CHAPTER

# 8

# *Augmentation and Recharge Program*

## 8.1 INTRODUCTION

The purpose of the Augmentation and Recharge Program for the Third Management Plan is to encourage the development, delivery, use, and storage of renewable water supplies now and in the future. The augmentation and recharge program, in combination with conservation program efforts, is intended to support achievement of the management goal for the Pinal Active Management Area (AMA) as interpreted for the third management period (see preface to Section II). Increasing the use of renewable water supplies, particularly Central Arizona Project (CAP) and effluent, in lieu of groundwater, is a key component in achieving the goal.

For the purposes of this chapter, "augmentation" means increasing the availability and use of renewable water supplies in lieu of groundwater. "Recharge" means storage of water supplies for future use pursuant to Chapter 3.1 of the Underground Water Storage, Savings, and Replenishment Act.

Many new management techniques and approaches were developed during the second management period to increase the use of renewable water supplies and lessen reliance on groundwater in meeting current and future water demands in the Pinal AMA. There have been many regulatory and institutional changes since adoption of the Second Management Plan in 1989 that affect the opportunities and implementation of augmentation and recharge activities, including the development of the Arizona Water Banking Authority (AWBA), the Central Arizona Groundwater Replenishment District (CAGRD), and the Pinal County Water Augmentation Authority (PCWAA).

The Arizona Department of Water Resources (Department) also recognizes that an AMA-wide management goal does not address local concerns regarding groundwater supplies because the goal allows for substantially variable water level conditions in the AMA. The Augmentation and Recharge Program for the Third Management Plan will build and expand on the activities of the Second Management Plan by taking these site-specific, or "critical areas," into consideration. During the third management period, the Department will continue to develop new techniques and approaches to help address the water management objectives of the Pinal AMA, including any subregional objectives for critical areas.

The emphasis of the augmentation and recharge program will be to encourage and facilitate to the maximum extent possible the replacement of groundwater use with the efficient use of those renewable water supplies that are expected to be available during the third management period. The Department intends to continue to explore other alternatives for future supply augmentation, such as importing additional surface water supplies through the CAP delivery system. The primary focus, however, for the third management period will be to take advantage of the excess Colorado River water supplies available through AWBA and the small, but growing, supply of effluent in the AMA.

The state's recharge program, authorized under the Underground Water Storage, Savings, and Replenishment Act, is an important component of the Third Management Plan Augmentation and Recharge Program. Recharge provides a cost-effective means of storing water that is currently available in the AMA but has no direct use. Additionally, the recharge program can be effective in helping to mitigate problems associated with critical areas, depending on where storage and recovery occurs.

While the principal responsibility for developing and storing water supplies remains with the region's water users, the Department has an important role in facilitating the development and efficient use of these supplies. The current scope of the Department's activities in supply augmentation includes the following:

- Director's roles and authorities The Department's director is statutorily designated as: representative of the State of Arizona in Colorado River and interstate water issues; advisor to the Secretary of the Interior in allocating water among users; coordinator of Arizona's review and comments on water development proposals by the United States Army Corps of Engineers,

Secretary of the Interior, and Secretary of Agriculture; manager of the state's water rights to ensure achievement of water management objectives; chairperson for AWBA; and serves on the Arizona Water Protection Fund (AWPF) Commission.

- Regulatory and permitting authority The Department's regulatory and permitting authority regarding the use of water rights and development of recharge projects provides the means to ensure that these uses of water achieve water management objectives.

- Regulatory incentives Regulatory incentives established in the agricultural, municipal, and industrial conservation programs (chapters 4, 5, and 6, respectively) are designed to facilitate the implementation of augmentation activities by water users, and the groundwater quality management program (Chapter 7) identifies methods to increase available water supplies by encouraging the use of remediated groundwater.

- Technical and planning assistance The Department provides technical assistance by reviewing and providing input on water management plans, proposals for augmentation and recharge projects, planning and feasibility studies, project operations, and data interpretation.

- Data management and public information The Department's responsibility for accumulation and dissemination of data on water use and water supply provides the information necessary to develop water management plans, implement augmentation projects, conduct research related to increasing available water supplies, and identify areas requiring additional water management.

- Coordination and facilitation The coordination and facilitation of augmentation and recharge activities, particularly between jurisdictions and multiple regulatory agencies, is an important component of the Department's statewide and regional water planning responsibilities.

- Financial assistance The augmentation and conservation assistance fund provides financial assistance to entities implementing augmentation projects or studies that contribute to achieving the AMA's management goal or resolving regional water management issues.

In addition to describing the Department's role in augmenting water supplies, this chapter summarizes why augmentation and recharge are important in the Pinal AMA based on an assessment of the physical effects of groundwater overdraft, the availability and use of renewable water supplies, and the effectiveness of the Second Management Plan Augmentation and Reuse Program in meetings its objectives and responding to changing conditions in the AMA. The augmentation assessment results in the identification of those issues that need to be addressed in developing the Third Management Plan Augmentation and Recharge Program. These issues are then used to identify the goal and objectives for the program. Statutorily required program elements and enforceable provisions are addressed in the program section. The future directions section focuses primarily on changes in the Groundwater Code (Code) and Assured Water Supply Rules (AWS Rules) that could assist in achieving the AMA's water management goal and objectives.

The remainder of this chapter is organized as follows:

- AMA Augmentation Assessment (section 8.2)
- Third Management Plan Program Development Issues (section 8.3)
- Third Management Plan Program Goal and Objectives (section 8.4)
- The Third Management Plan Augmentation and Recharge Program (section 8.5)
- Future Directions (section 8.6)

## 8.2 AMA AUGMENTATION ASSESSMENT

The augmentation assessment for the Pinal AMA includes the physical effects of groundwater overdraft, the availability and use of renewable water supplies, and the effectiveness of the Second Management Plan Augmentation and Reuse Program.

### 8.2.1 Groundwater Overdraft

Only about 11 percent of the water supplied in the Pinal AMA is mined groundwater. The latest available estimate is based on 1995 data. Total water use in the AMA, including that used by Indian communities, was approximately 1,129,700 acre-feet in 1995. About 40 percent of this demand, 450,300 acre-feet, was supplied with groundwater. Annual net groundwater inflow, stream channel recharge, and incidental recharge, however, are estimated to be 330,400 acre-feet. Groundwater overdraft in 1995 was thus approximately 119,900 acre-feet.

Although groundwater mining is still occurring in the Pinal AMA, it is at a rate of less than one-half the average rate of depletion determined to be consistent with the AMA's management goal. That rate is 310,000 acre-feet per year (see preface to Section II).

#### 8.2.1.1 Consequences of Groundwater Overdraft

Groundwater overdraft is often reflected in water level declines. Prior to the arrival of CAP water in the late 1980s, water levels in the Pinal AMA's two principal subbasins, Eloy and Maricopa-Stanfield, had been declining since the early 1900s and especially since the late 1940s when intensive agricultural development began. Due to a number of factors, including greater use of CAP water and reduced groundwater pumping, water levels generally increased in the two subbasins from the late 1980s through 1993. Since then, water levels have tended to stabilize but have begun to decline again in some areas within the Eloy Subbasin.

In areas with declining water levels, the land surface may subside, possibly resulting in substantial economic consequences. Land subsidence and the resulting earth fissures can cause considerable damage to sewage systems, well casings, and building foundations. Erosion along fissures may reverse drainage patterns and render land unusable for agricultural irrigation. Subsidence may also result in the compression of aquifer materials and a potential loss of storage capacity in the aquifer that may not be reversed even with intensive recharge.

In the Pinal AMA, land subsidence and earth fissuring have been recognized as problems for many years. In some areas within the Eloy and Maricopa-Stanfield subbasins, subsidence prior to 1980 was substantial. No recent data on subsidence are available for these areas. Subsidence problems in the AMA, however, are expected to continue as long as water levels decline.

### 8.2.2 Renewable Water Supplies

This section summarizes the availability and use of renewable water supplies in the Pinal AMA. These supplies consist of CAP water, Colorado River water, streamflow from the Gila and Santa Cruz Rivers, Salt River Project water, and effluent.

#### 8.2.2.1 Direct Use of CAP Water

The CAP is essential for reducing overdraft in the Pinal AMA because, when fully utilized, CAP water replaces about 50 percent of the AMA's potential annual groundwater withdrawals with renewable water supplies. In addition, the CAP delivery system provides a method by which water users in the AMA can

convey water supplies from other regions of the state through either direct transportation or exchange of water with other users within the CAP service area, which includes Maricopa, Pinal, and Pima Counties.

The CAP is a federal reclamation project, which was designed and built by the United States Bureau of Reclamation (USBR). The ownership of the physical works, therefore, remains with the United States. The project costs are being repaid to the federal government by the Central Arizona Water Conservation District (CAWCD), which operates the project. The use of the aqueduct to convey water supplies other than CAP water requires joint approval by USBR and CAWCD.

#### 8.2.2.1.1 Irrigation Districts

All four irrigation and drainage districts in the Pinal AMA were given allocations of CAP non-Indian agricultural water. Central Arizona Irrigation and Drainage District (CAIDD), Hohokam Irrigation and Drainage District (HIDD), and Maricopa-Stanfield Irrigation and Drainage District (MSIDD), all of which had been established for the sole purpose of delivering CAP water to farmland within their boundaries, signed subcontracts with CAWCD for their allocations. San Carlos Irrigation and Drainage District (SCIDD), which was established in 1928 to deliver Gila River water and groundwater to the non-Indian part of the San Carlos Irrigation Project, did not sign a subcontract, nor is it expected to. The allocations of the irrigation districts are shown in Table 8-1, and their CAP water use is shown in Table 8-2.

Once the three CAP irrigation districts completed construction of their delivery systems in 1988-1989, direct use of CAP water increased rapidly, reaching a peak in 1989 of 317,407 acre-feet. This high level of use was largely a result of the initial low price charged for CAP water. When the price for CAP water rose in 1991, CAP usage dropped precipitously in the districts, reaching an all time low of 27,757 acre-feet in 1993. To increase use of CAP water supplies by irrigation districts, CAWCD established an indirect ("in-lieu") recharge program in 1992 (see section 8.2.2.4).

In 1993, CAWCD established an incentive pricing program for non-Indian agricultural CAP water, beginning in 1994 and ending in 2003, to encourage greater direct use of these supplies. This restructuring program was established primarily to deal with the inability of the irrigation districts in the Pinal and Phoenix AMAs to meet their obligations to CAWCD under their CAP subcontracts. In exchange for waiving their entitlements to CAP water under their subcontracts, the irrigation districts would receive excess CAP water. The program, called "target pricing," created three pools of agricultural supplies. Pools 1 and 2 each contain 200,000 acre-feet, whereas the amount in Pool 3 is not capped. Pool 1 was initially priced at $27 per acre-foot, Pool 2 at $17, and Pool 3 at $41 per acre-foot. The prices charged for Pools 1 and 2 increase by $1 per acre-foot through 2003. The price charged for Pool 3 is largely based on the energy costs for pumping CAP water.

In 1994, both CAIDD and MSIDD elected to waive their entitlements and participate in the target pricing program (see Table 8-1). HIDD, however, had assigned its entitlement in 1993 to several cities in the Phoenix AMA as part of an agreement that provided debt relief to the district. CAWCD allowed HIDD to participate in the program, but the district is only allocated water from Pool 1 (see Table 8-1). As a result of target pricing, CAP usage in the three districts rose dramatically in 1994 to 306,452 acre-feet and set an all time high in 1996 of 320,922 acre-feet.

#### 8.2.2.1.2 Municipal Providers

The water providers serving the four incorporated municipalities in the Pinal AMA all have subcontracts with CAWCD for allocations of municipal CAP water. These municipal providers and their allocations are shown in Table 8-3.

**TABLE 8-1**
**CAP ALLOCATIONS OF IRRIGATION DISTRICTS**
**PINAL ACTIVE MANAGEMENT AREA**

| Irrigation District | Original Allocation[1] | Pool 1 Allocation[2] | Pool 1 Supply (acre-feet per year) | Pool 2 Allocation[2] | Pool 2 Supply (acre-feet per year) | Total Supply[3] (acre-feet per year) |
|---|---|---|---|---|---|---|
| Central Arizona | 18.01% | 27.92% | 55,838 | 38.28% | 76,566 | 132,404 |
| Hohokam | 6.36% | 8.95% | 17,910 | 0.00% | 0 | 17,910 |
| Maricopa-Stanfield | 20.48% | 27.35% | 54,694 | 37.50% | 74,998 | 129,962 |
| San Carlos[4] | 4.09% | 0.00% | 0 | 0.00% | 0 | 0 |
| TOTAL | 48.94% | 64.22% | 128,442 | 75.78% | 151,564 | 280,276 |

[1] Allocation through 1993.
[2] Allocation from 1994 to 2003.
[3] Pool 1 supply plus Pool 2 supply.
[4] The district has not contracted for its CAP allocation.

