economy exists, the goal is to protect the agricultural economy as long as feasible and preserve water supplies for future non-agricultural purposes.

Safe-yield, as defined in the Code, means “to achieve and thereafter maintain a long-term balance between the annual amount of groundwater withdrawn in an active management area and the annual amount of natural and artificial groundwater recharge in the active management area.” A.R.S. § 45-561(12). The volume of groundwater that can be withdrawn while maintaining a safe-yield condition in the AMA will not be a fixed amount; it will change due to annual variations in incidental recharge, natural recharge, and artificial recharge. If long-term water level trends (after adjusting for stored credits) show declining water tables on an AMA-wide average basis, groundwater withdrawals will have to be reduced and the safe-yield volume estimate adjusted accordingly. If long-term water levels rise (after adjusting for stored credits) above the level expected due to variations in incidental recharge, natural recharge, and safe-yield recharge, groundwater withdrawals may be increased. These evaluations of the impacts of withdrawals on localized long-term water levels could be made at regular intervals to ensure long-term groundwater level stability.

Information from annual water use reports is used to estimate the volume of groundwater withdrawals, water stored, and recovered water in an AMA. Water budgets are constructed to illustrate the total supply and demand picture. At the point in time where water budget estimates indicate groundwater withdrawals have been reduced to a safe-yield volume, groundwater levels will need to be monitored in the context of a hydrologic model to ensure that a safe-yield condition is maintained and to understand the effects of stored water. Hydrologic models can be used to predict changes in water levels based on projected groundwater pumping and credit recovery patterns and to verify assumptions in the water budget. The Department’s subsidence monitoring and gravity surveys will be increasingly useful in verifying whether water level rises result from increases in storage or from changes in aquifer compaction over time.

Safe-yield is achieved on an AMA-wide basis; the Code does not recognize localized achievement of safe-yield. The amount of groundwater pumped under safe-yield conditions is not allocated on a subbasin or local basis. It is recognized that as safe-yield conditions are attained on an AMA-wide basis some areas could be depleted, some areas of active recharge could be in surplus, and other areas could achieve a localized balance between the amount of water recharged and pumped.

Since the development of the Second Management Plan, new information has become available regarding the physical availability and distribution of water supplies. For example, recent publications by the United States Geological Survey have heightened awareness of the potential for land subsidence in the AMAs. This improved understanding of the risks associated with ongoing pumpage in certain areas brings a new perspective to safe-yield. A more site-specific, local resource management approach may be needed. Additional tools may be required to develop a more resource-based, localized water management program.

During the third management period, a critical area management strategy will be evaluated that establishes additional water management goals for specific geographic areas within the AMA. These goals may relate to mitigation of subsidence, water supply reliability, water quality management, implementation of Indian water rights settlements, or other groundwater supply-related considerations.

1.3.2.3 Management Plans

To achieve the management goal for each AMA, water conservation and management requirements are established in each of five management periods. The five management periods are as follows:

First Management Period:	1980-1990
Second Management Period:	1990-2000

Third Management Period:	2000-2010
Fourth Management Period:	2010-2020
Fifth Management Period:	2020-2025

Requirements for each management period are described in separate management plans prepared for each AMA. Management plans include water conservation requirements for agricultural, municipal, and industrial groundwater users; a water quality assessment and management program; an augmentation and recharge program; conservation assistance programs; and other management programs that define how the AMA will achieve its management goal.

The management plans also quantify the volume of the groundwater right for agricultural and municipal users. For example, in the case of Irrigation Grandfathered Rights, the right established in the Code is to irrigate particular acres of land that were historically irrigated. The volume of water that may be applied to that acreage, the “water duty,” is defined in the management plans. Similarly, service area rights for municipal users are not quantified in the Code but are quantified through the gallons per capita per day program in the management plan.

In each successive management period, the preparation of a management plan provides the Department and AMA water users with the opportunity to analyze the effectiveness of previous water management efforts and address water management issues in the AMA. Adjustments in water management strategies and conservation requirements are made in each successive plan to help achieve management goals.

The First Management Plan was the first step toward a comprehensive and effective management program. The plan initiated conservation programs and focused attention on important water management issues. The Second Management Plan expanded on the conservation programs of the First Management Plan and integrated water augmentation into the AMA management strategy. The Second Management Plan placed a strong focus on evaluation of conservation potential and implementation of water conservation measures to achieve cost-effective levels of efficiency in water use. New programs for conservation and augmentation assistance were included as well.

