FOURTH MANAGEMENT PLAN

PRESCOTT ACTIVE MANAGEMENT AREA

2010-2020

3550 N. Central Avenue, Phoenix, AZ 85012

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CHAPTER ONE:
INTRODUCTION

1.1 INTRODUCTION

In January 2011, the Arizona Department of Water Resources (ADWR) published the *Water Demand and Supply Assessment 1985-2025, Prescott Active Management Area* (Assessment), a compilation and study of historical water demand and supply characteristics for the Prescott Active Management Area (PRAMA) for the years 1985-2006. The Assessment calculated seven water supply and demand projection scenarios through the year 2025. ADWR conducted the Assessment in preparation for promulgation of the *Fourth Management Plan for the Prescott Active Management Area* (4MP) as required by the *1980 Groundwater Management Code* (Code). After publication of the Assessment, ADWR presented a summary of the document at the Groundwater Users Advisory Council (GUAC) for the PRAMA, a five-member council appointed by the Governor to represent the groundwater users in the area and advise the director of ADWR and the Statewide Active Management Area (AMA) director on matters relating to water management within the AMA. ADWR also received and reviewed comments and proposals from the Yavapai County Water Advisory Committee (WAC) and the Citizens Water Advocacy Group (CWAG) during the development of the 4MP for the PRAMA. The 4MP is effective from January 1, 2017 through 2020. The Fifth Management Plan (5MP) will be developed to cover the period from 2020 through 2025.

The management plans assist ADWR in achieving the management goal of each AMA. The statutorily established management goal of the PRAMA is to attain safe-yield, on an AMA wide basis, by the year 2025. Achievement of safe-yield requires that there is a long-term balance between the amount of groundwater pumped from the PRAMA annually and the amount of water naturally and artificially recharged in the PRAMA annually. Groundwater withdrawals in excess of natural and artificial recharge lead to groundwater overdraft. The Code identifies management strategies, such as conservation programs for all major water using sectors, to reduce total groundwater withdrawals in the AMAs and replacing groundwater use with renewable water supplies. Management plans also include optional programs to encourage use of renewable supplies and water management assistance programs. Enforcement provisions and monitoring programs are also included in the management plans. A description of ADWR's overall water management approach for the PRAMA is in this management plan's conclusion.

The statutory management plan process requires ADWR to conduct formal public hearings after completion of the proposed management plan (A.R.S. § 45-570). In these hearings, ADWR presents information in support of the proposed plan and a summary of any GUAC comments on the draft management plan. Before the plan is adopted, the director prepares a written summary and findings of matters considered at the hearing and may adopt the plan as presented or with modifications.

The Assured Water Supply (AWS) Rules, in addition to the management plans, also limit use of groundwater. The Underground Water Storage, Savings and Replenishment Program focuses on use of renewable water supplies and is an important vehicle for achievement of the AMA management goals and ADWR's water management objectives.

1.2 THE ASSURED WATER SUPPLY PROGRAM

The AWS program was created by the Code to preserve groundwater resources and promote long-term water supply planning in the AMAs. AWS statutes and rules limit the use of groundwater by new residential and commercial subdivisions. Every person proposing to subdivide land within an AMA must demonstrate the availability of a 100-year water supply.

In 1995, ADWR adopted the AWS Rules to implement the AWS Program. Under the AWS Rules, developers can demonstrate a 100-year supply by satisfying the criteria described below and either obtaining a Certificate of Assured Water Supply (CAWS) for a new subdivision, from ADWR or by obtaining a written commitment of service from a water provider for which ADWR has issued a Designation of Assured Water Supply (DAWS) for a municipal water provider's water service area.

An AWS demonstration must include proof of the following criteria: 1) that the water supplies will be of adequate quality; 2) that the water supplies will be physically, legally, and continuously available for the next 100 years; 3) that any groundwater use will be consistent with the management goal for the AMA; 4) that any groundwater use will be consistent with the management plan for the AMA; and 5) that the developer or water provider has the financial capability to construct the necessary water storage, treatment and delivery systems. The Arizona Department of Real Estate will not issue a public report that allows the developer to sell lots within an AMA without an AWS demonstration. For more information on the AWS Program, please visit the ADWR website at www.azwater.gov/AzDWR/WaterManagement/AAWS.

ADWR issued a determination in 1999 that the PRAMA was no longer in a state of safe yield. As a result, the AWS Rules require use of primarily renewable supplies, such as reclaimed water, for any new DAWS or CAWS issued in the PRAMA. However, the AWS Rules do allow a certain volume of groundwater to be used. These groundwater allowances are a mechanism to help municipal providers transition from groundwater to renewable supplies.

When a DAWS or CAWS is issued, a groundwater allowance account is established. ADWR credits additional allowable groundwater to these accounts based on a number of factors. The AWS Rules allow for a limited volume of groundwater to be pumped based on formulas for each AMA in the AWS Rules. The amounts of water that may be added to the groundwater allowance account are reduced over time, to zero in 2025 in the PRAMA. Through special legislation, the City of Prescott has an additional groundwater allowance in its DAWS for certain subdivisions that had been preliminarily platted but not finally platted, when the original DAWS for the City of Prescott was issued.

The AWS Rules also allow applicants for a DAWS or CAWS in the PRAMA to add to their groundwater allowance by using grandfathered groundwater right extinguishment credits. Extinguishment credits are issued by ADWR when a grandfathered groundwater rightholder extinguishes either: 1) a type 1 non-irrigation grandfathered right, 2) a type 2 non-irrigation grandfathered right, or 3) an irrigation grandfathered right through a process described in the AWS Rules. The extinguishment credits are calculated differently for each AMA. An applicant for an AWS determination that acquires extinguishment credits can pledge those credits to demonstrate that all or a portion of the applicant projected groundwater use is consistent with the AMA's management goal.

The AWS requirements are only one important tool to help attain the management goal of the AMA. Because the AWS requirements only apply to new subdivisions, additional programs or tools are likely to be required to bring the AMA into safe-yield.

1.3 THE UNDERGROUND WATER STORAGE, SAVINGS AND REPLENISHMENT PROGRAM

Prior to the adoption of the Code, more groundwater was pumped from Arizona's aquifers than naturally recharged back into the aquifers. This imbalance resulted in significant depletion of some aquifers.

Replacing groundwater use with renewable water supplies and recharging renewable water underground reduce this aquifer imbalance. Artificial recharge is also a means of storing available renewable water supplies for future use. Artificial recharge is an increasingly important tool in the management of Arizona's water supplies, particularly in meeting the goals of the Code.

The Arizona Legislature established the Underground Water Storage and Recovery Program in 1986 to allow persons with supplies of renewable water in excess of their demands to store that water underground for recovery at a later time. In 1994, the Legislature enacted the Underground Water Storage, Savings, and Replenishment Act, which further refined the program. Under this program, a person wishing to store, save, replenish, or recover water must secure permits from ADWR. For more information on the Underground Water Storage, Savings and Replenishment Program, please visit the ADWR website at www.azwater.gov/AzDWR/WaterManagement/Recharge.

In many cases, permitted artificial recharge under the Underground Water Storage, Savings and Replenishment Program requires a certain percentage of the recharged volume to be made non-recoverable in order to benefit the aquifer. These required non-recoverable volumes are called *cuts to the aquifer*. The cuts apply to the storage of water for long-term storage credits. They do not apply to water that is stored and recovered annually. In the PRAMA, due to the type of recharge that has occurred and is projected to occur in the future, the total cuts are insignificant as compared to the Phoenix, Pinal and Tucson AMAs. There are only two years in which a cut to the aquifer occurred in the PRAMA. In 2003 and 2004, a combined volume of less than 1,000 acre-feet was accounted as a non-recoverable cut to the aquifer.

1.4 GOVERNMENTAL AND INSTITUTIONAL SETTING

In the PRAMA water management activities are carried out by a number of entities. City, county, and regional government functions include retail water delivery, flood control, wastewater management, water quality management, planning and zoning. Several user groups, advisory committees, citizens' groups and other organizations are involved in developing legislative and policy guidelines and educational programs relating to water resources use and conservation. The GUAC for each AMA advises the Statewide AMA director and agency director on issues relating to groundwater management in the AMA.

The Arizona Water Protection Fund (AWPF) was established in 1994 to provide grant money for projects that protect or restore the state's rivers, streams, and associated riparian habitats. The AWPF may be used to purchase Central Arizona Project (CAP) water or reclaimed water for these purposes. The AWPF Commission, with the ADWR director serving as a nonvoting ex-officio member, oversees the grants process. AWPF staff is located within ADWR.

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

The Arizona Corporation Commission (ACC) regulates the activities of private water companies, particularly rate-setting. The Arizona Department of Real Estate works with ADWR to assure that new subdivisions comply with the AWS requirements.

Federal water management activities in the Prescott area include the US Bureau of Reclamation's appraisal level study referred to as the Central Yavapai Highlands Water Resources Management Study (CYHWRMS). The purpose of the CYHWRMS is to describe and analyze water supply alternatives to satisfy unmet water demand in the study area. It is unknown whether a subsequent feasibility study will follow the CYHWRMS appraisal level study. If alternate water supplies are identified in the appraisal study, and the alternative requires some federal infrastructure, the participants may decide to conduct a feasibility study.

Additional federal water management activities include the Environmental Protection Agency's Superfund and National Pollutant Discharge Elimination System permit programs. The United States Geological Survey (USGS) works independently, and in conjunction with ADWR, in the collection and analysis of hydrologic data in support of improving and understanding the hydrologic system of the Upper and Middle Verde River watersheds. The USGS also completed the Northern Arizona Regional Groundwater Flow Model, through cooperation with the Yavapai County WAC. Lastly, the USGS, ADWR, and Yavapai County cooperatively operate the Yavapai County flood warning system.

1.5 PRAMA WATER MANAGEMENT ISSUES

The PRAMA will continue to face many water management challenges in the fourth and fifth management periods. These include:

- *Physical Availability of Groundwater within the PRAMA*

  The volume of groundwater within the PRAMA considered to be "physically available" under the AWS Rules is close to being fully allocated to AWS determinations. It is possible that during the fourth or fifth management period full allocation of the PRAMA groundwater will be reached. At that time, additional development in the PRAMA will need to be based on either: (1) imported water supplies; (2) direct use of renewable supplies; or (3) underground storage and recovery of renewable water supplies.

- *Consistency with the AMA Goal under the AWS Rules*

  The AWS Rules reduce the volume of groundwater allowance granted to new subdivisions to zero by 2025. Most applicants for a CAWS rely on extinguishment credits to meet the requirement of consistency with the management goal for the 100 year subdivision water demand (minus the groundwater allowance, if any). However, the volume of extinguishment credits that may be generated within the PRAMA is finite, and the maximum potential volume of extinguishment credits also reduces each year under the AWS Rules. If all active grandfathered groundwater rights in the PRAMA had been extinguished in the year 2012, the total volume of extinguishment credits available in the PRAMA would have been about 2,250 acre-feet per year. When all AMA extinguishment credits are exhausted, the options for new subdivision growth would be to avoid use of AMA groundwater by using imported water supplies or renewable water supplies directly, or through the use of AMA long-term or annual storage credits to meet the "consistency with goal" criterion for water withdrawn within the AMA.

- *Financial Capability under the AWS Rules*

Insufficient infrastructure exists in the PRAMA for additional underground storage and recovery projects and water distribution systems, including regional wastewater collection systems. Financing for such construction is needed. If additional renewable supplies will be used for new development, applicants will need to demonstrate the financial capability to construct the necessary infrastructure. Applicants would also have to demonstrate the physical, legal, and continuous availability, as well as water quality, of the renewable or imported supply.

- *Limitations of the Management Plan Authority*

  The regulatory element of the 4MP includes conservation requirements for the municipal, industrial, and agricultural water use sectors. Although conservation is an effective means of managing available water supplies, it is insufficient by itself to bring the PRAMA to safe-yield. Individual water user choices, city and county ordinances, and regional cooperative water management efforts may result in additional progress toward safe-yield but are outside ADWR's authority to require or enforce, except through AWS determinations.

The PRAMA is currently in overdraft. Currently, there is insufficient management plan authority, infrastructure, or financing in place to ensure that safe-yield will be achieved by the year 2025. Surface water is being stored and recovered on an annual basis, but surface water supplies are susceptible to drought and potentially to long-term climate change. An agreement between Salt River Project (SRP) and the City of Prescott provides that some portion of the surface water supply in Watson and Willow Lakes remains in reservoir storage for recreational and other purposes, restricting the use of the full supply even during times of extreme drought. Arizona surface water laws prevent long-term storage of most surface water supplies. Reclaimed water is being stored for long-term storage credits or used directly for landscape and turf irrigation. The feasibility of water supply augmentation through rainwater harvesting is being studied and may be implemented in the future. However, a significant number of lots that were platted prior to the 1999 Declaration of the PRAMA being in an overdraft situation may still develop within the PRAMA and use groundwater without any investment in renewable water supplies. Importation of water supplies from outside the PRAMA or other water management techniques to augment the AMA water supply are critical to the PRAMA achieving its safe-yield goal.

1.6 PRAMA 4MP PROGRAMS

The 4MP primarily addresses water conservation, underground storage and recovery, and water management assistance for the years 2017 through 2020. Statutory guidelines provided in A.R.S. §§ 45-567, 567.01 and 567.02 direct that the following components shall, or may, be included in the 4MP:

- Irrigation water duties or intermediate irrigation water duties for Agricultural users
- Historic cropping program for Agricultural users
- Agricultural Best Management Practices Program
- A Non-Per Capita Conservation Program for Municipal Providers
- A Total Gallons Per Capita per Day (GPCD) Program for Municipal Providers
- Monitoring and distribution system requirements for Municipal Providers
- Additional conservation requirements for non-irrigation uses

In addition, ADWR has updated the water quality assessment that was included in the Third Management Plan (3MP) for the 4MP. The assessment discusses how ADWR proposes to manage the AMA's water supplies pursuant to the Code, the 4MP, the AWS Rules, and the Underground Water Storage, Savings

and Replenishment Program. The regulatory requirements for groundwater users and water distribution systems are printed in italics for easy reference and are located at the ends of Chapters 4, 5, 6 and 8.

1.7 CONCLUSION

The 4MP outlines the region's water management needs and presents ADWR's blueprint for working with water users to achieve the PRAMA's water management goals and objectives. Continued commitment from ADWR and the public is necessary to reduce dependence on groundwater and achieve the statutorily established water conservation goals. With the support of the community, ADWR can respond to changing water issues and needs while maintaining technical assistance and regulatory programs that ensure a dependable water supply for Arizona's future.

CHAPTER TWO:
HYDROLOGY

2.1 GEOGRAPHY

The Prescott Active Management Area (PRAMA) encompasses 485 square miles in Yavapai County Arizona. It lies within the Central Highlands physiographic province and is typified by gently rolling topography with broad sloping alluvial basins and fault-block mountains (Figure 2-1). Elevations range from about 4,400 feet above sea level in the valleys to about 7,800 feet above mean sea level (AMSL) in the Bradshaw Mountains. Native vegetation varies from high desert grassland in the basin areas to coniferous forest in the surrounding mountains.

The PRAMA consists of two sub-basins, the Little Chino (LIC) and the Upper Agua Fria (UAF), which are bisected by a surface drainage divide. Granite Creek and Willow Creek comprise the major tributaries draining the Little Chino Sub-basin into the Verde River. Lynx Creek and the Agua Fria River drain the Upper Agua Fria Sub-basin. With the exception of small perennial stretches at Del Rio Springs and along a short reach of the Agua Fria River in the vicinity of Humboldt-Dewey, all surface drainage in the PRAMA is either ephemeral or intermittent. The Little Chino Sub-basin encompasses the northwestern half of the PRAMA, while the Upper Agua Fria Sub-basin covers the southeastern half of the PRAMA.

2.2 CLIMATE

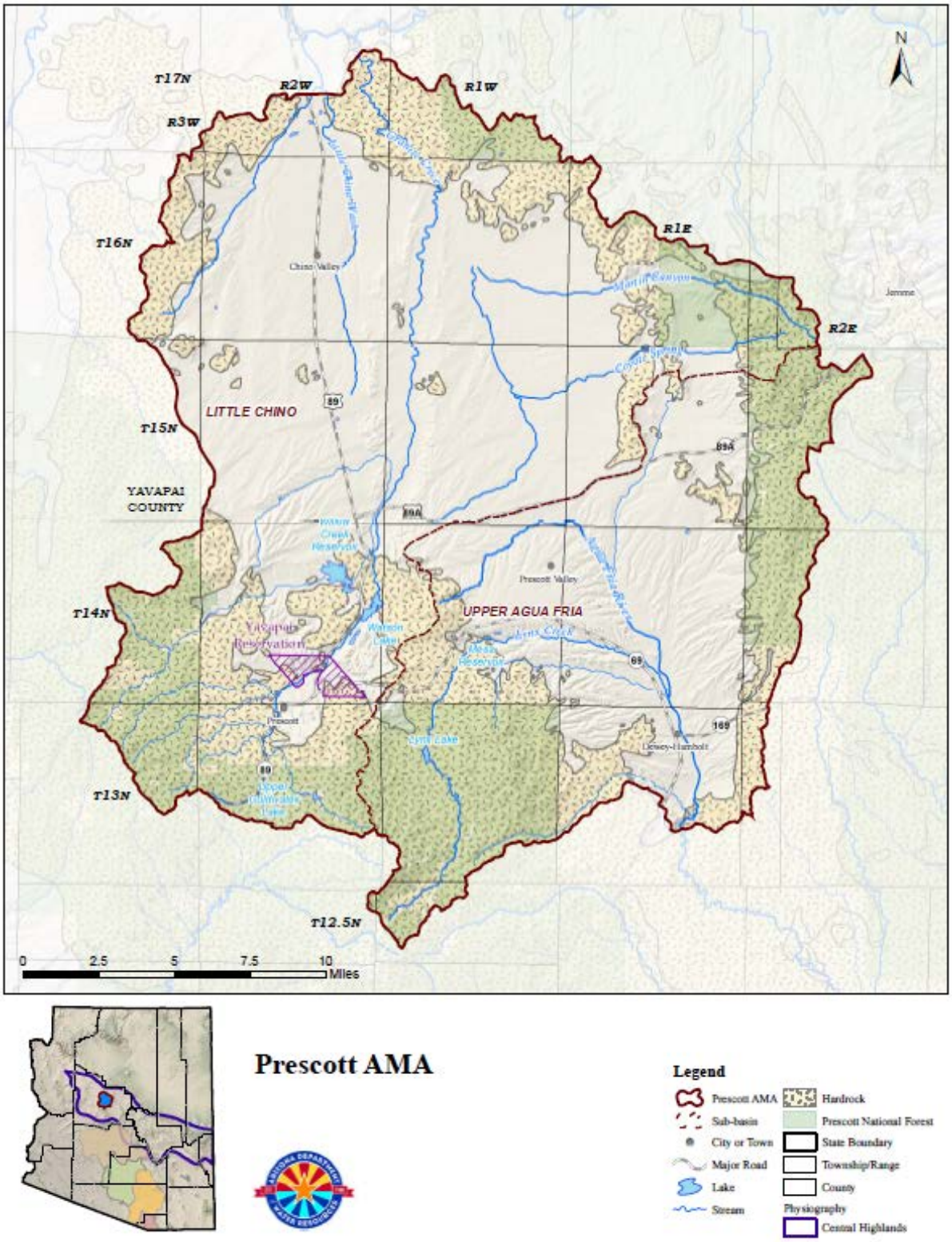
Annual precipitation is not uniformly distributed throughout the PRAMA. The distribution of precipitation in the PRAMA is influenced by elevation and orographic effects. In general, precipitation is highest in the upper elevations of the mountains that define the basin and lowest in the valleys.

Annual precipitation statistics for the Prescott weather station #026796 were reviewed for the 4MP. Since 1948, the station has apparently been located in a few different locations in the Prescott area that have a range of elevations from 5,515’ AMSL to 5,205’ AMSL. Current station location is at elevation of 5,205’ AMSL. Historical precipitation data for the PRAMA indicate that over a 110-year period of record (1899-2010), the mean annual precipitation rate in the PRAMA was 18.8 inches per year, with a median rate of 17.8 inches per year. Annual precipitation varies considerably. A shorter-term average taken from 2000-2009 is 14.5 inches per year and reflects the impacts of drought. There is a bimodal distribution throughout the year. The summer rainfall season, ranging from May to September, produced a long-term average rainfall of about 8.5 inches per year. Most of this seasonal rainfall typically occurs during the monsoon season (June-September), when long-term rainfall averaged about 7.6 inches per year. Significant precipitation also results from winter frontal storm events that often develop across northern and central portions of Arizona, although the frequency and intensity of these storms vary substantially year to year and from location to location.

Chino Valley precipitation is measured at station #021654. Over time, this station has also changed locations. The locations for this station in the Chino Valley area range in elevations from 4,750’ AMSL to 4,672’ AMSL. The current station location is at an elevation of 4,750’ AMSL. Average annual precipitation near Chino Valley is lower than it is near the City of Prescott. From 1941 to 2009, Chino Valley received an average of 11.5 inches of precipitation per year. Unfortunately, complete annual precipitation records are unavailable for most years after 1981. Given the lack of data during a dry period, this average likely is higher than if the full 58-year period were available. Chino Valley’s lower rainfall is partially attributed to its lesser average annual snowfall amounts compared to what occur in the City of Prescott.

Much of Arizona has experienced prolonged drought conditions since 1995. From 2002 to 2004, many parts of the state experienced exceptional drought conditions. Bark beetle infestations and wildfires caused major damage statewide, including portions of the PRAMA. Long-term drought conditions ranged from moderate to severe in the PRAMA from 2006 to 2010. Continued drought has the potential to impede efforts to provide a safe and secure supply of water to the water users of the PRAMA.

FIGURE 2-1
PRESCOTT ACTIVE MANAGEMENT AREA



2.3 SURFACE WATER RESOURCES

The surface water system in the PRAMA is characterized by numerous ephemeral streams, which flow only in direct response to precipitation or snowmelt, that carry snow melt and rainfall from the mountains that bound the PRAMA. Much of the ephemeral stream flow reaching the basins of the PRAMA infiltrates and recharges the underlying groundwater system before exiting the basins. However, some stream flow does exit the PRAMA along both Granite Creek and the Agua Fria River depending on the magnitude and timing of runoff.

Granite Creek, Willow Creek, Little Chino Creek, Lonesome Valley Draw, and Big Draw are the primary ephemeral streams which drain the mountains of the Little Chino Sub-basin (Figure 2-1). Granite Creek and Willow Creek drain the southwestern portion of the PRAMA. Dams were constructed on both Granite Creek (1914) and Willow Creek (1939), forming Watson Lake and Willow Lake, respectively. In 1998 Chino Valley Irrigation District's (CVID) surface water rights were severed and transferred to the City of Prescott for municipal use within the City's water service area, and non-consumptive (in situ) use for recreation, and wildlife, including fish for water held in storage

During periods of prolonged precipitation and flooding, flows from these lakes join at the confluence of Granite and Willow Creeks and then flow northward to join the Verde River several miles southeast of Paulden. Such flow events can provide significant recharge to the groundwater system when they occur. Little Chino Creek and Big Draw drain the northwestern part of the Little Chino Sub-basin. Little Chino Creek drains the CVID area and flows into the Del Rio Springs area where these surface flows join the groundwater discharge from the springs. In this area, spring discharge provides near-permanent baseflow conditions below the springs. Lonesome Valley Draw drains the eastern half of the Little Chino Sub-basin.

Lynx Creek and the Agua Fria River are the primary surface water drainages in the Upper Agua Fria Sub-basin of the PRAMA. Flow on Lynx Creek is normally impounded by Lynx Creek Dam at Lynx Lake, constructed for recreational purposes in 1952. Stream flow in Lynx Creek below Lynx Lake provides recharge to the Upper Agua Fria Sub-basin and, if substantial, joins the Agua Fria River near Highway 89 about 2 miles north of Dewey. Below its confluence with Lynx Creek, the Agua Fria River flows in a southerly direction, exiting the PRAMA southeast of Humboldt. Perennial to intermittent flow conditions exist along portions of the reach of the Agua Fria River between the Prescott Valley Wastewater Treatment Facility and the Dewey area. Perennial baseflow conditions exist south of Dewey where the alluvial aquifer pinches out against the basement unit and groundwater is discharged to the channel of the Agua Fria River near Humboldt.

TABLE 2-1
SUMMARY OF SELECTED USGS ANNUAL STREAM GAGE DATA
PRAMA AND VICINITY

	Granite Creek below Watson Lake near Prescott 9503300	Del Rio Springs near Chino Valley 9502900	Agua Fria River near Humboldt 9512450	Verde River Near Paulden 9503700
Long-Term Mean (CFS)	4.4	1.5	5.7	43.7
Long-Term Mean (AF/YR)	3,208	1,054	4,096	31,658
Long-Term Median (CFS)	1	1.4	4.5	28.4
Long-Term Median (AF/YR)	705	1,021	3,252	20,556
Number of Years in LT Record	11	14	10	47
Earliest Year of Record	2000	1997	2001	1964

Table 2-1, provides a summary of USGS annual stream flow data available for selected gages in and near the PRAMA.

2.4 HYDROGEOLOGIC UNITS AND AQUIFER CHARACTERISTICS

The Little Chino Sub-basin comprises the northwestern portion and the Upper Agua Fria Sub-basin comprises the southeastern portion of the PRAMA. The geologic structure of these sub-basins is characterized as a deep structural trough that extends north-northwest for a distance of about 25 miles from near Humboldt in the southern part of the Upper Agua Fria Sub-basin, to near Del Rio Springs in the northern part of the Little Chino Sub-basin. The trough was formed by basin-and-range faulting and warping in both sub-basins, which gradually filled with alluvial sedimentary and volcanic rocks.

In many areas, the basin-fill deposits contain groundwater and host a productive aquifer system. The aquifer system in the PRAMA is defined by three hydrogeologic units, the Basement Unit, the Lower Volcanic Unit, and the Upper Alluvial Unit. Figure 2-2 is a conceptual drawing showing groundwater flow within these hydrogeologic units.

2.4.1 Basement Unit

The Basement Unit (BU) is composed of a variety of igneous and metamorphic rocks that are generally dense, non-porous, and nearly impermeable (Wilson, 1988). It forms the impermeable floor and sides of the sub-basins and is exposed at the land surface throughout the mountainous areas which surround the sub-basins. There are a large number of domestic wells tapping into fissures and cracks in the Basement Unit. However, the Basement Unit has very limited groundwater storage and production capacity, and is not regarded as a viable aquifer for other than domestic purposes. The Basement Unit generally underlies the Lower Volcanic Unit within the Little Chino Sub-basin, and underlies the Upper Alluvial Unit in most of the Upper Agua Fria Sub-basin.

2.4.2 Lower Volcanic Unit

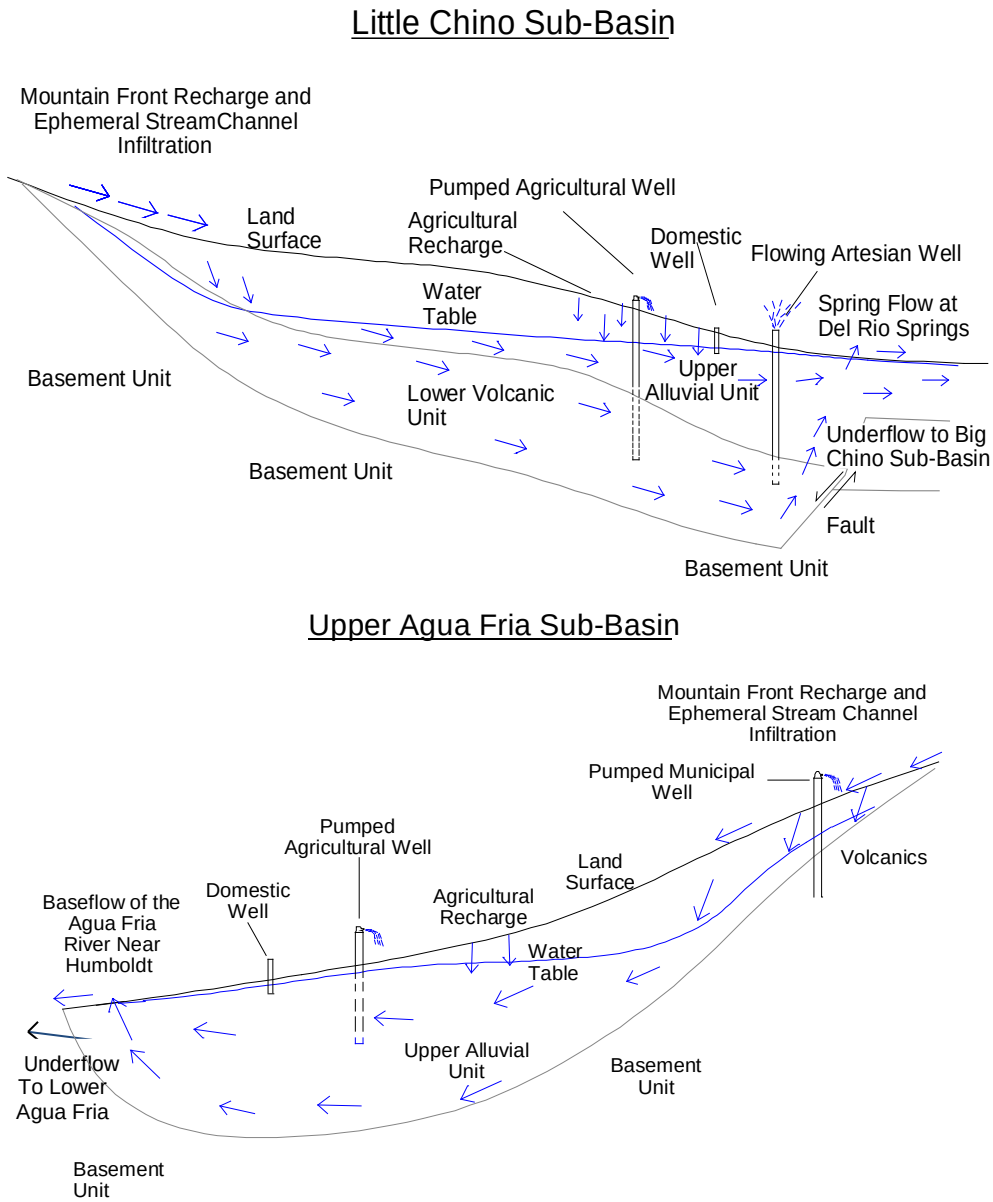
The Lower Volcanic Unit (LVU) overlies the Basement Unit in most of the Little Chino Sub-basin. It is composed of a thick sequence of basaltic and andesitic lava flows inter-bedded with layers of pyroclastic and alluvial material. The Lower Volcanic Unit, sometimes referred to as the basalt aquifer or layer, forms a highly productive confined (artesian) aquifer in the northwestern portion of the Little Chino Sub-basin. Many high-capacity irrigation wells (1,000-3,000 gallons per minute) tap into this aquifer system. Some of these high-capacity wells are included in the Prescott municipal well field, while a number are used for agricultural irrigation in and around the CVID.