For the most part, the municipal providers have continued to rely on groundwater to supply their service areas. CAP water must be treated to meet drinking water standards, and the providers do not have the facilities to treat it. The City of Eloy, however, has directly used several hundred acre-feet annually of its CAP allocation since 1992 for watering the city's municipal golf course (see Table 8-2) and, beginning in 1996, the community cemetery as well. In addition, Arizona Water Company in 1994 began using a small portion of its allocation for its Casa Grande system to supply water to a new, private golf course (see Table 8-2).

Given the high costs associated with constructing treatment facilities, the most realistic way that the municipal providers in the Pinal AMA have for increasing their use of CAP water is to recharge it. Efforts to do so are discussed in section 8.2.2.4.

#### 8.2.2.1.3 Indian Communities

The three Indian communities in the Pinal AMA all have allocations of CAP water. The three communities are: (1) the Ak-Chin Indian Community, (2) the Gila River Indian Community, and (3) the Tohono O'odham Nation.

##### 8.2.2.1.3.1 Ak-Chin Indian Community

By Congressional action in 1978 and 1984, the Ak-Chin Indian Community was awarded an annual entitlement of 75,000 acre-feet (reduced to 72,000 acre-feet in shortage years and increased to 85,000 acre-feet in surplus years) of CAP water and other Colorado River water supplies. The water is used to irrigate community farmland. Since 1988, annual water use has ranged from a low of 62,486 acre-feet in 1989 to a high of 81,983 acre-feet in 1996 (see Table 8-2).

In 1992, Congress amended the 1984 settlement to authorize the community to lease its unused CAP water to off-reservation users in the Phoenix, Pinal, and Tucson AMAs. In December 1996, the community signed an agreement to lease up to 10,000 acre-feet per year of these supplies for 100 years to Del Webb Corporation, which intends to use the water to supply a new development near the community of New River in the Phoenix AMA.

## TABLE 8-2
## CENTRAL ARIZONA PROJECT WATER USE, 1987-1997
## PINAL ACTIVE MANAGEMENT AREA
## (acre-feet)

| Non-Indian Agriculture | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CAIDD | 13,406 | 31,863 | 110,551 | 114,027 | 81,948 | 18,082 | 1,426 | 109,913 | 133,949 | 146,330 | 132,404 | 893,899 |
| HIDD | 0 | 8,830 | 13,135 | 24,913 | 21,993 | 9,998 | 8,918 | 50,179 | 17,030 | 17,227 | 18,390 | 190,613 |
| MSIDD | 27,602 | 116,615 | 193,721 | 166,767 | 94,476 | 44,272 | 17,413 | 146,360 | 147,557 | 157,365 | 129,692 | 1,241,840 |
| SCIDD[1,2] | 0 | 0 | 0 | 10,301 | 0 | 0 | 0 | 0 | 0 | 0 | 8,703 | 19,004 |
| James M. Jones[1,3] | 0 | 0 | 0 | 0 | 0 | 165 | 75 | 130 | 135 | 0 | 275 | 780 |
| SUBTOTAL | 41,008 | 157,308 | 317,407 | 316,008 | 198,417 | 72,517 | 27,832 | 306,582 | 298,671 | 320,922 | 289,464 | 2,346,136 |
| **Municipal and Industrial** | **1987** | **1988** | **1989** | **1990** | **1991** | **1992** | **1993** | **1994** | **1995** | **1996** | **1997** | **TOTAL** |
| Arizona Water Company - Casa Grande System | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 71 | 276 | 111 | 114 | 572 |
| City of Eloy | 0 | 0 | 0 | 0 | 0 | 260 | 340 | 525 | 559 | 605 | 567 | 2,856 |
| Picacho School[1,3] | 0 | 0 | 0 | 11 | 11 | 8 | 17 | 24 | 50 | 37 | 40 | 198 |
| SUBTOTAL | 0 | 0 | 0 | 11 | 11 | 268 | 357 | 620 | 885 | 753 | 721 | 3,626 |
| **Indian** | **1987** | **1988** | **1989** | **1990** | **1991** | **1992** | **1993** | **1994** | **1995** | **1996** | **1997** | **TOTAL** |
| Ak-Chin Indian Community[4] | 18,809 | 63,865 | 62,486 | 66,963 | 71,562 | 70,644 | 76,701 | 79,724 | 76,345 | 81,983 | 72,251 | 741,333 |
| Gila River Indian Community[1,2,5] | 0 | 0 | 0 | 47,548 | 0 | 0 | 0 | 0 | 0 | 0 | 14,010 | 61,558 |
| San Carlos Irrigation Project[1,2,6] | 0 | 0 | 0 | 24,483 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24,483 |
| SUBTOTAL | 18,809 | 63,865 | 62,486 | 138,994 | 71,562 | 70,644 | 76,701 | 79,724 | 76,345 | 81,983 | 86,261 | 827,374 |
| TOTAL | 59,817 | 221,173 | 379,893 | 455,013 | 269,990 | 143,429 | 104,890 | 386,926 | 375,901 | 403,658 | 376,446 | 3,177,136 |

[1] Water use is on an interim basis for excess CAP water.
[2] The entity has not contracted for its CAP allocation.
[3] The entity does not have a CAP allocation.
[4] The first 50,000 acre-feet of water use each year is from the entity's Colorado River entitlement; the balance is from its CAP allocation.
[5] Most of the farmland served by the entity is in the Phoenix AMA.
[6] The entity serves project farmland within the Gila River Indian Reservation.

**TABLE 8-3**
**CAP ALLOCATIONS OF MUNICIPAL PROVIDERS**
**PINAL ACTIVE MANAGEMENT AREA**

| Municipal Provider | Allocation (acre-feet/year) |
|---|---|
| Arizona Water Company - Casa Grande System | 8,884 |
| Arizona Water Company - Coolidge System | 2,000 |
| City of Eloy | 2,171 |
| Town of Florence | 2,048[1] |
| TOTAL | 15,103 |

[1] Allocation includes allocation of 407 acre-feet/year transferred from Arizona Sierra Utility Company in 1994.

#### 8.2.2.1.3.2 Gila River Indian Community

The Gila River Indian Community, whose reservation is located in both the Phoenix and Pinal AMAs, claims an annual entitlement to more than 1.5 million acre-feet in the Gila River General Stream Adjudication. Under the federal criteria and procedures for Indian water rights settlements, a federal negotiating team was established to facilitate settlement discussions. Although discussions have taken place between the community and individual parties, a full settlement is not expected until a determination is made of the amount of CAP water available for Indian settlements and the costs associated with providing these supplies. Once a settlement is reached, Congressional approval will be needed. A water rights settlement with the community could have substantial impacts on CAP water use in the Pinal AMA. In the meantime, the Department will continue to monitor negotiation progress and possible impacts.

Some impacts have already occurred. In 1996, MSIDD, in its CAP distribution system loan settlement with the federal government, agreed to limit district groundwater pumping, including recovery of stored supplies, to a total of 250,000 acre-feet per year and to 23,000 acre-feet annually within two miles of the Gila River Indian Reservation boundary. The district also agreed to limit its pumping to 2,500 acre-feet per year within approximately 2.5 miles of the Tohono O'odham Indian Reservation boundary. CAIDD, in a similar settlement earlier that year, agreed to limit its total pumping, including recovery of stored supplies, to 240,000 acre-feet annually. In addition, the district agreed to cooperate with a study funded by USBR on the impacts of district pumping within three miles of the Tohono O'odham Indian Reservation boundary and further agreed, under certain conditions, to abide by the study's findings.

#### 8.2.2.1.3.3 Tohono O'odham Nation

Much of the Tohono O'odham Nation's claims to water are for the San Xavier and Schuk Toak districts of the reservation, both of which are in the Tucson AMA. The nation's claims, however, will not be completely satisfied until those for the Sif Oidak District, which is partially in the Pinal AMA, are addressed. While the district has a contract for 8,000 acre-feet per year of CAP water, it is currently not using its CAP allocation due to unresolved water rights claims.

### 8.2.2.2 Direct Use of Effluent

Reclaimed effluent generated from municipal wastewater treatment plants is the only increasing water supply in the Pinal AMA. Historically, effluent has been recognized as a valuable resource and has been

used in the AMA since the 1970s, principally for irrigating farmland and, more recently, for watering golf courses.

In 1997, approximately 5,800 acre-feet of effluent were generated in the Pinal AMA, compared to about 4,000 acre-feet in 1987. During that period, one new treatment plant was constructed in the AMA and one was expanded. In 1989, the Arizona Department of Corrections completed construction of a new facility with a capacity of .68 million gallons per day (mgd) to serve the Arizona State Prison Complex - Florence, and the City of Casa Grande expanded the capacity of its facility from 2.5 to 4.0 mgd in 1996. Currently, effluent in the AMA is generated from nine local treatment plants, each serving its immediate community. The facilities range in capacity from 0.05 to 4.0 mgd (see Table 8-4). The capacity of the City of Eloy's facility is expected to be increased to 2.0 mgd by 1999. In addition, the City of Coolidge is currently exploring ways to increase the capacity of its facility to 1.5 mgd. Currently, five treatment plants deliver all or part of their effluent to irrigate nearby farmland, and five facilities supply effluent to water local golf courses (see Table 8-4). It should also be noted that approximately 5,300 acre-feet of additional effluent is used annually in the AMA to irrigate farmland within the Gila River Indian Reservation. This effluent is generated by the City of Chandler's treatment plant, which is located in the Phoenix AMA.

Three factors limit the ability to directly use all of the effluent generated in the Pinal AMA. First, the quality of the effluent is insufficient to directly introduce into potable water supply systems. Direct use, therefore, is limited to agricultural irrigation, turf watering, and some industrial applications. Second, users of effluent for irrigation and turf watering purposes have high summer and low winter water demands. Effluent generation, however, is directly related to indoor water consumption, which is relatively constant throughout the year. Third, over time, effluent generation will exceed the physical capacity of the distribution systems that have been constructed to deliver effluent for direct use purposes.

Groundwater recharge allows effluent to be stored during low demand periods and later recovered during high demand periods. Recharge also allows the possibility of indirect potable use of effluent. Recharge of effluent in the Pinal AMA is discussed in section 8.2.2.5.

#### 8.2.2.3 Direct Use of Other Renewable Water Supplies

Streamflow from the Gila River is the only other major source of renewable water supplies for the Pinal AMA. As previously mentioned, SCIDD has delivered water diverted from the river to irrigate farmland within its boundaries since 1928. The amount of water diverted by the irrigation district varies greatly from year to year, depending largely on availability of supplies and much less so on level of demand. Historically, annual diversions have averaged about 169,000 acre-feet. In addition to irrigation water, the district also delivers water to several schools, parks, and subdivisions in Casa Grande and Coolidge for non-potable uses, principally turf and lawn watering.

Gila River water is also diverted by the San Carlos Irrigation Project for delivery to project farmland within the Gila River Indian Reservation. While most of this farmland is located in the Phoenix AMA, about 31,000 acre-feet of these supplies are used annually to irrigate the farmland that is located in the Pinal AMA.

A much smaller source of renewable water supplies for the Pinal AMA is intermittent streamflow from the Santa Cruz River. Comprised mostly of effluent discharged from treatment plants in the Tucson metropolitan area, annual streamflow into the AMA is approximately 10,000 acre-feet, including natural flow from floods. Approximately 6,400 acre-feet is diverted in the Red Rock area for irrigating farmland adjacent to the river channel.

Another small source of renewable water supplies for the Pinal AMA is Salt River Project water, almost all of which is diverted from the Gila Drain, which originates in the Phoenix AMA. Annually, about 5,000 acre-feet of these supplies are used for irrigating farmland within the Gila River Indian Reservation.

No water users in the Pinal AMA currently use or have plans to use renewable water supplies generated from any of the four augmentation measures analyzed by the Department for the Second Management Plan: storm water runoff, interbasin water transfers, watershed management, and weather modification. The many uncertainties and high costs associated with these alternative water supplies render them infeasible to irrigation districts and municipal providers alike.

**TABLE 8-4**
**WASTEWATER TREATMENT PLANTS - 1997**
**PINAL ACTIVE MANAGEMENT AREA**

| Treatment Plant | Capacity (mgd) | Average Production (mgd) | Use of Effluent |
|---|---|---|---|
| City of Casa Grande | 4.0 | 2.5 | Golf course watering (excess is for irrigation) |
| City of Coolidge | 0.8 | 0.5 | Irrigation |
| City of Eloy | 0.5 | 0.5 | Irrigation |
| Town of Florence | 1.5 | 0.75 | Irrigation |
| Town of Florence - North System[1] | 0.424 | 0.1 | Golf course watering (excess is for recharge) |
| Arizona State Prison Complex - Florence | 0.68 | 0.55 | Irrigation |
| Francisco Grande | 0.0424 | 0.0424 | Golf course watering |
| Arizona City | 0.5 | 0.2 | Golf course watering |
| Tierra Grande | 0.067 | 0.0085 | Golf course watering |
| TOTAL | 8.5134 | 5.1509 | |

[1] Treatment plant purchased from Arizona Sierra Utility Company in 1994.