Even after the implementation of two management plans, groundwater remains a significant source of supply for municipal, agricultural, and industrial uses in all five AMAs. The total annual groundwater overdraft in the Tucson AMA decreased from 179,000 acre-feet in 1985 to close to 164,000 acre-feet in 1995, but remains a serious problem.

The third management period constitutes the midpoint in Arizona’s effort to achieve its groundwater management goals. After the end of the third management period in 2010, there will be only 15 years left to achieve safe-yield by 2025. The Third Management Plan establishes a water management strategy that encompasses the use of water conservation, augmentation, recharge, and water quality management by the agricultural, municipal, and industrial sectors to help achieve the safe-yield goal by 2025. In order to achieve safe-yield, all water supplies must be used efficiently, and mechanisms need to be developed to replace existing groundwater use with renewable supplies.

Water conservation requirements in the Third Management Plan are similar in structure to those established in the Second Management Plan. Changes in the Third Management Plan address comments received from regulated water users, additional water management issues, and local water management concerns. The Third Management Plan describes the developing role the Department and the water users must play in meeting local, regional, and statewide water management objectives. Achievement of safe-yield and other objectives will require community-wide support and commitment.

1.3.2.4 Assured Water Supply Program

The Code prohibits the sale or lease of subdivided land in an AMA without the demonstration of an assured water supply. The Assured Water Supply Program (AWS Program) was instituted in 1980, but substantially strengthened in 1995 with adoption of the Assured Water Supply Rules (AWS Rules). Under the AWS Rules, new development within an AMA must demonstrate that sufficient water supplies of adequate quantity and quality are available to meet proposed uses for 100 years. The AWS Rules require the utilization of these supplies to be consistent with the safe-yield management goal of the AMA. Only after demonstration of sufficient water supply can a development be approved for sale to the public.

The AWS Rules apply to developers who seek a Certificate of Assured Water Supply (Certificate of AWS) for an individual subdivision and to water providers seeking a Designation of Assured Water Supply (Designation of AWS). A Designation of AWS results from a demonstration that there are adequate water supplies available to the provider to meet current and future demands of the customers currently on their system, and the demands of customers they have committed to serve, for 100 years. The water supplies used to demonstrate an assured water supply may include surface water, effluent, imported groundwater, credits from extinguishment of groundwater rights, a quantity of allowable groundwater use specified by the AWS Rules, or water stored pursuant to an underground storage permit. The AWS Program plays a key role in achievement of the management goal since it requires the largest water use sector in the AMA to move from dependence on mined groundwater to the use of renewable supplies.

1.3.2.5 Revisions to the Groundwater Code

Since 1980, the Code has undergone numerous changes to address emerging water management issues. Sections have been added to limit use of water in artificial lakes, address underground storage and recovery of water, limit transfer of groundwater between groundwater basins statewide, establish groundwater replenishment districts and other entities designed to facilitate the use of renewable supplies, establish the water conservation assistance program, and provide alternative municipal and agricultural conservation programs. In addition, numerous changes have been made to expand or clarify previous language and deregulate small groundwater users.

Throughout this process, the fundamental concepts of allocating the right to use groundwater and planning for the efficient and economic use of the water have been preserved. The Code, as comprehensive as it is, does not contain detailed instructions on how to manage water resources. Instead it provides a framework from which water management decisions are made in the AMAs. The Department and the water users, through the development and implementation of the management plans and community-based decisions, must establish the management strategies that lead to efficient water management and achieving safe-yield and related management goals.

1.4 GOVERNMENTAL AND INSTITUTIONAL SETTING

Water management activities within the Tucson AMA are carried out by a number of entities. City, county, special district and regional government functions include retail water delivery, flood control, wastewater management, water quality management, planning, and zoning. Several user groups, advisory committees, citizen's groups, and other organizations play significant roles in developing legislative and policy guidelines and educational programs relating to water resources use and conservation. The Groundwater Users Advisory Council (GUAC) for each AMA advises the director of the AMA and the director of the Department on issues relating to groundwater management in the AMA.