The areal extent of the Lower Volcanic Unit is not well known in many other parts of the PRAMA. However, a high capacity production well has been drilled into volcanic deposits located near the City of Prescott airport recharge facility. Productive volcanic deposits have also been penetrated by some of the wells drilled in the Lonesome Valley and Prescott Valley areas. The total thickness of the Lower Volcanic Unit is not well known, except at a few locations where wells have been drilled through the unit's entire thickness. The productive thickness of the Lower Volcanic Unit is estimated to range from less than 100 feet up to several hundred feet. These estimates are based on the average depth-of-penetration of wells that tap water from the Lower Volcanic Unit and from depth-to-bedrock maps produced from gravity data (Oppenheimer & Sumner, 1980). Depth to bedrock in the PRAMA area is estimated by a variety of data and reports including: (Oppenheimer & Sumner, 1980), (Krieger, 1965); (Langenheim & etal, 2005).

A thick sequence of fine-grained materials overlies the Lower Volcanic Unit in much of the PRAMA. These deposits tend to restrict the vertical movement of groundwater, limiting groundwater flow to the cracks or fractures in these volcanic deposits (i.e., secondary porosity). Natural recharge to the Lower Volcanic Unit aquifer occurs mainly through infiltration of runoff in ephemeral stream channels and along the mountain fronts of the Little Chino Sub-basin. In unconfined areas, where the overlying Upper Alluvial Unit aquifer is unsaturated, recharge may directly reach the water table through deep percolation. In outlying areas, where the Upper Alluvial Unit aquifer is saturated and confining layers do not exist,

recharge may reach the Lower Volcanic Unit aquifer through vertical groundwater flow. In other small areas where there are basalt outcrops, precipitation may move downward through openings and crevices to reach the Lower Volcanic Unit aquifer (Schwalen, 1967). Other sources of recharge to the Lower Volcanic Unit aquifer include incidental recharge from irrigation, canal seepage, and Prescott's artificial recharge project in the southwestern portion of the Little Chino Sub-basin.

FIGURE 2-2
CONCEPTUAL MODEL OF GROUNDWATER FLOW
PRAMA AQUIFER SYSTEM



Natural discharge from the Lower Volcanic Unit out of the PRAMA occurs at two locations in the Little Chino Sub-basin. Near Del Rio Springs, the hydraulic head or pressure in the Lower Volcanic Unit is greater than the head in the Upper Alluvial Unit. In this vicinity, groundwater flows upward from the Lower Volcanic Unit and is eventually discharged to the surface at Del Rio Springs. Minor groundwater underflow may also leave the PRAMA through the bedrock gap just northwest of Del Rio Springs.

2.4.3 Upper Alluvial Unit

The alluvial unit contains both saturated and unsaturated rock. The Upper Alluvial Aquifer is limited to the saturated deposits. Thick deposits of sedimentary and volcanic rocks fill the deep structural trough which extends northwest-southeast across the entire length of the Little Chino and Upper Agua Fria Sub-basins. These rocks are collectively referred to as the Upper Alluvial Unit. Where saturated, the Upper Alluvial Unit constitutes the main, unconfined aquifer in the PRAMA.

Natural recharge to the Upper Alluvial Unit is derived from the infiltration of runoff in ephemeral stream channels and along the mountain fronts of the PRAMA. Agricultural irrigation also recharges the Upper Alluvial Unit. Artificial recharge of reclaimed water at the City of Prescott's airport recharge site, Prescott Valley's Agua Fria Recharge Facility, and the Town of Chino Valley's Old Home Manor Recharge Facility are other sources of aquifer replenishment.

Production capacities vary substantially for wells in the Upper Alluvial Unit. In many instances, the yields are governed more by pump size (limited by well diameter) than the aquifer's ability to produce water (Remick, 1983). In the Little Chino Sub-basin, the Upper Alluvial Unit has been tapped mainly by numerous small-capacity domestic wells with less than 35 gallons-per-minute (gpm) capacity. In the Upper Agua Fria Sub-basin, in addition to shallow domestic wells, large agricultural and municipal wells with pump capacities ranging from 100 to 3,000 gpm also tap into this aquifer (Wilson, 1988); (Wellendorf, 1994).

Natural discharge from the Upper Alluvial Unit occurs at three locations in the PRAMA. In the Little Chino Sub-basin, natural discharge occurs as spring flow at Del Rio Springs and as underflow through a bedrock gap located immediately to the northwest of Del Rio Springs. In the Upper Agua Fria Sub-basin, natural discharge occurs as perennial baseflow along the Agua Fria River near Humboldt. Recent groundwater modeling studies also indicate that there may be some groundwater underflow from the Upper Agua Fria Sub-basin through cracks and faults within the Basement Unit in the Humboldt area.

2.5 GROUNDWATER RESOURCES

2.5.1 Historical Water Use

Groundwater withdrawals haves impacted groundwater conditions in the PRAMA since the early 1940s when the use of artesian water from flowing wells and groundwater pumping for irrigation in the Little Chino sub-basin began to cause seasonal impacts (water level declines and reductions in spring discharge) that became a matter of concern to water users (Schwalen, 1967). Groundwater pumping for irrigation purposes in the Upper Agua Fria Sub-basin may have occurred as early as 1936 (Wigal, 1988).

Use of groundwater for irrigation in the Little Chino Sub-basin continued to increase from the 1940s to the 1970s, resulting in significant local water level declines. Groundwater use for irrigation peaked in the 1960s, and diminished through the 1970s and 1980s (Corkhill & Mason, 1995). Between 2000 and 2010, groundwater pumping for agriculture averaged about 3,400 acre-feet per year in the PRAMA. By 2010, groundwater pumping for agriculture had decreased to about 1,600 acre-feet.

Groundwater pumping for municipal use (including domestic well pumping) has increased with population growth. The City of Prescott was unable to supply itself with local supplies since at least the late 1940s and began to pump and import groundwater from the Chino Valley area. Since that time, municipal pumping by the City of Prescott, the Town of Prescott Valley and numerous other smaller water providers and domestic wells have contributed to overall water level declines in the PRAMA. Between 2000 and 2010, groundwater pumping for municipal purposes averaged about 14,600 acre-feet per year. In 2010, municipal groundwater pumping was roughly 13,000 acre-feet.

During the last two decades, the City of Prescott (Airport Recharge Facility) and the Town of Prescott Valley (Agua Fria Recharge Facility) began to recharge and directly use reclaimed water. Recharge and any direct use(s) of reclaimed water that may have replaced existing groundwater uses have contributed to local groundwater recoveries. From 2000 to 2010, the direct use of reclaimed water averaged about 1,700 acre-feet per year, and the 2010 total was about 1,900 acre-feet. During the last decade the City of Prescott also recharged some surface water (from the Granite and Willow Creek watersheds) at its Airport Recharge Facility. Some of the credits earned from those recharge activities were later recovered by CVID wells for farming activities within the district. Since 2005, the Town of Chino Valley has also recharged about 600 acre-feet of reclaimed water at its Old Home Manor Recharge Facility.

Groundwater use for industrial purposes also impacts groundwater levels. Between 2000 and 2010, industrial groundwater pumping averaged about 1,400 acre-feet per year. In 2010, industrial groundwater pumping was about 1,100 acre-feet. Most of the industrial groundwater use in the PRAMA is by turf-related facilities or by facilities that have no specific conservation requirements in the management plan, which ADWR refers to in the Assessment budget template as “Other” industrial users.

2.5.2 Net Recharge

Groundwater recharge is an important component of the water budget of the PRAMA. When groundwater recharge exceeds groundwater pumping in an area, water levels will rise. For the purposes of this discussion, recharge is comprised of the following natural and incidental components: (1) mountain front recharge, (2) stream channel recharge, (3) groundwater underflow (outflow), (4) groundwater discharge, (5) riparian evapotranspiration (ET), (6) canal recharge and (7) agricultural return flow (agricultural recharge).

The major sources of natural recharge in the PRAMA are (1) mountain front recharge and (2) stream recharge along major tributaries including portions of Granite Creek, Lynx Creek and the Agua Fria River. Mountain front recharge is estimated to occur at a long-term fixed rate of 2,930 acre-feet per year along the periphery of the LIC and UAF Sub-basins. Observation data and groundwater modeling indicates that most natural recharge enters the groundwater flow system along major tributaries and ephemeral streams. Ephemeral stream channel recharge is temporally variable, and occurs during periods of moderate to significant stream flow along major tributaries.

Recent analysis of annual stream flow data conducted by ADWR provided updated estimates for years when significant stream flow was available for recharge on the major drainages in the PRAMA (Nelson, 2012). Based on this analysis, estimates of annual runoff to major drainages were input into the ADWR - PRAMA groundwater flow model to develop model-calculated estimates of stream channel recharge. The results of this effort generally indicated higher rates of sporadically applied ephemeral stream channel recharge provided a better model calibration. Based on the available data, periods of significant natural recharge from ephemeral stream flows occurred in the late 1970s and early 1980s, 1993 and the winter of 2004/2005. Alternatively, periods of minimal/negligible stream recharge occurred between the early 1940s and the mid-1960s, and from mid-1995 to late-2004 (Nelson, 2012). Annual estimates of natural recharge for the period from 1985 to 2010 are listed in Table 2-2. We believe the long-term average of ephemeral channel recharge reasonably captures the magnitude of this process. However, inherent data limitations limit/compromise the accuracy of the annual estimates.

Groundwater in the UAU and LVU flows from the Little Chino Sub-basin out of the PRAMA to the Big Chino Sub-basin northwest of Del Rio Springs. Some underflow may also occur in saturated carbonate rocks that underlie the western Sullivan Buttes in that same general area. Recent modeling results also indicate that some underflow may leave the Upper Agua Fria Sub-basin in the Humboldt area through faults and cracks in basement Unit rocks. Model estimates of net groundwater underflow out of the PRAMA in these areas are listed in Table 2-2.

TABLE 2-2
COMPONENTS OF NET RECHARGE (AF)
PRAMA 1985-2010

	Year	Natural Components of GW Recharge and Discharge					Incidental Recharge	Net Recharge [7]
		Mountain Front Recharge [1]	Stream Channel Recharge [2]	GW Underflow Outflow [3]	GW Discharge [4]	Riparian ET [5]	AG Recharge [6]	
Historical Period	1985	2,930	62	2,831	3,886	769	10,494	6,000
	1986	2,930	92	2,831	3,346	767	8,235	4,313
	1987	2,930	122	2,815	3,117	766	7,021	3,375
	1988	2,930	13,482	2,815	2,990	759	6,975	16,823
	1989	2,930	182	2,811	2,653	763	3,964	849
	1990	2,930	165	2,796	2,417	764	3,020	138
	1991	2,930	13,468	2,773	2,357	763	7,161	17,667
	1992	2,930	13,444	2,763	2,490	764	7,365	17,722
	1993	2,930	33,185	2,766	3,139	766	9,586	39,030
	1994	2,930	125	2,733	2,666	766	4,604	1,495
	1995	2,930	26,889	2,725	3,017	766	8,873	32,185
	1996	2,930	116	2,737	2,685	766	4,074	933
	1997	2,930	130	2,718	2,373	765	5,528	2,731
	1998	2,930	13,384	2,705	2,447	765	3,344	13,741
	1999	2,930	107	2,708	2,635	767	4,283	1,209
	2000	2,930	134	2,694	2,279	765	4,684	2,010
	2001	2,930	149	2,647	2,045	766	3,283	903
	2002	2,930	172	2,627	1,870	765	3,814	1,655
	2003	2,930	187	2,607	1,775	765	2,127	97
	2004	2,930	208	2,636	1,730	764	2,495	503
	2005	2,930	35,500	2,627	2,448	766	1,651	34,240
	2006	2,930	144	2,655	2,380	766	1,423	-1,303
	2007	2,930	164	2,662	2,148	765	1,934	-547
	2008	2,930	13,420	2,649	1,912	765	2,180	13,205
	2009	2,930	165	2,633	1,779	766	1,911	-172
	2010	2,930	23,738	2,629	2,098	766	1,228	22,403

Notes:
[1] Mountain Front Recharge Estimates from ADWR Prescott Model Update 2012.
[2] Stream Channel Recharge Estimates from ADWR Prescott Model Update 2012 (Includes Granite Creek, Lynx Creek and Agua Fria River).
[3] Groundwater Underflow Estimates from ADWR Prescott Model Update 2012 (Includes Outflow from LIC to BIC and UAF to AF).
[4] Groundwater Discharge Estimates from ADWR Prescott Model Update 2012 (Includes Del Rio Springs and Agua Fria River near Humboldt).
[5] Riparian ET Estimates from ADWR Prescott Model Update 2012 (Includes Del Rio Springs and Agua Fria River near Humboldt).
[6] Agricultural Recharge Estimates from ADWR Ag Water Use Data (Assumes Irrigation and Canal Recharge as 50% of Total AG Water Use).
[7] Net Recharge = All Recharge Components - All Discharge Components.

Groundwater discharge occurs in the Little Chino Sub-basin at Del Rio Springs and in the Upper Agua Fria Sub-basin in the channel of the Agua Fria River near Humboldt. Model estimates of groundwater discharge at these locations are listed in Table 2-2. Evapotranspiration occurs in riparian zones co-located in these areas where groundwater discharge occurs. Groundwater model estimates of riparian evapotranspiration are also listed in Table 2-2.

Estimated incidental recharge from agricultural irrigation in both the LIC and UAF Sub-basins is presented in Table 2-2. Incidental agricultural recharge was estimated at 50 percent of the total reported agricultural water applied from both groundwater and surface water sources (Corkhill & Mason, 1995). Comparison of the agricultural recharge estimates presented in Table 2-2 to modeling estimates that also include CVID canal recharge were very similar. This is mainly due to the fact that both estimates assume 50 percent irrigation efficiencies for groundwater and surface water applied, and canal recharge was estimated to be zero after 1999, when the City of Prescott purchased the rights to water in Watson and Willow Lakes, and canal deliveries were discontinued to the CVID.

Table 2-3 presents projections of future groundwater recharge and discharge for the period 2011 to 2025. For the most part, these estimates were derived by extrapolating current estimated recharge and discharge rates into the future (Nelson, 2012). Projections of future ephemeral stream channel recharge were developed by analyzing historic "wet" and "dry" periods that included dry (1940-1953), average (1963-1976 and 1994-2007), and wet (1973-1986) epochs. Further information on these projections is provided in the water budget and planning sections presented Chapter 11 of this Plan.

TABLE 2-3
COMPONENTS OF NET NATURAL RECHARGE (AF)
PRAMA 2011-2025

	Year	Natural Components of GW Recharge and Discharge						Incidental Recharge	Net Recharge	
		Mountain Front Recharge	Stream Channel Recharge		GW Underflow Outflow	GW Discharge	Riparian ET	AG Recharge		
			Dry Scenario [2]	Wet Scenario [3]					Dry Scenario	Wet Scenario
Projection Period [1]	2011	2,930	0	35,461	2,951	2,364	766	1,228	-1,923	33,538
	2012	2,930	30,033	0	2,951	2,339	766	1,228	28,135	-1,898
	2013	2,930	0	0	2,941	2,314	766	1,228	-1,863	-1,863
	2014	2,930	0	0	2,931	2,289	766	1,228	-1,828	-1,828
	2015	2,930	0	0	2,921	2,264	766	1,228	-1,793	-1,793
	2016	2,930	0	29,557	2,911	2,239	766	1,228	-1,758	27,799
	2017	2,930	0	26,858	2,901	2,214	766	1,228	-1,723	25,135
	2018	2,930	0	38,755	2,891	2,189	766	1,228	-1,688	37,067
	2019	2,930	0	0	2,881	2,164	766	1,228	-1,653	-1,653
	2020	2,930	0	26,190	2,871	2,139	766	1,228	-1,618	24,572
	2021	2,930	0	24,835	2,861	2,114	766	1,228	-1,583	23,252
	2022	2,930	0	0	2,851	2,089	766	1,228	-1,548	-1,548
	2023	2,930	0	0	2,841	2,064	766	1,228	-1,513	-1,513
	2024	2,930	24,677	0	2,831	2,039	766	1,228	23,199	-1,478
	2025	2,930	0	0	2,821	2,014	766	1,228	-1,443	-1,443

Notes:
[1] Projection Estimates Based on ADWR Modeling Section Analysis of Future GW Conditions in the PRAMA Dry Scenario From ADWR Modeling Section Analysis of 1940 to 1953 Time Period Wet Scenario From ADWR Modeling Section Analysis of 1973 to 1986 Time Period.
[2] Stream Channel Recharge Estimates from ADWR Prescott Model Update 2012 (Includes Granite Creek, Lynx Creek and Agua Fria River).
[3] Groundwater Underflow Estimates from ADWR Prescott Model Update 2012 (Includes Outflow from LIC to BIC and UAF to AF).

2.6 GROUNDWATER CONDITIONS

2.6.1 Sources of Groundwater Data

Aquifer water levels reflect the collective impacts of various applied stresses (pumping and recharge) and the influence of existing boundary conditions, including, but not limited to, the following:

evapotranspiration, groundwater discharge to springs and streams, and groundwater underflow to and from adjacent groundwater basins. Groundwater level measurements provide important information on groundwater trends and changing aquifer storage conditions. Water level data has collected for many years from a number of wells in the PRAMA, including a few with records dating back to the 1930s and 1940s. The ADWR Hydrology Division's Field Services Section - Basic Data Unit collects groundwater-level data using both conventional field methods and automated technology.

Annual water-level measurements are collected manually from a select group of wells across the state referred to as Index Wells. Basic Data staff collects data from these wells using electric sounders or steel tapes facilitating collection of discrete measurements on a specified schedule (normally, annual water level measurements are made between January and March in the PRAMA). Between 2000 and 2010, ADWR collected an average of 169 water level measurements per year in the PRAMA. ADWR also collects continuous water-level data at dedicated index well sites using automated groundwater monitoring devices (transducers, bubblers and shaft encoders) that take measurements on a predefined frequency. ADWR uses both real-time (satellite-linked) and non-real-time automated recording systems. ADWR currently maintains and operates 16 automated water level monitoring sites in the PRAMA. All water-level data collected by ADWR's Basic Data Unit are uploaded and stored in the ADWR's Groundwater Site Inventory (GWSI) database. Figure 2-3 shows both index well and automated site locations within the PRAMA as of 2012.

2.6.2 Water Level Trends (1994 to 2009/2010)

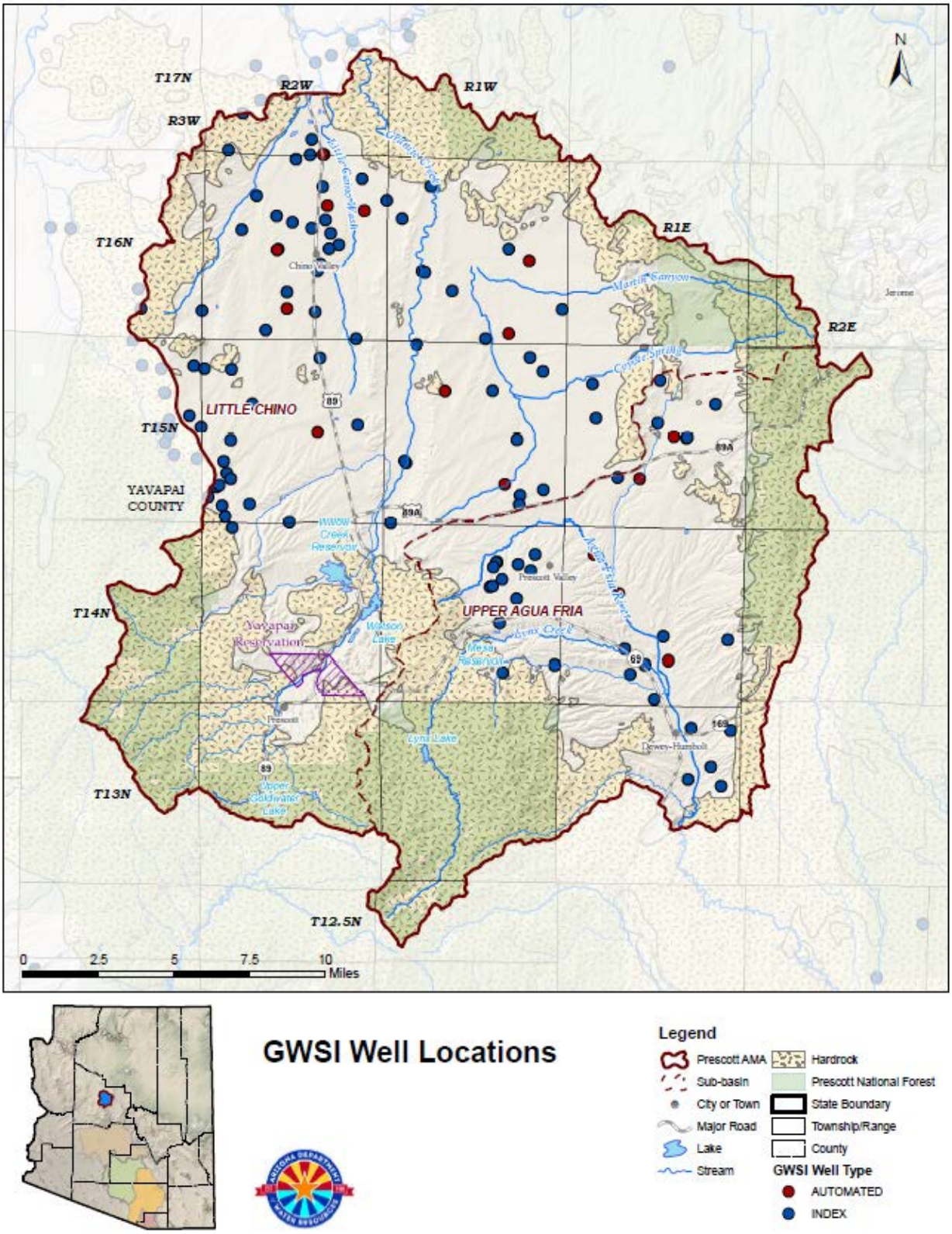
From 1994 to 2010, water levels were impacted by several important factors, including: groundwater withdrawals; recharge from flood flows on major drainages; recharge of treated reclaimed water by the City of Prescott, the Towns of Prescott Valley and Chino Valley; and drought. Water levels were measured in 35 wells in the LIC and 20 wells in the UAF Sub-basins between 1994 and 2009/2010. Analysis of the data for these wells evidences that 31 of the 35 wells measured in the LIC Sub-basin experienced water level declines, with an average rate of water level decline of -1.4 feet/year over the period from 1994 to 2009/2010. The 4 wells that experienced water level rises in the LIC for the same period had an average rate of rise of +0.9 feet/year. The average rate of water level decline for the 14 wells that declined in the UAF Sub-basin was -1.4 feet/year and the average rate of water level rise for the 6 wells showing rises was +0.2 feet/year (Figure 2-4). Representative hydrographs from selected wells are shown in Appendix 2-1. Additional information concerning water level changes in the PRAMA, and in other areas of the State, can be found in ADWR's 2012 Statewide Hydrologic Monitoring Report (ADWR, 2012).

Trends in measured water levels reflect the aquifer system's collective response to a number of important factors which include:

- Overall water use (groundwater and surface water, as it may impact groundwater use)
- Incidental recharge (from groundwater and surface sources)
- Precipitation and natural recharge
- Artificial recharge activities
- Use of reclaimed water (as it may replace existing groundwater use)
- Water conservation

Water level trends in the PRAMA for the period from 1994 to 2010 include declining water levels in most of the PRAMA and significant water level recovery in one area where a major change in municipal pumping patterns occurred (Figure 2-4).

FIGURE 2-3
INDEX AND AUTOMATED WELL LOCATIONS
PRESCOTT ACTIVE MANAGEMENT AREA



In the northern part of the Little Chino Sub-basin north of the Town of Chino Valley, water levels were observed to decline about 20 to 30 feet over the period from 1994 to 2010 (see Appendix 2-1, Figures 2-7A, 2-7B, 2-7F and 2-7G, for example). Water level declines in this area were mainly caused by groundwater pumping at the City of Prescott's Chino Valley well field and by agricultural, minor industrial and domestic pumping in the same general area. Historically, groundwater pumping in this area has caused once flowing artesian wells to cease flowing and groundwater discharge from Del Rio Springs to decline (United States Geological Survey, 2012). East of Chino Valley, as shown in Appendix 2-1, Figure 2-7E, a well located along Granite Creek showed impacts of recharge from sporadic storm flow events in 1993 and 2005. Further south along Granite Creek near the City of Prescott's Airport Recharge facility, shallow wells showed water level rises due to the combined impacts of recharge of treated reclaimed water at the site (in Appendix 2-1, Figure 2-7I) and sporadic flood flows on Granite Creek. However, deeper wells completed in the confined LVU basin-fill aquifer in that same area showed declines of over 20 feet during the same time period in response to municipal, agricultural and industrial pumping from this unit.

In the southwestern portion of the Little Chino Sub-basin, near Granite Mountain and Williamson Valley Road, water levels were observed to decline by 10 to 60 feet, or more between the years 2000 and 2012, in wells drilled in basin-fill and/or fractured bedrock formations (see Appendix 2-1, Figure 2-7K, for example). Water level declines in this area are primarily due to domestic and small water company pumping. However, prolonged drought reducing local natural recharge in the area has likely also contributed to the overall decline.

In the northern part of the Upper Agua Fria Sub-basin, water levels have recovered by 200 feet or more in some deep municipal wells located in the Prescott Valley-Santa Fe well field (see Appendix 2-1, Figure 2-7M). Recoveries at the Santa Fe well field are due to the construction and operation of several new municipal wells in the Prescott Valley-North well field, located a few miles to the north in Lonesome Valley. The construction of the new wells has allowed Prescott Valley to distribute, balance, and optimize pumping operations over its service area. Water level declines in other parts of the Prescott Valley area were generally in the range of 11 to 38 feet (see Appendix 2-1, Figure 2-7N). In the northeastern portion of the Upper Agua Fria Sub-basin water levels declined by 7 to 10 feet in the Coyote Springs area (see Appendix 2-1, Figure 2-7J). Declines in this area were believed to be a consequence of a combination of local domestic pumping and reductions in natural recharge because of drought.

Water level declines were observed in most other portions of the central and northern sections of the Upper Agua Fria Sub-basin. However, impacts of sporadic recharge of flood flows on Lynx Creek and the Agua Fria River were observed in the hydrographs of some wells located close to those drainages (see Appendix 2-1, Figure 2-7O). The water level in well A-13-01 02CAD (Appendix 2-1, Figure 2-7Q) located along the Agua Fria River near Dewey rose by roughly 3 feet from 1994 to 2010 and provides evidence of the influence of periodic flood recharge and more gradual recovery that may be associated with reductions in local agricultural pumping and artificial recharge from the Town of Prescott Valley's Upper Agua Fria Recharge facility.

2.6.3 2010 Water Level Elevation and Depth-to-Water Maps

The 2010 water level elevation map for the PRAMA is shown in Figure 2-5. The water level elevation map displays the elevation of the water table above mean sea level. The general direction of groundwater flow in an aquifer is inferred by the orientation of the contours on a water level elevation map. A general rule of thumb to use when interpreting these maps is that groundwater flows from higher to lower elevations, and the direction of flow is at right angles to the water level elevation contours.

Depth-to-water in 2010 is shown in Figure 2-6. The 2010 depth-to-water map demonstrates the depth of the water table below land surface and provides information typically used for well design and hydrologic interpretation purposes.