### 8.2.2.4 Recharge of CAP and Colorado River Water

As previously mentioned, recharge of CAP water began in the Pinal AMA in 1992 when CAWCD established its in-lieu recharge program in order to increase use of CAP water supplies by irrigation districts. Under this program, in-lieu recharge water, or "in-lieu groundwater," was priced well below that for agricultural CAP water. Because of the price incentive, the three CAP irrigation districts in the AMA took delivery of approximately 163,400 acre-feet of in-lieu groundwater in 1992 and about 233,400 acre-feet in 1993. The districts curtailed their groundwater pumping by these amounts, and CAWCD was thus able to accrue long-term storage credits for the saved groundwater, totaling about 155,200 acre-feet in 1992 and 217,200 acre-feet in 1993. (The difference between the amount of in-lieu groundwater delivered each year and the amount of storage credits accrued reflects deductions for distribution system losses and the 5 percent statutory "cut to the aquifer.") The amount of credits accrued by CAWCD at each district's "groundwater savings facility" (the name given by 1994 legislation to a facility that stores water through in-lieu recharge) are shown in Table 8-5, and Figure 8-1 shows the location of each facility.

**TABLE 8-5**
**LONG-TERM STORAGE CREDITS, 1989-97**
**PINAL ACTIVE MANAGEMENT AREA**
**(acre-feet)**

| Groundwater Savings Facility Permit Holder | Water Storage Permit Holder | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CAIDD | CAWCD | | | | 53,257 | 89,738 | 0 | 1,516 | 14,497 | 0 | 159,008 |
| | AWBA | | | | | | | | | 39,628 | 39,628 |
| HIDD | CAWCD | | | | 25,033 | 31,522 | 0 | 20,612 | 4,708 | 0 | 81,875 |
| | City of Eloy | | | | | | | | 22,345 | (325) | 22,020 |
| | AWBA | | | | | | | | | 45,763 | 45,763 |
| MSIDD | CAWCD | | | | 76,905 | 95,909 | 0 | 21,451 | 14,338 | 0 | 208,603 |
| | AWBA | | | | | | | | | 59,974 | 59,974 |
| SUBTOTAL | | | | | 155,195 | 217,169 | 0 | 43,579 | 55,888 | 145,040 | 616,871 |
| **Underground Storage Facility Permit Holder** | **Water Storage Permit Holder** | **1989** | **1990** | **1991** | **1992** | **1993** | **1994** | **1995** | **1996** | **1997** | **TOTAL** |
| Arizona Sierra Utility Company | Arizona Sierra Utility Company | 167 | 100 | 181 | 173 | 35 | | | | | 656[1] |
| Town of Florence | Town of Florence | | | | | | 31 | 44 | 56 | 70 | 201 |
| SUBTOTAL | | 167 | 100 | 181 | 173 | 35 | 31 | 44 | 56 | 70 | 857 |
| TOTAL | | 167 | 100 | 181 | 155,368 | 217,204 | 31 | 43,623 | 55,944 | 145,110 | 617,728 |

[1] Credits transferred to the Town of Florence in 1994.

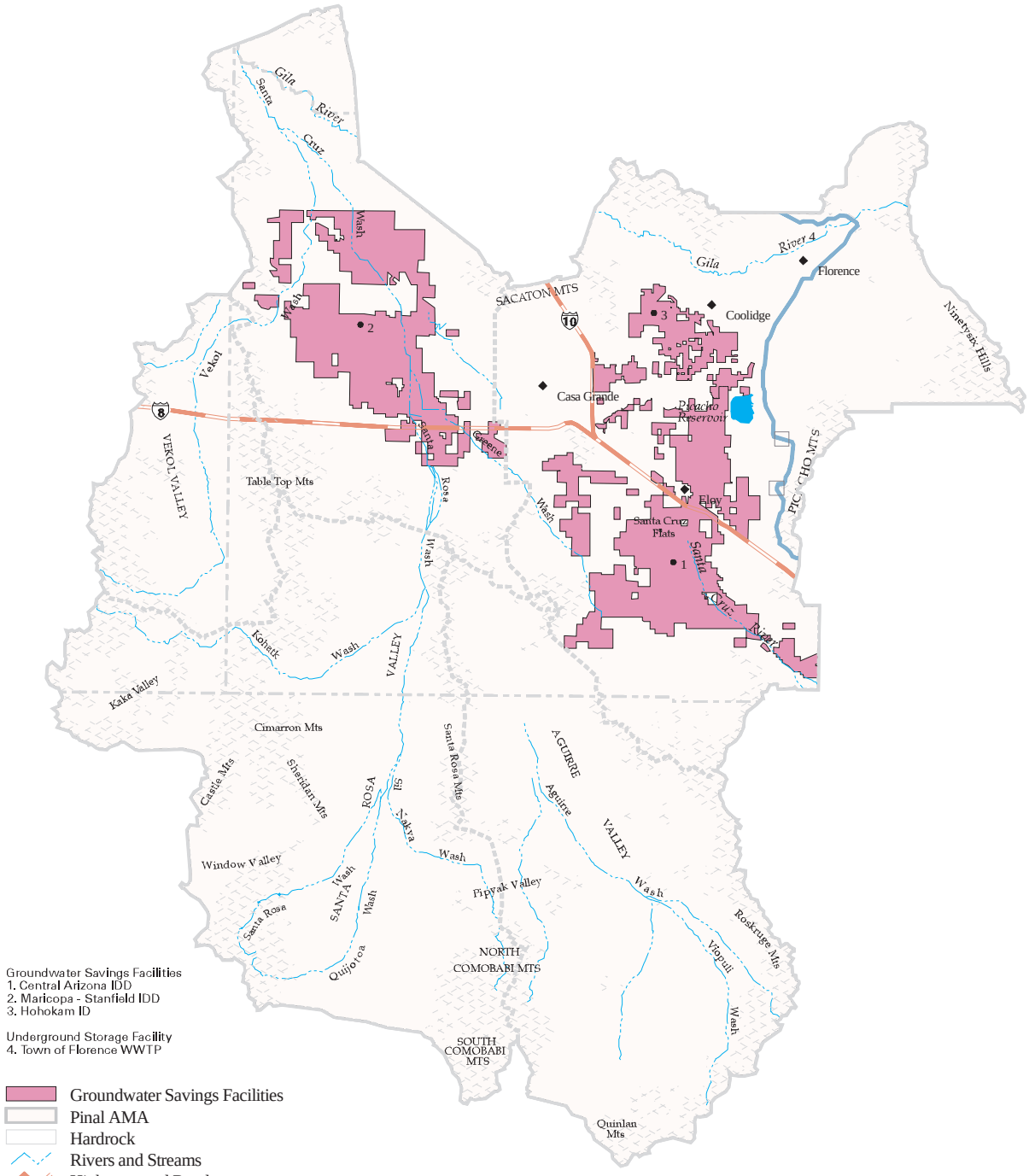



Figure 8- 1

## Permitted Storage Facilities
1997

ORIGINAL SOURCE
Arizona Department of Water Resources
Geographic Information System

With the onset of CAWCD's target pricing program for agricultural CAP water in 1994, the in-lieu recharge program was ended. However, in 1995-1996, CAWCD initiated a new in-lieu recharge program and made 50,000 acre-feet of in-lieu groundwater available each year to irrigation districts that committed to fully utilize their Pool 1 and 2 allocations. The three districts in the Pinal AMA took deliveries of about 47,000 acre-feet of in-lieu groundwater in 1995 and 36,200 acre-feet in 1996, with CAWCD accruing storage credits of approximately 43,600 acre-feet and 33,600 acre-feet respectively (see Table 8-5).

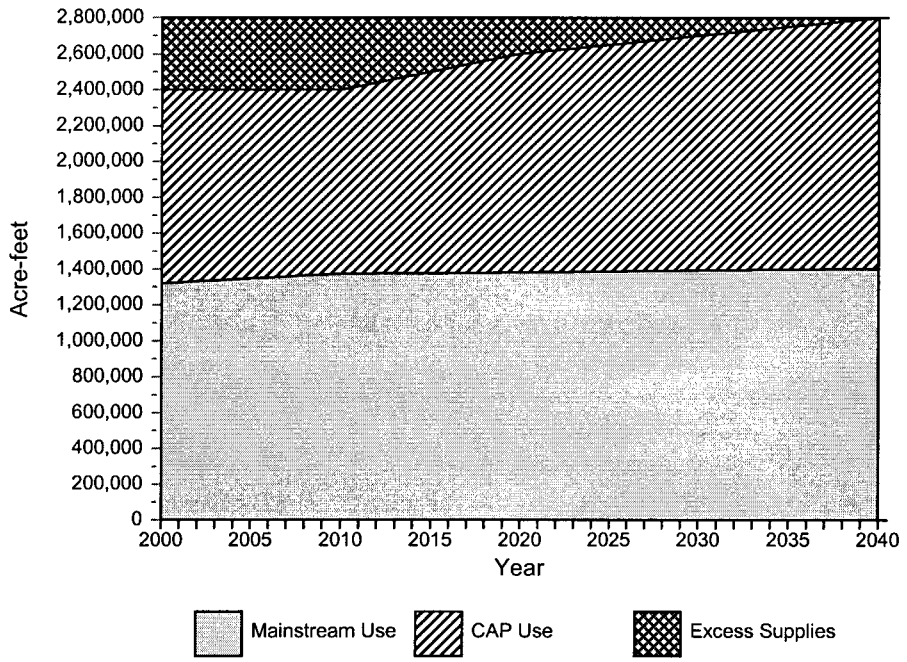
In 1996, the City of Eloy took advantage of a new incentive pricing program for municipal CAP water that had been initiated that year by CAWCD. The city purchased 24,445 acre-feet of these supplies, obtained a water storage permit from the Department, stored the water in HIDD's groundwater savings facility, and accrued 22,345 acre-feet of storage credits (see Table 8-5). In 1997, the city used 325 acre-feet of credits to meet its groundwater use limitation requirement under the Alternative Conservation Program for the Second Management Plan. The primary use of the credits, however, is to assist the city in demonstrating an assured water supply.

With the creation of AWBA by the Legislature in 1996, CAWCD decided to end its in-lieu recharge program for irrigation districts because AWBA had specifically been created to annually purchase, through 2016, a portion of the state's unused Colorado River supply (see Figure 8-2), bring it into central Arizona through the CAP aqueduct, and store it through recharge. One of AWBA's first tasks was to develop a plan of operation for 1997 using available storage facilities. The only facilities available in the Pinal AMA were the groundwater savings facilities of the three irrigation districts. Even though the districts are required to fully utilize their Pool 1 and 2 allocations to participate in the water banking program, they agreed to take deliveries in 1997 of at least 140,000 acre-feet of in-lieu groundwater because it was incentively priced by AWBA at $21 per acre-foot (AWBA purchased the water from CAWCD for $36 per acre-foot). Actual deliveries to the three facilities were, in fact, about 159,900 acre-feet, with AWBA accruing storage credits of approximately 145,400 acre-feet (see Table 8-5).

When CAWCD ended its in-lieu recharge program for irrigation districts in 1996, it had accrued nearly 450,000 acre-feet of storage credits in the Pinal AMA (see Table 8-5). Although CAWCD has not developed a recovery plan for the credits, some are expected to be purchased by the CAGRD to meet its replenishment obligations in the AMA. The CAGRD, which was established by legislation passed in 1993 and is administered and operated by CAWCD, is obligated to replenish groundwater that is withdrawn by its members in excess of the amount of groundwater allocated to them under the Department's new AWS Rules. In 1994, the CAGRD adopted its first 20-year plan of operation, which stated that the CAGRD would most likely meet its replenishment services in the AMA by purchasing and extinguishing storage credits from CAWCD.

Also in 1994, PCWAA was formed to facilitate groundwater recharge in the Pinal AMA, and in 1995, PCWAA developed a general plan for augmenting the AMA's supplies. Although there have been difficulties in implementing the augmentation plan, PCWAA recently completed development of a program for recharging CAP water for the AMA's municipal providers. This program, which will initially focus on in-lieu recharge, is expected to be implemented in 1998. The program will allow the City of Eloy and the Town of Florence to put their CAP allocations to use through recharge and thus enable each municipality to obtain a Designation of Assured Water Supply under the new rules. It is unlikely that Arizona Water Company will choose to participate in the recharge program unless issues regarding cost recovery of CAP water are resolved with the Arizona Corporation Commission. In 1995, Arizona Water Company lost its assured water supply designations for its Casa Grande and Coolidge systems because the company was not willing to put its CAP allocations for the two systems to use given the uncertainty of recovering the costs.

**FIGURE 8-2**
**PROJECTED EXCESS COLORADO RIVER SUPPLIES, 2000 - 2040**
**STATE OF ARIZONA**




### 8.2.2.5 Recharge of Effluent

Effluent has been recharged in the Pinal AMA since 1989 when Arizona Sierra Utility Company, pursuant to the first permit for an "underground storage facility" ever issued by the Department, began recharging effluent within its Florence Gardens service area (see Figure 8-1). Effluent generated from the company's treatment plant was used to water the community's private golf course, and the excess was recharged in nearby percolation ponds. When the company was purchased by the Town of Florence in 1994, the company had accrued 656 acre-feet of storage credits (see Table 8-5). After the purchase, the Department transferred the credits and the facility and water storage permits to the town, which continues to operate the facility. Through 1997, the town had accrued a total of 857 acre-feet of credits, including those received in the transfer (see Table 8-5). The town considers the primary purpose of the facility to be for establishing a drought supply.