The Central Arizona Water Conservation District (CAWCD), also known as the Central Arizona Project (CAP), is a multi-county governmental agency that was formed to reimburse federal CAP canal construction costs, operate the CAP canal, and deliver CAP water to users in AMAs. The CAWCD is

overseen by an elected board of 15 members, which represents the three-county service area of the district. The Central Arizona Groundwater Replenishment District (CAGR) is a tax-exempt public improvement district authorized by state legislation to acquire water supplies to replenish aquifers depleted by district members. It is an organizational unit of the CAWCD and is overseen by the CAWCD board. CAWCD has been involved in construction of three demonstration recharge projects in the Tucson AMA.

The Arizona Water Banking Authority (AWBA) was created in 1996, primarily to ensure that Arizona's municipal and industrial allocations of Colorado River water will be protected in times of shortage. The AWBA uses several funding sources to buy excess CAP water and recharge it for the future benefit of users both inside and outside of the CAP service area. The AWBA is authorized to store water to support the management objectives of the AMAs and to engage in interstate water banking under specified conditions. The AWBA has a five-member appointed board chaired by the director of the Department. The AWBA staff are housed in the Department's offices.

The Arizona Water Protection Fund (AWPF) was established in 1994 to provide grant monies for implementation of projects to protect or restore the state's riparian areas. The Fund may be used to purchase CAP water or effluent for riparian enhancement. The AWPF Commission oversees the grants process; the director of the Department serves as an ex-officio member on the Commission and the staff are located within the Department.

At the state level, the Arizona Department of Environmental Quality (ADEQ) develops and enforces water quality regulations. Through recent legislation (amending provisions of the Water Quality Assurance Revolving Fund or WQARF) the Department and ADEQ jointly participate in specified activities related to protection of groundwater quality and remediation.

The Arizona Corporation Commission (ACC) regulates the activities of private water companies, particularly those related to rate-setting. The Arizona Department of Real Estate works with the Department to assure availability of water for new subdivisions.

Federal water management activities in the Tucson area include the Bureau of Reclamation's involvement in regional water supply planning, possible construction of terminal storage facilities for CAP water, and research into treatment alternatives for CAP water. The Bureau of Reclamation also participates in negotiations to provide water resources to Indian communities on behalf of the Secretary of the Interior. Additional federal water management activities include an Army Corps of Engineers' River Basin Study, the Environmental Protection Agency's Superfund program, and the National Pollutant Discharge Elimination System permit program. The United States Geological Survey works independently and in conjunction with the Department and others in the collection and analysis of hydrologic and subsidence-related data and flood warning information.

The Tohono O'odham and Pascua Yaqui Indian Nations are involved with issues related to the use of groundwater and renewable water supplies. The San Xavier and Schuk Toak Districts of the Tohono O'odham Nation are the focus of ongoing negotiations related to the Southern Arizona Water Rights Settlement Act, federal legislation addressing water claims in the Tucson AMA.

1.5 DEVELOPMENT OF THE THIRD MANAGEMENT PLAN

Preparation of the Third Management Plan has been guided by a set of overriding principles and specific objectives. These principles and objectives and the Third Management Plan development process are described below.

1.5.1 Guiding Principles in Program Development

The Code provides the Department with a series of management tools, some of which are more effective than others. In addition to the Code, general management principles have been developed to guide the operations of the Department and preparation of the Third Management Plan. These are:

- **The authorities granted to the Department must be integrated into a coordinated strategy for meeting the management goal of the AMA.** Numerous tools are provided by the statutory structure to assist in meeting water management objectives. These tools include: (1) groundwater rights components of the Code, (2) assured water supply provisions, (3) underground storage and recovery provisions, (4) permitting requirements and conditions, (5) authority to develop well-spacing rules, (6) AWBA and AWPf activities, (7) conservation and augmentation assistance programs, and (8) water use reporting and enforcement authorities. All of these activities must be integrated and focused toward meeting the goal.
- **Effective water management must include both supply augmentation and demand management programs.** Supply augmentation includes substitution of renewable supplies for non-renewable groundwater resources, storage of excess renewable water for future use, utilization of effluent, and meeting new demands with renewable supplies. The major focus of demand management is water conservation and restrictions on certain uses such as lakes. Demand management extends the availability of existing water supplies to serve more uses over a longer time frame.
- **Effective and efficient water management must take a long-term perspective and be regional in scope.** The Department is responsible for ensuring that sustainable water supplies are available for future generations. If possible, safe-yield should be achieved sooner than 2025, and efforts to ensure that the goal can be maintained after 2025 should be encouraged.
- **All water sources need to be included in any long-term, comprehensive water management strategy.** Because groundwater use reductions are dependent on the efficient utilization of non-groundwater sources, the inclusion of these sources in a water management program is essential.
- **Water users must have an integral role in management program development and implementation.** Water users with expertise in their own water use sector must play a major role in development and implementation of water management programs in order to ensure the success of these programs.
- **Water management efforts must consider economic impacts and feasibility.** Attaining water management goals requires the expenditure of public and private funds, which must be used as effectively and efficiently as possible. Therefore, water management strategies must be developed using sound economic principles.
- **Educating the public on water issues and involving the public in developing management programs are essential to building and sustaining an effective water management effort.** It is ultimately the members of the public who are asked to commit to implementing water management strategies. It is essential to provide them with the information they need to make informed choices and the opportunity to participate in developing water management programs.
- **Water management efforts should be consistent with, and enhance, the quality of life in the community.** Social values and environmental quality considerations are integral to the development of water management approaches in Arizona. Adverse impacts on the quality of life and the potential for economic development must be avoided to the greatest extent possible.

- **The Department's water management efforts must recognize that individual customers, water users, water providers, municipal governments, and the real estate industry are important decision-makers.** The role of the Department's programs and regulatory tools is to create a decision-making environment that results in good water management decisions and investments.
- **Renewable water supplies available today must be used to meet the needs of the future.** Excess CAP water available during the third management period must be managed to meet growing AMA demands and to provide adequate supplies during future water shortages. Underground storage of excess CAP water by the AWBA and by AMA water providers is an important component of successful water management.
- **Water management programs should provide a stable institutional framework creates an environment of certainty in water resource decision-making.** Water users and providers must commit to, and implement, long-range plans in a world of evolving regulations. The provision of a predictable framework within which these regulations will evolve reduces uncertainty. Additionally, management programs must be clearly stated and free of ambiguity, while maintaining flexibility to respond to changing conditions.
- **Local water management issues must be addressed as regional and statewide strategies are developed.** There must be recognition of the impacts that regional or statewide water management programs can have on local water users.
- **Water management programs should be based on the premise that future issues are unlikely to be the same as those we have encountered in the past, and that the pace of change is likely to increase.** In order to provide maximum flexibility for the future, data bases must be enhanced and tools developed to identify trends early and to test scenarios that vary from current conditions.

1.5.2 Third Management Plan Objectives

The following objectives must be achieved during the third management period:

- The Department will establish and implement Third Management Plan water conservation requirements among all groundwater users as equitably as possible. Public acceptance and economic, technical, health, and environmental constraints will be considered when establishing these requirements. Flexibility will be provided as appropriate to address water users who, while implementing effective conservation measures, may not be able to comply with specific conservation regulations. Unique circumstances may be addressed through alternative conservation requirements designed to result in equivalent conservation or through variance or administrative review procedures provided for by statute.
- The Department will maintain conservation requirements initiated by the Second Management Plan that were effective and expand them where appropriate. The Department will recognize existing conservation efforts in setting Third Management Plan conservation standards.
- The Department will provide financial and technical assistance to implement water conservation, augmentation, monitoring, and recharge measures.
- The Department will encourage development of infrastructure that will allow use and storage of renewable water supplies.

- The Department will expand public assistance and public education efforts to reach a larger portion of the public.
- The Department will provide incentives, as appropriate, to encourage water conservation and water augmentation activities consistent with water management objectives.
- Department staff will actively participate in regional and local water management planning and cooperative projects.
- The Department will collect, analyze, and maintain data in order to provide the information necessary to identify water management issues and trends and to propose appropriate and timely solutions.
- The Department will endeavor to enhance water quality management efforts in order to preserve the quality and quantity of water available for existing and future needs.
- The Department will encourage recharge activities in areas where storage of renewable supplies will be beneficial from a water management perspective. Management of both storage and recovery activities will be required to protect future water supplies and the storage capacity of the aquifers.
- The Department will encourage coordination between the many agencies that affect water policy, particularly the CAWCD, AWBA, CAGR, ADEQ, and the ACC.
- The Department will work with the state's political leadership, water users, and the public to identify and develop the tools and additional statutory authority necessary to achieve water management goals and objectives, including reaching safe-yield by 2025.