2.6.4 Estimated Groundwater-In-Storage

Information on aquifer thickness, depth-to-water, and aquifer storage properties are commonly employed to estimate the volume of groundwater in storage in an aquifer. The volume of groundwater storage in the PRAMA to a depth of 1,000 feet below land surface range from 3 to 5.2 million acre-feet (Corkhill & Mason, 1995), (Hipke, 2012). Although the volume in storage is seemingly large as compared to annual groundwater pumping, it should be realized that not all of that volume could be practically produced by groundwater withdrawals from wells. Hydrologic and technical issues that ultimately limit the actual volume of groundwater that can be produced include, but are not limited to:

- Aquifer productivity and heterogeneity
- Costs to drill new wells
- Increasing pumping costs and decreasing well yields with increasing depth-to-water
- Physical availability requirements under the Assured Water Supply Program
- Legal restrictions on well locations
- Water quality
- Land subsidence

FIGURE 2-4
WATER LEVEL CHANGE 1994 TO 2010
PRAMA

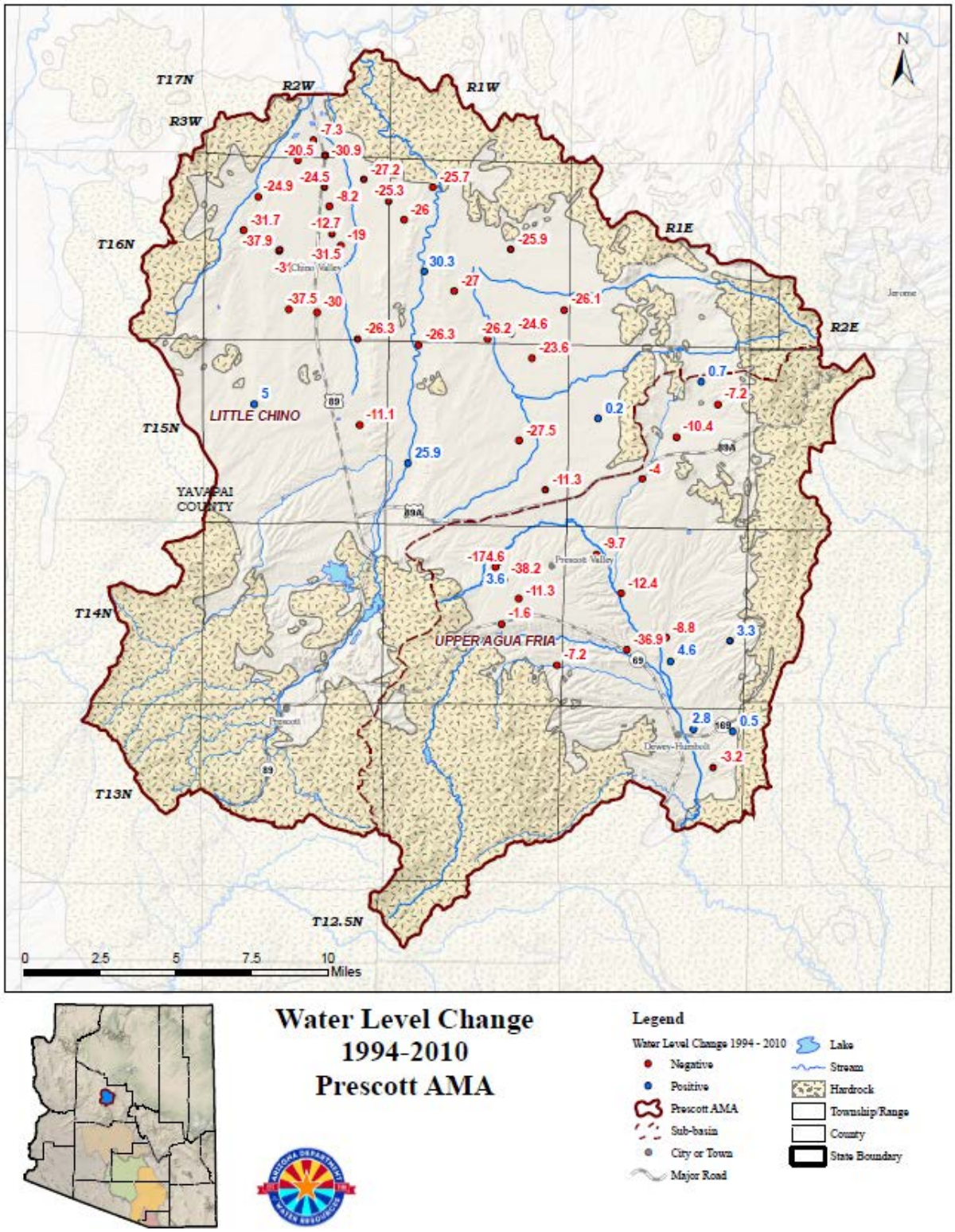


FIGURE 2-5
2010 WATER LEVEL ELEVATION
PRAMA

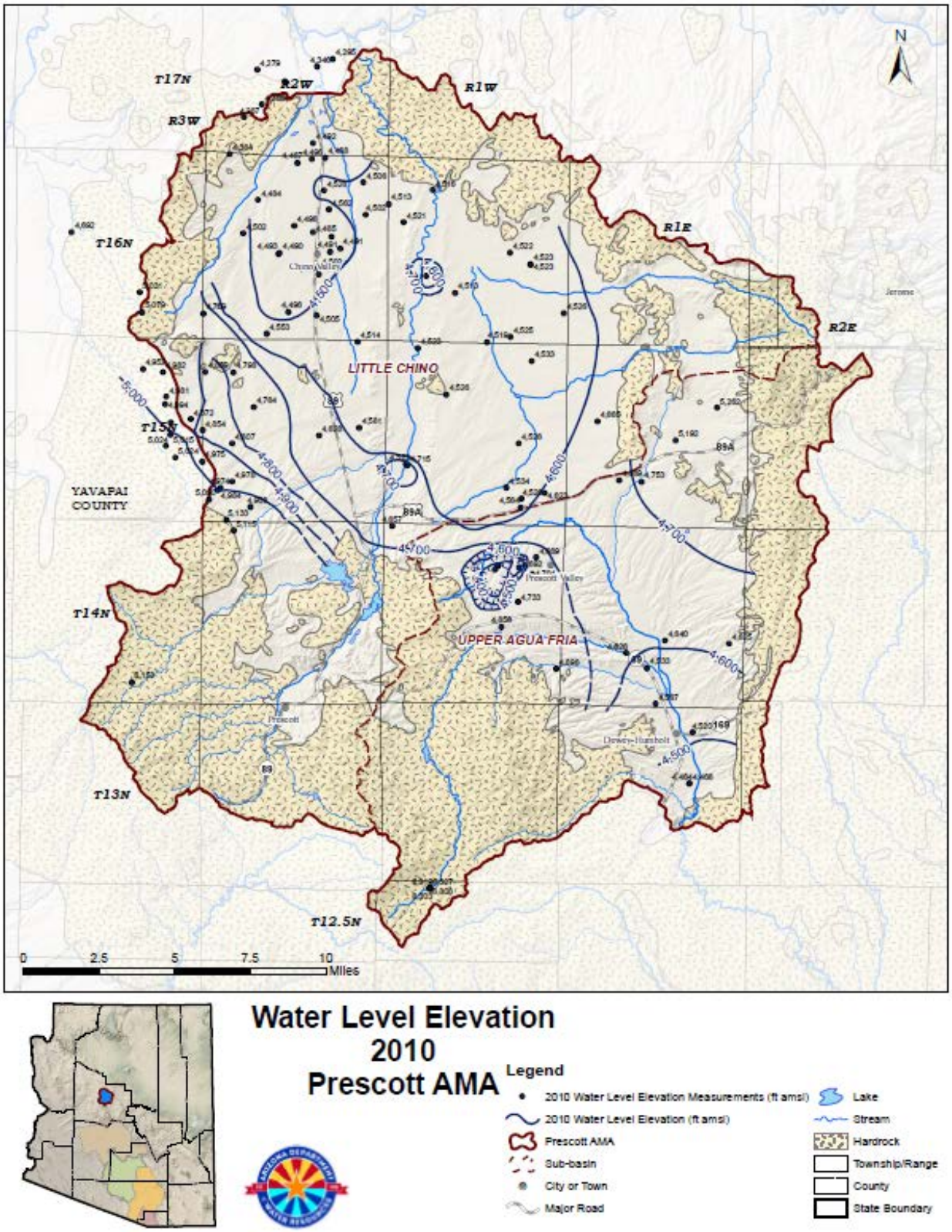
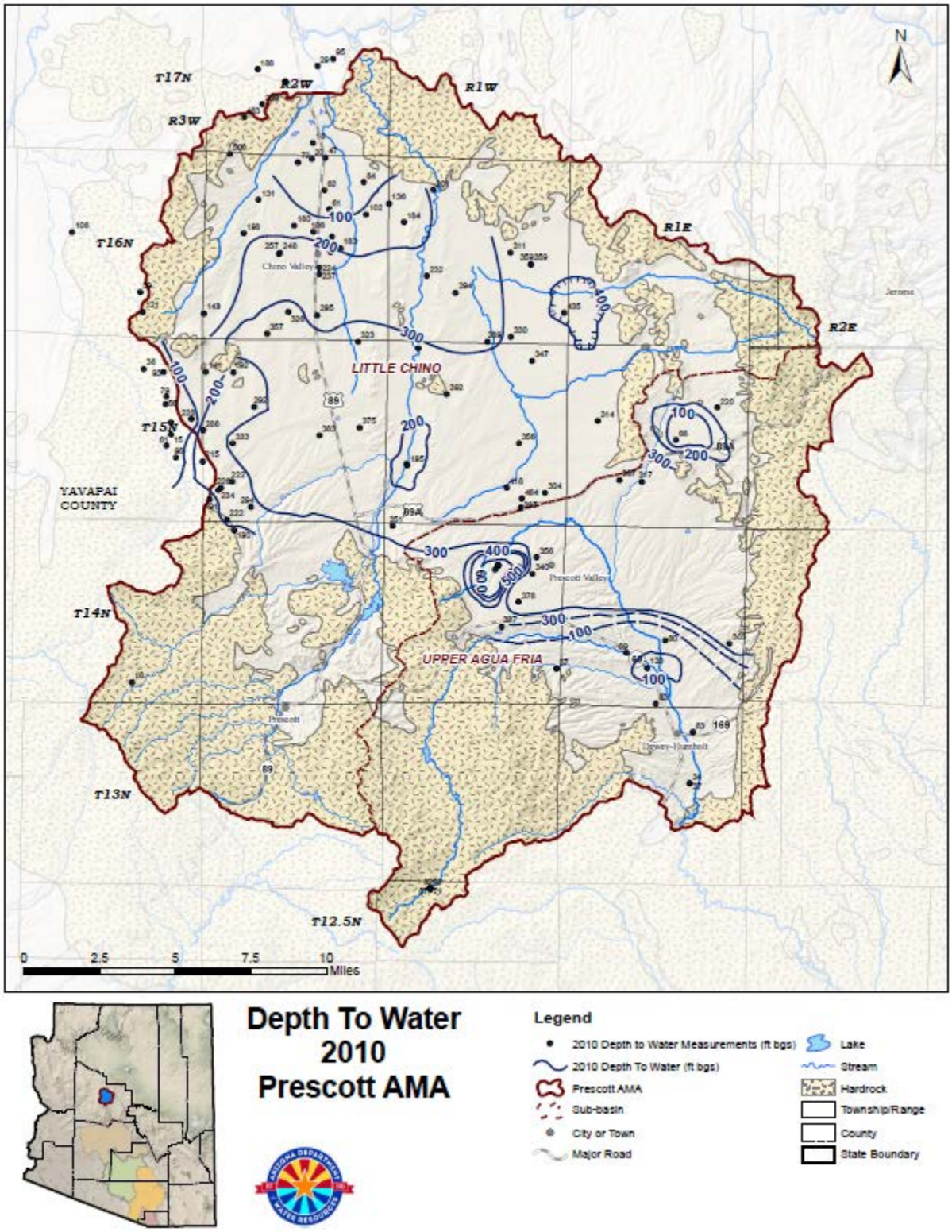


FIGURE 2-6
2010 DEPTH-TO-WATER
PRAMA



Bibliography

ADWR. (2012). *Statewide Hydrologic Monitoring Report (Late 1980s Early/Mid 1990s to Mid/Late 2000s).*

Corkhill, E., & Mason, D. (1995). *Hydrogeology and Simulation of Groundwater Flow, Prescott Active Management Area, Yavapai County, Arizona, Modeling Report No. 9.* Arizona Department of Water Resources.

Hipke. (2012, May 15). Memo from Wes Hipke to Frank Corkhill concerning groundwater storage estimates for the PRAMA.

Krieger, M. (1965). Geology of the Prescott and Paulden quadrangles, Arizona. *USGS Professional Paper 467*, p. 127.

Langenheim, & etal. (2005). *Geophysical Framework Based on Analysis of Aeromagnetic and Gravity Data, Upper and Middle Verde River Watershed, Yavapai County.* USGS Scientific Investigations Report 2005-5278.

Nelson, K. (2012, May 15). memo from Keith Nelson to Pam Muse concerning groundwater storage estimates for the PRAMA.

Oppenheimer, J., & Sumner, J. (1980). Depth-to-bedrock map (Prescott). Lab of Geophysics, University of Arizona.

Remick, W. (1983). Maps Showing Groundwater Conditions in the Prescott Active Management Area, Yavapai County, Arizona, 1982. *Arizona Department of Water Resources Hydrologic Map Series Report Number 9.* ADWR.

Schwalen, H. (1967). *Little Chino Valley Artesian Area and Groundwater Basin, Technical Bulletin 178.* Tucson, Arizona: Agricultural Experiment Station, University of Arizona.

United States Geological Survey. (2012). USGS 09502900, Del Rio Springs Near Chino Valley, Online.

Wellendorf, W. (1994). Personal Communication with F. Corkhill (Arizona Department of Water Resources) Concerning Well Discharge and Specific Capacity of a Recently Drilled Offset Well to Shamrock Water Company's "Santa Fe" Well.

Wigal, R. (1988). *Adequacy Report for Shamrock Water Company.*

Wilson, R. (1988). *Water Resources of the Northern Part of the Agua Fria Area, Yavapai County, Arizona, Bulletin No. 5.* ADWR.

APPENDIX 2-1
SELECTED HYDROGRAPHS
PRAMA

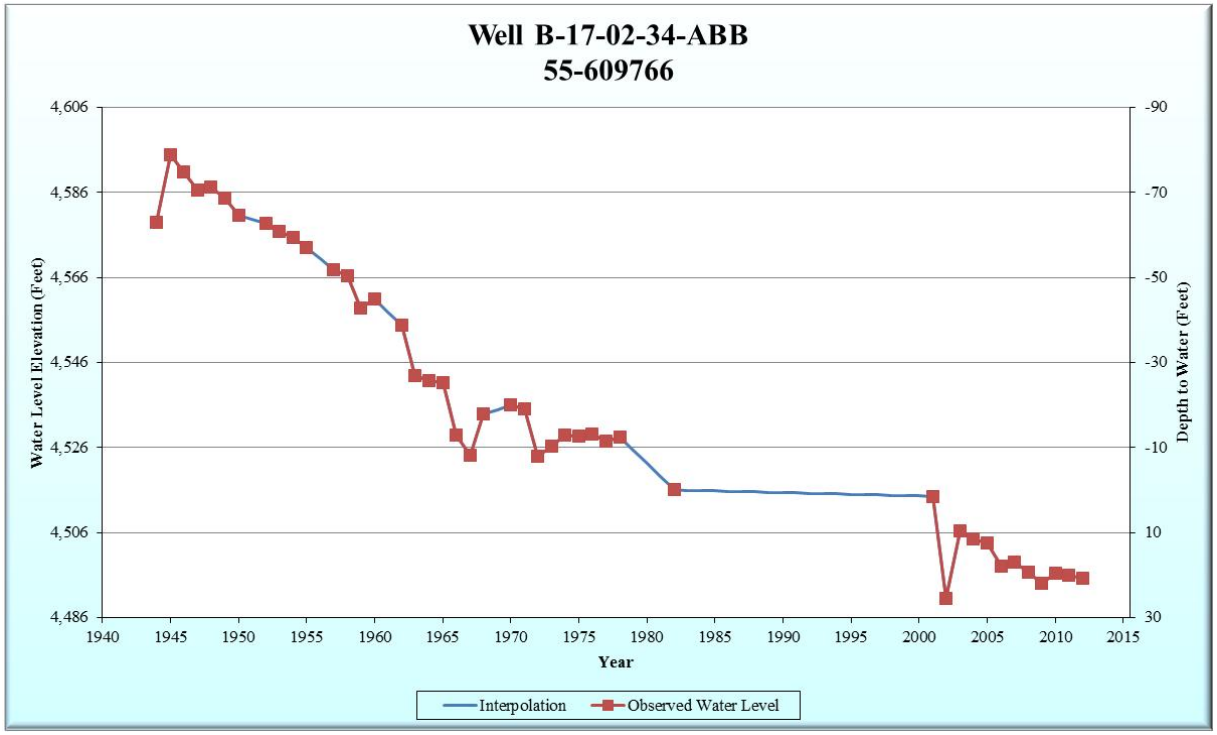


Figure 2-7A B-17-02 34ABB PRAMA - Little Chino Sub-Basin about 1.3 miles south of Del Rio Springs. Well was originally a flowing artesian well. Reduction in hydraulic head due to historic irrigation and municipal pumping reduced water level in the well to below the land surface.

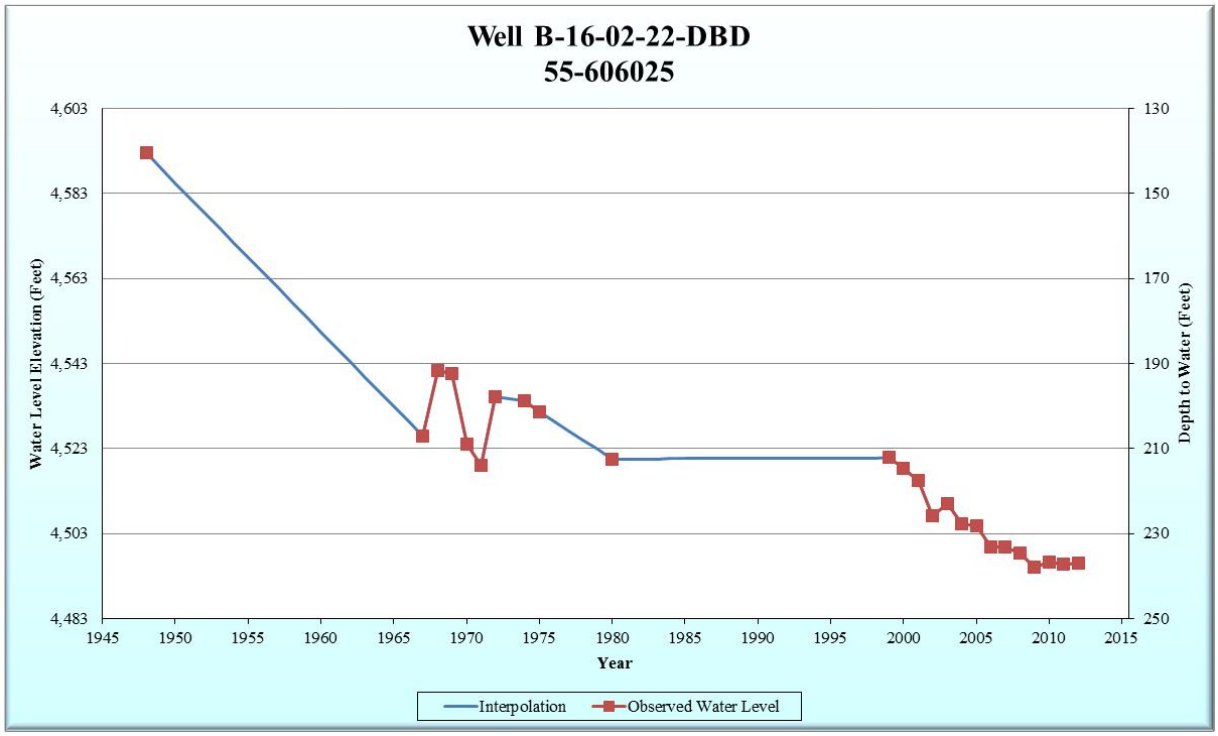


Figure 2-7B B-16-02 22DBD PRAMA – Southern part of Little Chino Sub-Basin agricultural area. Historic water level declines are caused by combination of agricultural and municipal pumping.

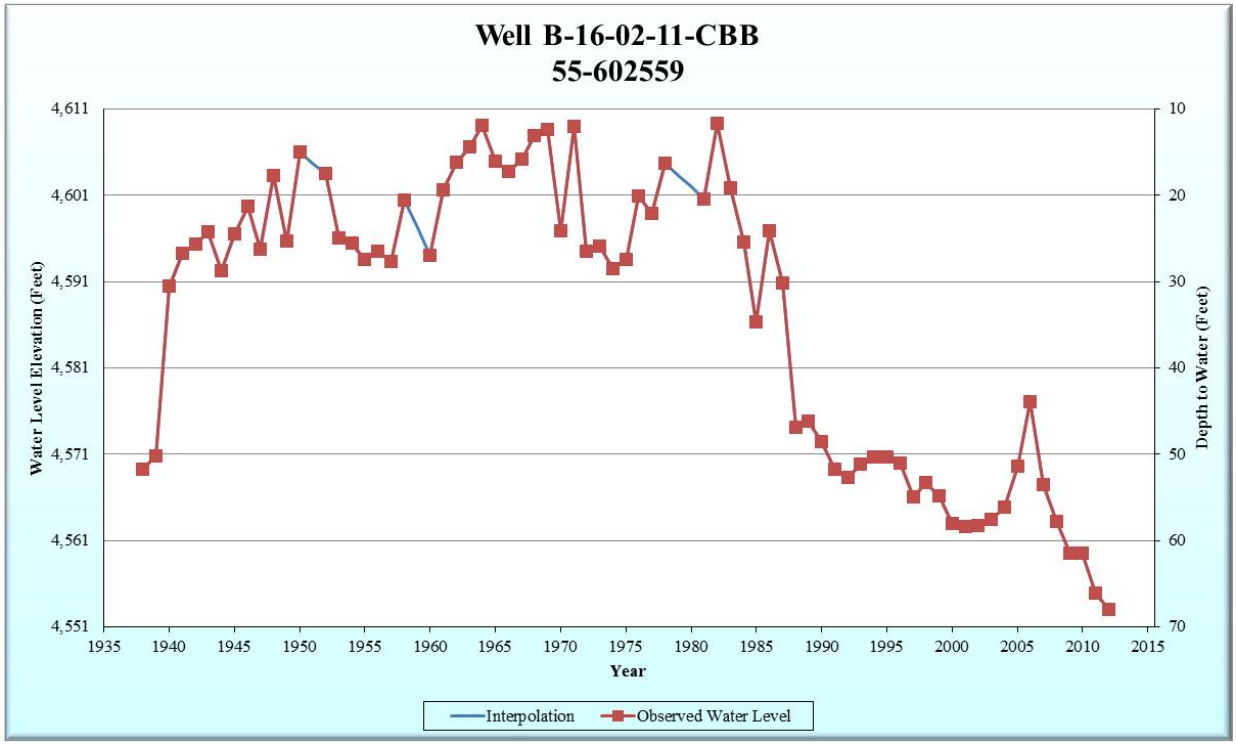


Figure 2-7C B-16-02 11CBB1 PRAMA – Shallow well in Little Chino Sub-Basin agricultural area showing "reverse" water table response due to agricultural recharge. Reductions in agricultural activity (using both groundwater and surface water supplies) in recent years have caused water levels to decline as the incidental recharge has diminished.

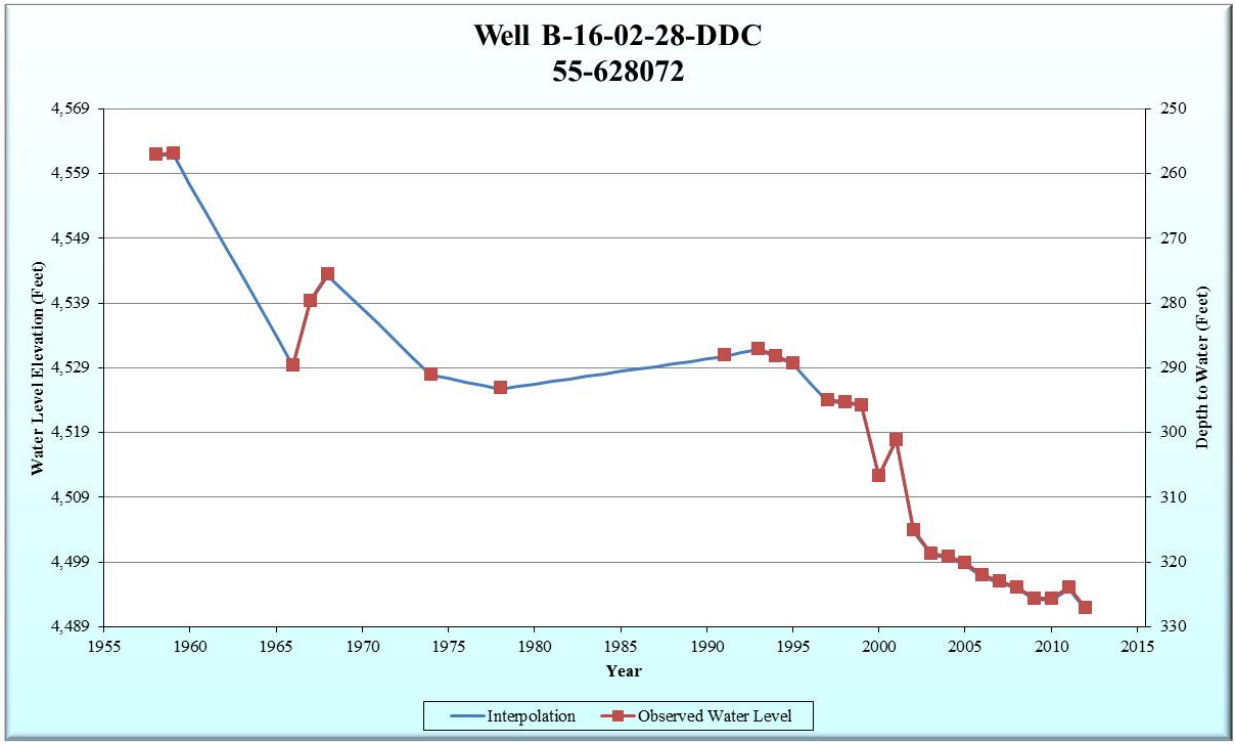


Figure 2-7D B-16-02 28DDC PRAMA – Southern part of Little Chino Sub-Basin farming area. Historic water level declines are caused by combination of agricultural and municipal pumping.

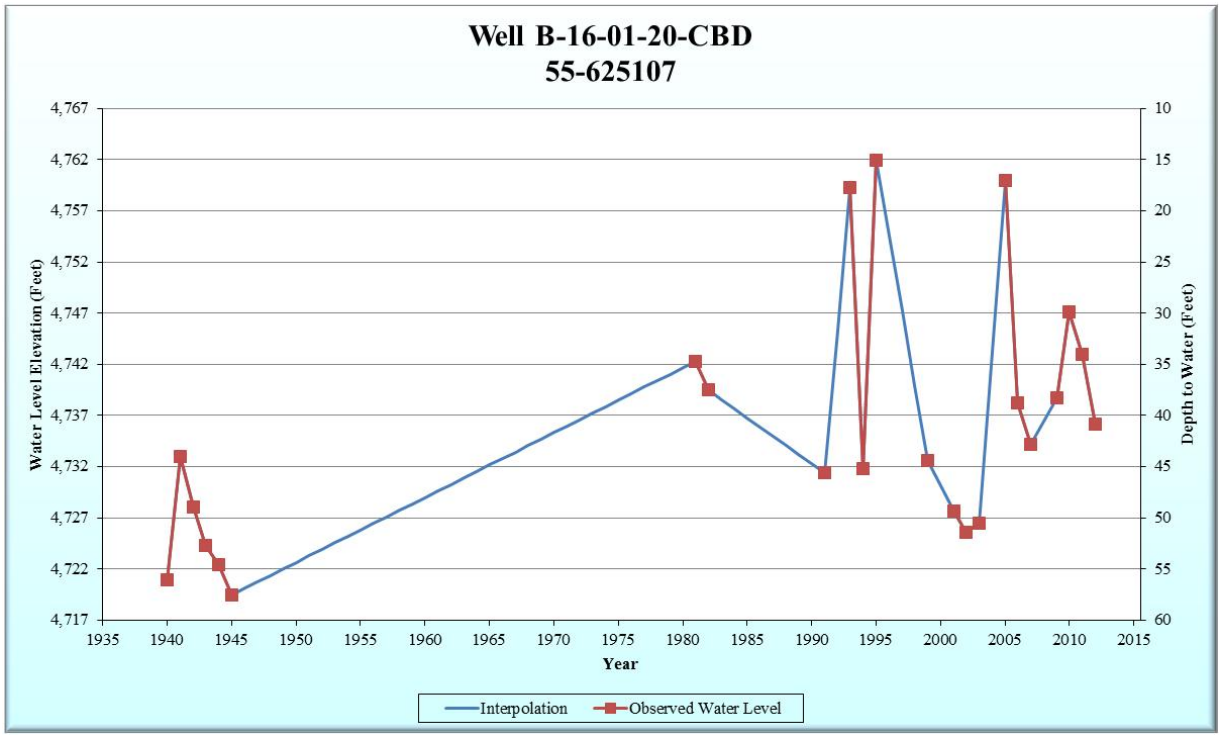


Figure 2-7E B-16-01 20CBD1 PRAMA – Northern area of Little Chino Sub-Basin near Granite Creek. Water levels show periodic rises due to flood recharge.

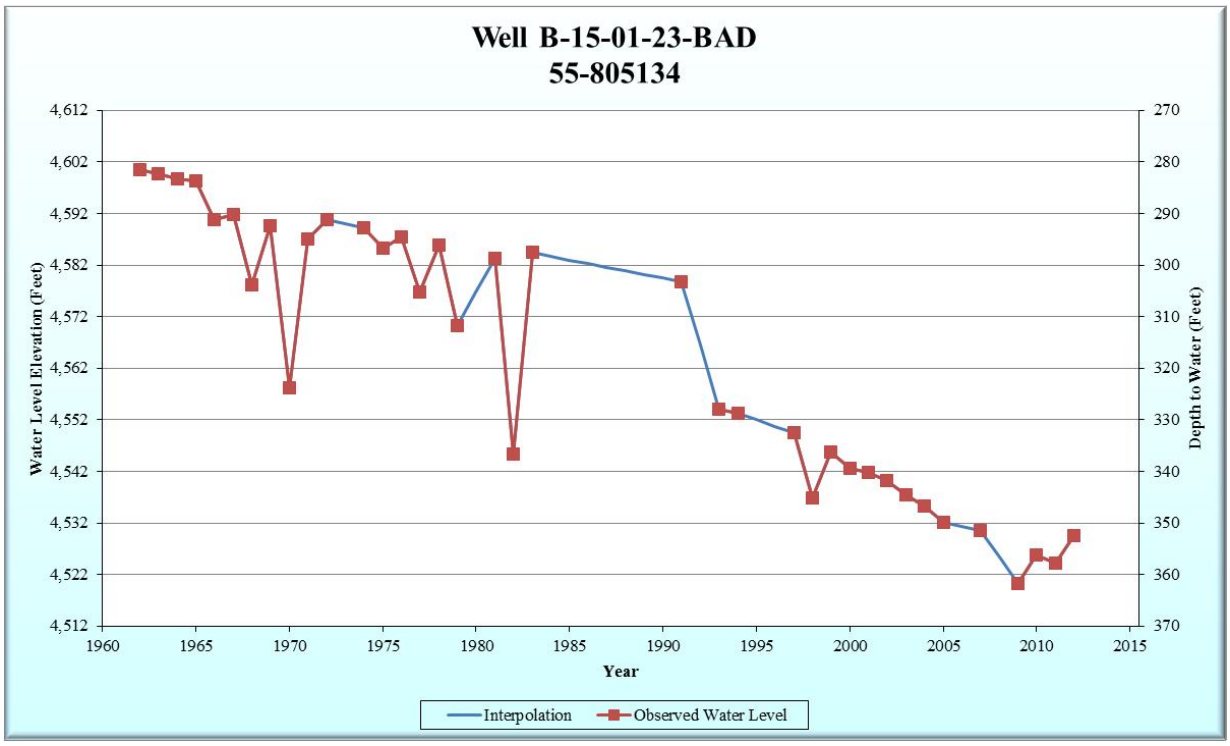


Figure 2-7F B-15-01 23BAD PRAMA – This well is located in the southern Lonesome Valley area of Little Chino Sub-Basin. Historic water level declines are caused by a combination of regional agricultural and municipal pumping and local pumping.