Beginning in 1998, effluent generated from the City of Casa Grande's recently expanded treatment plant is expected to exceed demand for effluent for watering the municipal golf course and irrigating nearby farmland. The city plans to construct percolation ponds at the golf course to recharge the excess effluent.

### 8.2.3 Second Management Plan Augmentation and Reuse Program

This section summarizes and assesses the effectiveness of the Second Management Plan Augmentation and Reuse Program for the Pinal AMA.

### 8.2.3.1 Second Management Plan Program Overview

The Code did not require the Department to include an augmentation program in the Pinal AMA's First Management Plan. The Code did, however, require that the Department include such a program, including incentives for artificial groundwater recharge, in the Second Management Plan for each AMA. A.R.S. § 45-565(A)(6).

The augmentation program was designed to increase the use of renewable water supplies in the Pinal AMA during the second management period in order to reduce the overall dependence on groundwater for meeting water demands. The program encouraged the use of CAP water and effluent in order to preserve groundwater for future uses in the AMA. To maximize the use of these water supplies, the program included provisions to incorporate groundwater recharge into plans for water supply development.

The Second Management Plan stated that the Department would take a lead role in identifying, facilitating, and coordinating augmentation activities. The Department would also provide planning support, technical support, and financial assistance to entities wishing to implement augmentation projects in the Pinal AMA during the second management period.

### 8.2.3.2 Second Management Plan Program Goals and Objectives

In the Pinal AMA, major private and public expenditures were made in the mid 1980s to build the canal systems necessary to deliver CAP water. No major projects, other than the importation of CAP water, were identified in the Second Management Plan as being feasible in the AMA. Due to the large allocation of financial resources to augment groundwater supplies with CAP water and the lack of other feasible projects, the focus of the augmentation program for the AMA was expected to be on modest research projects to augment deliveries of Colorado River water and construction projects to recharge CAP water and effluent.

The Second Management Plan Augmentation and Reuse Program was designed and implemented to support the management goal for the Pinal AMA. The investments to augment the water supplies by importing CAP water were estimated in the management plan to at least double the number of years that groundwater supplies would be available for irrigation purposes. Other augmentation measures analyzed by the Department for the management plan, including storm water runoff, interbasin groundwater transfers, watershed management, and weather modification, were expected to be too expensive for the agricultural sector to feasibly substitute for groundwater.

The Second Management Plan also stated that augmentation would probably be needed to preserve water for future non-irrigation uses in the Pinal AMA. Objectives determined to be consistent with this part of the management goal included maximum use of CAP water by all entities, recharge of excess effluent or other renewable water supplies, and research to determine feasible new water supplies.

Three primary and two secondary objectives were identified for the augmentation program. The primary objectives were: (1) maximize the utilization of CAP allocations within the AMA; (2) utilize the CAP delivery system to the fullest extent possible to deliver excess Colorado River and other water supplies to the AMA; and (3) maximize recharge of developed water supplies, including effluent, for water that cannot be used directly. The secondary objectives were: (1) generate additional water supplies within the state to maximize the benefit to the AMA of interregional water transfers and exchanges; and (2) research and identify augmentation measures for future implementation, including the study of technical, institutional, legal, and environmental constraints that inhibit the development and beneficial use of alternative water supplies.

### 8.2.3.3 Second Management Plan Program Implementation

The Department has been an active participant in supply augmentation during the second management period. The principal responsibility for developing water supplies, however, has remained with the region's water users. The Augmentation and Reuse Program for the Second Management Plan included five main elements designed to assist water users in developing new water supplies: (1) regulatory incentives, (2) technical assistance, (3) coordination and facilitation of efforts, (4) resolving legal and institutional barriers, and (5) the augmentation and conservation assistance fund.

#### 8.2.3.3.1 Regulatory Incentives

Provisions established under the agricultural, municipal, and industrial conservation programs for the Second Management Plan provided incentives for water users in the Pinal AMA to implement augmentation measures, especially for the use of effluent. The Groundwater Quality Assessment and Management Program for the management plan also identified methods to increase the AMA's usable water supply by increasing the use of remediated groundwater.

The effectiveness of the Second Management Plan regulatory incentives has been discussed in detail in previous chapters, but the overall effectiveness of these incentives has been limited at best. The principal reason for this lack of effectiveness is that the incentives have little or no effect on water costs or availability, which are the main factors in determining whether renewable water supplies will be used instead of groundwater. Availability is especially critical in the case of effluent use because only water users in close proximity to treatment plants are able to receive effluent due to their limited distribution systems.

#### 8.2.3.3.2 Technical Assistance

The Second Management Plan stated that the Department would support augmentation project construction, planning, and research activities during the second management period. While only two augmentation projects have been constructed in the Pinal AMA since the management plan was adopted in 1989, several project feasibility studies have been undertaken. AMA staff provided technical assistance to water users in assessing the need for the augmentation projects and determining their feasibility and by helping with study design, providing data, reviewing results, and disseminating information.

AMA staff has also provided significant technical and planning support to PCWAA since its formation, especially in the development of its augmentation plan and recharge program.

Because of the small staff size in the Pinal AMA, the Department's ability to provide technical assistance to water users and PCWAA could have been severely limited. The Department, however, put a high priority on such support to ensure that augmentation planning and research activities resulted in high quality products that addressed the AMA's augmentation objectives.

#### 8.2.3.3.3 Coordination and Facilitation of Efforts

Because cooperative efforts among government agencies, water users, and other groups allow the development of larger, more effective augmentation projects and studies, the Second Management Plan stated that the Department would work with organizations to coordinate and facilitate augmentation activities.

Since passage of the Underground Storage and Recovery Act in 1986, the Department has worked closely with water users to permit recharge projects. This level of facilitation is critical, especially for storage facility permits because applicants are required to submit substantial, often detailed information that must

be reviewed by the Department for completeness and correctness. In the Pinal AMA, the Department has permitted one constructed underground storage facility and three groundwater savings facilities. In addition, the Department has issued eight water storage permits for these facilities.

In 1992-1993, the Department facilitated extensive studies on the underutilization of CAP water in the state for the Governor's CAP Advisory Committee. These studies led to the establishment of incentive pricing of agricultural CAP water by CAWCD and the passage of legislation to address the underutilization problem.

The Department reviewed the CAGRD's first plan of operation in 1994 and cooperated with PCWAA in developing its initial augmentation plan in 1995. In both cases, the level of coordination undertaken by the Department was required under the authorizing legislation for each entity.

In addition, in the early to mid 1990s, the Department coordinated a multi-agency research effort, known as the Arizona Atmospheric Modification Program, to assess the feasibility of using weather modification in the Verde River watershed to increase water supplies. The study confirmed that it is possible to accurately predict both the amount and distribution of precipitation resulting from cloud seeding.

#### 8.2.3.3.4 Resolving Institutional and Legal Barriers

The augmentation alternatives presented in the Second Management Plan identified a number of legal and institutional issues that needed to be resolved before augmentation projects could be undertaken on a large scale. Examples of the problems identified included questions regarding ownership of rights to augmented water supplies, questions regarding liability for potential damages resulting from augmentation projects, and Department rules or specific provisions of the Code that may be disincentives for augmentation.

The Second Management Plan stated that the Department would work with interested parties in the AMAs and around the state to draft rules and to propose legislation that would resolve these and other regulatory and institutional problems. Since adoption of the management plan, the Department has done just that. While there are still legal and institutional barriers to augmentation activities in the AMAs, it is clear from the following chronological discussion that many of the barriers that were present in 1989 have since been removed as a result of the efforts of the Department, water users, and other interested parties.

##### 8.2.3.3.4.1 Groundwater Transportation

Passage of the 1991 Groundwater Transportation Act severely restricted the ability of municipal water providers to transfer groundwater from rural basins to AMAs. The Act nonetheless provided a legal framework for interbasin transfers of groundwater supplies to assist in demonstrating an assured water supply. With some limitations, the Act gave the City of Mesa the right to transfer groundwater withdrawn pursuant to Type 1 grandfathered rights from its water farm in the Pinal AMA for up to 100 years. In 1995, the Act was amended to prohibit groundwater transfers between rural basins.

##### 8.2.3.3.4.2 Water Exchanges

Passage of the 1992 Water Exchange Act allowed for the trade between water users of any water supply for any other water supply as long as each water user has the legal right to use the water it gives in trade.

##### 8.2.3.3.4.3 Non-Per Capita Conservation Program

Legislation was also passed in 1992 that amended the Code to provide for the establishment of an alternative municipal conservation program for those providers that have an assured water supply designation or are able to phase out their groundwater use. This program, called the Non-Per Capita

Conservation Program (NPCCP), is not based on gallons per capita per day (GPCD) requirements, but rather on efficient water use through the implementation of specific conservation programs that are, in turn, based on "best management practices." In 1995, the Second Management Plan was modified to include the NPCCP.

#### 8.2.3.3.4.4 Central Arizona Groundwater Replenishment District

In 1993, legislation was passed that created the CAGRD, administered and operated by CAWCD, for the purposes of assisting developments in the Phoenix, Pinal, and Tucson AMAs to demonstrate an assured water supply. The CAGRD is responsible for acquiring CAP or other renewable water supplies to replace groundwater pumped by subdivisions or municipal providers that choose to become members. The replacement water is then recharged into aquifers within the AMA. The CAGRD allows new development to occur in areas that have access to ample groundwater supplies but lack access to renewable water supplies, such as CAP or effluent.

Costs of the CAGRD are covered by an annual replenishment tax levied on "excess" groundwater use by members. The tax is based on the CAGRD's cost of obtaining and recharging replacement water. For each subdivision lot within "member land," which is land that has been enrolled in the CAGRD for the purpose of obtaining a Certificate of Assured Water Supply (Certificate of AWS), the annual property tax assessment will reflect the cost of excess water delivered to the lot. Municipal providers that join the CAGRD for purposes of obtaining a Designation of Assured Water Supply pay the assessment directly to the CAGRD based on the amount of excess water delivered in the provider's service area.

The CAGRD has three years in which to fulfill its groundwater replenishment obligation for a given year. The CAGRD, not its members, determines how the replenishment obligation will be met.

#### 8.2.3.3.4.5 Pinal County Water Augmentation Authority

Legislation was also passed in 1993 authorizing the formation of a county augmentation authority to augment water supplies in the Pinal AMA by facilitating regional recharge activities. Membership in the augmentation authority was limited to Pinal County, incorporated municipalities and irrigation districts in the AMA, and two at-large members appointed by the county supervisors (one to represent private water companies with CAP allocations and another to represent those without CAP allocations).

In September 1994, the county supervisors approved the establishment of PCWAA. At that time, two irrigation districts, HIDD and SCIDD, chose to be excluded from membership in PCWAA. They can, however, petition to be members in the future, as can any Indian communities or newly incorporated municipalities in the Pinal AMA.

The principal source of funding for PCWAA is provided by the Department, which transfers a limited portion of the monies collected annually from groundwater withdrawal fees levied within the Pinal AMA.

#### 8.2.3.3.4.6 Underground Water Storage, Savings, and Replenishment Program

Passage in 1994 of the Underground Water Storage, Savings, and Replenishment Act included all of the various recharge programs authorized since passage of the 1986 Underground Storage and Recovery Act and consolidated them into a single, unified program. The 1994 Act made the regulatory provisions easier to administer, established a unified accounting system for all water that is stored and recovered, and attempted to simplify the recharge program for potential applicants. More detailed information on the state's recharge program can be found in section 8.5.2.

#### 8.2.3.3.4.7 Arizona Water Protection Fund

Legislation was also passed in 1994 to address several recommendations by the Governor's CAP Advisory Committee for increasing the state's use of CAP water. The legislation created the Arizona Water Protection Fund, administered by a commission, to issue grants to water users for implementing projects to protect the state's rivers and streams, including the use of excess CAP water for riparian enhancement.

To encourage earlier use of CAP water, the legislation also changed the statutory expiration date from December 31, 2001 to December 31, 1997 for those cities and towns deemed to have an assured water supply based upon their signature of CAP subcontracts.

#### 8.2.3.3.4.8 Assured and Adequate Water Supply Rules

In February 1995, the Department adopted new rules for its Assured and Adequate Water Supply Program. The Assured Water Supply Program (AWS Program) applies to new subdivided developments (currently defined as six or more parcels with at least one parcel having an area less than 36 acres) within AMAs, and the adequate water supply program applies to all new developments outside of AMAs. The AWS Rules are intended to aid in achieving the management goal for the AMA and to ensure sufficient water supplies for new development by requiring that new development be largely based on renewable water supplies that are sufficient to meet the demand of the development for 100 years.