1.5.3 Third Management Plan Development Process

Development of the Third Management Plan has involved data collection and analysis, issues identification, and program development. Public participation has been an important component of the process throughout the development of the Third Management Plan.

1.5.3.1 Program Development and Implementation

This Third Management Plan is the result of a three-staged work effort began in 1994. The first stage involved data collection and analysis culminating in development of a "State of the AMA" (SOAMA) report was widely distributed. In the second stage, issues identified in the SOAMA report and raised by the community were addressed in issue papers describing the issue and identifying recommended alternatives. The third stage involved developing recommended alternatives into program concepts and, ultimately, into the program chapters and legal requirements presented in the Third Management Plan. Throughout preparation of the Third Management Plan, public input and technical research have been used to identify issues, objectives, and solutions.

1.5.3.2 Public Participation

Multiple levels of public input have been used in development of the Third Management Plan. The Code established a five-member Groundwater Users Advisory Council (GUAC) for each AMA. The GUAC members are appointed by the Governor to represent the groundwater users in the area and advise the director of the Department and the AMA director on matters relating to water management within the AMA. Tucson AMA staff met regularly with the GUAC to obtain member opinions and recommendations

on all components of this plan. The GUAC meetings were open to the public, and interested groups and individuals communicated their views and recommendations in this forum. Pursuant to A.R.S. § 45-421(1), the GUAC must comment on the proposed plan before it is promulgated by the director.

The Department also consulted with numerous technical advisory committees (TACs) and groups comprised of technical experts, water providers, industry representatives, agricultural representatives, scientists, and other organizations and individuals concerned with water use and water resource issues. TACs were established to review material, identify issues, and advise the Department in the development of programs in the following areas:

- Municipal (Phoenix and Tucson AMAs)
- Agricultural (Phoenix and Tucson AMAs)
- Turf-related Facilities (Phoenix and Tucson AMAs)
- Metal Mining Facilities (Tucson AMA)
- Sand and Gravel Facilities (Joint committee for the Tucson, Phoenix, and Pinal AMAs)
- Large-scale Power Plants and Cooling Facilities (Joint committee for the Tucson and Phoenix AMAs)
- Dairy and Feedlot Operations (Joint committee for the Tucson, Phoenix, and Pinal AMAs)
- Augmentation and Recharge (Phoenix and Tucson AMAs)

The TACs met over approximately a two-year period, and members spent considerable time reviewing data, discussing issues, and assisting in developing regulatory programs. Participation by the TACs was critical in development of the management plan. Technical review was also provided by outside committees and experts on the water quality, water resources, and water budget chapters. Public comments were received in meetings with interested parties and during and after presentations to civic organizations and the general public. The Department's philosophy is to maximize public input on the content of the management plans to ensure that the public's concerns and ideas are adequately incorporated.

Additional public input is obtained through formal public hearings conducted after the proposed plan is completed. A.R.S. § 45-570. In these hearings the Department presents information in support of the plan and obtains comments regarding the plan. Before the plan is adopted, the director of the Department may revise the plan and must prepare a written response to the written and oral comments submitted as part of the hearings process.

1.6 THIRD MANAGEMENT PLAN CONTENT

The Third Management Plan addresses water conservation, water quality, water augmentation, and related water management programs for the years 2000 to 2010, and comprises the following five primary elements:

- Assessment of the status of water supplies and demands in the AMA
- Mandatory conservation and monitoring requirements for agricultural, municipal, and industrial groundwater users and groundwater distribution systems
- Water supply augmentation and recharge program
- Water quality assessment and management program
- Conservation, augmentation, and monitoring assistance program

Statutory guidelines provided in A.R.S. §§ 45-566 and 566.01 direct that the following components be included in the Third Management Plan:

- New irrigation water duties for each farm unit
- An alternative agricultural program for Irrigation Grandfathered Right holders
- Additional reasonable reductions in per capita use to those specified in the Second Management Plan
- A Non-Per Capita Conservation Program for municipal providers
- Appropriate conservation measures for individual users on municipal systems
- Conservation or rate-of-use requirements for deliveries of untreated water
- Reasonable conservation requirements for small municipal providers
- Additional economically reasonable requirements for groundwater distribution by cities, towns, private water companies, and irrigation districts
- Conservation requirements for industrial uses based on the use of the latest commercially available conservation technology consistent with reasonable economic return
- A program for additional augmentation of water supplies by AMAs, if feasible, including incentives for artificial groundwater recharge
- Cooperation with the Arizona Department of Environmental Quality in developing a groundwater quality assessment for the AMAs including suggestions for groundwater protection
- A program for conservation assistance to water users
- At the discretion of the director, a program subsequent to January 1, 2006 for the purchase and retirement of grandfathered groundwater rights
- A determination of historic annual net recharge for AMAs in which a groundwater replenishment district is located
- For the Santa Cruz AMA, an evaluation of the potential impact of that AMA's Third Management Plan on the Tucson AMA
- For the Tucson, Phoenix, and Pinal AMAs, advice to the Arizona Water Banking Authority (AWBA) regarding whether storage in the AMA would help achieve the management goal, where such storage should occur, and whether extinguishment of long-term storage credits would help to achieve the management goal for the AMA

In addition, the Department describes in the Third Management Plan the groundwater management issues emerging in the AMA and what programs or changes in statute or rule may be required to resolve these issues.

Information is provided throughout the Third Management Plan to explain its development, educate interested individuals regarding the water management issues facing the AMA, and provide information useful in developing future water management policies for the AMA. Throughout the document there are significant policy statements regarding how the Department proposes to manage the AMA's water supplies pursuant to the provisions of the Code and the provisions of the Third Management Plan. The regulatory requirements for groundwater users and water distribution systems are printed in italics for easy reference and are located at the ends of Chapters 4 and 5, after each industrial use sector in Chapter 6, and in Chapters 8 and 9.

1.7 EMERGING CHALLENGES FOR THE TUCSON ACTIVE MANAGEMENT AREA

Several major challenges are emerging as the AMA moves into the third management period. The foremost challenge is achieving full utilization of available CAP supplies, including excess supplies that may only be available in the short term. Augmentation efforts are particularly important during the third management period, because during this period of relative abundance of Colorado River water, water must be stored to offset future periods of limited supplies and to achieve other management objectives. The Central Arizona Project (CAP) is clearly the major source of new supplies for the AMA, and utilization plans need to be implemented quickly.

The current volume of grandfathered groundwater right allotments far exceeds the amount of groundwater available for pumping under safe-yield conditions. During the second management period significant actions were taken toward reaching safe-yield, including establishment of the AWBA and the AWS Program. During the third and subsequent management periods, additional major changes in legislation or rules may be needed to improve the likelihood of achieving the safe-yield goal.

Another important challenge is addressing physical availability problems within specific geographic subareas of the AMA. While recognizing that the groundwater management goal for the Tucson AMA is defined as achieving safe-yield on a basin-wide basis, localized water management may be necessary to fully achieve the Code's stated policy of "protecting and stabilizing the general economy and welfare of this state and its citizens...." Localized issues may arise in areas experiencing rapid declines in water tables and possible subsidence and areas with water quality constraints or limited access to renewable water supplies. The AWS Rules will contribute to a more localized approach to water management in cases where groundwater deficits make it necessary for developers to obtain and deliver water supplies other than groundwater. Mechanisms such as recharge activities conducted by the AWBA, the CAGR, and others also have the potential to address local water management issues. Addressing these major challenges will become an important part of the Tucson AMA's groundwater management strategy.

Groundwater and non-groundwater sources are managed under different statutes with limited integration and consistency in approach. As municipal growth increases demand for renewable supplies, sound management of all sources of water is warranted. It is recognized that there are major obstacles to conjunctive management of water supplies, but it is a worthy long-term goal.

1.8 CONCLUSION

The Third Management Plan is designed to outline the region's water management needs and present the Department's blueprint for working with water users to achieve the Tucson AMA's water management goals and objectives. Continued commitment will be needed from the Department and the public to reduce dependence on groundwater and achieve water conservation goals. With the support of the community, the Department can respond to changing water issues and needs while maintaining technical assistance and regulatory programs that ensure a dependable water supply for Arizona's future.