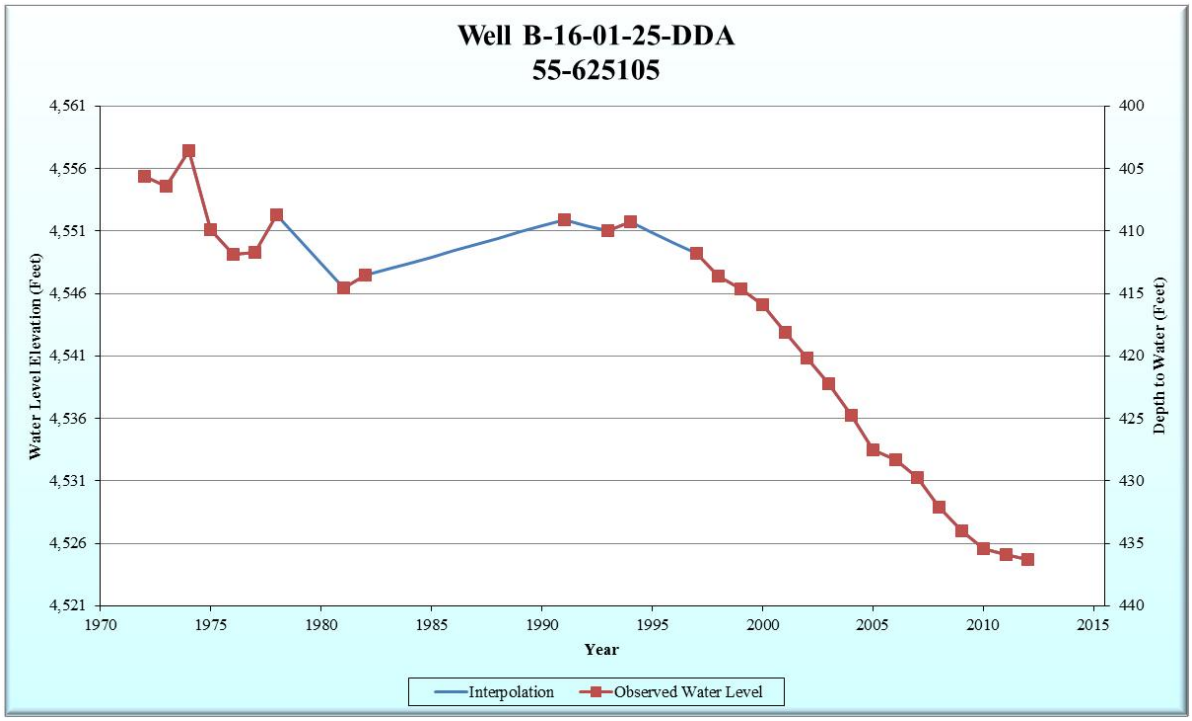


Figure 2-7G B-16-01 25DDA PRAMA – this well is in the NE Lonesome Valley area of Little Chino Sub-Basin. Historic water level declines are caused by a combination of regional agricultural and municipal pumping and local pumping.

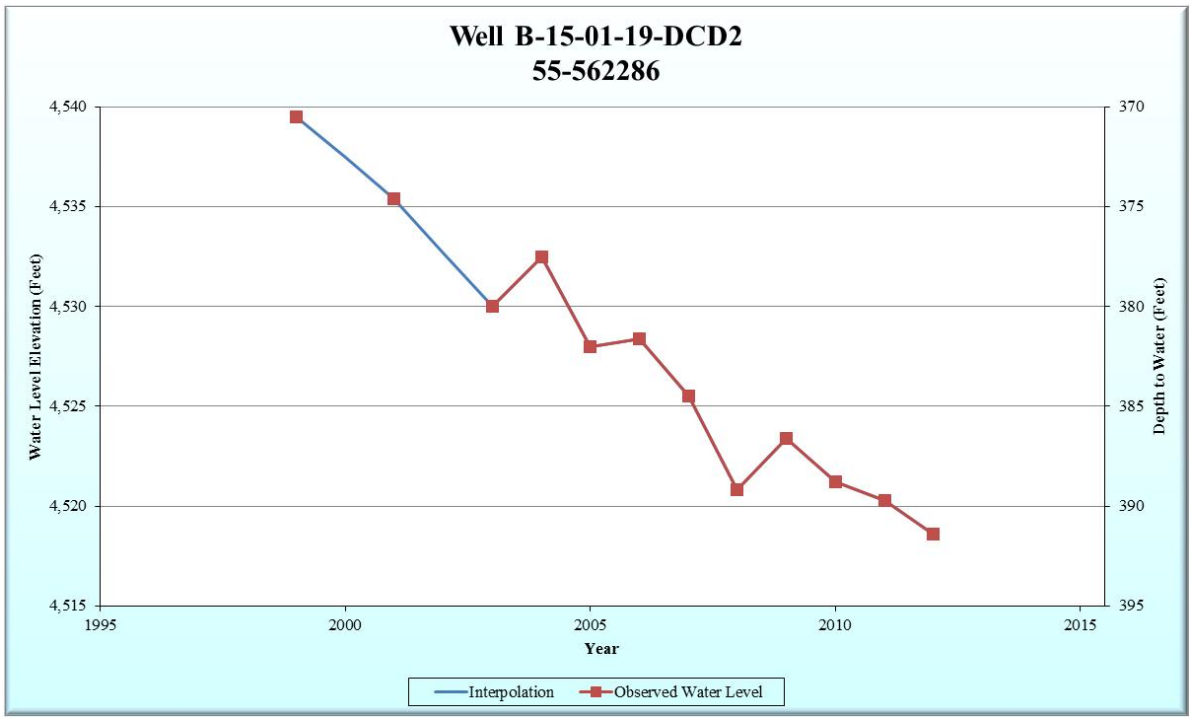


Figure 2-7H B-15-01 19DCD2 PRAMA – Little Chino Sub-Basin near Prescott Airport along Granite Creek. Deep well showing water level declines is due to local and regional groundwater withdrawals and little or no evidence of recharge from flood events or recharge of reclaimed water at the nearby City of Prescott Airport Recharge facility.

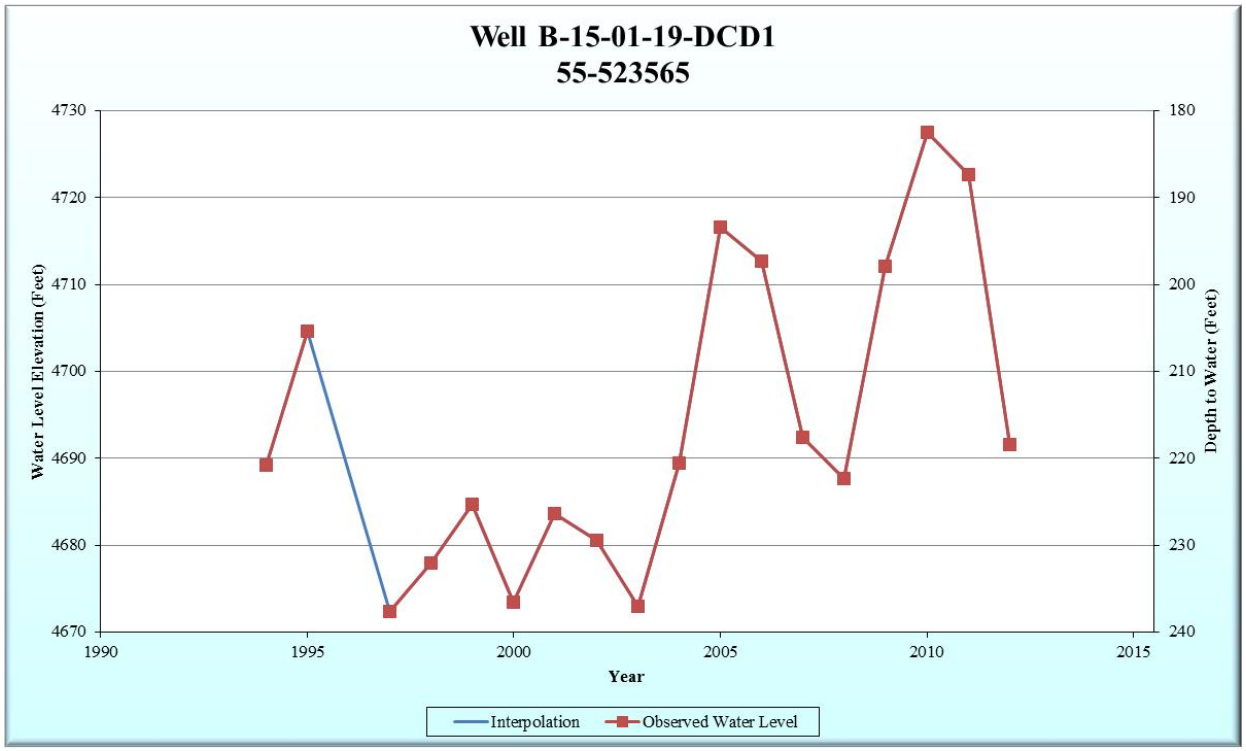


Figure 2-7I B-15-01 19DCD1 PRAMA – This well is in the Little Chino Sub-Basin near Prescott Airport along Granite Creek. This shallow well shows evidence of flood recharge and recharge of reclaimed water at the nearby City of Prescott Recharge facility.

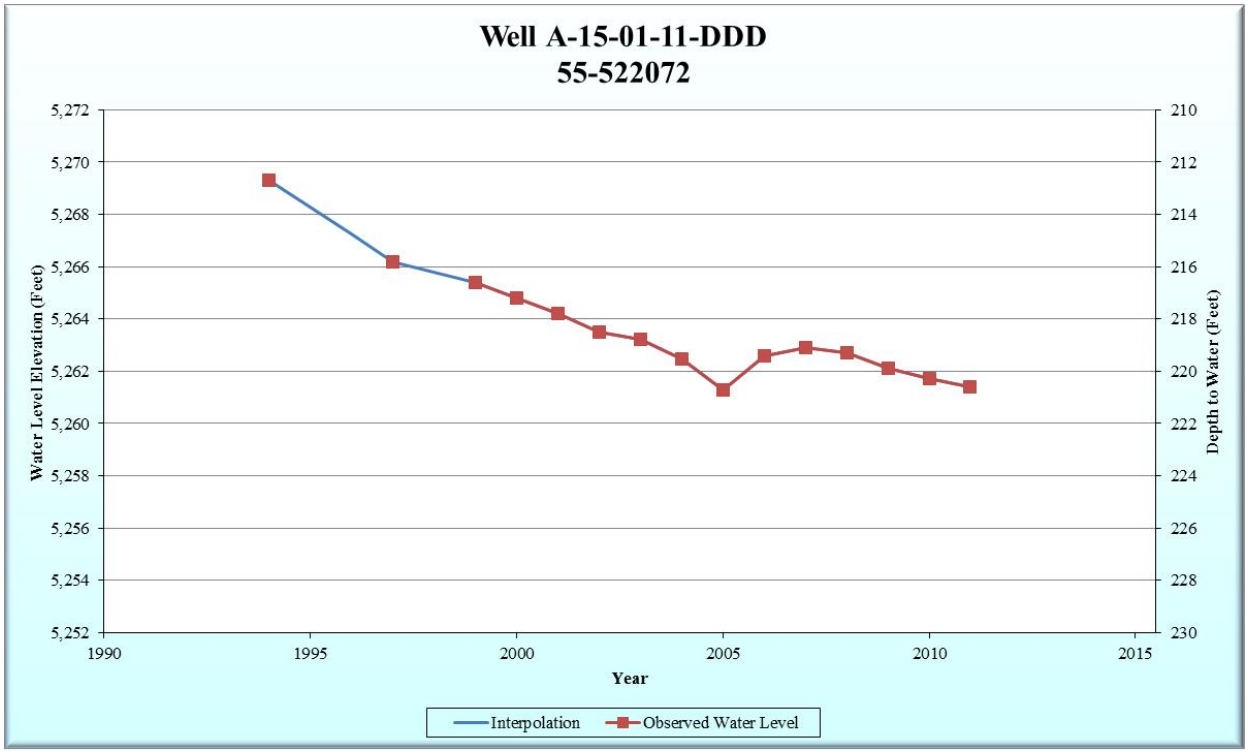


Figure 2-7J A-15-01 11DDD Prescott AMA – Coyote Springs/Indian Hills area of Upper Agua Fria Sub-Basin. Water level declines believed to be caused by local pumping and local reductions in natural recharge due to drought.

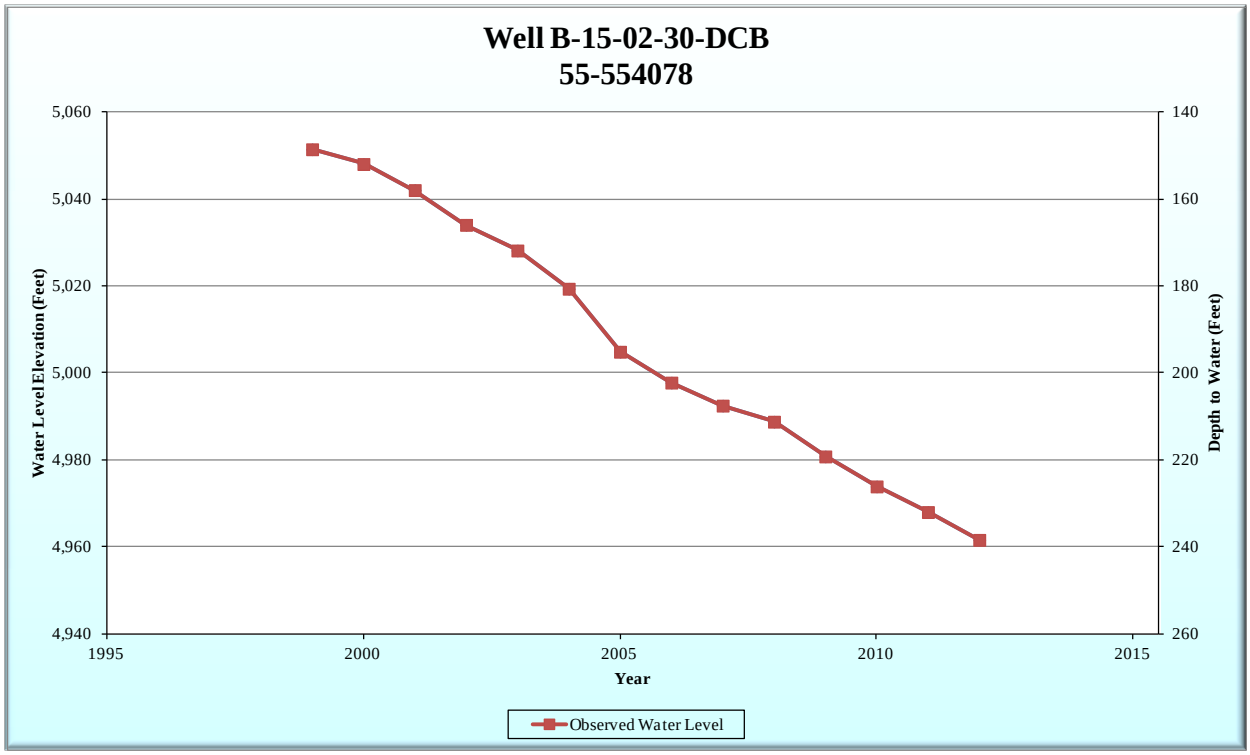


Figure 2-7K B-15-02 30DCB PRAMA – Little Chino Sub-Basin near Granite Mountain along Williamson Valley Road. Local domestic and municipal pumping believed to be primary cause of water level declines.

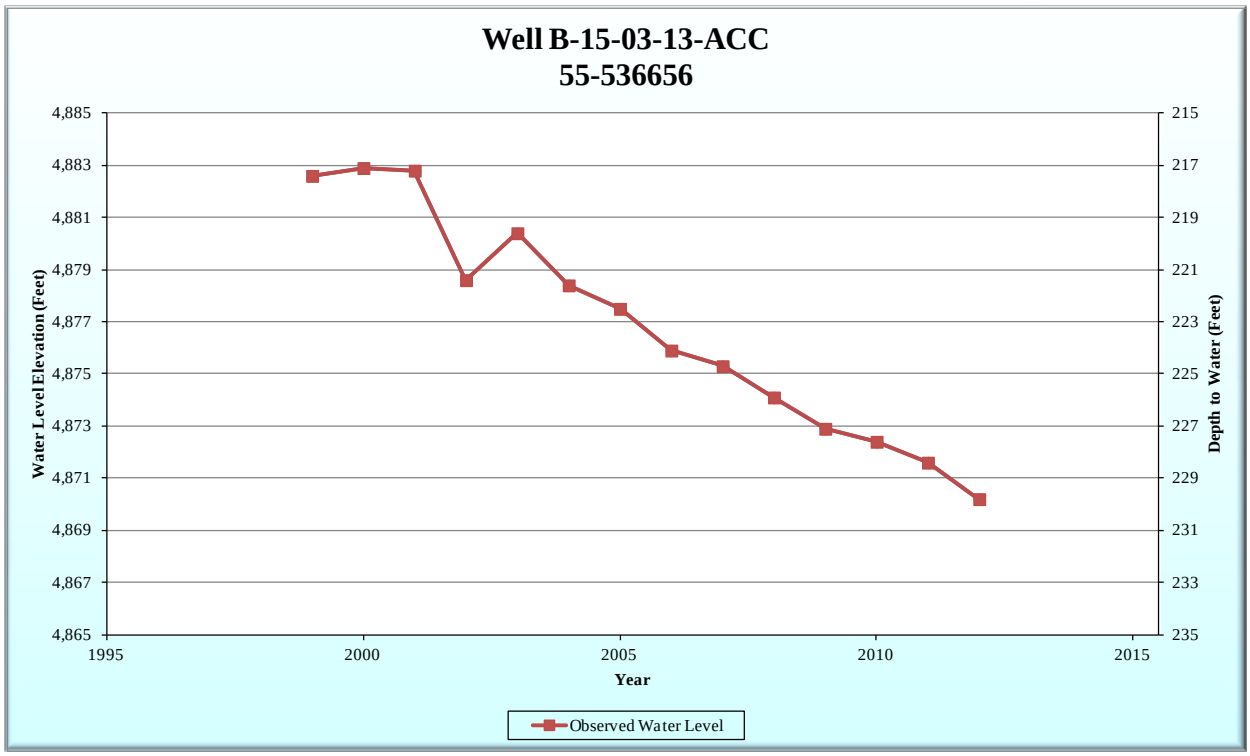


Figure 2-7L B-15-03 13ACC PRAMA – SW portion of Little Chino Sub-basin near American Ranch. Local domestic and municipal pumping believed to be primary cause of water level declines.

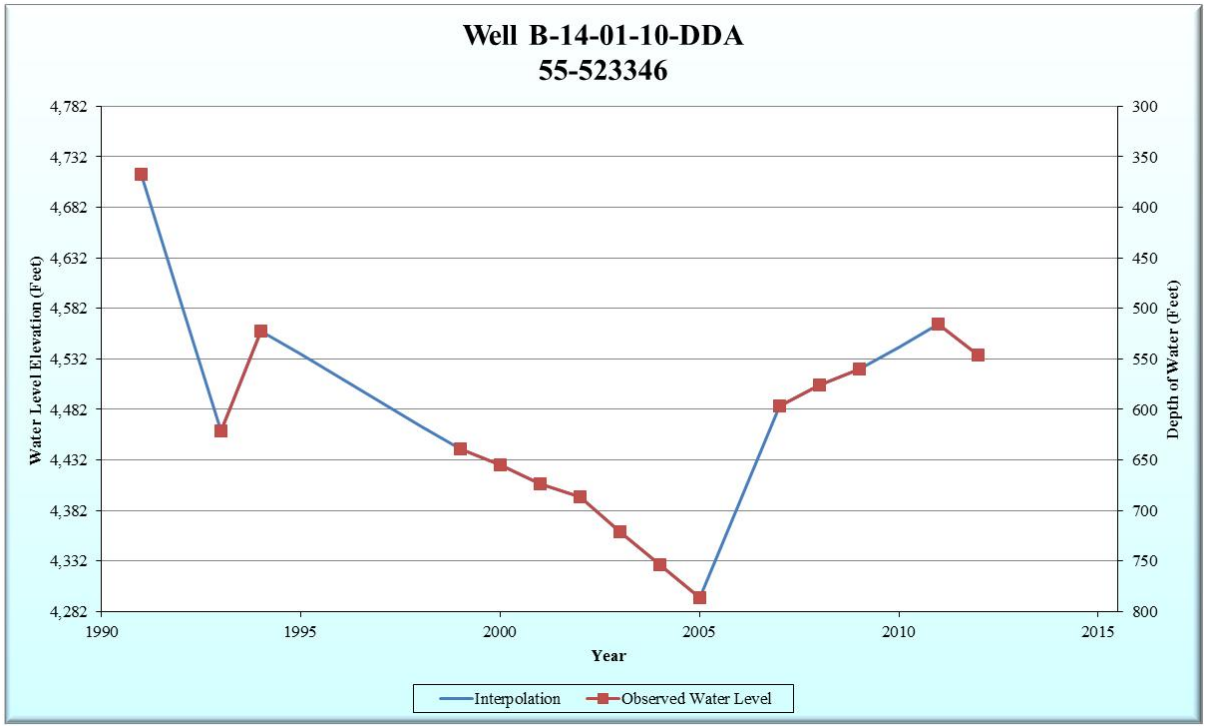


Figure 2-7M B-14-01 10DDA PRAMA – Prescott Valley Santa Fe Well Field area of Upper Agua Fria Sub-Basin. Recovery in water levels since 2005 due to shifting of pumping to newly developed Prescott Valley's "North" well field.

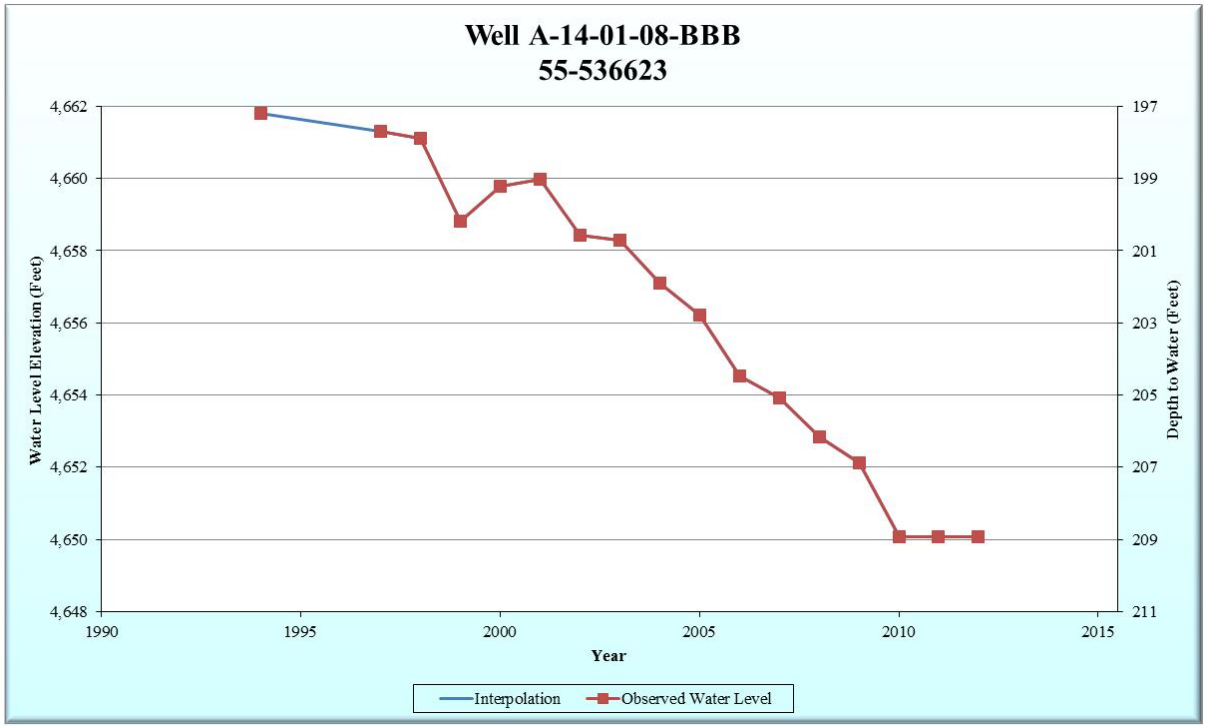


Figure 2-7N A-14-01 08BBB PRAMA – This well is in north-central Prescott Valley area of Upper Agua Fria Sub-Basin. Water level declines due to local and regional pumping.

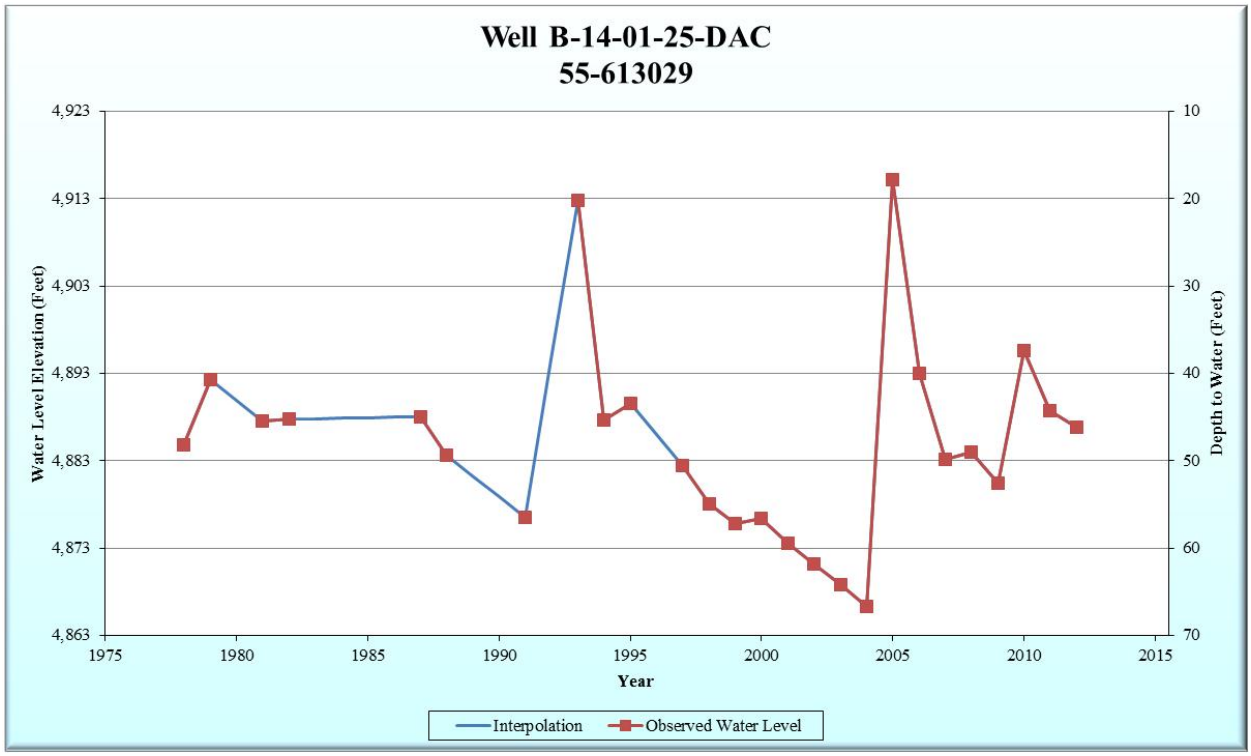


Figure 2-7O B-14-01 25DAC PRAMA – Southern Prescott Valley area 1 mile south of Lynx Creek in Upper Agua Fria Sub-Basin. Water level peaks in 1993 and 2005 correspond to significant flow events along Lynx Creek.