Although assured water supply applicants must limit their overall use of mined groundwater, a certain amount of mined groundwater is still allocated to them. Any use above an applicant's groundwater allocation must be met by renewable water supplies. If an applicant does not have access to renewable water supplies, the development or service area may be enrolled in the CAGRD and, in doing so, agree to finance the replenishment of groundwater withdrawn in excess of their groundwater allocation. Any groundwater withdrawn in excess of the groundwater allocation must then be replenished by the CAGRD.

#### 8.2.3.3.4.9 Arizona Water Banking Authority

In 1996, legislation was passed to create AWBA for the primary purpose of annually purchasing a portion of the state's unused Colorado River supply, bringing it into central Arizona via the CAP aqueduct, and storing it through recharge. AWBA, which is authorized to operate through 2016, is administered through a commission, with the Department and CAWCD serving as administrative and technical staff.

Storage of excess Colorado River supplies is primarily intended to provide drought protection for municipalities in the Phoenix, Pinal, and Tucson AMAs. In the event of a water shortage on the river, CAWCD would recover the stored water for AWBA and use it to supply municipal needs that otherwise would have been supplied with CAP water. Water stored by AWBA may also be used to replenish depleted aquifers, enhancing the ability of the AMAs to meet water management objectives. AWBA can also provide another source of supply for Arizona's Colorado River communities and for Indian water rights settlements. In addition, AWBA can contract with similar entities in California and Nevada to allow those states to annually acquire a portion of Arizona's excess Colorado River supply and store it in Arizona. In exchange, the states will take additional water from the river in the future.

Funding for AWBA comes from four sources: (1) a groundwater withdrawal fee collected within the three AMAs, (2) a four-cent ad valorem tax levied by CAWCD on property located within the CAP service area, (3) an annual appropriation from the state general fund, and (4) monies paid annually by California and Nevada entities pursuant to interstate banking agreements. Each funding source must be accounted for and used in a specific manner (see section 8.5.1).

#### 8.2.3.3.5 The Augmentation and Conservation Assistance Fund

Through 1996, the Code allowed an augmentation and conservation assistance fee of up to $2.00 per acre-foot per year to be levied on groundwater withdrawals. With passage of the legislation that created AWBA in 1996, the maximum fee for conservation assistance and augmentation was changed to $.50 per acre-foot per year beginning in 1997.

The Pinal AMA's augmentation and conservation assistance fee began at $.25 per acre-foot in 1990, was increased to $.35 in 1991, and to $.50 per acre-foot in 1994, where it has remained. Monies collected from the fee have ranged from almost $100,000 in 1990 to greater than $255,000 in 1996 and have annually averaged about $175,000 since 1990 and approximately $215,000 since the fee was increased to $.50 per acre-foot.

These monies provide the basis for the augmentation and conservation assistance fund. The Second Management Plan stated that monies in the fund designated for augmentation would be used to provide: (1) cost-sharing grants for augmentation projects and studies initiated or conducted by private or public entities and (2) funds for augmentation projects and studies initiated or conducted by the Department. More detailed information on the augmentation and conservation assistance fund can be found in Chapter 9.

With passage of the legislation establishing PCWAA in 1993, one-half of the unencumbered monies in the Pinal AMA's augmentation and conservation assistance fund were transferred annually to PCWAA. In 1996, the legislation that created AWBA also changed PCWAA's funding mechanism. PCWAA can now request up to $200,000 annually from the Department. The first source of these monies is from the AMA's augmentation and conservation assistance fund. If there are insufficient monies in this fund to fulfill the request, the balance is to come from the AMA's water banking fund. From 1993 through 1997, the Department transferred, on average, about $70,000 annually to PCWAA, with all of the monies coming from the augmentation and conservation assistance fund.

Including 1998, the Department has awarded six augmentation grants in the Pinal AMA totaling nearly $200,000. AMA staff worked with local water users and other interested parties to encourage the submittal of augmentation project proposals that met one or more of the AMA's primary augmentation objectives for the Second Management Plan. AMA staff was especially interested in having feasibility studies conducted for recharging the CAP allocations of the AMA's municipal providers. As a result of staff efforts, three of the six grants involved feasibility studies that focused on or included as a component the recharge of municipal CAP water. More detailed information on the six grants can be found in Appendix 9A.

#### 8.2.3.3.6 Summary of Second Management Plan Program Effectiveness

Overall, the implementation of the Second Management Plan Augmentation and Reuse Program for the Pinal AMA has been effective. It is clear from the above discussion that the Department has taken a lead role in facilitating and coordinating augmentation activities and in resolving many of the institutional and legal barriers to such activities. The Pinal AMA staff has provided significant technical and financial assistance to entities wishing to implement augmentation projects during the second management period. Regulatory incentives are the only element of the augmentation program that have not been that effective.

The primary objectives identified for the augmentation program have generally been met. Utilization of CAP allocations within the Pinal AMA has been maximized, with the exception of those of the municipal providers. The CAP delivery system is close to being utilized to the fullest extent possible by AWBA to deliver unused Colorado River water to the AMA. Those supplies, as well as effluent that cannot be used directly, are being recharged in the AMA.

While the program's secondary objectives involving the development of alternative water supplies in the state have largely not been met, it has not affected augmentation activities in the Pinal AMA. Even if alternative water supplies were to be developed and made available to water users in the AMA, it is highly unlikely that such supplies would be used due to their high costs.

## 8.3 THIRD MANAGEMENT PLAN PROGRAM DEVELOPMENT ISSUES

Although the Second Management Plan Augmentation and Reuse Program has been largely successful in meeting its primary objectives, there are several issues involving augmentation and recharge in the Pinal AMA that will need to be addressed during the third management period. Many of these issues have recently arisen and were, for the most part, not anticipated when the Second Management Plan was adopted in 1989.

Perhaps the most important augmentation issue facing the Pinal AMA involves potential reductions in the direct use of CAP water supplies. Of particular concern is the continued availability of non-Indian agricultural CAP water at a price competitive with groundwater supplies. CAWCD's target pricing program is currently scheduled to end in 2003. If incentive pricing in some form is not continued, the AMA's three CAP irrigation districts will not be able to afford to directly use CAP water to any significant degree and will be forced to substantially increase their use of less costly groundwater supplies.

The same concern applies to the price for in-lieu groundwater that is delivered to the irrigation districts' groundwater savings facilities by AWBA. As long as the price remains at $21 per acre-foot, it is competitive with the cost of groundwater. It may be increasingly difficult, however, for AWBA to maintain this price in the future. In 1997, CAWCD charged AWBA $36 per acre-foot to deliver excess Colorado River water to storage facilities. In 1998, CAWCD increased the price to $41 per acre-foot. Although AWBA decided not to increase its 1998 price for in-lieu groundwater, it has limited funds available and will thus be unable to purchase as much excess supplies as would have otherwise been the case.

Another critical concern is the retention of municipal CAP allocations. Although these allocations involve only a small portion of the Pinal AMA's total water supply, they are nonetheless an important source of renewable water supplies and have the potential, if fully utilized, to supply the demands of more than 100,000 people. Over 70 percent of these supplies are allocated to Arizona Water Company for its Casa Grande and Coolidge systems. It will be increasingly difficult for the company to afford the costs of retaining these allocations unless it is able to significantly increase its use of CAP water. Capital charges, which must be paid annually to CAWCD whether a municipal subcontractor uses any of its CAP allocation or not, are rapidly increasing. As recently as 1994, these charges were only $11 per acre-foot. By 1998, they had increased to $48 per acre-foot and are scheduled to increase to $54 per acre-foot in 2000.

Lack of a comprehensive plan to guide regional recharge activities is another important augmentation issue confronting the Pinal AMA. Prior to the creation of AWBA, recharge activities in the AMA were largely guided by the self-interests of the entities directly involved. AWBA is required by statute, however, to coordinate its recharge activities and extinguishment of storage credits with the Department in a manner consistent with the water management objectives of the Code. Without a comprehensive regional recharge plan, it will be difficult for the AMA to make informed recommendations to AWBA on whether additional storage is needed, where the water should be stored, and whether storage credits should be extinguished. Such a plan is also needed to make recommendations to AWBA, as well as CAWCD/CAGRD, concerning the recovery of stored water.

In addition, a regional recharge plan is needed to address the issue of Indian groundwater supplies being depleted by off-reservation pumping and whether a program to purchase and retire grandfathered rights would be effective in reducing pumping within these areas. Such a plan is also needed to determine

whether sub-regional water management objectives need to be developed to address decline rates and other groundwater problems in these and other critical areas.

While substantial information on groundwater conditions in the Pinal AMA's two principal subbasins, Eloy and Maricopa-Stanfield, has been gathered and analyzed during the second management period, it is nevertheless inadequate to develop and implement a regional recharge plan. More accurate information is needed on groundwater movement, amounts of groundwater in storage, water levels, and decline rates in these subbasins. Better information is also needed on land subsidence in the subbasins. All of this information can only be obtained through developing and implementing an extensive, long-term groundwater monitoring program.

Finally, the development and use of alternative augmentation measures, such as weather modification, are not expected to be feasible in the Pinal AMA during the third management period unless the associated legal, institutional, technical, environmental, and economic constraints are resolved.

## 8.4 THIRD MANAGEMENT PLAN PROGRAM GOAL AND OBJECTIVES

The possibilities of and need for supply augmentation during the third management period differ substantially among the five AMAs. In the Pinal AMA, augmentation is needed to reduce current and projected groundwater uses to facilitate the management goal for the AMA and especially to ensure that the amount of available groundwater in storage to 1,000 feet below land surface in the Eloy and Maricopa-Stanfield subbasins is adequate to meet the needs of all water users for at least 100 years. That amount of groundwater was recently estimated by the Department's Hydrology Division, using the Pinal AMA Groundwater Model, to be 31 million acre-feet. Consequently, an acceptable average rate of groundwater depletion was determined to be 310,000 acre-feet per year (see preface to Section II). Should groundwater supplies be depleted at a rate greater than the "planned depletion allowance" (PDA) of 310,000 acre-feet per year, additional renewable water supplies will need to be found for the AMA. The following objectives and their relative priorities have been determined to be consistent with the AMA's management goal:

Primary Objectives

- Encourage the maximum direct use of CAP water by irrigation districts within the AMA.
- Retain and fully utilize all of the municipal CAP allocations within the AMA.
- Utilize the CAP delivery system to the maximum extent possible to store unused Colorado River water within the AMA.
- Maximize the recharge of renewable water supplies, including effluent, that cannot be used directly.
- Develop and implement a groundwater monitoring program to facilitate effective development of a regional recharge plan and achievement of water management objectives.
- Develop and implement a regional recharge plan to coordinate storage and recovery of renewable water supplies and address groundwater problems in critical areas in a manner consistent with water management objectives.
- Integrate assured water supply, water banking, groundwater replenishment, and related activities to facilitate achievement of water management objectives.

Secondary Objectives

- Assess the need for developing and implementing a program to reduce groundwater withdrawals through the purchase and retirement of grandfathered rights.

- Continue to research and identify augmentation measures for future implementation, including the study of legal, institutional, technical, environmental, and economic constraints that inhibit the development and use of alternative water supplies.

## 8.5 THE THIRD MANAGEMENT PLAN AUGMENTATION AND RECHARGE PROGRAM

The Department is required to include in the Third Management Plan "a program for additional augmentation of the water supply of the active management area, if feasible, including incentives for artificial groundwater recharge." A.R.S. § 45-566(A)(6). "Augmentation" in this context is statutorily defined to mean "to supplement the water supply of an active management area and may include the importation of water into the active management area, storage of water or storage of water pursuant to Chapter 3.1 of this title." A.R.S. § 45-561(2). For the purposes of this chapter, the Department has drawn a finer distinction. As described in section 8.1, *augmentation* means increasing the availability and use of renewable water supplies in lieu of groundwater, and *recharge* means storage of water pursuant to Chapter 3.1 of the Underground Water Storage, Savings, and Replenishment Act. The augmentation and recharge program, therefore, includes provisions addressing the development of additional water supplies for the AMA, maximizing the use of renewable water supplies, and the storage of these supplies either above ground or underground.

A.R.S. § 45-566(A) also requires the Third Management Plan to include a number of other provisions related to augmenting the AMA's water supplies. Paragraph 9 of that subsection provides that the Third Management Plan may include a plan for the purchase and retirement of grandfathered rights beginning no earlier than January 1, 2006. Paragraph 13 requires that the plan include recommendations to AWBA regarding:

(a) Whether additional water storage in the active management area would help to achieve the management goal for the active management area.
(b) Where additional water storage in the active management area would be most useful to achieve the management goal for the active management area.
(c) Whether the extinguishment of long-term storage credits accrued or to be accrued by the Arizona Water Banking Authority would help to achieve the management goal for the active management area.

The augmentation program for the Third Management Plan contains these required elements.

The principal responsibility for developing water supplies and for storing that water for future uses lies with the area's water users. The Department's responsibility under A.R.S. § 45-566(A) is to design an augmentation program that encourages and facilitates the efforts of those water users. The program should particularly encourage augmentation and storage of water where groundwater supplies are limited. However, the program must also allow the Department to use the authorities granted it by the Legislature to prevent unreasonable harm to third parties and to avoid aggravating existing local water supply problems.