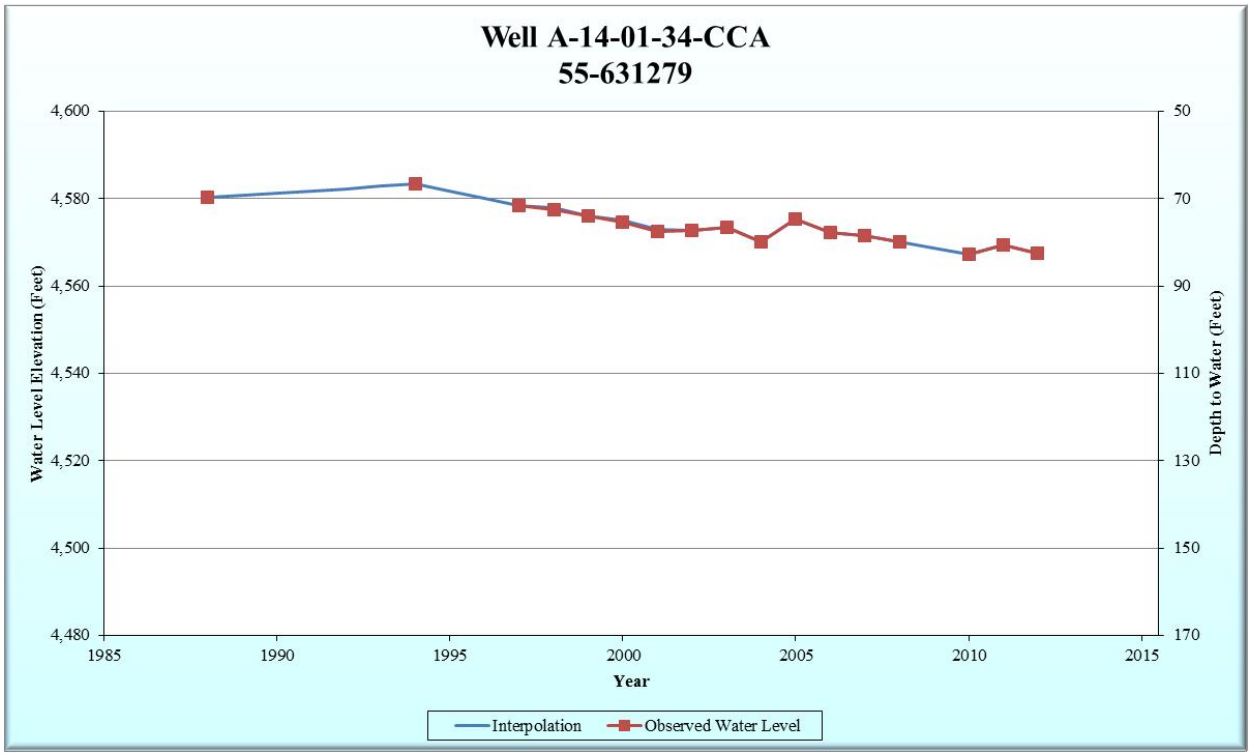


Figure 2-7P A-14-01 34CCA PRAMA – Upper Agua Fria Sub-Basin near confluence of Agua Fria River and Lynx Creek. Water level declines due to local and regional pumping.

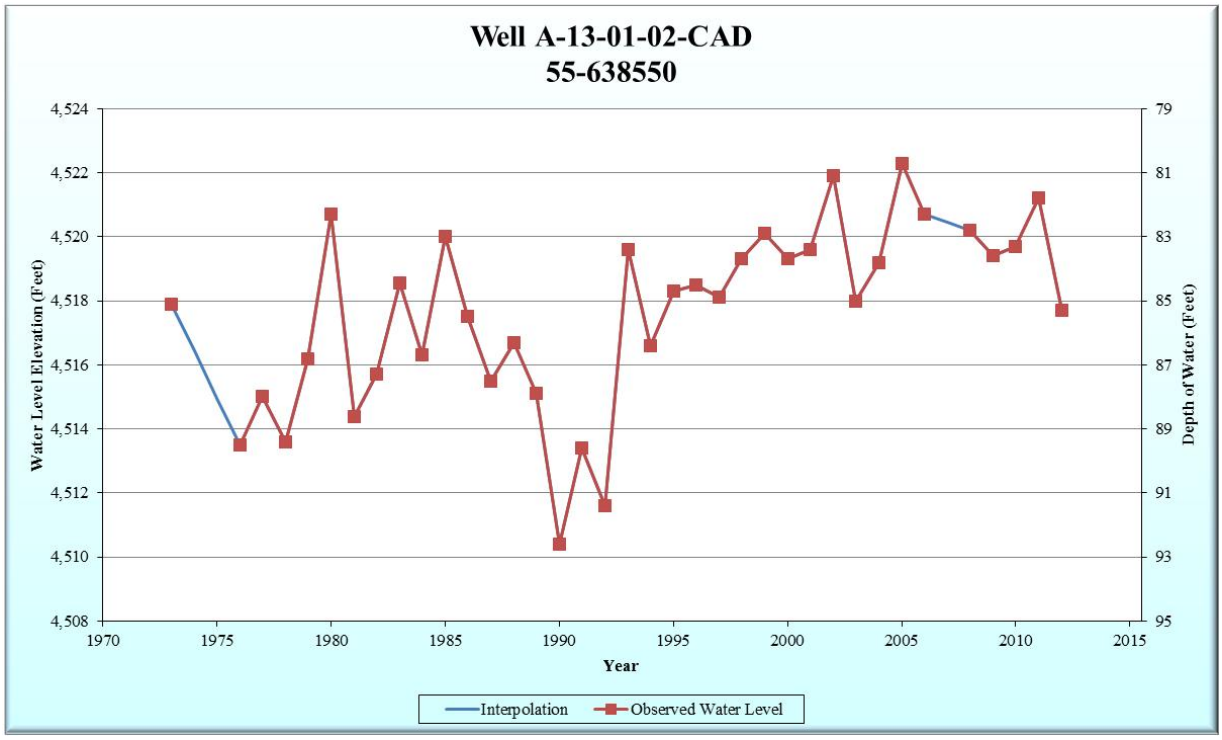


Figure 2-7Q A-13-01 02CAD PRAMA – Upper Agua Fria Sub-Basin about .25 miles east of Agua Fria River near Dewey. Peaks in water levels generally correspond to high flow events in those years. Recent gradual increase in water levels may reflect impacts of reduced agricultural activity in general area. Prescott Valley artificial recharge activities may also contribute to recovery trend in more recent years.

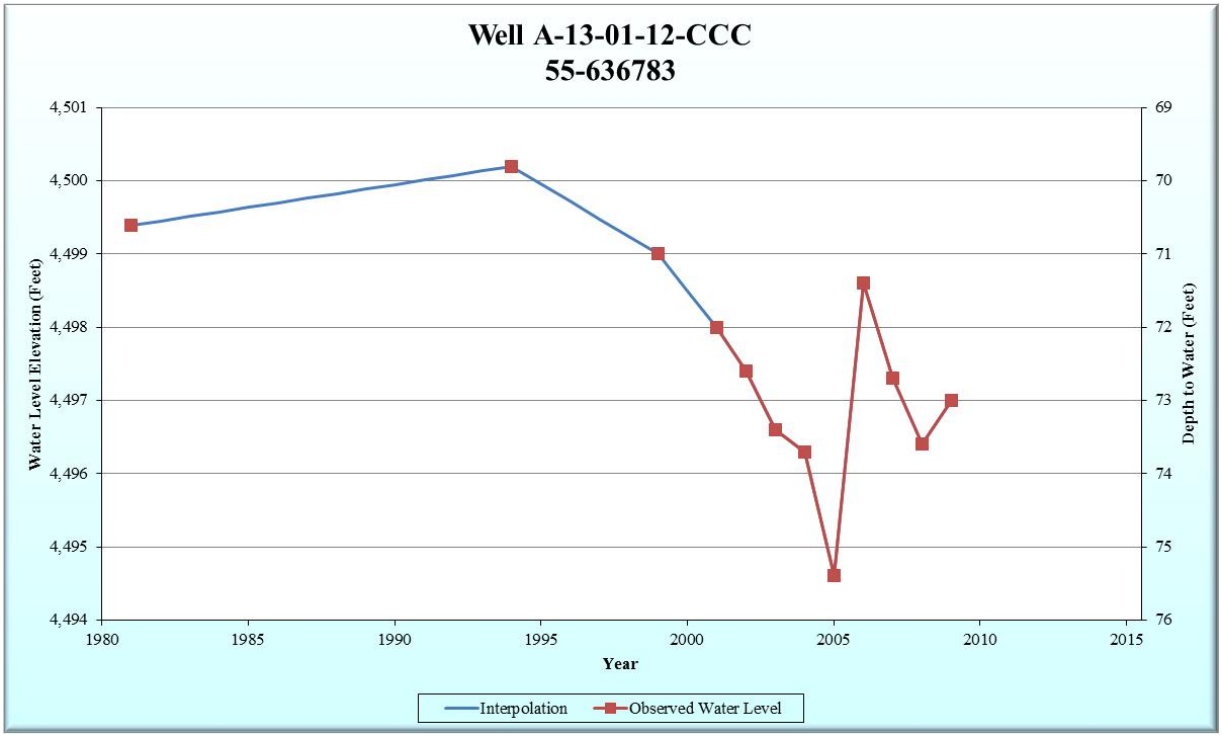


Figure 2-7R A-13-01 12CCC PRAMA – This well is in the Upper Agua Fria Sub-Basin east of the Agua Fria River near Humboldt.

CHAPTER THREE:
WATER DEMANDS
AND SUPPLY

3.1 INTRODUCTION

The *Water Demand and Supply Assessment 1985-2025, Prescott Active Management Area* (Assessment) (ADWR, 2011) compiled historical water demand and supply characteristics from 1985 to 2006 for the two groundwater sub-basins that comprise the PRAMA. The report reviewed past conditions and made projections to the year 2025, offering seven scenarios. ADWR conducted the Assessment as preparation for the planning and public interaction that preceded drafting of this *Fourth Management Plan for Prescott Active Management Area* (4MP) as required by the *1980 Groundwater Management Code* (Code). This chapter summarizes and updates the data included in the Assessment and analyzes and identifies the implications of that data.

Water users in the PRAMA depend almost solely on groundwater due to the limited and variable nature of surface water supplies in the PRAMA. The direct delivery and storage of reclaimed water began in the mid-1990s and has increased over time, which has helped to slow the increase in use of groundwater supplies. Annual storage and recovery of surface water began in the year 2000 and has fluctuated on an annual basis with supply availability. For a detailed overview of the geography, hydrology, climate, and environmental conditions in the PRAMA, refer to the *Arizona Water Atlas, Volume 8, Active Management Area Planning Area* (ADWR, 2010).

The proportion of water demand between use sectors has changed significantly in the PRAMA between 1985 and 2012, with the primary change being a transition from the agricultural to the municipal sector. In 1985, agricultural demand accounted for almost 80 percent of the total PRAMA demand, with large and small municipal provider demand accounting for an additional 15 percent, and industrial and estimated exempt well demand accounting for less than five percent each. In 1995, agricultural demand had decreased to approximately 61 percent of demand and large and small municipal provider demand had increased to almost 32 percent of total demand. By 2012, agricultural demand had decreased to only 13 percent of demand with large and small municipal provider demand increasing to 72 percent. Industrial demands now comprise approximately five percent of PRAMA demands. Estimated exempt well demand in 2012 accounted for more than 10 percent of the PRAMA total water demand.

In 1948, the City of Prescott began withdrawing groundwater as a supplement to the surface water supply that had been the predominant supply since the city's founding in 1864. By 1975, over 90 percent of the water utilized by the City of Prescott was groundwater withdrawn from the Chino Valley well field. Historically, a significant portion of agricultural demand in the PRAMA was met with surface water supplied by the Chino Valley Irrigation District (CVID). In 1985, approximately 38 percent of the total PRAMA water supply was surface water. Nearly this entire volume was provided by CVID to agricultural use. In 1998, CVID and the City of Prescott entered into an agreement that resulted in replacing surface water deliveries to agricultural users by CVID with delivery of recovered reclaimed water. The surface water rights were transferred to the City of Prescott, who utilizes surface water via annual recharge and recovery. Use of reclaimed water to supply municipal demand also increased over time. In 2012, groundwater remained the primary source of supply, accounting for approximately 82 percent of supply; reclaimed water accounted for 15 percent, with the balance of the supply being recovered surface water.

Figure 3-1 illustrates the trend of agricultural demand decreasing over time and municipal demand increasing in PRAMA. The PRAMA has also seen modest increases in industrial demand, which have stabilized in recent years. Table 3-1 shows the trend in municipal, estimated exempt well, industrial, and agricultural water use within the PRAMA from 1985 through 2012. Municipal water use expressed in Table 3-1 includes water delivered for non-irrigation uses by a city, town, private water company or irrigation district. Municipal demand is composed of the large provider and small provider subsectors. Turf-related facilities, which have their own conservation requirements under the management plan, are included in the large and small municipal demand category if they receive water from a municipal provider. For purposes of categorizing water demand in the Assessment ADWR included estimated water

demand associated with domestic exempt wells in the municipal demand category. However, for the 4MP ADWR is showing estimated exempt well demand as a separate category of use. ADWR has no regulatory authority over exempt wells. An exempt well is a well with a pump capacity less than 35 gallons per minute. Agricultural water use in Table 3-1 includes surface water and reclaimed water deliveries by the CVID to individual farms within the PRAMA for all years except for 1990, when groundwater alone was used to meet CVID agricultural water needs. Agricultural demand is composed of the use of water by Irrigation Grandfathered Groundwater Rights (IGFRs) for agricultural uses not on Indian Reservations, and its associated lost and unaccounted for water. Agricultural use is using water to irrigate two or more acres of land to produce crops or feed. Industrial use is a non-irrigation use of water, not supplied by a municipal water provider. In general, industrial users withdraw water from their own wells that are associated with Type 1 and Type 2 non-irrigation grandfathered groundwater rights, General Industrial Use (GIU) permits or other withdrawal permits. In the PRAMA, industrial demand is composed of the following subsectors: sand and gravel, turf, and other.

FIGURE 3-1
HISTORICAL WATER DEMAND BY SECTOR
PRAMA

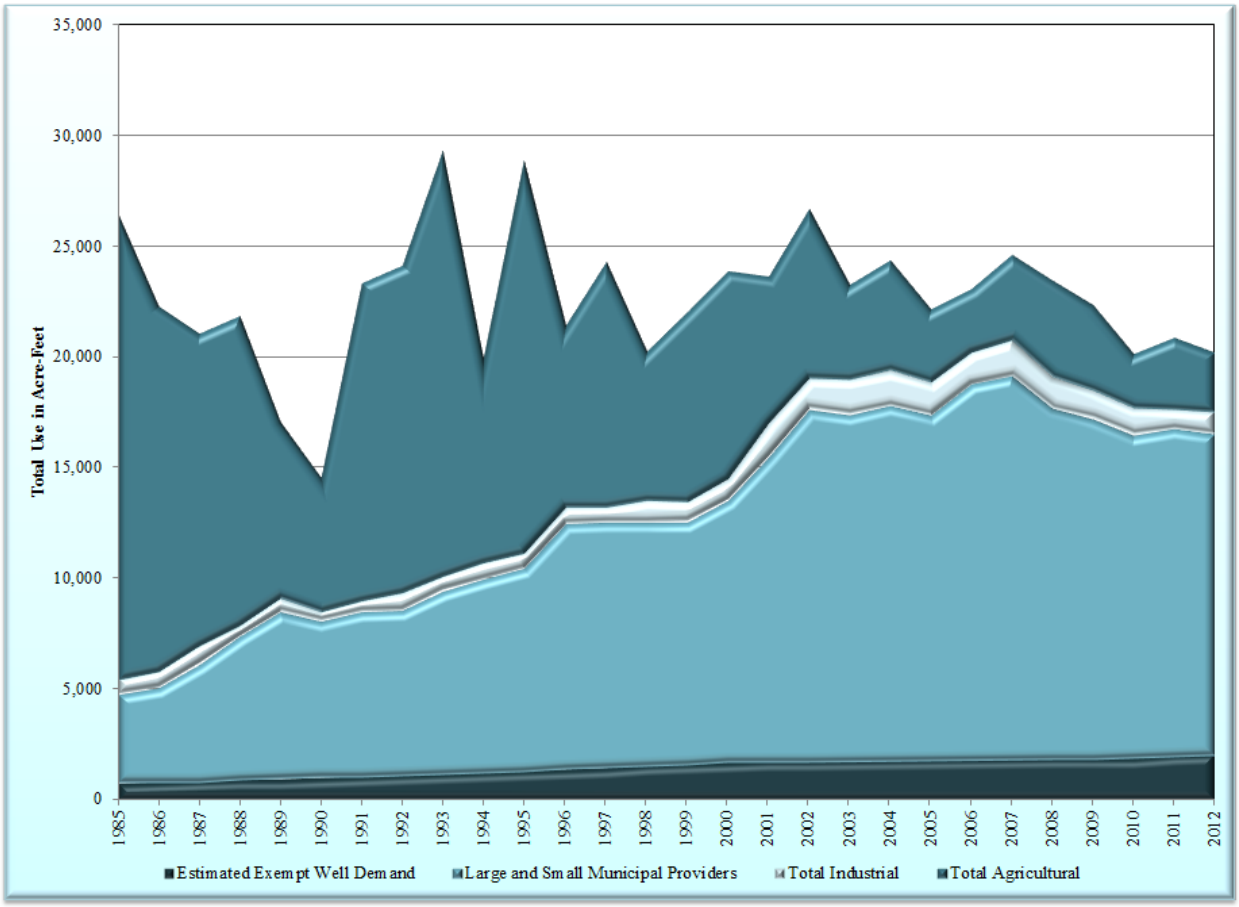


Figure 3-2 shows the sources of supply used to meet demand by all three sectors in the PRAMA during the historical period from 1985-2012. Municipal groundwater demand gradually increased from 1985 to 2007, then, as overall municipal demand declined, so did groundwater use. The reduction in municipal groundwater demand after 2007 corresponds with the economic downturn in those years, although some part of this reduction may be due to conservation. Industrial groundwater demand has been fairly constant while agricultural groundwater demand has declined over time.

TABLE 3-1
HISTORICAL WATER DEMAND BY SECTOR (AF)
PRAMA

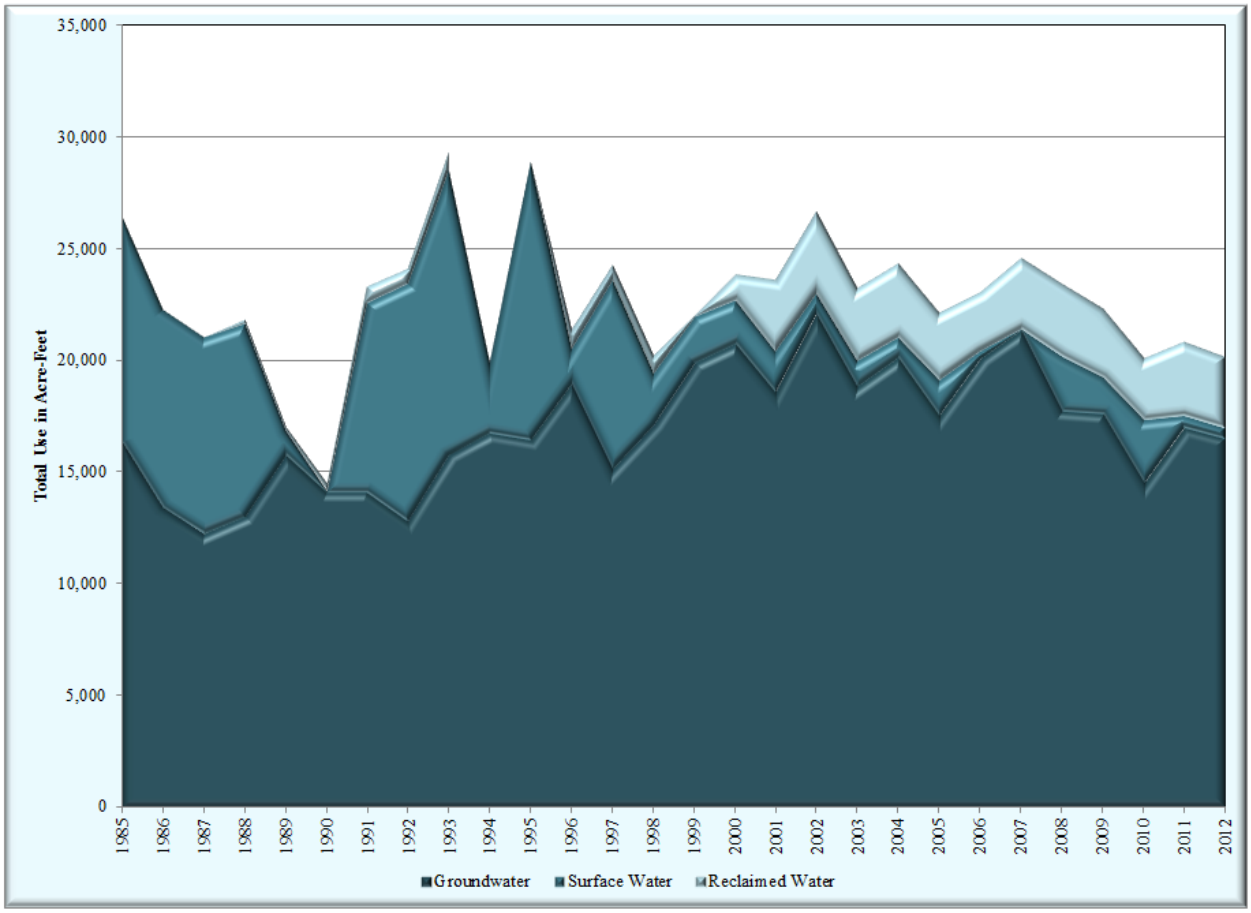
	Municipal			Exempt Wells	Industrial			Agricultural			
Year	Ground-water	Surface Water	Reclaimed Water	Ground-water	Ground-water	Surface Water	Reclaimed Water	Ground-water	Surface Water	Reclaimed Water	**TOTAL AMA**
1985	3,794	210	-	785	641	-	-	11,192	9,795	-	26,418
1986	3,958	276	-	826	779	-	-	7,913	8,556	-	22,309
1987	5,000	259	-	870	895	-	-	5,513	8,530	-	21,067
1988	6,150	121	187	916	523	-	-	5,490	8,460	-	21,847
1989	7,365	-	176	964	669	-	-	6,794	1,134	-	17,101
1990	6,710	-	344	1,015	476	-	-	5,958	83	-	14,585
1991	6,706	-	712	1,068	516	-	-	5,861	8,460	-	23,323
1992	6,786	-	650	1,124	805	-	-	4,129	10,600	-	24,094
1993	7,483	-	777	1,184	704	-	-	6,452	12,720	-	29,320
1994	8,729	-	-	1,246	778	-	-	6,027	3,180	-	19,960
1995	9,137	-	-	1,311	696	-	-	5,331	12,415	-	28,889
1996	10,247	-	842	1,380	796	-	-	6,569	1,580	-	21,415
1997	10,414	-	656	1,453	731	-	-	2,597	8,460	-	24,311
1998	10,252	-	738	1,530	1,035	-	-	4,342	2,303	-	20,200
1999	10,892	-	47	1,610	926	-	-	6,447	2,120	-	22,041
2000	10,999	825	12	1,695	967	-	-	7,090	1,155	1,122	23,866
2001	11,434	688	1,667	1,713	1,309	241	-	4,167	900	1,499	23,619
2002	13,732	-	2,171	1,732	1,411	-	-	5,227	900	1,500	26,673
2003	12,842	1,064	1,729	1,750	1,542	66	-	2,754	-	1,500	23,246
2004	13,358	864	1,813	1,768	1,541	50	-	3,490	-	1,500	24,384
2005	12,271	1,548	1,752	1,787	1,442	54	-	2,091	-	1,211	22,156
2006	14,843	229	1,875	1,805	1,360	126	-	2,065	-	782	23,085
2007	15,199	-	2,119	1,824	1,562	68	-	2,801	-	1,068	24,639
2008	11,331	2,331	2,152	1,842	1,362	63	-	3,256	-	1,103	23,440
2009	11,810	1,569	1,963	1,860	1,263	49	-	2,717	-	1,105	22,336
2010	9,913	2,784	1,898	1,879	1,153	65	-	1,618	-	837	20,147
2011	11,911	548	2,327	1,960	895	30	-	2,260	-	971	20,902
2012	11,865	445	2,163	2,044	964	47	-	1,689	-	994	20,210

Municipal reclaimed water use has increased since 1985 but since 2001 has remained more or less around 2,000 acre-feet per year. No reclaimed water has been used in the industrial sector, while the agricultural sector has used about 1,500 acre-feet of reclaimed water per year since 2000, due to the transfer of long-term storage credits to the CVID by the City of Prescott.

Surface water use has fluctuated in all three sectors based on the availability of the supply. Since 2000, after the agreement between CVID and City of Prescott was finalized, the City has been annually storing and recovering surface water. During this period, surface water use in the agricultural sector delivered by CVID was discontinued. Outside of the CVID, the Bond Ranch has historically used surface water from Del Rio Springs for agricultural irrigation. The 900 acre-feet of surface water use shown in Table 3-1 for

the agricultural sector in 2001 and 2002 was used by the Bond Ranch. The IGFR associated with the Bond Ranch was subsequently converted to a Type 1 Non-Irrigation Grandfathered Groundwater Right and extinguished in 2008. ADWR does not have records of post-2002 surface water use at the Bond Ranch. A small amount of surface water is also used by the industrial sector, at a sand and gravel operation through a surface water claim on Lynx Creek owned by Fain Family LP.

FIGURE 3-2
HISTORICAL WATER SUPPLIES USED
PRAMA



3.2 OVERVIEW OF DEMAND AND SUPPLY BY WATER USE SECTOR

3.2.1 Municipal Sector

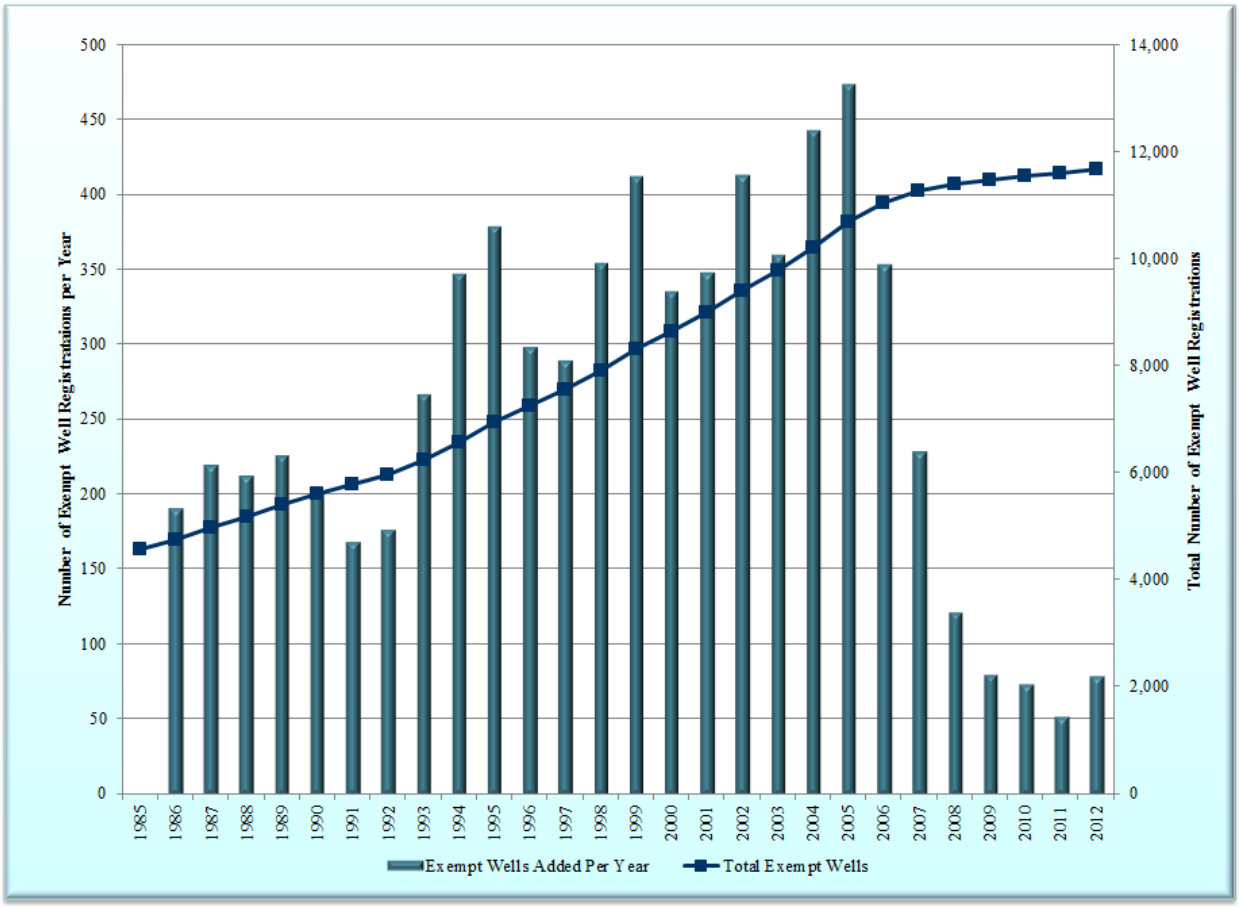
ADWR calculated a total PRAMA population of 118,446 persons in 2010 based on disaggregation of the 2010 US Census data. Major communities within the PRAMA include Prescott, Prescott Valley, Chino Valley, and Dewey-Humboldt. The City of Prescott and the Town of Prescott Valley are large municipal water providers. Large provider population was 90,126 persons in 2010. The towns of Chino Valley and Dewey-Humboldt are small municipal providers. Other small municipal water providers include private water companies regulated by the Arizona Corporation Commission, mobile home parks, and well cooperatives. In 2010, the small municipal provider population was 9,683 people.

3.2.2 Exempt Wells

After accounting for population served by large and small municipal providers, the remainder of the total PRAMA population in 2010 was 18,637 people, which are presumed to rely on private, exempt domestic wells for their water. A very small portion of the remainder of the total PRAMA population may haul

water. Since 1985 the number of exempt well registrations in the PRAMA has increased more than 150 percent, from 4,560 exempt well registrations in 1985 to 11,671 exempt well registrations in 2012. From 1994 through 2006 the PRAMA saw very high numbers of Notices of Intent (NOI) to drill an exempt well filed (most of which were completed). Recent numbers of new exempt wells have not re-attained the pre-2007 annual rate of new NOIs (See Figure 3-3).

FIGURE 3-3
HISTORICAL EXEMPT WELL REGISTRATIONS
PRAMA



3.2.3 Estimated AMA Population and the 2010 Census

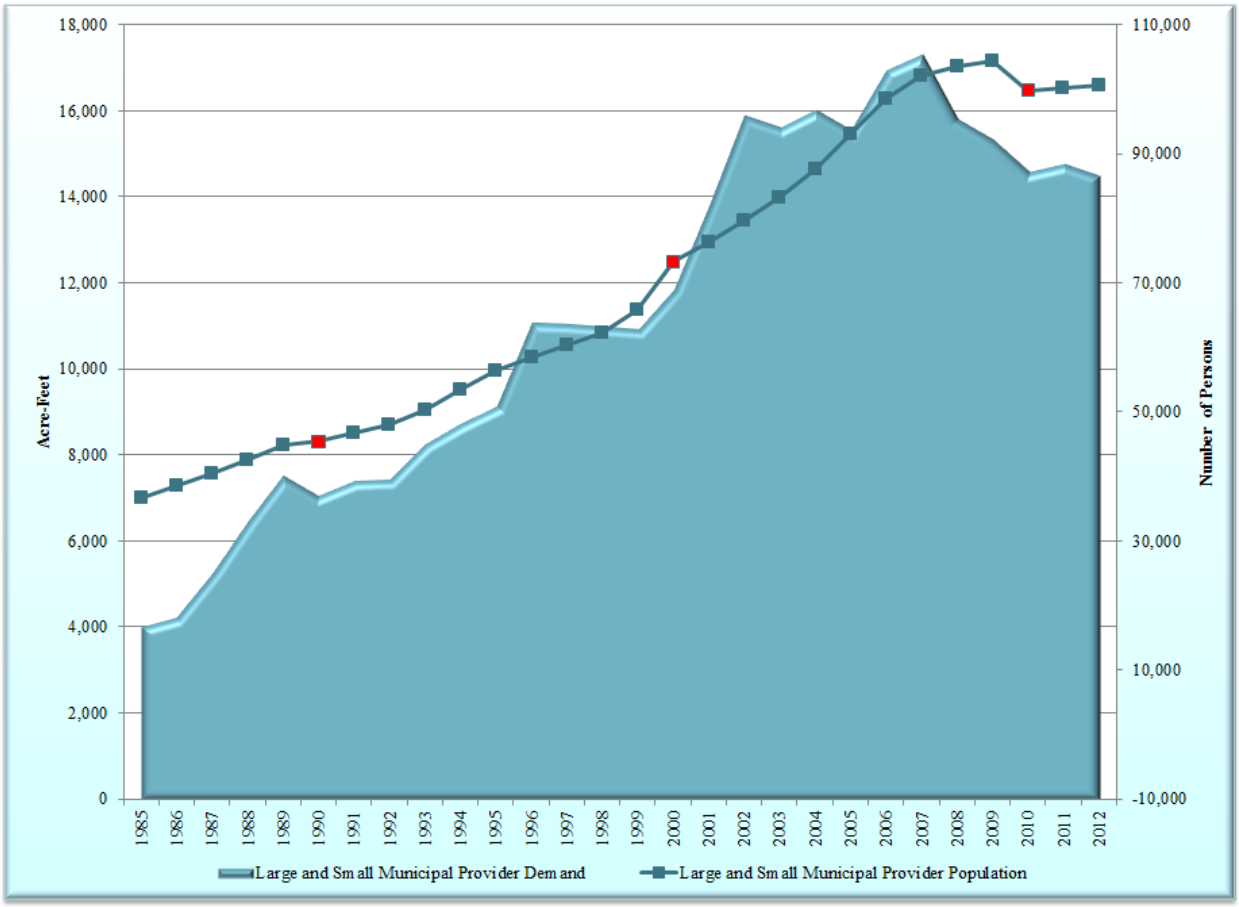
In the Assessment, ADWR estimated the population that relies on exempt wells for their water by using the average growth rate for large municipal providers between 1985 and 2006. This resulted in the exempt well population being overestimated by approximately 6,000 people by 2010 (comparing the 2010 projected exempt well population in the Assessment scenarios to the Census figure for 2010). However, between the 2000 Census and the 2010 Census, the exempt well population only increased by an estimated 1,826 people.

In the municipal sector, the large provider population was overestimated by approximately 13,500 people and the small provider population was overestimated by about 60 people in the Assessment. Figure 3-4 compares the large and small municipal provider population with the large and small municipal provider demand from 1985 through 2010. The Census years are clearly visible (shown with red markers). Because the Census is an actual population count, it reveals the over- or under-estimation in the inter-census population estimates. Slight dips or increases in the population seem to occur as the over- or under-

estimation of the population estimates is corrected by the actual Census data. The Census data thus serves to "bench" the estimates to the actual population count from the Census.

Due to this overestimation of population in between Censuses, it is difficult to analyze whether individual consumption, expressed in gallons per capita per day (GPCD), was actually increasing or decreasing during this period. Overestimating population results in a downward bias in GPCD figures. A more accurate comparison would be to compare water use in the actual Census years. In 1990, the large provider GPCD rate in the PRAMA was 143 GPCD. The large provider GPCD was 149 and 133, in 2000 and 2010, respectively. Water conservation activities, and the use of new, low water using fixtures, and newer homes with low water using landscapes, result in reductions in GPCD over time. Other factors that affect GPCD are weather conditions and water cost. The low GPCD figure in 2010 could be due to loss of income and subsequent cut back in outdoor watering, as well as possible weather conditions (2010 experienced higher than average precipitation). Multiple factors affect the GPCD rate, making it sometimes an unreliable measure of actual water conservation efforts. However, GPCD can be used as a basic indicator of consumption rates in the absence of more detailed data, such as end-use metering or data-logging, which cost more to collect.

FIGURE 3-4
HISTORICAL MUNICIPAL DEMAND AND MUNICIPAL POPULATION
PRAMA



Clearly municipal demand in the PRAMA has been on a steep growth curve over the historical period, necessitating the need for water managers, including ADWR, to evaluate the continued viability of the groundwater supply and the feasibility and logistics of importing additional water supplies to meet future demands.

3.2.4 Industrial Sector

The Code defines industrial use as a non-irrigation use of water, not supplied by a city, town or private water company, including animal industry use, such as dairies and cattle feedlots, and expansions of those uses. In general, industrial users withdraw water from their own wells that are associated with non-irrigation grandfathered groundwater water rights (Type 1 and Type 2 rights) or withdrawal permits. Although industrial users are primarily dependent on groundwater, some use renewable supplies such as surface water. Historically, industrial uses in the PRAMA included turf related facilities, sand and gravel operations, and other industrial uses such as small landscape users, cooling uses, construction, and others.

Industrial use is largely dependent on population growth and the economy. In some cases, the difference between the actual water use and the total annual allotment at an individual industrial facility is substantial, and is generally a remnant of the allocation process used to establish Type 2 rights. This process assigned users allotments based on the highest annual groundwater withdrawal between the years 1975 and 1980. In 2012, less than 20 percent of the PRAMA's industrial rights and permit volumes were used.

Approximately 48 percent of the total Type 1 and Type 2 allotments in the PRAMA belong to the City of Prescott. One Type 2 right has an allotment of 3,169 acre-feet, and was pledged by the City to the Yavapai-Prescott Indian Tribe (YPIT) in 1995 to guarantee the YPIT water service pursuant to the YPIT Settlement. Consequently, this Type 2 right will likely never be utilized unless the YPIT population grows beyond the City of Prescott's capacity to meet their water needs.

Historically, the industrial sector in the PRAMA has been quite small as compared to the other Active Management Areas (AMAs). Total sector water use in 1985 was 641 acre-feet, or about 2 percent of the PRAMA's total water use. By 1995, it had only grown only to 696 acre-feet. By 2012, total demand was 1,011 acre-feet, which comprised approximately five percent of the PRAMA's total water use. Turf water use and uncategorized industrial use, generally referred to as "other" industrial use currently dominate the AMA's industrial sector. Other industrial uses can include health care facilities, resorts, restaurants, office buildings, shopping malls, and laundries. Although the industrial sector has the authority to grow into its allotment, based on the historical trend of industrial water use in the PRAMA, it seems unlikely that this sector will comprise a much greater share of the total PRAMA demand than it does at present.

3.2.5 Agricultural Sector

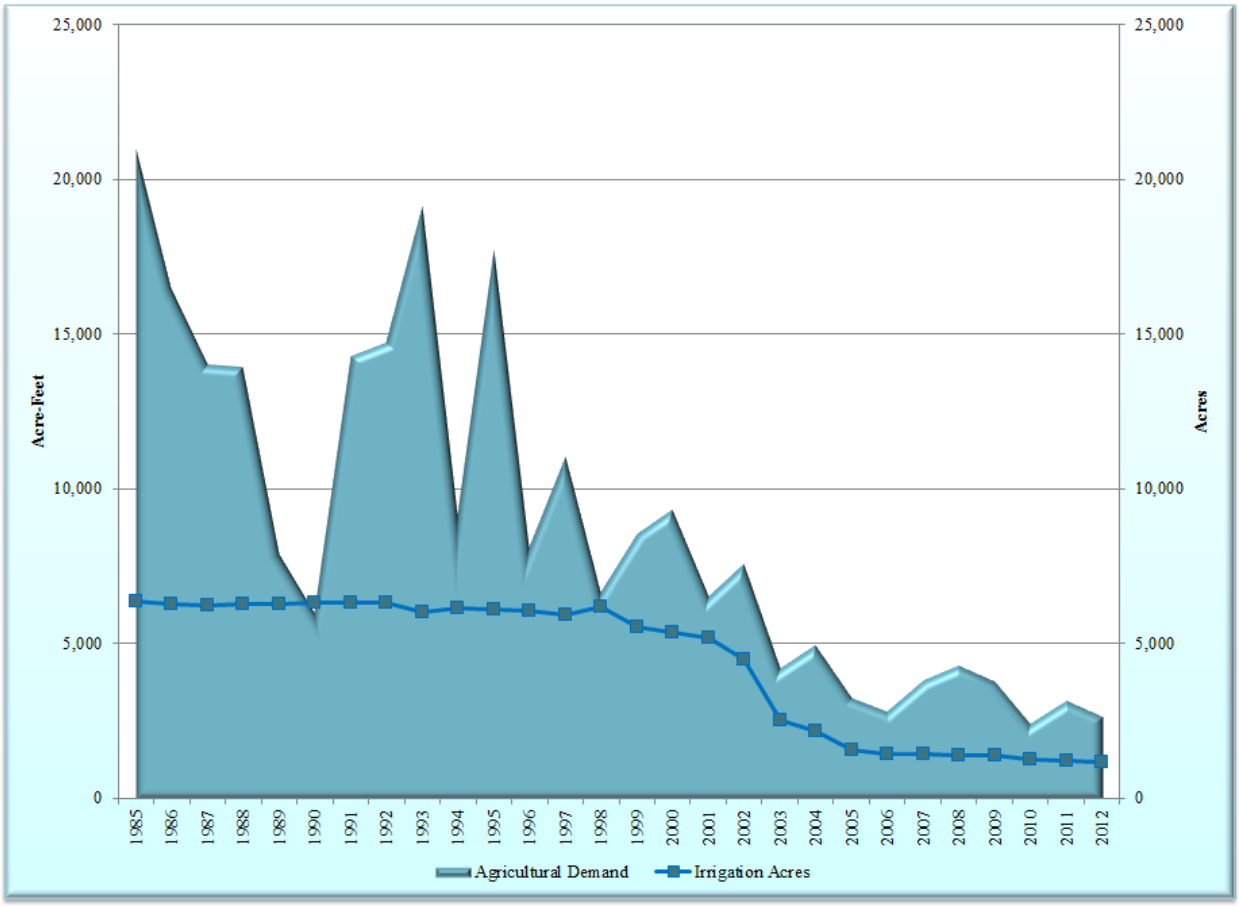
The agricultural sector is comprised of farm acreage actively irrigated with groundwater from 1975 to 1980, and some additional farms that use only surface water. Agricultural lands that used groundwater to irrigate crops during this time period were issued an IGFR by ADWR. Water use pursuant to these rights must be reported to ADWR if the right is larger than ten acres. In the PRAMA, other lands are irrigated exclusively with surface water or reclaimed water recovered within the area of impact of the storage. Such uses are legal without an IGFR, provided that no groundwater is used. People using only surface water or reclaimed water recovered within the area of impact for irrigation purposes are not required to report their annual water use to ADWR.

Historically, agriculture has been a large demand sector in the PRAMA. However, the number of irrigation acres, the number of active IGFRs, and the total allotment for IGFRs decreased significantly between 1985 and 2012. A total of 28 IGFRs associated with 1,142 irrigation acres remain. The sum of the remaining IGFR allotments is 3,966 acre-feet per year. The agricultural sector used approximately 2,683 acre-feet of water from all sources in 2012. Figure 3-5 shows historical agricultural water use from 1985 through 2012 and the total IGFR irrigation acres.

Since 1998, grandfathered rights (GFRs) were partially or fully extinguished pursuant to the Assured Water Supply (AWS) Rules. The AWS Rules allow IGFRs and Type 1 and Type 2 Non-Irrigation

Grandfathered Groundwater Rights (GFRs) to be permanently extinguished to generate credits that can be used to meet the consistency with the management goal requirement of proving a 100-year AWS. This accounts for over 4,000 acres in the PRAMA that can no longer be used for agricultural production. Extinguishment of these rights generated about 162,000 acre-feet of extinguishment credits, of which 23,011 have been pledged to help meet the consistency with management goal criterion under the AWS Rules. The balance, 139,273 acre-feet, remains unpledged. Divided out over a 100 year period, this extinguishment credit volume could result in an additional 1,393 acre-feet per year of new demand consistent with the PRAMA goal. If all the remaining IGFRs and GFRs in the PRAMA were to have been extinguished prior to the end of the year 2012, an additional 92,400 acre-feet of extinguishment credits could have been generated, equating to 924 more acre-feet of new demand per year for 100 years.

FIGURE 3-5
HISTORICAL AGRICULTURAL DEMAND AND IRRIGATION ACRES
PRAMA

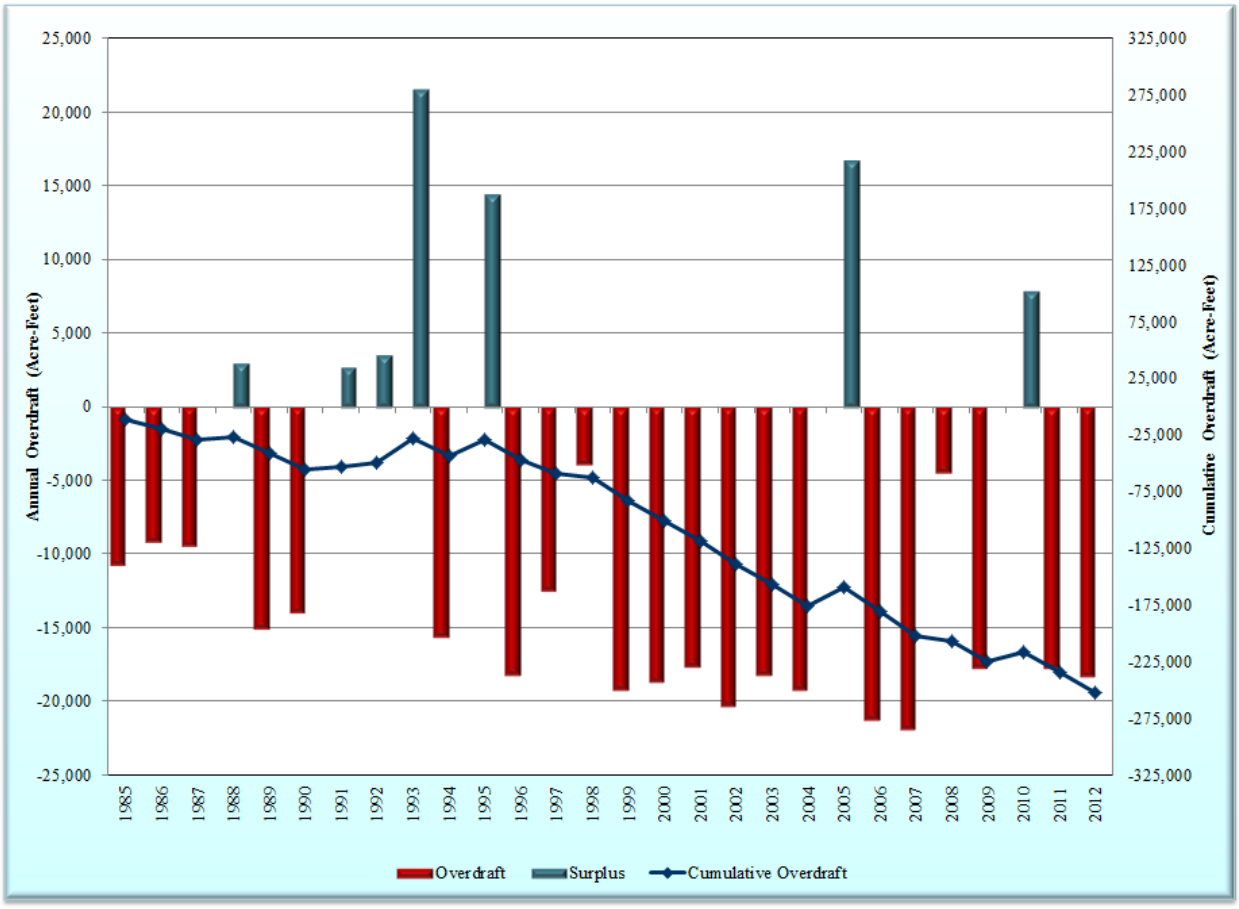


The *Chino Valley Irrigation District* (CVID) is the only irrigation district in the PRAMA. Historical information regarding CVID is somewhat limited because, as a purely surface water district, CVID was not required to report irrigation use to ADWR or its predecessor agencies. The district originally included approximately 2,500 acres of irrigated land (Gookin., 1977). In 1998, CVID entered into an intergovernmental agreement (IGA) with the City of Prescott in which CVID's surface water rights were relinquished to the City. Pursuant to the IGA, all CVID deliveries after 1999 are reclaimed water provided through storage and recovery of reclaimed water. CVID retained a small commitment to serve less than 30 acre-feet of surface water per year to three CVID properties. The maximum annual recovery limit under the IGA is 1,500 acre-feet until a total of 33,000 acre-feet has been recovered. CVID used approximately 3,200 acre-feet of surface water per year from 1985 to 1999. Many CVID shareholders

were issued their own IGFRs and retain the ability to utilize groundwater for irrigation use (or conversion to non-irrigation uses) into the future.

The agricultural sector represents a small portion of the total PRAMA demand and its groundwater demand is similar to that of the industrial sector. Therefore, the impact of the agricultural sector on the PRAMA overdraft is far less significant today and into the future than it has been in the past. Each year between now and 2025, the volume of extinguishment credits that would be generated by extinguishment of IGFRs reduces. When or if the few remaining active IGFRs in PRAMA will be extinguished is unknown. In the Assessment projections, ADWR assumed that 96 acres would remain in production in the year 2025 in Baseline Scenario One, about 600 acres would remain in production in 2025 in Baseline Scenario Two, and 1,400 acres (more than remain today) would be in production in 2025 in Baseline Scenario Three.

FIGURE 3-6
HISTORICAL OVERDRAFT, 1985-2012
PRAMA



3.3 CURRENT WATER BUDGET

The management goal of the PRAMA is to achieve a long-term balance between the annual amount of groundwater pumping and the annual amount of natural and artificial recharge in the PRAMA by 2025 (safe-yield). Net natural recharge and the other components in the calculation of safe-yield are described in the Assessment (ADWR, 2011) in part 3, "The Basic Budget Components." Overdraft, depicted in Figure 3-6 above, is equal to the sum of the groundwater use for all three sectors (estimated exempt well demand) minus the sum of incidental recharge plus the additional offsets to overdraft (including net

natural recharge and canal seepage). Red bars indicate overdraft, while blue bars indicate that supplies stored in the aquifer exceeded the volume of water withdrawn and leaving the aquifer through groundwater outflow in that year. The cumulative overdraft between 1985 and 2012 is shown as a line on a second axis. By 2012, the cumulative overdraft in the PRAMA since 1985 was nearly 275,000 acre-feet.

TABLE 3-2
HISTORICAL WATER DEMAND BY SECTOR (AF)
PRAMA

Year	Municipal Demand	Exempt Wells	Industrial Demand	Agricultural Demand	*TOTAL AMA DEMAND*	Renewable Supplies to Meet Demand[1]	Ground-water to Meet Demand	Offsets to GW Pumping[2]	*OVERDRAFT*
1985	4,004	785	641	20,987	***26,418***	10,005	**16,413**	5,639	***(10,774)***
1986	4,234	826	779	16,469	***22,309***	8,832	**13,476**	4,339	***(9,138)***
1987	5,259	870	895	14,043	***21,067***	8,789	**12,278**	2,793	***(9,485)***
1988	6,459	916	523	13,950	***21,847***	8,769	**13,078**	16,101	***3,023***
1989	7,541	964	669	7,927	***17,101***	1,310	**15,791**	732	***(15,059)***
1990	7,054	1,015	476	6,040	***14,585***	427	**14,158**	192	***(13,967)***
1991	7,418	1,068	516	14,321	***23,323***	9,172	**14,151**	16,882	***2,731***
1992	7,436	1,124	805	14,729	***24,094***	11,250	**12,844**	16,443	***3,599***
1993	8,260	1,184	704	19,172	***29,320***	13,497	**15,822**	37,334	***21,511***
1994	8,729	1,246	778	9,207	***19,960***	3,180	**16,780**	1,182	***(15,598)***
1995	9,137	1,311	696	17,745	***28,889***	12,415	**16,475**	30,952	***14,477***
1996	11,089	1,380	796	8,149	***21,415***	2,422	**18,992**	838	***(18,154)***
1997	11,070	1,453	731	11,057	***24,311***	9,116	**15,195**	2,721	***(12,474)***
1998	10,990	1,530	1,035	6,688	***20,243***	3,084	**17,159**	13,261	***(3,898)***
1999	10,939	1,610	926	8,566	***22,041***	2,167	**19,875**	737	***(19,138)***
2000	11,837	1,695	967	9,367	***23,866***	3,114	**20,752**	2,097	***(18,655)***
2001	13,789	1,713	1,550	6,567	***23,619***	4,996	**18,624**	1,051	***(17,573)***
2002	15,903	1,732	1,411	7,627	***26,673***	4,571	**22,102**	1,780	***(20,322)***
2003	15,634	1,750	1,608	4,254	***23,246***	4,358	**18,888**	762	***(18,126)***
2004	16,035	1,768	1,591	4,990	***24,385***	4,227	**20,157**	987	***(19,171)***
2005	15,571	1,787	1,496	3,302	***22,156***	4,565	**17,591**	34,366	***16,776***
2006	16,946	1,805	1,486	2,847	***23,085***	3,011	**20,073**	-1,170	***(21,243)***
2007	17,317	1,824	1,630	3,868	***24,639***	3,254	**21,385**	-415	***(21,801)***
2008	15,814	1,842	1,425	4,359	***23,440***	5,649	**17,791**	13,328	***(4,463)***
2009	15,342	1,860	1,312	3,822	***22,336***	4,686	**17,650**	-59	***(17,709)***
2010	14,595	1,879	1,218	2,455	***20,147***	5,583	**14,564**	22,508	***7,944***
2011	14,786	1,960	925	3,231	***20,902***	3,876	**17,026**	-686	***(17,712)***
2012	14,472	2,044	1,011	2,683	***20,210***	3,649	**16,562**	-1,664	***(18,226)***

[1] Surface water and reclaimed water
[2] Includes Cuts to the Aquifer, Incidental Recharge and Net Natural Recharge

All Indian uses in the PRAMA are included within the municipal sector. For purposes of the 4MP, overdraft includes use of the groundwater allowance. Despite these volumes of groundwater being consistent with the management goal under the AWS Rules, they are included in the overdraft calculation

to allow analysis of the groundwater allowance withdrawal physical impact on the aquifer.

The values in Figure 3-6 differ from those in the Assessment due to water budget hydrologic component updates, discussed previously in Chapter 2. Since publication of the Assessment, (Nelson, 2013), ADWR has updated its hydrologic groundwater model for the PRAMA and in so doing, increased its previous assumptions regarding the volume of mountain front and stream channel recharge. Further, ADWR groundwater modelers now have a greater understanding of the susceptibility of the PRAMA aquifers to drought and natural recharge. Those updated figures, reflecting actual conditions from 1985 through 2012, are reflected in Figure 3-6. This period of record indicates that the PRAMA has been in an overdraft condition more frequently than it has been in surplus. Values for Figure 3-6 are shown in Table 3-2. The net natural recharge in Chapter 2, Table 2-2 and offsets to groundwater pumping in Table 3-2 do not precisely match. This is due to the way the hydrologic model estimates incidental recharge (from human activities) as opposed to the method of estimating incidental recharge used in the Assessment. However, the figures are fairly close to one another.

FIGURE 3-7
HISTORICAL & AVERAGE NET NATURAL RECHARGE, 1985-2012
PRAMA

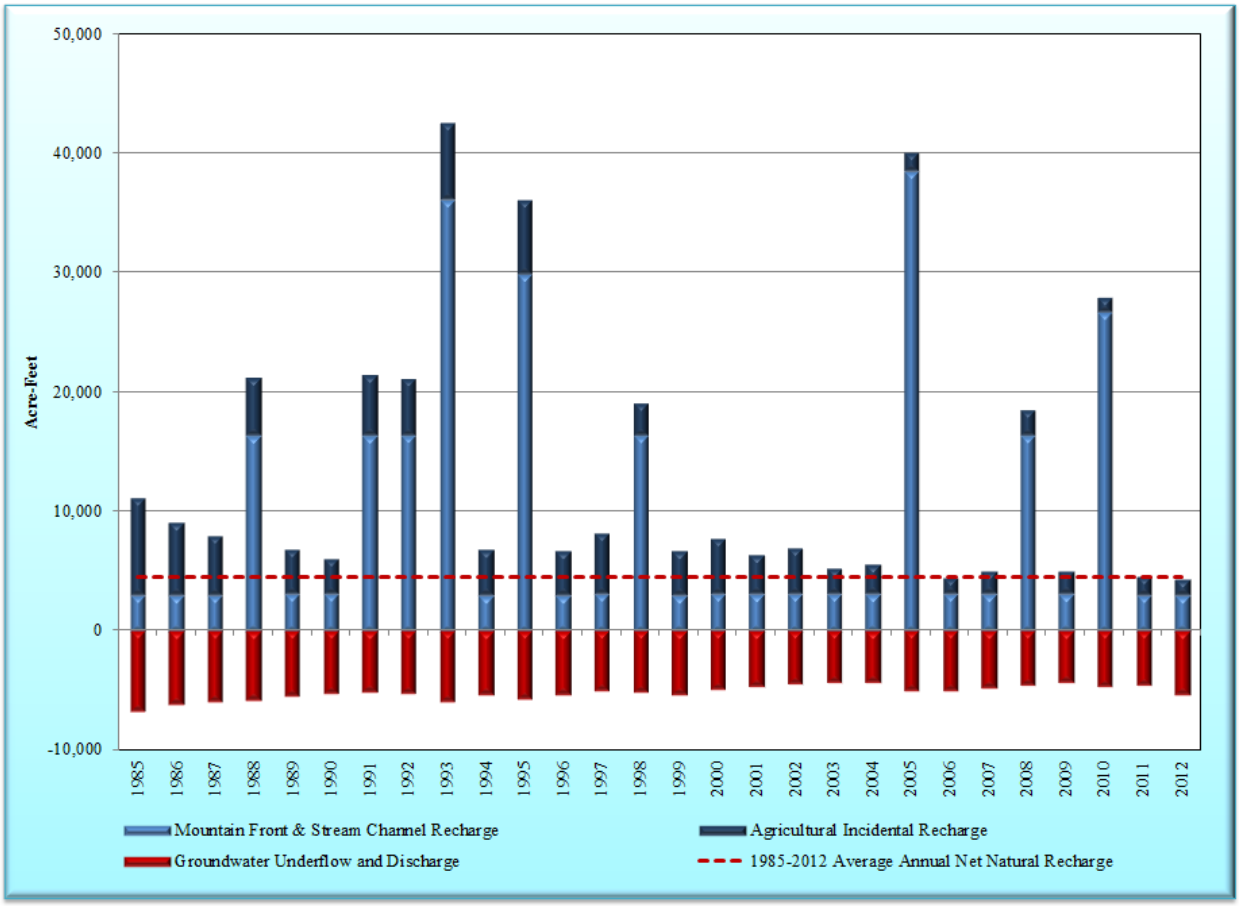


Figure 3-7 charts the net natural recharge components and agricultural incidental recharge figures from 1985 through 2012 and also shows the 1985 – 2012 average for net natural recharge. This figure demonstrates that there are many years when outflow continues despite low precipitation. In addition to the natural components shown in Figure 3-7, human activities also result in recharge of the aquifer. Agricultural incidental recharge is also a component of the aquifer water balance. In years where Figure 3-7 shows more outflow occurring (red bars) than mountain front or stream channel recharge (light blue

bars) the additional outflow can be attributed to incidental recharge. In addition, higher rates of outflow may occur for a few years following a year of surplus. In many years the net natural recharge that occurs is below the historical average of approximately 4,400 acre-feet per year, while from time to time a surplus year is well above the average figure. Thus, use of a long-term average for net natural recharge masks the variable availability non-groundwater natural water supplies from year to year.

3.4 CONCLUSIONS

The water demand characteristics described above, including sources of supply, coupled with the assumption that economic recovery will occur and result in additional population growth and water demands, illustrate that additional water conservation and augmentation programs are necessary in order to achieve the PRAMA goal by 2025. Furthermore, Figure 3-6 and the associated data shown in Table 3-2 give an indication of just how much more effort is needed to achieve the goal. The average annual overdraft in the PRAMA between 1985 and 2012 was about 9,000 acre-feet per year.

Bibliography

ADWR. (2010). *DRAFT Arizona Water Atlas: Active Management Area Planning Area (Vol. 8).* ADWR.

ADWR. (2011). *Water Demand and Supply Assessment 1985-2025, Prescott Active Management Area.* ADWR.

Gookin., W. (1977). *Comprehensive Water Study of the City of Prescott and Environs.*

Nelson, K. (2013, February 7). Personal communication.

CHAPTER FOUR:
AGRICULTURAL

4.1 INTRODUCTION

The Agricultural Conservation Program for the Fourth Management Plan (4MP) is identical to the program included in the Third Management Plan (3MP). Historically, the agricultural sector has contributed to meeting the PRAMA safe-yield goal through the Code prohibiting new agricultural land being brought into production inside an AMA, and a combination of improved on-farm water management practices, decreasing reliance on groundwater by increasing utilization of renewable supplies, and reduction of irrigated acreage due to retirement and/or urban development of farmland.