The recharge program for the Third Management Plan derives from A.R.S.§ 45-801.01, *et seq.*, the Underground Water Storage, Savings, and Replenishment Act, which details the statutory requirements for storing and recovering water within an AMA. The key statutory provisions for storage facilities include hydrologic feasibility, protection from unreasonable harm to land and other water users, and avoidance of

water quality impacts. A.R.S. §§ 45-811.01(C)(2), 45-811.01(C)(3), and 45-811.01(C)(5) respectively. Protection from unreasonable harm to land and other water users. A.R.S. § 45-811.01(C)(3). Avoidance of water quality impacts. A.R.S. § 45-811.01(C)(5). Although this Act contains requirements for water storage and for recovery, it also includes requirements linking storage and recovery to the management plan goals. The provision that affects non-recoverable storage is found in A.R.S. § 45-833.01(A), with a requirement that non-recoverable water storage must be consistent with the AMA's augmentation program. The provisions that affect recovery are found in A.R.S. § 45-834.01. They include a requirement for consistency with the management plan in the case of recovery outside the area of impact where the water is stored. A.R.S. § 45-834.01(A)(2)(b).

To address the program goal and objectives identified in section 8.4, the Department has developed the Augmentation and Recharge Program for the Third Management Plan based on the above statutory authorities. The program includes seven elements, which are discussed in the following order:

- Recommendations to AWBA (section 8.5.1)
- Underground Water Storage, Savings, and Replenishment Program (section 8.5.2)
- Regulatory Incentives (section 8.5.3)
- Financial Assistance (section 8.5.4)
- Technical Assistance, Coordination, and Facilitation (section 8.5.5)
- Resolution of Legal and Institutional Barriers (section 8.5.6)
- Purchase and Retirement of Grandfathered Rights (section 8.5.7)

### 8.5.1 Recommendations to AWBA

A.R.S. § 45-566(A)(13) requires that the director include in the management plans for the Tucson, Phoenix, and Pinal AMAs three recommendations to AWBA. These recommendations are: (1) whether additional water storage in the AMA would help to achieve the AMA's management goal, (2) where additional water storage in the AMA would be most useful to achieve the management goal, and (3) whether extinguishment of long-term storage credits accrued or to be accrued by AWBA would help to achieve the management goal.

Other important statutory provisions relating to AWBA and the AMAs are found under A.R.S. § 45-2401, *et seq.*, the authority for AWBA. A.R.S. § 45-2423(A)(3) requires AWBA to coordinate the storage of water and distribution and extinguishment of long-term storage credits with the director in accordance with the water management objectives of the Code. A.R.S. § 45-2425 describes how the water banking fund is collected, and A.R.S. § 45-2457 describes how each fund component is to be used.

The fund comes from four basic sources: (1) state general fund appropriations; (2) groundwater withdrawal fees within the Tucson, Phoenix, and Pinal AMAs; (3) ad valorem property taxes assessed within the CAWCD service area; and (4) monies deriving from interstate banking agreements. Storage credits accrued with general fund appropriations may be used by AWBA only as follows: (1) to make water available to municipal and industrial (M&I) water users of Colorado River water within Arizona that are outside of the CAWCD service area (limited to situations where there are water shortages and requires reimbursement), (2) to assist CAWCD in meeting the demands of its M&I subcontractors (also limited to situations where there are water shortages and requires reimbursement), (3) to implement Indian water rights settlements, and (4) to fulfill the Code's water management objectives.

Credits accrued using withdrawal fees may only be used for the benefit of the AMA in which the monies were collected. These credits may be used by AWBA to implement Indian water rights settlements or meet the Code's water management objectives.

Credits accrued with the ad valorem tax may only be used to benefit the county in which the monies were collected. AWBA is required to distribute the credits to CAWCD to meet the demands of CAWCD's M&I subcontractors during times of shortage.

Credits accrued using monies paid to AWBA by California and Nevada entities pursuant to interstate banking agreements must be associated with a plan for forbearance from taking Colorado River water in the future.

When AWBA prepared its storage facility inventory for the Pinal AMA in 1997 pursuant to A.R.S. § 45-2452, it determined that the existing facilities were adequate for meeting its needs for the next ten years. In making this determination, AWBA was required to consider whether the facilities to be used by it promote the Code's water management objectives. A.R.S. § 45-2452(B). In preparing plans for additional storage facilities for the AMA, AWBA must consider the advice of the Department as to where storage would most contribute to meeting the Code's water management objectives. A.R.S. § 45-2453(B)(2). The draft plan for additional facilities and each year's plan of operation must be reviewed by the AMA's Groundwater Users Advisory Council prior to adoption. A.R.S. §§ 45-2453(C)(1) and 45-2456(C)(1).

#### 8.5.1.1 Need for Additional Storage

As previously discussed, a comprehensive regional recharge plan will need to be developed for the Pinal AMA before an informed recommendation to AWBA can be made on how much additional storage is needed to achieve the AMA's management goal of maintaining an average rate of groundwater depletion that is not greater than the PDA of 310,000 acre-feet per year. In the meantime, however, it is recommended that AWBA continue to store 140,000 to 160,000 acre-feet annually of unused Colorado River water within the AMA. This level of storage, which accounts for approximately 40-50 percent of the excess Colorado River supplies expected to be available in the short-term, will help AWBA meet its primary objective of storing as much of these supplies in the state as possible. Such a storage level will also result in the AMA's aquifers being augmented by 7,000 to 8,000 acre-feet per year because, by statute, the storer can only receive long-term storage credits for 95 percent of the recoverable amount of water it stores. This 5 percent deduction, commonly referred to as the "cut to the aquifer," will help ensure that sufficient supplies of water are stored within the AMA to achieve the management goal.

#### 8.5.1.2 Locations for Additional Storage

The three groundwater savings facilities in the Pinal AMA have been permitted to store up to 285,000 acre-feet of water annually (permitted capacity is 55,000 acre-feet for HIDD's facility, 110,000 acre-feet for CAIDD's, and 120,000 acre-feet for MSIDD's), which is well in excess of anticipated deliveries from AWBA. There is, therefore, sufficient capacity available in the AMA to store any additional supplies that may be made available by AWBA in the future. Physical difficulties associated with the recovery of stored supplies, however, could limit the use of these facilities for water stored by AWBA using funds from the state general fund or from any interstate participants in the water banking program.

The recovery issue was the focus of a 1997 study conducted by CAIDD and MSIDD for their groundwater savings facilities. The study found that if certain modifications to district distribution systems are made, the potential recovery capability of the two facilities is greater than 100,000 acre-feet per year. Without these modifications, recovery is limited to about 24,000 acre-feet annually. HIDD has not yet assessed the recovery capability for its groundwater savings facility.

In the Pinal AMA, there are currently no underground storage facilities for AWBA to utilize. If such facilities did exist, they would allow AWBA to store water in the AMA during winter months when demand for CAP water for irrigation purposes is low. PCWAA, however, is continuing as part of its

recharge program to assess the need to develop either a constructed or managed facility to store the CAP allocations of the AMA's four municipal subcontractors. Should PCWAA decide to develop such a facility, it could be done in partnership with AWBA and located in a site that would help meet water management objectives, including ensuring the physical availability of groundwater supplies.

#### 8.5.1.3 Need for Extinguishment of Storage Credits

The need for AWBA to extinguish long-term storage credits, which has the same effect as storage of non-recoverable water, is difficult to assess without a regional recharge plan. Storage credits accrued, however, using withdrawal fees should be dedicated to meeting the Pinal AMA's water management goal and objectives. If the average rate of groundwater depletion in the AMA exceeds the PDA, extinguishment of credits could be used to offset the excess. Should the amount of credits accrued using withdrawal fees be insufficient, then credits accrued with general fund appropriations should also be extinguished. In addition, Indian water rights settlements, particularly a settlement of the Gila River Indian Community's claims, could require the extinguishment of credits accrued with general fund appropriations.

#### 8.5.1.4 Incorporation of Water Management Objectives

Credits that are accrued by AWBA using either withdrawal fees or general fund appropriations can be used to fulfill the Code's water management objectives. There is also potential that the credits accrued through monies derived from interstate banking agreements could assist in meeting such objectives.

To ensure that storage is occurring in appropriate locations, the purpose of the storage (meeting water management objectives, "firming up" CAP water supplies for M&I subcontractors, implementing Indian water rights settlements, or interstate banking) needs to be established first. In some cases, it may be possible for AWBA to store water in an area that is experiencing high decline rates, while developing a program to recover the stored water in other parts of the AMA that have more stable groundwater conditions. It is recommended that AWBA work in close cooperation with AMA staff, PCWAA, and local water users prior to the development of the draft annual plan of operation, so that opportunities to incorporate water management objectives in AWBA's activities may be maximized.

The siting of storage facilities for firming up CAP water supplies for M&I subcontractors is especially important because it is imperative that the stored water be recoverable. Utilization of the groundwater savings facilities in the Pinal AMA has allowed AWBA to store water in locations that should hydrologically benefit the well fields of most of the municipal subcontractors. An important concept that should be incorporated by AWBA in developing its recovery plan is that storage siting decisions that are made on an annual basis and through the facilities plan should be consistent with each subcontractor's long-range plans for developing water supplies.

### 8.5.2 Underground Water Storage, Savings, and Replenishment Program

Underground water storage is an increasingly important technique for water management in the Pinal AMA. Underground storage provides an additional benefit of restoring or preserving groundwater in areas where water levels have declined. The Underground Water Storage, Savings, and Replenishment Program is, therefore, a significant component of the Augmentation and Recharge Program for the Third Management Plan.

The state's Underground Water Storage, Savings, and Replenishment Program, which is commonly referred to as the "underground water storage (UWS) program" or simply the "recharge program," provides a regulatory program under which water may be stored underground and rights to recover the same amount of water may be accrued. Together, the statutes and policies of the UWS Program establish a number of program objectives. These objectives are:

- To protect the general economy and welfare of the state by encouraging the use of renewable water supplies, especially Colorado River water, instead of groundwater through a flexible and effective regulatory program for the underground storage, savings, and replenishment of water.

- To allow the use of direct storage facilities to aid with filtration and to develop an accounting system that allows for the cost-effective distribution of withdrawal authority instead of expanding physical distribution systems.

- To further the conjunctive management of the water resources of the state to reduce the overdraft and achieve the management goals of the AMAs.
- To store water underground for seasonal peak demand use and for use during years of shortage.

- To augment the water supply for future growth and development.

Since its inception in 1986, the UWS Program has become increasingly flexible over time with regard to storage and recovery locations and the number and types of programs available. With the increased flexibility has come an increased complexity and an increased potential for recharge projects to aggravate, as well as mitigate, local water problems. High and low water levels, water quality, physical availability, and third-party impacts are all conditions that can be impacted positively or negatively by storage facilities. Thus, the regulation of the program to maximize benefits and minimize harms is crucial to an effective program.

This section describes: (1) a brief overview of the UWS Program; (2) the definition of what is, and what is not, considered a storage facility; and (3) the storage and recovery location criteria that determines whether a recharge project is considered "consistent with the management plan and achievement of the management goal" of the AMA.

#### 8.5.2.1 Overview of the UWS Program

Persons who want to undertake recharge activities are required to obtain permits from the Department. There are three types of permits: (1) "storage facility" permits, which may be "constructed underground storage facility" permits, "managed underground storage facility" permits, or "groundwater savings facility" permits; (2) "water storage" permits; and (3) "recovery well" permits.

##### 8.5.2.1.1 Storage Facility Permits

Storage facility permits allow the holder to construct, develop, and operate a storage facility. If storage is to occur at a facility that will use constructed basins or injection wells to add water to an aquifer, a constructed underground storage facility permit is required. If the storage will utilize the natural channel of a river or stream to add water to an aquifer, a managed underground storage facility permit is required. At a groundwater savings facility, a water user who would otherwise have pumped groundwater is provided an alternative supply of water by a water storer. The alternative supply is then used in lieu of the groundwater, thus preserving the groundwater.

##### 8.5.2.1.2 Water Storage Permits

Water storage permits are associated with a particular storage facility where the storage will occur. The holder of the water storage permit is authorized to store water at the storage facility. Rights to recover water under the UWS Program always accrue to the holder of the water storage permit.

#### 8.5.2.1.3 Recovery Well Permits

Recovery well permits allow the holder to recover water stored pursuant to the UWS Program. The storer of the water may always recover the water stored within the area of impact of the storage. Under a number of conditions, some of which are discussed in detail in section 8.5.2.3, recovery can also occur outside the area of impact, which is defined "as projected on the land surface, the area where the stored water has migrated or is stored." A.R.S. § 45-802.01(2). Theoretically, if these conditions are met, recovery of water stored in an AMA could occur anywhere within the AMA. Under no circumstance, however, can water be recovered in the AMA if it were stored outside the AMA.