What is an agricultural water user?
Pursuant to A.R.S. § 45-465, only land associated with a Certificate of Irrigation Grandfathered Right (IGFR) can be legally irrigated with groundwater within an AMA. IGFRs were issued by ADWR based on irrigated acreage from the years 1975 to 1980. The term "irrigation" is limited in the Code to the growing of crops for sale, human consumption or livestock or poultry feed on two or more acres. A key component of the Code prohibits the establishment of new IGFRs – prohibiting new acres from being put into agricultural production. Land not associated with an IGFR may not be irrigated with groundwater unless one of the exceptions stated in the Code applies (*See A.R.S. § 45-452*).

Agricultural Conservation Program Requirements
The Base Agricultural Conservation Program is an allotment-based program that provides flexibility for farmers to use water in excess of their allotment in some years, and less in other years, provided they do not exceed a maximum debit limit in their flexibility account. Since adoption of the Code, alternative conservation programs have been adopted for IGFR holders based not on meeting an allotment, but rather on implementation of best management practices and conservation measures.

Agricultural Program Goal and Objectives for the 4MP
The Agricultural Conservation Program for the 4MP is identical to the program included in the 3MP. The provisions of this program are mandated by statute.

PRAMA Agricultural Sector Description
Until the mid-1990s the agricultural sector comprised the largest portion of the PRAMA's total water demand. There were 11,192 acre-feet of groundwater and 9,795 acre-feet of surface water used by the agricultural sector in 1985, which was nearly 80 percent of total AMA water use. By 2012, agricultural water use had decreased by more than 87 percent. Groundwater use had dropped to 1,689 acre-feet and recovered reclaimed water long-term storage credits accounted for the remaining 994 acre-feet of water use. Table 4-1 illustrates the agricultural sector's decreasing water use trend in the PRAMA between 1985 and 2012. As the AMA's agricultural water demands decreased, the municipal sector emerged as the dominant water use sector in the AMA.

History of PRAMA Agricultural Regulatory Programs/4MP Goals Summarized
ADWR is required by statute to develop and administer an Agricultural Conservation Program in all five management plans. The original allotment-based program has been modified several times since the Code was adopted. Changes pertained to a farmer's ability to market some of his flexibility account credits to other farms, the treatment of reclaimed water in the calculation of compliance, the exemption of IGFRs of ten or fewer acres from compliance and reporting requirements, and limitations on the maximum on-farm efficiency ADWR may use when calculating irrigation water duties. In 2002 the 3MP was modified to add alternative conservation programs for famers who had difficulty staying in compliance with the base program.

Agricultural Conservation Programs – History and Background

A person using groundwater within an AMA must comply with conservation requirements established in the management plan for each management period (A.R.S. § 45-563). Holders of an IGFR are subject to agricultural conservation requirements, which include irrigation water duties and maximum annual allotments (A.R.S. § 45-567). Conservation requirements also exist for irrigation districts and private water companies that distribute groundwater for irrigation purposes.

TABLE 4-1
HISTORICAL AGRICULTURAL SECTOR DEMAND AND SUPPLY (AF)
PRAMA

Year	Demand	Groundwater	Surface Water	Reclaimed Water	Allotment
1985	20,987	11,192	9,795	0	28,078
1986	16,469	7,913	8,556	0	28,091
1987	14,043	5,513	8,530	0	27,956
1988	13,950	5,490	8,460	0	28,045
1989	7,927	6,794	1,134	0	28,031
1990	6,040	5,958	83	0	28,202
1991	14,321	5,861	8,460	0	28,597
1992	14,729	4,129	10,600	0	28,748
1993	19,172	6,452	12,720	0	26,972
1994	9,207	6,027	3,180	0	27,498
1995	17,745	5,331	12,415	0	27,263
1996	8,149	6,569	1,580	0	27,215
1997	11,057	2,597	8,460	0	26,581
1998	6,688	4,342	2,303	43	27,767
1999	8,566	6,447	2,120	0	24,869
2000	9,367	7,090	1,155	1,122	17,680
2001	6,567	4,167	900	1,499	17,450
2002	7,627	5,227	900	1,500	15,408
2003	4,254	2,754	0	1,500	8,083
2004	4,990	3,490	0	1,500	6,956
2005	3,302	2,091	0	1,211	5,224
2006	2,847	2,065	0	782	4,753
2007	3,868	2,801	0	1,068	4,744
2008	4,359	3,256	0	1,103	4,535
2009	3,822	2,717	0	1,105	4,535
2010	2,455	1,618	0	837	4,088
2011	3,231	2,260	0	971	4,067
2012	2,683	1,689	0	994	3,966

ADWR will calculate a maximum annual groundwater allotment in the fourth management period for each IGFR in the PRAMA in accordance with the statutory provisions of A.R.S. § 45-567(A)(1). The fourth management period calculation is identical to that mandated by A.R.S. § 45-566. Under this Agricultural Conservation Base Program (Base Program), the water duty for a farm unit is calculated using an assigned irrigation efficiency of 80 percent, with certain exceptions. The Code provides for participants in the Base Program to borrow or bank groundwater from year to year to allow for varying climatic and market conditions. To meet this provision, ADWR maintains an operating flexibility account for each IGFR. All IGFRs in the PRAMA will be regulated under the Base Program unless the owner of the IGFR has been accepted into one of the alternative conservation programs described below.

In addition to the Base Program, the 4MP includes two alternative conservation programs for IGFR owners, as required by A.R.S. § 45-567.02(A) and (G): 1) the Historic Cropping Program and 2) the Best Management Practices (BMP) Program. The owner of an IGFR may opt to enroll in one of the alternative conservation programs if certain requirements are met.

The Historic Cropping Program is similar to the Base Program in that it is allotment-based. The water duty for the farm unit is calculated based upon its 1975 to 1980 crop history and an assigned irrigation efficiency of 75 percent. This program also has a flexibility account provision. There is a limit, however, on the total amount of flexibility account credits and debits that may be accumulated. The Historic Cropping Program requires a high level of farm management. Participants in the Historic Cropping Program are required to provide information regarding irrigation water management practices, irrigation system type, and the acreage and type of crops grown to assist ADWR in determining program effectiveness.

Unlike the Base Program or the Historic Cropping Program, participation in the BMP Program requires the implementation and maintenance of specific agricultural conservation practices. To efficiently use water, this program relies upon physical on-farm improvements and farm management practices. Since this program is not allotment-based, there is no provision for an operating flexibility account. The BMP Program allows participants flexibility to make decisions concerning their farming operation. As with the Base Program and the Historic Cropping Program, only acres irrigated between 1975 and 1980 may be irrigated under the BMP Program.

4.2 RELATIONSHIP OF THE AGRICULTURAL SECTOR TO ACHIEVEMENT OF THE AMA WATER MANAGEMENT GOAL

Physical description

Within the PRAMA, the majority of irrigated lands are located in the northern reaches of the AMA near the Town of Chino Valley and in the southern part of the AMA along the Agua Fria River (*See Figure 4-1)*. There is one irrigation district within the PRAMA, the Chino Valley Irrigation District (CVID). Pasture, which tends to be deficit irrigated, is the predominant crop. Other crops include alfalfa, corn, small grains, and garden vegetables.

Assessment

ADWR anticipates the eventual retirement of most IGFRs in the PRAMA *(See Figure 4-2)*. Some will be retired to Type 1 non-irrigation grandfathered rights to be used to supply groundwater for industrial uses, and others will be subdivided for residential and commercial development. In the latter case, if the development occurs before 2025, the IGFR will be extinguished for credits to meet the consistency with goal criterion of the AWS Rules (*See A.A.C. R12-15-726*). As of 2013, all farms in the PRAMA are regulated under the Base Program. None of the farms in the AMA have opted for regulation under either the Historic Cropping Program or the BMP Program.

4.3 INCENTIVES FOR THE USE OF RENEWABLE SUPPLIES AND REMEDIATED GROUNDWATER

The State of Arizona and ADWR have developed incentives to increase the use of non-groundwater supplies. For example, in 1991, the Legislature amended A.R.S. § 45-467 to exclude reclaimed water from consideration in determining the amount of any debit to be registered to a farm's flex account (Laws 1991, Ch. 112, § 3). Under this amendment, a person using groundwater on a farm pursuant to an IGFR may use an unlimited amount of reclaimed water on the farm without any debit being registered to the farm's flex account as a result of reclaimed water use. This amendment has created an incentive for the use of reclaimed water.

FIGURE 4-1
AGRICULTURAL IRRIGATION ACRES
PRAMA

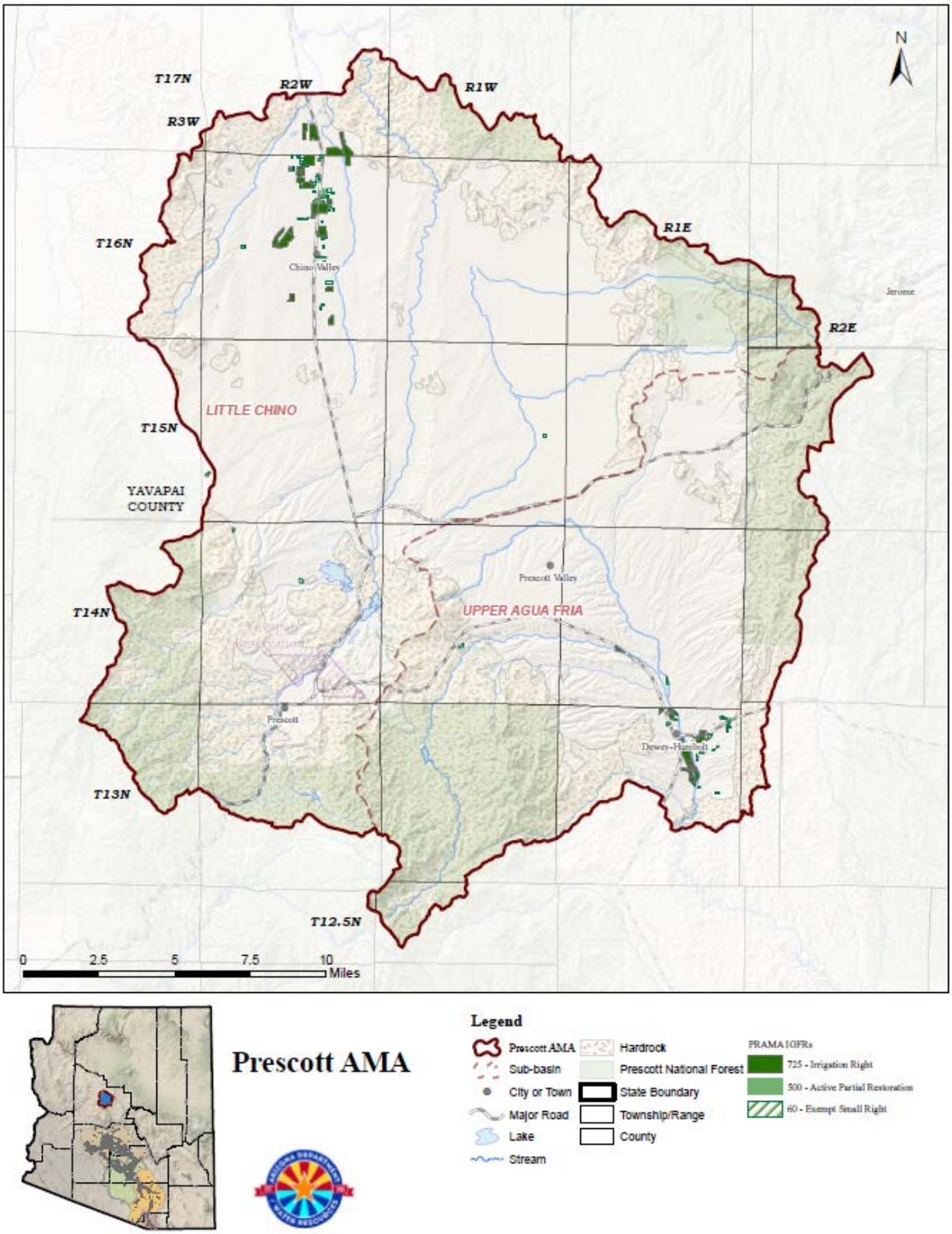
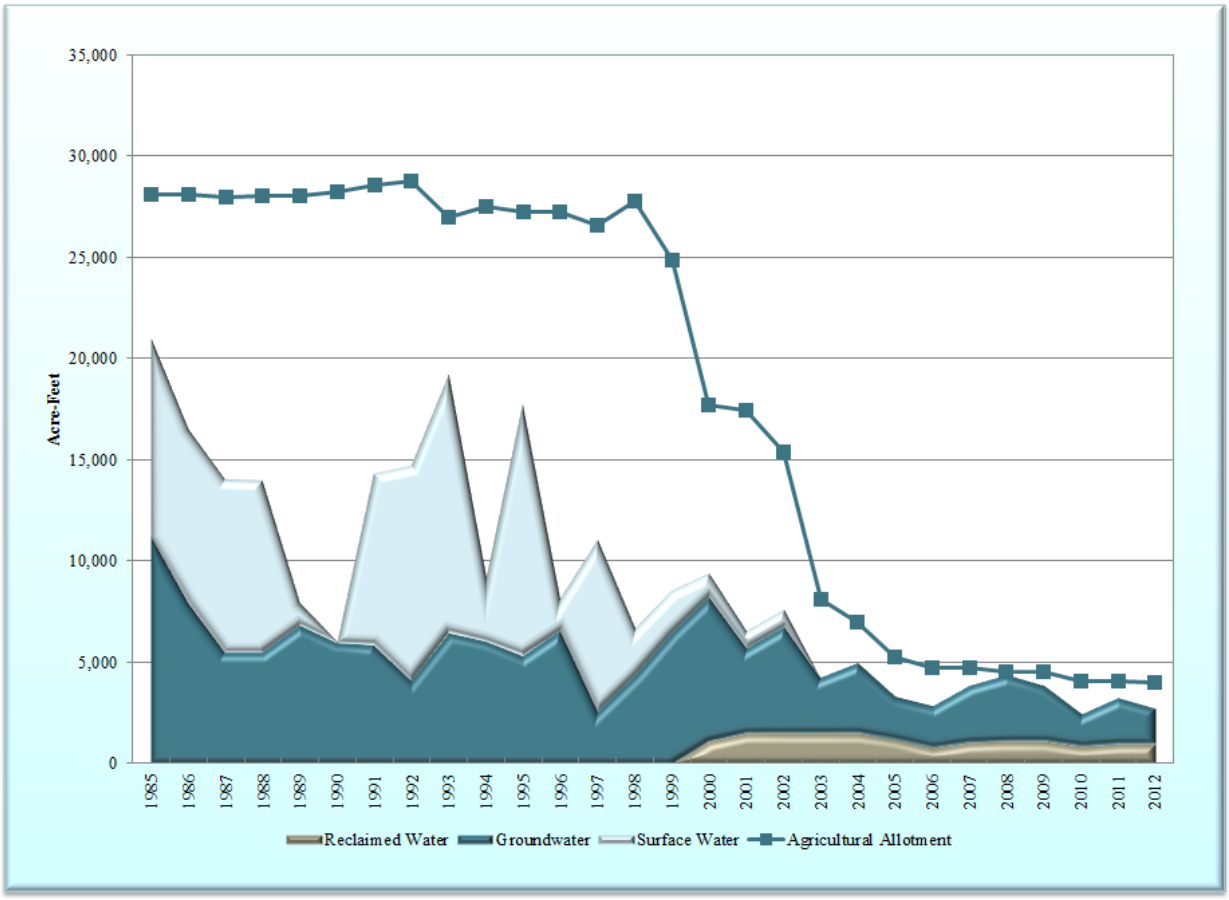


FIGURE 4-2
HISTORICAL AGRICULTURAL SECTOR DEMAND AND SUPPLY
PRAMA



Legislation was enacted in 1997 that significantly revised the Water Quality Assurance Revolving Fund (WQARF) Program to provide incentives for the use of remediated groundwater to facilitate the treatment of contaminated groundwater. This legislation provides that ADWR shall account for the use of groundwater withdrawn pursuant to an approved remedial action project as surface water when determining compliance with management plan conservation requirements (Laws 1997, Ch. 287, § 51(B)). The criteria that must be met to qualify for this accounting are set forth in Section 4-107 of this chapter, (legally enforceable provisions), entitled: *Agricultural Conservation Requirements and Monitoring and Reporting Requirements*. Groundwater withdrawn pursuant to an approved remedial action project retains its legal character as groundwater for all other purposes under Title 45, Arizona Revised Statutes Chapter 2. More information on the statutory mandates for ADWR's involvement in the WQARF Program is provided in Chapter 7.

During the fourth management period, ADWR will continue to support the increased use of reclaimed water in all sectors, including the agricultural sector. In the past, direct reclaimed water utilization for agricultural irrigation has been limited due to a lack of infrastructure. Other requirements, such as the wastewater reuse rules adopted by the Arizona Department of Environmental Quality, have limited the types of crops that can be irrigated solely by reclaimed water (A.A.C. R18-11-301 thru 309). As water treatment techniques improve and reclaimed water becomes more accessible to the agricultural sector, ADWR expects that reclaimed water use for agricultural purposes will increase. The agricultural sector may also use reclaimed water that is stored underground and later recovered within the area of impact of

storage or, subject to certain restrictions, recovered outside the area of impact of storage. This water experiences further treatment as it infiltrates the aquifer and is treated in the same manner as direct use reclaimed water in the calculation of the farm's flexibility account.

Indirect use of reclaimed water through underground storage and recovery is practiced in the Little Chino Sub-Basin of the PRAMA through the IGA between the City of Prescott and the CVID. In 2007, the Town of Prescott Valley auctioned the rights to the effluent it will generate with a stipulation that the water be put to use within the Town of Prescott Valley. This arrangement will likely preclude the reuse of reclaimed water for agricultural use in the Agua Fria Sub-Basin.

4.4 NON-REGULATORY EFFORTS

In addition to the agricultural conservation programs described above, other water resource management strategies have been developed to help achieve the water management goal for the PRAMA. The Water Management Assistance Program is designed to provide funds to enhance groundwater conservation activities within all use sectors, including the agricultural sector, and is expected to continue during the fourth management period. The Water Management Assistance Program is described more fully in Chapter 9 of this plan.

4.5 AGRICULTURAL CONSERVATION PROGRAM COMPONENTS AND CALCULATIONS

This section describes the Agricultural Conservation Program components for the 4MP. This program, which exists in all AMAs, consists of three conservation programs for IGFRs: (1) the Base Program, (2) the Historic Cropping Program, and (3) the BMP Program. The Agricultural Conservation Program also contains irrigation distribution system conservation requirements for irrigation districts and private water companies distributing groundwater for irrigation use. Each of these programs is described below.

4.5.1 Calculation of Irrigation Water Duties and Maximum Annual Groundwater Allotments

The irrigation water duty is the primary component of the Base Program and the Historic Cropping Program and is used to determine the maximum annual groundwater allotment for each IGFR regulated under these programs. This section describes how ADWR determines water duties and maximum annual groundwater allotments. This section does not apply to the BMP Program.

4.5.1.1 Irrigation Water Duties

The irrigation water duty is the quantity of water reasonably required per acre to annually irrigate the crops historically grown on a farm unit from 1975 to 1980. The crops historically grown in each farm unit were verified and established during the first management period. ADWR calculates the irrigation water duty for each IGFR using the following formula:

$$\textit{Irrigation Water Duty} = \frac{\textit{Total Irrigation Requirement per Acre}}{\textit{Assigned Irrigation Efficiency}}$$

In this formula, the irrigation water duty is calculated by dividing the total water requirements to produce the crops historically grown by the assigned irrigation efficiency. Each component of the formula is discussed below.

Assigned Irrigation Efficiencies
As described in the 3MP, all farm units in the PRAMA are situated on limiting soils. Under A.R.S. § 45-567(A)(1) an irrigation efficiency of 80 percent is assigned to farm units in the Base program having non-limiting soils; however, a lower irrigation efficiency may be used for a farm unit determined by the director to be on limiting soils or excessive slopes. Because all farms in the PRAMA have been determined to be situated on limiting soils, the director has determined that the assigned irrigation efficiency for each farm unit is 75 percent.

For the Historic Cropping Program, the assigned irrigation efficiency for farm units with non-limiting soils is 75 percent. Because all farm units within the PRAMA are situated on limiting soils, the director has determined that an assigned irrigation efficiency of 70 percent will be used to calculate a farm unit's water duty under the Historic Cropping Program. A.R.S. § 45-567.02(B)(2).

Total Irrigation Requirement
The total irrigation requirement for each farm unit equals the amount of water needed annually to satisfy the sum of the irrigation requirements for any crops grown between 1975 and 1980. For each crop, the irrigation requirement (IR) consists of the amount of water needed to meet the consumptive use (CU) requirement of the crop, plus any other needs (ON) that the crop may have, plus any needed leaching allowance (LA), less any effective precipitation (EP). The irrigation requirement is calculated by the following equation:

$$IR = CU + ON + LA - EP$$

The components of the irrigation requirement equation are discussed below.

Consumptive Use
The consumptive use requirement of a crop is the amount of water used in transpiration and building of plant tissue, together with the amount of water evaporated from adjacent soil during the growing season. Crop consumptive use values are unchanged from the information provided in the 3MP and commonly used values for the PRAMA. Appendix 4A lists the consumptive use requirement for each crop historically grown in the region.

Other Needs
Water required by certain crops for purposes other than consumptive use is referred to as "other needs" water. Examples of "other needs" include additional water for certain vegetable crops for germination, cooling, and quality control. ADWR makes adjustments for those crops that have "other needs". For the fourth management period, no crops grown in the PRAMA were identified as needing additional water for "other needs."

Leaching Allowance
In some situations, a crop may require additional water for leaching or deep percolation. A leaching allowance may be necessary to prevent salts from accumulating in the crop root zone when high levels of total dissolved solids (TDS) are present in the irrigation water. If the accumulated salts in the soil profile are not leached below the root zone, soil salinity will increase and eventually inhibit plant growth and yields.

The procedure ADWR uses to calculate the leaching allowance for a crop is shown by the following equation:

$$LA = \frac{AE}{0.85}\left[CU \left[\frac{1}{1 - \frac{EC_w}{5\,EC_e - EC_w}} - 1 \right] \right]$$

Where, LA = leaching allowance for the crop; AE = assigned irrigation efficiency for the farm unit; CU = consumptive use requirement of the crop; EC_w = electrical conductivity of the irrigation water (expressed in millimhos per centimeter); and EC_e = tolerance of the crop to soil salinity as indicated by the electrical conductivity of the soil saturation extract (expressed in millimhos per centimeter).

Most irrigation water in the PRAMA is of adequate quality for irrigation purposes. Consequently, ADWR does not include leaching allowances in the calculation of irrigation requirements for crops grown in the AMA. If, however, an IGFR had an irrigation water supply with an EC_w value greater than 1.5 millimhos per centimeter (a concentration of approximately 1,000 milligrams per liter of TDS), the owner of the IGFR may apply to ADWR for an administrative review to seek a leaching allowance as discussed in Chapter 10 of this plan.

Effective Precipitation

Effective precipitation is defined as the amount of precipitation occurring before and during the growing season that is available for plant growth. Because precipitation in the PRAMA is substantial during most years, an effective precipitation value was incorporated into the calculation of the total irrigation requirement. Consumptive use values for crops grown in the PRAMA, including values for effective precipitation, can be found in Appendix 4A.

4.5.1.2 Calculation of Maximum Annual Groundwater Allotments

The maximum annual groundwater allotment for each IGFR is determined by multiplying the irrigation water duty by the water duty acres. These calculations are governed by A.R.S. § 45-465.

4.5.2 Base Program

Pursuant to A.R.S. § 45-567(A)(1), each IGFR owner and any person entitled to use groundwater pursuant to the right will be regulated under the Base Program unless an application for regulation under an alternative conservation program is approved by ADWR. This statute requires ADWR to calculate the water duty for each farm unit by dividing the total irrigation requirement per acre of the crops historically grown on the farm unit by an assigned irrigation efficiency of 80 percent. A lower assigned irrigation efficiency may be used to calculate the water duties for farm units or portions of farm units that are determined by the director as having limiting soils or excessive slopes. As discussed earlier, all farm units in the PRAMA are situated on limiting soils and have been assigned an irrigation efficiency of 75 percent.

A.R.S. § 45-567(A)(1) authorizes ADWR, subject to certain limitations, to reduce the highest 25 percent of the water duties within an area of similar farming conditions. ADWR chose not to implement this provision for the fourth management period.

In the Base Program, the potential to accrue flex account credits is not limited. However, a negative balance that exceeds 50 percent of the annual allotment constitutes in a violation of the conservation requirement. Flex credits can be used at any time in future years, and may be used to offset debits. Under certain conditions, IGFR owners regulated under the Base Program may transfer, convey or acquire flex account credits during the second calendar year following the year in which the flex account credits were registered (A.R.S. § 45-467(O)).

4.5.3 Historic Cropping Program

ADWR developed the Historic Cropping Program pursuant to A.R.S. § 45-567.02. Because the director has determined that all farms in the PRAMA are situated on limiting soils, ADWR will calculate the water duty by dividing the total irrigation requirement per acre of the crops historically grown on the farm unit by the assigned irrigation efficiency of 70 percent.

In the Historic Cropping Program, accrued flex account credits are limited to 75 percent of the farm's annual allotment. A negative flex account balance that exceeds 25 percent of the annual allotment constitutes a violation of the conservation requirement. Flex credits can be used at any time in future years, and may be used to offset debits. Participants in the Historic Cropping Program are not allowed to convey, sell or acquire flex account credits (See A.R.S. § 45-467.02).

The Historic Cropping Program requires a high level of farm management. Participants in the Historic Cropping Program will be required to comply with certain reporting requirements. Participants must provide information regarding irrigation water management practices, irrigation system type, and the acreage and type of crops grown to assist ADWR in determining program effectiveness.

IGFR owners interested in enrolling in the Historic Cropping Program must satisfy the following requirements:

- File an application with ADWR.
- Reduce any debit balance in the existing flex account to an amount which does not exceed 25 percent of the existing maximum annual groundwater allotment.
- Reduce any flex account credits in the existing flex account balance to an amount which does not exceed 75 percent of the existing maximum annual groundwater allotment.
- Provide documentation showing that an actual irrigation efficiency of at least 70 percent has been, or will be, achieved on the farm unit on a seasonal basis, or agree to enroll in an irrigation management services program.

Once an IGFR owner has enrolled in the Historic Cropping Program, the owner must remain in the program until the effective date of the conservation requirements established in the subsequent management plan unless there is a change in ownership of the IGFR.

4.5.4 BMP Program

As required by A.R.S. § 45-567.02(G), the director has included a BMP Program in the 4MP. The BMP Program can best be characterized as an IGFR owner's commitment to implement certain agricultural conservation practices. The purpose of this program is to provide an alternative conservation program that is designed to be at least as effective in achieving water conservation as the Base Program. Program participants are not restricted to maximum annual groundwater allotments based on the crops historically grown. Instead, they are required to implement specific agricultural conservation practices that involve on-farm irrigation system improvements and increased farm management. This combination of applied physical and management improvements is designed to assist farmers in achieving a high level of on-farm seasonal irrigation efficiency.

BMPs are approved practices that can be used by farmers to increase the overall water use efficiency of the farm. In order to meet the changing demands of agricultural production, irrigation system improvements and a high level of farm management are essential. ADWR, with assistance of the agricultural community, has developed a menu of approved BMPs to ensure that individual farmers can select practices that provide the greatest opportunity for increased water savings and efficient operation of their farms.

Approved BMPs are listed in Appendix 4B and are separated into four distinct categories: 1) Water Conveyance System Improvements; 2) Farm Irrigation Systems; 3) Irrigation Water Management Practices; and 4) Agronomic Management Practices. Each category contains specific ADWR approved BMPs, with point values based on their potential contribution to water conservation. To ensure a balance between categories, an applicant to the BMP Program may only score a maximum of three points within each category. Furthermore, the applicant must score a minimum of two points in the Farm Irrigation Systems category, a minimum of one point in each of the other three categories, and at least 10 points overall. The applicant may select a BMP in Category 1 or 2 only if the BMP has already been installed and is in use on the farm at the time the application is filed. The applicant may select a BMP in Category 3 or 4 only if the BMP will be implemented annually during the time the farm is regulated under the BMP Program. In order to receive points for agricultural conservation practices in Category 3 or 4 that are not approved BMPs described in Appendix 4B, the applicant must demonstrate to ADWR that such practices will likely result in water savings that are at least equivalent to that of the approved BMPs.

In order to enroll in the BMP Program, an individual must apply to the director on a form provided by ADWR. If all eligibility requirements are met, the director will approve the application. The applicant must also submit the following:

- A current farm map showing all existing improvements to the farm unit respective to water conveyance and farm irrigation systems.

- If the applicant is leasing the land, a signed affidavit from the owner of each IGFR for which the application is filed stating that the owner agrees to regulation under the BMP Program until the conservation requirements in the 5MP become effective. ADWR will develop a policy that allows the owner and ADWR to agree to specific terms of compliance at the time the application is filed so that the owner will know at that time the extent of the owner's liability for any violations of the BMP Program while the land is leased.

It should be noted that under the BMP Program, it is possible to include multiple IGFRs under a single BMP enrollment as long as the IGFRs are either contiguous or in close proximity to each other, and part of a single farm unit. Once enrolled in the BMP Program, the IGFR owner and any person using groundwater pursuant to the right (e.g. farm operator or lessee) will be regulated under the BMP Program until the 5MP requirements become effective, unless there is a change in ownership of the farm unit. New owners of IGFRs may file a written request to withdraw from the BMP Program within 30 days after the conveyance of the IGFR has been completed. The director will grant the request unless the director determines that the transfer of ownership was made solely for the purpose of withdrawing from the BMP Program. If the request is granted, the new owner will be regulated under the Base Program, unless it applies and is accepted for regulation under the Historic Cropping Program.

An IGFR owner enrolled in the BMP Program may, under certain conditions, be allowed to withdraw from the program if the owner demonstrates to the director that the owner has been unable to find a person willing to lease the IGFR and be regulated under the BMP Program. If a person regulated under the BMP Program acquires or leases land with an IGFR that is not enrolled in the BMP Program, the

person may apply to have the IGFR enrolled in the BMP Program, subject to the owner's consent, if applicable.