#### 8.5.2.1.4 Other UWS Program Elements

There are a number of other important elements of the UWS Program. Rights to recover water may be exercised annually or long-term. Almost any water stored can be recovered within the same year in which it was stored. If a number of conditions are met, stored water will be credited to a long-term storage account that allows the account holder to recover the water at any point in the future. These conditions greatly assist the achievement of water management objectives by preventing an entity from storing water and earning long-term storage credits if the water could have otherwise been put to direct use. A.R.S. § 45-802.01(21) defines the sources of water that cannot be put to direct use and thus may be eligible for long-term storage credits. In general, if an entity stores effluent prior to 2025, it is determined that the effluent cannot be reasonably put to direct use and is therefore eligible to earn credits. Additionally, CAP water is considered water that cannot be put to direct use if the storer is not simultaneously mining groundwater. In other words, if the storer continues to mine groundwater, then credits may be earned only if the entity stores an additional amount of CAP water to offset the mined groundwater. (An exception is made for designated providers that are pumping groundwater pursuant to their groundwater allocation under the AWS Rules.) The intent of this provision is to discourage groundwater mining and avoid giving credits in cases where there is no net increase in storage in the aquifer. It should be reemphasized that while a given storer may not be eligible for credits, the water stored is eligible to be recovered on an annual basis and is treated as a direct use for all intents and purposes.

There is no time limit on the right to recover storage credits. They may be assigned to another person as long as that person could meet the same provisions for earning credits as the storer. In addition, when the water is recovered, it retains the same legal characteristics it had before storage. For example, if CAP water is stored, the water, when recovered, may be used in any legal manner CAP water can be used, even if the recovery occurs outside the area of impact of the storage.

The UWS Program is also the mechanism by which the CAGRD replenishes water on behalf of its members. The CAGRD may store water and accrue storage credits or obtain credits already accrued. At the CAGRD's request, the Department will transfer credits from CAGRD's long-term storage account to its replenishment account, termed a "conservation district account" by A.R.S. § 45-859.01, to offset the CAGRD replenishment obligations. Once the credits are transferred to the replenishment account, they may not be recovered, assigned, or moved back to the long-term storage account.

### 8.5.2.2 UWS Program Issues

The UWS Program is complex, which leads to a number of implementation issues.

#### 8.5.2.2.1 Storage Facility Qualifications

The Department can only permit legitimate storage facilities. With regard to underground storage facilities, A.R.S. § 45-815.01 specifically lists a number of water-related facilities that are categorically excluded. These include aqueducts, irrigation canals, and other man-made water conveyance systems. In

addition, incidental recharge from any agricultural, municipal, mining, or industrial use is precluded from qualifying for a underground storage facility permit.

A.R.S. § 45-815.01(1) also specifically references "bodies of water," stating that they do not qualify for underground storage facility permits unless they "have been designed, constructed or altered so that water storage is a principal purpose of the body of water." In addition, A.R.S. § 45-132(B)(6) generally prohibits artificial bodies of water constructed for landscape, scenic, or recreational purposes, unless the body of water is "unsealed and an integral part of an underground storage facility." State law, therefore, does allow for a body of water to be both an underground storage facility and a recreational lake. The Department, however, will not permit a facility if it appears to be designed to evade the prohibition on recreational lakes by designating the facility as an underground storage facility. Therefore, if the purpose of the facility is primarily recreational or aesthetic, it does not qualify as an underground storage facility. If the facility, however, meets the goals and requirements of the UWS Program while serving other uses as well, it may qualify as an underground storage facility.

Usually, the efficiency of an underground storage facility is related to its purpose. If a permit applicant's primary intent is to store water, achieving high efficiency at the facility is an important objective for the applicant. If storage is not a primary purpose, efficiency is likely to be less important.

As the Pinal AMA becomes more reliant on renewable water supplies, as required under the AWS Rules, efficient storage and use of all water supplies will become even more important. The UWS Program will continue to encourage efficient uses of water. Every effort will be made in the future to retain the integrity of the program's objectives and to maximize the efficiency of recharge at permitted facilities. The Department examines projected efficiency of an underground storage facility as a part of its review to determine whether a recharge project is hydrologically feasible, which must be established before a facility permit will be issued. A.R.S. § 45-811.01(C)(2). The less efficient a proposed recharge project is, the more likely the Department will be concerned about its legitimacy as an underground storage facility. The Department will consider a number of factors when evaluating a facility for efficiency as a component of hydrologic feasibility, including the following:

- Whether the facility has the potential to store water and the quantity of that potential storage;
- Whether the facility is designed, constructed, or altered so that water storage is a principal purpose;
- Whether other regulatory agencies apply standards to a facility that are inconsistent with the Department's program objectives;
- Whether the facility will be maintained to ensure and/or enhance infiltration;
- If a facility serves multiple purposes, whether purposes other than recharge would not be legal or regulated without being associated with a underground storage facility; and
- Whether potential water storers at the facility are subject to conservation requirements and lost and unaccounted for water limits under the management plan.

The Department is also concerned about potential misuses of groundwater savings facility permits. Not every instance where groundwater use is replaced with renewable water supplies qualifies for a groundwater savings facility permit. Only where the use of renewable water supplies would not have otherwise occurred without the operation of the groundwater savings facility, and there is no other reasonably available alternative source, will a groundwater savings facility be permitted. A.R.S. § 812.01(B).

#### 8.5.2.2.2 Decline Rate Methodology

In evaluating an application for a recovery well permit, the Department considers many factors in determining consistency with the average annual water level decline rate of the recovery location criteria.

The time frame on which the average is calculated may vary based on data availability and the hydrologic characteristics of the area. Major trends in water supply utilization over time, trends in precipitation, hydrogeologic data, and modeling of projected impacts may be factors in evaluating this rate. Other considerations may also be appropriate depending on the location of the proposed recovery well.

Typically, the Department examines the historic static water level data for the period of record for wells located in the section of land in which the proposed recovery well is located and in the adjacent eight sections. The specific area examined depends on the availability and quality of water level data and the hydro-geology of the area. Bedrock outcrops, areas of intensive pumping, and other features may affect determination of which data are pertinent. Generally, wells that are perforated within the aquifer of concern and regularly monitored using consistent methods for static water level data, such as the Department's statewide monitoring or index wells, are good reference points. The Department examines the well hydrographs (plots of static water levels over time) and evaluates the slope of the curve for the period of interest. The slope indicates whether the static water level in the monitoring well has risen or fallen over time, and a horizontal line indicates that the water level has remained stable. The Department identifies which activities may have caused the groundwater changes over time in order to determine whether the activity still exists or has reduced or increased over time.

This approach provides more flexibility and protection of groundwater supplies than would be provided by a simplistic evaluation of decline rates calculated for all water level data within a set radius and the entire period of record. For example, if a recovery well is proposed for an area in which historically there was a rapid decline in water levels due to activities that no longer exist, and if the proposed area is not at high risk for subsidence, the proposed recovery well might be deemed consistent with the average annual decline rate criteria by looking at the period of time after the historic change in use. Similarly, if for decades water levels in the vicinity of the proposed recovery well were stable, but recently a new use has caused rapid decline rates, the proposed recovery well may be deemed inconsistent with the criteria.

The Department's groundwater models can be used to project future water levels and decline rates on a regional basis. Modeling may assist the permit applicant in evaluating recovery options. Where there are sufficient data, a model can give an indication of how long recovery within a region may remain permitted based on the average annual decline rate criteria.

The most current procedures for establishing the average annual decline rate in the vicinity of a proposed recovery well will be published in the Department's recovery well application packet.

### 8.5.2.3 Storage and Recovery Location Criteria

The benefits to water management through the UWS Program depend on the location where water is stored and where it is recovered, if it is recovered at all (non-recoverable storage is discussed in section 8.5.2.4). For storage and recovery, A.R.S. § 45-834.01(A) clarifies that unless stored water is recovered by the storer within the area of impact of the storage, the recovery is only allowed "if the director determines that recovery at the proposed location is consistent with the management plan and achievement of the management goal for the active management area." Additionally, recovery of stored water within the area of impact of the storage is always considered consistent with the management plan.

Although the statute ties recovery outside the area of impact to the consistency requirements of the management plan, the locations of storage and recovery of water are inherently linked and must both be considered when determining whether the future recovery meets the consistency requirements and management goal of the AMA. Outside the area of impact, it cannot be determined whether recovery is consistent with the AMA's water management objectives unless the storage location is also considered. Water management benefits to the AMA would depend greatly on whether credits recovered from an existing well were accrued through storage in a remote area or an area of intensive pumping. Therefore,

the criteria to determine whether a recovery location is consistent with the management plan and goal of the AMA must also consider where water is stored.

The locations of storage and recovery are important factors in addressing regional and local groundwater supply problems, particularly in critical areas. For example, the usable groundwater supplies of the AMA may be diminished if water storage occurs in a location where there is no foreseeable future demand for the stored water and if recovery occurs outside the area of impact of the storage. In addition, recovery outside the area of impact could aggravate problems if the recovery location was experiencing rapidly declining water levels or limited urban development because groundwater supplies were already fully committed under the AWS Program. On the other hand, if water storage occurs in an area experiencing high water levels and recovery occurs away from the area of impact, the storage may contribute to the high water levels. If dewatering is required as a direct result of the storage, either the storage facility's operational plan should be adjusted to minimize impacts, which may include strategic recovery locations to mitigate impacts, or the storer may not be issued storage credits.

While the recovery location criteria for the Second Management Plan provided no protection of groundwater supplies already committed under the AWS Program, the criteria for the Third Management Plan protect groundwater supplies that are already committed for an assured water supply from an entity that wishes to recover water outside of the area of impact.

The Third Management Plan criteria also link future use benefits to determinations under the AWS Program. If storage occurs in a remote area, but one that has a committed and projected demand through a Designation or Certificate of AWS, then it is deemed to contribute to groundwater supplies that will be used in the future. If the storage does not meet the criteria, it must otherwise be beneficial to the AMA if recovery is to occur outside the area of impact of the storage. If a storage facility does not meet the criteria, this concern would be incorporated in the permit as a notice to potential water storers that future recovery may only be allowed inside the area of impact.

Recovery from within the area of impact is not required to meet management plan consistency requirements. A.R.S. § 45-834.01(A) states that recovery may occur outside the area of impact of the storage only if the director determines that the recovery location is consistent with the management plan. Therefore, recovery must continue to be consistent with management plan criteria, even after the recovery well permit has been issued. Existing, previously permitted recovery wells are subject to the criteria of the Third Management Plan and future management plans.

***8-101. Recovery Location Criteria***

*During the third management period, for the purposes of A.R.S. § 45-834.01(A)(2)(b), recovery of stored water at a location is consistent with the management plan and achievement of the management goal for the AMA:*

*A. If recovery will occur within the area of impact, regardless of whether the recovery well permit applicant was the storer of the water; or*

*B. If recovery will occur outside the area of impact, all of the following three criteria are met:*

*1. The water storage that resulted in the right to recover water:*

*a. Is contributing to groundwater supplies that are accessible to current groundwater users or that have been committed to establish a Designation, Certificate, or Analysis of Assured Water Supply pursuant to A.R.S. § 45-576 or rules adopted thereunder so*

*long as the areas in which water is stored are not experiencing problems associated with shallow depth to water; or*

b. *Is a component of a remedial action project under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or Title 49, Arizona Revised Statutes, and the director has determined that the remedial action will contribute to the objectives of this chapter or the achievement of the management goal for the AMA; or*

c. *Is otherwise determined by the director to have contributed to the objectives of this chapter or the achievement of the management goal for the AMA.*

2. *Either:*

a. *At the time of the application, the maximum projected depth to water at the location of the recovery well after 100 years does not exceed the general 100-year depth-to-static water level for the AMA specified by A.A.C. R12-15-703 after considering: (1) the maximum proposed withdrawals from the recovery well; (2) current, committed, and projected demands associated with determinations made under A.R.S. § 45-576 that are reliant on the water that the recovery well will withdraw; and (3) withdrawals for other current or projected demands that are reliant on water that the recovery well will withdraw; or*

b. *The recovery will be undertaken within the applicant's service area, and the applicant is a municipal provider designated as having an assured water supply.*

3. *The recovery well is:*

a. *Located in an area experiencing a long-term average annual rate of decline that is less than 4.0 feet per year; or*

b. *A component of a remedial action project under CERCLA or Title 49, Arizona Revised Statutes, and the director has determined that the remedial action will contribute to the objectives of this chapter or the achievement of the management goal for the AMA; or*

c. *Likely to contribute to the water management objectives of the geographic area in which the recovery well is located, as determined by the director.*

### 8.5.2.4 Criteria for Non-Recoverable Storage

A.R.S. § 45-833.01(A) provides that "the director may designate a water storage permit as storing non-recoverable water. If the water storage occurs within an active management area, the water storage permit may be designated in this manner only if the storage is consistent with the active management area's augmentation program." Water that is stored pursuant to such a permit "may not be recovered on an annual basis, may not be credited to a long-term storage account, and may not be used for replenishment purposes." The same considerations that shaped the recovery location criteria have shaped the criteria for non-recoverable storage.

*8-201. Criteria for Storage of Non-Recoverable Water*

*During the third management period, water storage that is designated as non-recoverable is consistent with the AMA's augmentation program if the following criteria is met:*

*The water storage:*

1. *Is contributing to groundwater supplies that are accessible to current groundwater users or that have been committed to establish a Designation, Certificate, or Analysis of Assured Water Supply pursuant to A.R.S. § 45-576 or rules adopted thereunder so long as the areas in which water is stored are not experiencing problems associated with shallow depth to water; or*

2. *Is a component of a remedial action project under CERCLA or Title 49, Arizona Revised Statutes, and the director has determined that the remedial action will contribute to the objectives of this chapter or the achievement of the management goal for the AMA; or*

3. *Is otherwise determined by the director to contribute to the objectives of this chapter or the achievement of the management goal for the AMA.*

### 8.5.3 Regulatory Incentives

Provisions established in the agricultural, municipal, and industrial conservation programs (chapters 4, 5, and 6, respectively) provide incentives to encourage water users in the Pinal AMA to use renewable water supplies, particularly effluent. Examples of these regulatory incentives include:

- Pursuant to A.R.S. § 45- 467, effluent is excluded from consideration in determining the amount of any debit to be registered to a farm's flexibility account.

- Delivery of effluent by a municipal water provider does not count against its GPCD conservation requirement unless the effluent was stored in one location and recovered outside the area of impact of the storage.

- CAP water that is delivered by a municipal provider to a non-residential water user is excluded from the provider's GPCD requirements for up to ten years, if it can be shown that the delivery will expedite the development of infrastructure to deliver effluent to the water user in the future.

- If a municipal provider has an assured water supply designation or is able to phase out its groundwater use, it may elect to be regulated under the NPCCP, which removes the GPCD requirements entirely in exchange for the implementation of specific conservation programs.

- Effluent use by a turf-related facility is discounted by 30 percent when calculating compliance with the facility's annual allotment.

The inclusion of regulatory incentives as a trade-off for conservation requirements is controversial. The program to increase the use of renewable water supplies should not be perceived as an alternative to conservation. Although Arizona is currently not directly using all of its Colorado River supplies, this situation is likely to change in the relatively near future. The Code and the series of five management plans require a long-term perspective on supply and demand, and in the long-term, efficient use of all water supplies will be necessary. In fact, shortages are anticipated on the Colorado River system 35 out of the next 100 years. Therefore, it continues to be appropriate to expect that all water users practice conservation.

The groundwater quality management program (Chapter 7) also identifies methods to increase the water supply available in the Pinal AMA by encouraging the use of remediated groundwater.

### 8.5.4 Financial Assistance

The augmentation and conservation assistance fund will provide financial assistance to entities for implementing augmentation projects or conducting studies that contribute to achieving the AMA's management goal or resolving regional water management issues. This fund will also be available to fund projects for monitoring or assessing water availability within the AMA. More detailed information on the augmentation and conservation assistance fund, including how it will be administered during the third management period, can be found in Chapter 9.

### 8.5.5 Technical Assistance, Coordination, and Facilitation

The Department will support augmentation project construction, planning, and research activities during the third management period. Technical assistance will be provided to entities in assessing the need for augmentation projects, determining project feasibility, and reviewing project impacts. Department staff will participate on oversight committees, provide data, and review planning and feasibility study reports. To facilitate research projects, the Department will assist entities by initiating research activities, assisting in study design, providing data, reviewing results, and disseminating information.

Many augmentation activities during the third management period will require the participation of water users, government agencies, and a variety of interest groups. Cooperative efforts among the participants will allow the development of more effective projects and studies. The Department will work with organizations to coordinate and facilitate augmentation activities. Examples of these activities include:

- Developing and implementing a groundwater monitoring program and a regional recharge plan for the Pinal AMA.
- Reviewing plans for additional storage facilities and annual plans of operation for AWBA, the second plan of operation for the CAGRD, and any new augmentation plan for PCWAA.
- Promoting the efficient use of the CAP delivery system.
- Facilitating Indian water rights settlements and leases.
- Streamlining the recharge permitting process and ensuring timely processing and good communication within the Department and between agencies and applicants.
- Continuing to assess the feasibility of weather modification and other augmentation measures.

### 8.5.6 Resolution of Legal and Institutional Barriers

The Department will continue to work with interested parties in the AMAs and around the state during the third management period to draft rules and propose legislation that will resolve legal and institutional barriers to augmentation activities. There are some problems that the Department can address with its existing statutory authorities, such as revising the AWS Rules and the well spacing and impact rules. The Department can also indirectly influence progress in some areas through support of legislation. For some issues, new statutory authorities for the Department may be necessary. Some of the authorities that may be needed by the Department are discussed in section 8.6.

### 8.5.7 Purchase and Retirement of Grandfathered Rights

The possibility of the Department purchasing grandfathered rights and then retiring them is a concept that can be considered for inclusion as a program in the Third Management Plan. Pursuant to A.R.S. § 45-566(A)(9), a grandfathered rights purchase and retirement program cannot be implemented prior to 2006. An annual groundwater withdrawal fee of up to $2.00 per acre-foot can be collected for the purchase and retirement of grandfathered rights beginning in 2006, although the fee cannot be levied until the management plan contains a program for such purposes. A.R.S. § 45-611(C)(4). If the management plan were to include a grandfathered rights purchase and retirement program, it would provide the Pinal AMA with another method for reducing groundwater overdraft and helping to achieve the management goal. Such a program could also be effective in helping to reduce depletions of Indian groundwater supplies caused by off-reservation pumping. The purpose of this section is to analyze those issues that need to be considered in determining the feasibility of developing and implementing a grandfathered rights purchase and retirement program in the AMA.

#### 8.5.7.1 Program Concept

The focus of this analysis is on the purchase and retirement of irrigation grandfathered rights (IGFRs). Although a purchase and retirement program could also legally include Type 1 and Type 2 grandfathered rights, their purchase and retirement would likely be offset by increases in general industrial use permits, thereby defeating the objective of reducing groundwater demand. At a minimum, the program should be limited to those IGFRs that use groundwater exclusively and do not lie in the path of urban development. In addition, IGFRs that would be targeted for purchase and retirement should be required to meet one or more of the following secondary criteria: have high water duties, grow high consumptive use crops, have high land utilization rates, and are in areas historically exhibiting high groundwater decline rates.

#### 8.5.7.2 Potential Groundwater Savings

To analyze the potential groundwater savings that could be realized from an IGFR purchase and retirement program in the Pinal AMA, an estimate was first made of the total withdrawal fees that could be collected by the Department in 2006 assuming: (1) use of a $2.00 per acre-foot withdrawal fee for purchase and retirement, and (2) groundwater and in-lieu groundwater use equivalent to the AMA's average annual groundwater and in-lieu groundwater use from 1990 through 1996. An estimate was next made of the amount of farmland that could be purchased by the Department assuming: (1) use of all of the collected fees, and (2) a purchase cost for farmland equivalent to the representative 1996-1997 price for an acre of farmland in those areas of the AMA that best meet the proposed minimum program criteria. The groundwater savings were then estimated by assuming: (1) a historic groundwater use for the retired farmland equivalent to the representative annual groundwater use per acre for those IGFRs in the AMA that grow high consumptive use crops and have high land utilization rates, and (2) a 20-year benefit period for the groundwater savings, beginning in 2006 and lasting through the end of the fifth management period in 2025. While this information, which is shown in Table 8-6, is useful for analytical purposes, it is unrealistic to assume that the Department would implement an IGFR purchase and retirement program for just one year. Therefore, using the same basic assumptions, the potential groundwater savings that could be realized from alternative IGFR purchase and retirement programs implemented for 5, 10, 15, and 20 years were also analyzed (see Table 8-6).

As shown in Table 8-6, the potential groundwater savings for a five-year program, which would be implemented in 2006 and terminated at the end of the third management period in 2010, are estimated to average 5,832 acre-feet per year, and the average cost associated with the groundwater savings is estimated to be $37.04 per acre-foot. It should be noted that this cost reflects only the Department's costs for purchasing farmland and assumes that: (1) 432 acres of farmland would be purchased each year using the $864,000 of withdrawal fees that were collected during that year, and (2) the 1,296 acre-feet of

groundwater savings resulting from the purchase would continue to accrue on an annual basis from the year of purchase through 2025.

While possible, it is unlikely, that the Department would terminate a purchase and retirement program at the end of the third management period. A more realistic assumption is that the program would be continued for the fourth and fifth management periods. Assuming no change in the price for farmland, the potential groundwater savings for a 20-year purchase and retirement program are estimated to average 13,608 acre-feet per year, with purchase costs averaging $63.49 per acre-foot (see Table 8-6). It is likely, however, that the price for farmland will increase before 2006. Should the price increase by 50 percent, the potential groundwater savings that could be realized from a 20-year program would decrease by 33 percent and the purchase costs would increase by 50 percent.

**TABLE 8-6**
**POTENTIAL GROUNDWATER SAVINGS, 2006-2025**
**ALTERNATIVE IGFR PURCHASE AND RETIREMENT PROGRAMS**
**PINAL ACTIVE MANAGEMENT AREA**

| Program Duration (years) | Total Withdrawal Fees Collected[1] | Total Farmland Purchased and Retired[2] (acres) | Total Groundwater Savings[3] (acre-feet) | Average Groundwater Savings[4] (acre-feet per year) | Average Cost of Groundwater Savings[5] (per acre-foot) |
|---|---|---|---|---|---|
| 1 | $864,000 | 432 | 25,920 | 1,296 | $33.33 |
| 5 | $4,320,000 | 2,160 | 116,640 | 5,832 | $37.04 |
| 10 | $8,640,000 | 4,320 | 200,880 | 10,044 | $43.01 |
| 15 | $12,960,000 | 6,480 | 252,720 | 12,636 | $51.28 |
| 20 | $17,280,000 | 8,640 | 272,160 | 13,608 | $63.49 |

[1] Assumes a $2.00 per acre-foot withdrawal fee for purchase and retirement and 432,000 acre-feet per year of groundwater and in-lieu groundwater use.
[2] Assumes purchase of the farmland in the year the fees were collected and a $2,000 per acre purchase cost.
[3] Assumes 3.00 acre-feet per acre of historic groundwater use and groundwater savings accruing annually through 2025.
[4] Total groundwater savings ÷ 20 years.
[5] Total withdrawal fees collected ÷ total groundwater savings.

Even without considering the costs to manage and maintain the retired farmland, it is clear from the above analysis that saving groundwater in the Pinal AMA through purchase and retirement would be expensive. Other augmentation or demand reduction measures could be more cost effective to implement.

It should also be noted that the potential groundwater savings assume that the retired farmland would not be offset by previously inactive farmland being brought back into production. The possibility of such a "rebound effect" is expected to be high in the Pinal AMA because in most years there is a considerable amount of fallow farmland.

### 8.5.7.3 Land Management and Maintenance Issues

Before an IGFR purchase and retirement program could be developed and implemented in the Pinal AMA, a number of issues involving land management and maintenance would also need to be addressed by the Department. These issues include, but are not limited to:

- Funding for staff and other resources needed to manage the retired farmland
- Liability claims
- Impacts of removing the land from the county and local property tax base
- Control of noxious weeds and dust

#### 8.5.7.4 Program Inclusion Decision

The Department has decided that because there is not a demonstrated need in the Pinal AMA for a grandfathered rights purchase and retirement program, one will not be included in the Third Management Plan at this time. However, if the need arises, the management plan can be modified in the future to include such a program as long as the issues discussed above are addressed.

## 8.6 FUTURE DIRECTIONS

The focus of this chapter has been on defining the Department's role in augmenting the water supplies of the Pinal AMA for the third management period. The augmentation issues summarized in this chapter show that there is continuing need for active participation by the Department in augmentation activities to facilitate achievement of the AMA's water management goal and objectives. An augmentation and recharge program has been developed for the Third Management Plan that will use recommendations to AWBA; the state's recharge program, including recovery location criteria and criteria for non- recoverable storage; regulatory incentives; financial assistance; technical assistance, coordination, and facilitation; and resolution of legal and institutional barriers to enhance the Department's ability to reduce reliance on groundwater and encourage the use of renewable water supplies in the AMA. If needed, the Department may also modify the management plan in the future to include a grandfathered rights purchase and retirement program.

New authorities may be needed by the Department in the future to ensure achievement of the Pinal AMA's water management goal and objectives, including any sub-regional objectives. These authorities include, but are not limited to:

- Providing ability to manage water levels within critical areas by limiting new general industrial use permits, restricting the ways in which new service areas can be established, limiting the number of new Type 1 grandfathered rights, and developing incentives for extinguishing grandfathered rights.

- Developing statutory, management plan, or incentive programs to encourage storage in critical areas with recovery elsewhere, non-recoverable storage, or extinguishment of storage credits.

- Ensuring that all uses associated with a new development, including golf courses, are included in the groundwater allocation under the AWS Rules.

- Addressing the ability for undesignated municipal providers to serve new developments that have demonstrated an assured water supply, while continuing to serve mined groundwater to existing users within their service areas.

- Reducing the amount of groundwater allocated under the AWS Rules to encourage greater use of renewable water supplies and/or extinguishment of grandfathered rights.

- Reexamining the 1,100 foot depth to water limit for determining physical availability under the AWS Rules for consistency with the AMA's management goal as interpreted for the third management period.