While enrolled in the program, the participant must implement all BMPs selected in the application approved by ADWR, except that the owner or lessee of the farm unit may replace a selected BMP in Category 3 or 4 with a different BMP under certain conditions. A BMP selected in Category 3 or 4 may be replaced with an approved BMP in the same category without prior approval of ADWR. However, the owner or lessee of the farm unit must give ADWR written notice of the replacement within thirty days following replacement.

A BMP selected in Category 3 or 4 may also be replaced with a substitute practice (i.e., a practice that is not an approved BMP) in the same category if the owner or lessee of the farm unit applies to ADWR and the application is approved. ADWR will approve an application for replacement of a selected BMP with a substitute practice if it is determined that implementation of the substitute practice will likely result in water savings on the farm at least equivalent to the water savings that would result from implementation of the originally approved BMP.

4.5.4.1 BMP Advisory Committee

The Agricultural Water Conservation Best Management Practices Advisory Committee (BMP Advisory Committee) was established in 2002. The current members are listed on ADWR's website at http://www.azwater.gov/azdwr/WaterManagement/AMAs/PrescottAMAFourthManagementPlan.htm.

The BMP Advisory Committee, in consultation with ADWR and the agricultural community, will continue to review and analyze the effectiveness and administration of the BMP Program during the fourth management period. Based on this information, the BMP Advisory Committee may recommend changing or terminating the program, and may also recommend the structure of a BMP Program for subsequent management periods.

4.5.4.2 BMP Technical Standards Assistance

During 2013, ADWR established a new partnership with the US Department of Agriculture Natural Resource Conservation Service (NRCS) to assist with the technical standards of the BMPs included in the Agricultural BMP program. The NRCS is available to provide technical and financial assistance to farmers in implementing the BMPs. The NRCS has established specific technical standards for each BMP including yield increase and water savings. In addition, the NRCS is providing matching funds which will result in additional technical personnel available to assist farms in implementing the program requirements at local agricultural conservation assistance offices.

The NRCS has made recommendations to the ADWR director intended to improve the implementation of the BMP program during the fourth management period. These recommendations will be presented to the BMP Advisory Committee for consideration and approval.

4.6 IRRIGATION DISTRIBUTION SYSTEM REQUIREMENTS

For the fourth management period, the director may establish "additional economically reasonable conservation requirements for the distribution of groundwater by cities, towns, private water companies and irrigation districts within their service areas." (A.R.S. § 45-567(A)(4)). Establishment of these conservation requirements was required by the 3MP (A.R.S. § 45-566(A)(5)).

The irrigation distribution system requirements as well as the monitoring and reporting requirements for irrigation districts and private water companies have been modified in the 4MP

to apply to irrigation districts and private water companies distributing any amount of water for irrigation use. This is a change from the 3MP which applied the irrigation distribution system requirements as well as the monitoring and reporting requirements to only those irrigation districts and private water companies distributing 20 percent or more of their total water deliveries for irrigation use. These irrigation districts and private water companies are required to reduce their irrigation distribution system lost and unaccounted for water by lining all their canals, or by operating their delivery systems so that the total quantity of lost and unaccounted for water is 10 percent or less of the total quantity of water withdrawn, diverted, or received during a year. These requirements are effective upon the commencement of operation, or by the first compliance date of the 4MP, whichever is later.

If a private water company or irrigation district has economic circumstances which prevent timely compliance with the irrigation distribution system conservation requirements, a variance of up to five years may be requested as provided by A.R.S. § 45-574. Information submitted in support of the variance request must include a complete water loss reduction plan prepared by a registered civil engineer that contains:

- A complete construction design document showing specifications for repairing or modifying the irrigation distribution system. The document must include material specifications, proposed design specifications, installation and construction specifications, and any other engineering information or specifications necessary to complete the proposed rehabilitation of the distribution system.

- A detailed list of engineering costs and the proposed financing options to complete the system improvements.

- The final completion date for the rehabilitation.

- If applicable, a system operating guide to minimize lost and unaccounted for water. This guide may be modified as the rehabilitation progresses.

The procedures for obtaining a variance are described in Chapter 10.

4.7 AGRICULTURAL CONSERVATION REQUIREMENTS AND MONITORING AND REPORTING REQUIREMENTS

4-701. Definitions

In addition to the definitions set forth in Chapters 1 and 2 of Title 45 of the Arizona Revised Statutes, the following words and phrases used in sections 4-701 through 4-707 of this chapter shall have the meanings set forth below, unless the context otherwise requires:

1. *"4MP" means the Fourth Management Plan for the Prescott Active Management Area.*

2. *"5MP" means the Fifth Management Plan for the Prescott Active Management Area.*

3. *"ADWR" means the Arizona Department of Water Resources.*

4. *"Assigned Irrigation Efficiency" means the irrigation efficiency used to compute an irrigation water duty for the fourth management period pursuant to A.R.S. §§ 45-567 and 45-567.02.*

5. *"Canal" means a waterway constructed for the purpose of transporting water to a point of delivery, including main canals and lateral canals.*

6. *"Farm" has the same definition as prescribed in A.R.S. § 45-402.*

7. *"Farm Unit" has the same definition as prescribed in A.R.S. § 45-402.*

8. *"Flexibility Account" is an account maintained under A.R.S. § 45-467.*

9. *"IGFR" means an Irrigation Grandfathered Right.*

10. *"Irrigation Acre" has the same definition as prescribed in A.R.S. § 45-402.*

11. *"Irrigation Distribution System" means a system of canals, flumes, pipes, or other works that are owned or operated by an irrigation district or private water company and used to deliver water for irrigation use.*

12. *"Irrigation Water Duty" has the same definition as prescribed in A.R.S. § 45-567 which, for the 4MP, is the total irrigation requirement to produce the crops historically grown divided by the assigned irrigation efficiency.*

13. *"Lost Water" means water from any source, including reclaimed water, which enters an irrigation distribution system and is lost from the system during transportation or distribution due to seepage, evaporation, leaks, breaks, phreatophyte use, or other causes.*

14. *"Maximum Annual Groundwater Allotment" means the maximum amount of groundwater that may be used per year for the irrigation of each irrigation acre in the farm that is calculated pursuant to A.R.S. § 45-465.*

15. *"On-farm Seasonal Irrigation Efficiency" means the total water requirements to produce a crop divided by the total quantity of water actually applied to that crop during one growing season.*

16. *"Reclaimed water" has the same definition as "effluent" in A.R.S. § 45-101.*

17. *"Total Quantity of Lost and Unaccounted for Water" means the total quantity of water from any source, including reclaimed water, that enters an irrigation district's or private water company's irrigation distribution system during a calendar year less the total deliveries of water made by the irrigation district or private water company through its irrigation distribution system during the calendar year that are measured or estimated based on a generally accepted method of estimating water use.*

18. *"Water Duty Acres" has the same definition as prescribed in A.R.S. § 45-461.*

4-702. Base Agricultural Conservation Program Requirements

A. *Unless the owner of a Certificate of Irrigation Grandfathered Right ("IGFR") has applied and been approved for regulation under the Historic Cropping Program described in section 4-703 or the Best Management Practices Program described in section 4-704, the IGFR owner and any person who is entitled to use groundwater pursuant to that IGFR shall comply with this section.*

B. *The IGFR owner and any person entitled to use groundwater pursuant to that IGFR shall comply with the irrigation water duty and maximum annual groundwater allotment assigned for the IGFR beginning January 1, 2017, and during each calendar year thereafter until the first compliance date for any substitute conservation requirement established in the 5MP. The irrigation acres, water duty acres, assigned irrigation efficiency, irrigation water duty and maximum annual groundwater allotment for each IGFR in the PRAMA are set forth in the document entitled "Supplement I to the 4MP for the PRAMA," which is incorporated herein by reference and which is available for inspection and copying at ADWR.*

C. *The IGFR owner and any person entitled to use groundwater pursuant to that IGFR may use the maximum annual groundwater allotment assigned for the right in Supplement I to irrigate only the irrigation acres to which the right is appurtenant.*

D. *The IGFR owner and any person entitled to use groundwater pursuant to that IGFR shall not use water for irrigation purposes during a calendar year in an amount which exceeds the maximum annual groundwater allotment assigned for the right in Supplement I, except as provided by the flexibility account provisions of A.R.S. § 45-467 and any rules adopted by the director.*

E. *Pursuant to A.A.C. R12-15-1013, the IGFR owner and any person using groundwater pursuant that IGFR shall keep and maintain, for at least three calendar years following the filing of an annual report required by A.R.S. § 45-632, all records which may be necessary to verify the information and data contained in the annual report.*

4-703. Historic Cropping Program

A. *Application for Regulation under the Historic Cropping Program*

Only an owner of an IGFR may apply to be regulated under the Historic Cropping Program. An application may be filed by an IGFR owner at any time prior to the first compliance date for the agricultural conservation requirements established in the 5MP. An application for regulation under the Historic Cropping Program shall be on a form prescribed and furnished by the director and shall include the following information:

1. *The name, address, and phone number of the IGFR owner.*

2. *The number of the Certificate of IGFR.*

3. *The name, address, and phone number of any person entitled to use groundwater under the IGFR.*

4. *For each of the three previous years, the number of acres and types of crops planted, and the amount of water used to irrigate the planted acres.*

5. *For each of the three previous years, the type of irrigation system which has been used, including percent of slope, length of runs, and method of field application.*

6. *For each of the three previous years, a description of all water conservation practices used on the farm, including the name of any conservation program or irrigation water management service used on the farm.*

B. *Criteria for Approval of Application*

The director shall approve an application for regulation under the historic cropping program if all of the following requirements are satisfied:

1. *The application is found to be complete and correct.*

2. *Any negative flexibility account balance in the farm's flexibility account does not exceed 25 percent of the maximum annual groundwater allotment in effect at the time that the application is made.*

3. *Any positive flexibility account balance in the farm's flexibility account does not exceed 75 percent of the maximum annual groundwater allotment in effect at the time that the application is made. In order to satisfy this requirement, the IGFR owner may sell or convey any excess credits as provided by A.R.S. § 45-467 or the IGFR owner may relinquish any excess credits.*

4. *The IGFR owner demonstrates that the average on-farm seasonal irrigation efficiency achieved on the farm's irrigation acres during the previous three years was 70 percent or greater. If the IGFR owner cannot demonstrate that an average on-farm seasonal irrigation efficiency of at least 70 percent has been achieved during the previous three years, the IGFR owner shall agree in writing to develop and implement at least one of the following:*

    a. *Enroll in an ADWR-sponsored or private irrigation management services program at all times while regulated under the Historic Cropping Program, or*

until the IGFR owner can demonstrate to the director's satisfaction that an average on-farm seasonal irrigation efficiency of at least 70 percent has been achieved during the previous three years.

b. Implement water conveyance system or farm irrigation system improvements, approved by the director, designed to enable the IGFR owner to achieve an on-farm seasonal irrigation efficiency of at least 70 percent.

C. Historic Cropping Program Requirements

An IGFR owner whose application has been approved for regulation under the Historic Cropping Program and any person using groundwater pursuant to that IGFR shall comply with all of the following:

1. The irrigation water duty and maximum annual groundwater allotment established by the director under this section, beginning with the calendar year in which the IGFR owner is accepted into the Historic Cropping Program, and continuing thereafter until the first compliance date for any substitute conservation requirement established in the 5MP. The director shall establish the irrigation water duty and maximum annual groundwater allotment in the same manner that the director established the irrigation water duty and maximum annual groundwater allotment assigned for the IGFR in the Base Agricultural Conservation Program described in section 4-702, except that the director shall use an assigned irrigation efficiency of 70 percent.

2. The IGFR owner may use the maximum annual groundwater allotment assigned for the IGFR to irrigate only the irrigation acres to which the IGFR is appurtenant.

3. Not use water for irrigation purposes during a calendar year in an amount which exceeds the maximum annual groundwater allotment assigned to the right, except as provided in the flexibility account provisions of A.R.S. § 45-467, as modified in subsection D of this section, and any rules adopted by the director.

D. Flexibility Account Provisions

Under the Historic Cropping Program, the flexibility account provisions of A.R.S. § 45-467 shall apply to the IGFR owner, and any person entitled to use groundwater under that IGFR, with the following modifications:

1. If the amount of water used to irrigate the farm in any year is less than the maximum annual groundwater allotment established for the farm pursuant to subsection C, paragraph 1 of this section, the amount of any credit registered to the farm's flexibility account pursuant to A.R.S. § 45-467 shall not exceed the difference between the existing balance in the account and a positive account balance of 75 percent of the maximum annual groundwater allotment. The director shall not register a credit to the farm's flexibility account in any year in which the account has an existing positive account balance equal to 75 percent of the maximum annual groundwater allotment.

2. *The IGFR owner, and any person entitled to use groundwater under that IGFR, regulated under the Historic Cropping Program shall not:*

   a. *Purchase flexibility account credits from, or convey or sell flexibility account credits to, another IGFR owner, or any other person entitled to use groundwater under another IGFR, regardless of whether they are regulated under the Historic Cropping Program.*

   b. *Transfer credits from the flexibility account of one farm to another farm even if the farms are owned by the same IGFR owner.*

3. *The maximum excess amount of groundwater that may be used pursuant to A.R.S. § 45-467 shall not exceed 25 percent of the maximum annual groundwater allotment established for the farm pursuant to subsection C, paragraph 1 of this section. The IGFR owner, and any person entitled to use groundwater under that IGFR, violates this section if the flexibility account maintained for the IGFR is in arrears at any time in excess of this amount.*

E. *Reporting Requirements*

1. *In addition to the information required to be submitted in the annual report required by A.R.S. § 45-632, the IGFR owner, or any person entitled to use groundwater pursuant to that IGFR, shall submit the following information on a form prescribed by the director, regardless of whether an irrigation district files the annual report on behalf of the IGFR owner:*

   a. *The name, address, and phone number of any person entitled to use groundwater under the IGFR.*

   b. *The number of acres and types of crops planted and the amount of water used to irrigate the planted acres.*

   c. *The type of irrigation system which has been used, including percent of slope, length of runs, and method of field application.*

   d. *A description of all water conservation practices used on the farm, including the name of any conservation program or irrigation water management service used on the farm.*

2. *Pursuant to A.A.C. R12-15-1013, the IGFR owner, and any person using groundwater pursuant the IGFR shall keep and maintain, for a minimum of three calendar years following the filing of the form, all records which may be necessary to verify the information and data contained therein.*

F. *Duration of Regulation under Historic Cropping Program*

1. *Except as provided in paragraph 2 of this subsection, after the director approves an application for regulation under the Historic Cropping Program, the IGFR owner and any person entitled to use groundwater pursuant to that right shall be regulated under the Historic Cropping Program until the first compliance date for any substitute agricultural conservation requirement established in the 5MP.*

2. *After the director approves an application for regulation under the Historic Cropping Program, a subsequent owner of the IGFR may file with the director a written request to withdraw from the Historic Cropping Program within 90 days after acquiring an ownership interest in the IGFR. The director shall grant the request unless the director determines that the transfer of ownership was made solely for the purpose of circumventing the provisions of paragraph 1 of this subsection, in which case the request shall be denied.*

4-704. Best Management Practices Program

A. *Application for Regulation under the Best Management Practices Program*

An owner of an IGFR, or any person using groundwater pursuant to that IGFR, may apply to be regulated under the Best Management Practices ("BMP") Program at any time prior to the first compliance date for the agricultural conservation requirements established in the 5MP. One application may be filed for multiple IGFRs if the IGFRs are contiguous or in close proximity to each other and are within the same farm unit. An application for regulation under the BMP Program shall be on a form prescribed and furnished by the director and shall include the following information:

1. *The name, address, and phone number of the applicant.*

2. *The certificate number(s) of the IGFR(s) for which the application is filed.*

3. *The name of the farm or farm unit (if applicable).*

4. *The current balance in the flexibility account for the farm.*

5. *If the applicant is not the owner of an IGFR for which the application is filed, a signed affidavit from the owner of that IGFR stating that the owner agrees to regulation under the BMP Program until the effective date of any substitute conservation requirements established in the 5MP, except as provided in subsection I, paragraph 2 of this section.*

6. *A current farm plan map showing all existing improvements to the farm unit's water conveyance system and farm irrigation systems.*

7. *An identification of those BMPs described in Appendix 4B that the applicant selects to implement on the farm while regulated under the BMP Program. In selecting BMPs:*

   a. *The applicant shall select at least one BMP from each of the four BMP Categories described in Appendix 4B: Category 1 (water conveyance system improvements), Category 2, (farm irrigation systems), Category 3 (irrigation water management practices), and Category 4 (agronomic management practices). The total number of points for all BMPs selected by the applicant shall be at least ten points, using the point values assigned to each BMP in Appendix 4B, subject to the following:*

      i. *The maximum number of points allowed in any category is three points.*

ii. The applicant shall select a BMP or BMPs in BMP Category 2 that have a total of at least two points.

b. A BMP may be selected in BMP Category 1 or BMP Category 2 only if the BMP has already been installed and is being used on the farm at the time the application is filed. A BMP may be selected in BMP Category 3 or BMP Category 4 only if the BMP will be implemented on the farm annually while water use on the farm is regulated under the BMP Program.

c. If the applicant selects a substitute practice in BMP Category 3 or BMP Category 4 as described in Appendix 4B, the applicant shall describe the substitute practice in detail and demonstrate that the practice will likely achieve water savings on the farm at least equivalent to the water savings that would result from implementation of an approved BMP in that category.

B. Criteria for Approval of Application

The director shall approve an application for regulation under the BMP program if all of the following requirements are satisfied:

1. The application is found to be complete and correct, and the BMPs selected by the applicant under subsection A paragraph 7 of this section meet the requirements of that paragraph.

2. The applicant is not currently out of compliance with any agricultural conservation requirement in this chapter. This paragraph does not apply to a violation of a conservation requirement if the violation has been resolved by ADWR through a stipulation and consent order or other mechanism, and the applicant is not in violation of that stipulation and consent order or other mechanism.

3. If the BMPs selected by the applicant under subsection A, paragraph 7 of this section include a substitute practice in BMP Category 3 or BMP Category 4 as described in Appendix 4B, the applicant has demonstrated to the satisfaction of the director that the substitute practice will likely achieve water savings on the farm at least equivalent to the water savings that would result from implementation of an approved BMP in that category.

C. Exemption from Maximum Annual Groundwater Allotment Conservation Requirements

After the director approves an application for regulation under the BMP Program, the owner of an IGFR included in the application, and any person using groundwater pursuant to that IGFR, are exempt from the maximum annual groundwater allotment conservation requirements set forth in section 4-702 beginning on January 1 of the first calendar year after the application for enrollment into the BMP Program is approved, unless the director approves an earlier date.

D. BMP Program Requirements

After the director approves an application for regulation under the BMP Program, the owner of an IGFR included in the application, and any person using groundwater pursuant to that IGFR, shall comply with all of the following:

1. *The IGFR owner and any person entitled to use groundwater pursuant to that IGFR shall implement all selected BMPs in the application approved by the director under this section, beginning on January 1 of the first calendar year after the application for enrollment into the BMP Program is approved, unless the director approves an earlier date, and, except as provided in subsection I, paragraph 2 of this section, continuing thereafter until the first compliance date for any substitute conservation requirement established in the 5MP. If a selected BMP has been replaced with a new BMP pursuant to subsection E of this section, the IGFR owner and any person entitled to use groundwater pursuant to that IGFR shall implement the new BMP in lieu of the selected BMP.*

2. *The IGFR owner, and any person entitled to use groundwater under that IGFR, may use groundwater to irrigate only the irrigation acres to which the IGFR is appurtenant.*

E. Replacement of an Existing BMP with a New BMP after Acceptance into BMP Program

After the director approves an application for regulation under the BMP Program, the owner of an IGFR included in the application, or any person using groundwater pursuant to that IGFR, may:

1. *Replace a BMP selected in BMP Category 3 or BMP Category 4 in the application approved by the director with an approved BMP in the same category, as described in Appendix 4B, if the applicant notifies the director in writing of the replacement within thirty days after the replacement occurs.*

2. *Apply to the director to replace a BMP selected in BMP Category 3 or BMP Category 4 in the application approved by the director with a substitute practice in the same category as described in Appendix 4B. The director shall approve the application if the director determines that implementation of the substitute practice will likely result in water savings on the farm at least equivalent to the water savings that would result from implementation of the BMP selected in the application approved by the director.*

F. Requirement of New Lessee to Apply for Participation in BMP Program

1. *After the director approves an application for regulation under the BMP Program under subsection B of this section, any person who subsequently acquires a leasehold interest in the land enrolled in the program shall file with the director an application to participate in the BMP Program prior to using water on the land. The application shall be on a form prescribed and furnished by the director and shall contain the following information:*

   a. *The applicant's name, address and telephone number.*

   b. *The certificate number(s) of the IGFR(s) for which the application is filed.*

   c. *A certification that the applicant agrees to be regulated under the BMP Program*

while leasing the land, and identification of all BMPs the applicant agrees to implement while leasing the land. The BMPs shall meet the requirements set forth in subsection A, paragraph 7 of this section.

d. Any other information required by the director.

2. The director shall approve an application to participate in the BMP Program filed under paragraph 1 of this subsection if the application meets all of the requirements set forth in subsection B of this section. If the director denies the application, the applicant shall file a new application to participate in the BMP Program within thirty days after receiving notice of the director's decision or, if the applicant files a timely notice of appeal of the decision and the appeal is denied, within thirty days after receiving notice of the denial of the appeal. In the new application, the applicant shall make a good faith effort to correct the deficiencies that the director identifies with the first application. If the director denies the new application, both the owner of the IGFR and the applicant shall be regulated under the Base Agricultural Conservation Program in section 4-702.

G. Flexibility Account Provisions

Under the BMP Program, the flexibility account provisions of A.R.S. § 45-467 shall not apply to the IGFR owner and any person entitled to use groundwater pursuant to that IGFR. Upon acceptance into the BMP Program, the balance in the farm's flexibility account at the time of acceptance into the BMP Program shall remain unchanged until water use on the farm is no longer regulated under the BMP program.

H. Reporting Requirements

In addition to the information required to be submitted in the annual report required by A.R.S. § 45-632, the IGFR owner, or any person entitled to use groundwater pursuant to that IGFR, shall submit the following information on a form prescribed by the director by the date the annual report is due, regardless of whether an irrigation district files the annual report on behalf of the IGFR owner:

1. The name, address, and phone number of any person entitled to use groundwater on the farm unit.

2. Certification that all required BMPs have been implemented during the previous calendar year. Pursuant to A.A.C. R12-15-1013, the person submitting the form shall keep and maintain, for a minimum of three calendar years following the filing of the form, current and accurate records verifying that the BMPs were implemented.

I. Duration of Regulation under BMP Program

1. Except as provided in paragraph 2 of this subsection, after the director approves an application for regulation under the BMP Program, the IGFR owner, and any person entitled to use groundwater pursuant to that right, shall be regulated under the BMP Program until the first compliance date for any substitute agricultural conservation requirement established in the 5MP.

2. After the director approves an application for regulation under the BMP Program:

a. The owner of an IGFR included in the application may file with the director a written request to withdraw from the BMP Program. The director shall grant the request if the owner demonstrates to the satisfaction of the director that both of the following apply:

1) The owner of the IGFR desires to lease the land to which the IGFR is appurtenant to a lessee for a term of at least one year, but has been unable to find a lessee willing to be regulated under the BMP Program, after making a good faith effort to find such a lessee.

2) The owner of the IGFR has found a person that will lease the land for a term of at least one year if the owner is allowed to withdraw from the BMP Program, and that person did not previously lease the land while the owner was regulated under the BMP Program.

b. A subsequent owner of the IGFR may file with the director a written request to withdraw from the BMP Program within 90 days after acquiring an ownership interest in the IGFR. The director shall grant the request unless the director determines that the transfer of ownership was made solely for the purpose of circumventing the provisions of paragraph 1 of this subsection, in which case the request shall be denied.

4-705. Conservation Requirements for Irrigation Distribution Systems

A. Applicability

The irrigation distribution system conservation requirements set forth in subsection B below apply to irrigation districts and private water companies that distribute water for irrigation uses.

B. Conservation Requirements

By January 1, 2017 or upon commencement of operation, whichever is later and continuing thereafter until the first compliance date of any substitute requirement in the 5MP, each irrigation district and private water company owning or operating an irrigation distribution system shall either:

1. Line all canals used to deliver water for irrigation use with a material that allows no more lost water than a well-maintained concrete lining, or

2. Operate and maintain its irrigation distribution system so that the total quantity of lost and unaccounted for water is 10 percent or less of the total quantity of water from any source, including reclaimed water, that enters its irrigation distribution system, calculated on either a calendar year basis or a three-year average basis based on that calendar year and the two preceding calendar years.

4-706. Monitoring and Reporting Requirements for Irrigation Districts and Private Water Companies

A. Applicability

The monitoring and reporting requirements set forth in subsection B below apply to irrigation districts and private water companies that distribute water for irrigation uses.

B. Monitoring and Reporting Requirements

Beginning with calendar year 2017 or the calendar year in which the irrigation district or private water company commences service, whichever is later, and for each calendar year thereafter until the first compliance date for any substitute requirement in the 5MP, each irrigation district and private water company owning or operating an irrigation distribution system shall submit in its annual report required by A.R.S. § 45-632, the following information as it applies to the irrigation district or private water company:

1. *A map showing the irrigation distribution system, including those portions which have lined canals and those portions which have unlined canals, unless a current map is on file with ADWR.*

2. *The number of miles of lined canals and the number of miles of unlined canals in the irrigation distribution system.*

3. *The total quantity of water from any source, including reclaimed water, that entered the irrigation district's or private water company's irrigation distribution system during the calendar year.*

4. *The total quantity of water from any source, including reclaimed water, delivered by the irrigation district or private water company through its irrigation distribution system to all water users during the calendar year.*

5. *An estimate of the irrigation district's or private water company's total quantity of lost and unaccounted for water for the calendar year. This quantity shall be determined by a generally accepted engineering method.*

6. *The total quantity of water ordered by a municipal provider from the irrigation district and released by the irrigation district from a storage or distribution facility but not accepted by the municipal provider or delivered to any other person.*

4-707. Remediated Groundwater Accounting for Conservation Requirements

A. Accounting

Groundwater withdrawn pursuant to an approved remedial action project under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or Title 49, Arizona Revised Statutes, and used by a person subject to a conservation requirement established under this chapter, shall be accounted for consistent with the accounting for surface water for purposes of determining the person's compliance with the conservation requirement, subject to the provisions of subsections B through D of this section.

B. Amount of Groundwater Eligible for Accounting

For each approved remedial action project, the annual amount of groundwater that is eligible for the remediated groundwater accounting is the project's annual authorized

volume. The annual authorized volume for a remedial action project approved on or after June 15, 1999 is the maximum annual volume of groundwater that may be withdrawn pursuant to the project, as specified in a consent decree or other document approved by the United States Environmental Protection Agency (EPA) or the Arizona Department of Environmental Quality (ADEQ). The annual authorized volume for a project approved prior to June 15, 1999 is the highest annual use of groundwater withdrawn pursuant to the project prior to January 1, 1999, except that if a consent decree or other document approved by the EPA or ADEQ specifies the maximum annual volume of groundwater that may be withdrawn pursuant to the project, the project's annual authorized volume is the maximum annual volume of groundwater specified in that document. The director may modify the annual authorized volume for a remedial action project as follows:

1. *For an approved remedial action project associated with a treatment plant that was in operation prior to June 15, 1999, a person may request an increase in the annual authorized volume at the same time the notice is submitted pursuant to subsection C of this section. The director shall increase the annual authorized volume up to the maximum treatment capacity of the treatment plant if adequate documentation is submitted to the director demonstrating that an increase is necessary to further the purpose of the remedial action project and the increase is not in violation of the consent decree or other document approved by the EPA or ADEQ.*

2. *A person may request an increase in the annual authorized volume of an approved remedial action project at any time if it is necessary to withdraw groundwater in excess of the annual authorized volume to further the purpose of the project. The director shall increase the annual authorized volume up to the maximum volume needed to further the purpose of the project if adequate documentation justifying the increase is submitted to the director and the increase is not in violation of the consent decree or other document approved by the EPA or ADEQ.*

3. *The director shall modify the annual authorized volume of an approved remedial action project to conform to any change in the consent decree or other document approved by the EPA or ADEQ if the person desiring the modification gives the director written notice of the change within thirty days after the change. The notice shall include a copy of the legally binding agreement changing the consent decree or other document approved by the EPA or ADEQ.*

C. Notification

To qualify for the remediated groundwater accounting provided in subsection A of this section, the person desiring the accounting must notify the director in writing of the anticipated withdrawal of groundwater pursuant to an approved remedial action project under CERCLA or Title 49, Arizona Revised Statutes, prior to the withdrawal. At the time the notice is given, the person desiring the accounting must be using remediated groundwater pursuant to the approved remedial action project, or must have agreed to do so through a consent decree or other document approved by the EPA or ADEQ. The notice required by this subsection shall include all of the following:

1. *A copy of the document approved by ADEQ or the EPA, such as the Remedial Action Plan (RAP), Record of Decision (ROD,) or consent decree authorizing the remediated groundwater project. Unless expressly specified in the document, the person shall include in the notice the volume of groundwater that will be pumped annually pursuant to the*

project, the time period to which the document applies, and the annual authorized volume of groundwater that may be withdrawn pursuant to the project.

2. *The purpose for which the remediated groundwater will be used.*

3. *The name and telephone number of a contact person.*

4. *Any other information required by the director.*

D. Monitoring and Reporting Requirements

To qualify for the remediated groundwater accounting for conservation requirements as provided in subsection A of this section, groundwater withdrawn pursuant to the approved remedial action project must be metered separately from groundwater withdrawn in association with another groundwater withdrawal authority for the same or other end use. A person desiring the remediated groundwater accounting for conservation requirements shall indicate in its annual report, under A.R.S. § 45-632, the volume of water withdrawn and used during the previous calendar year that qualifies for the accounting.

Bibliography

Food and Agriculture Organization of the United Nations. (1977). *FAO Irrigation and Drainage Paper #24*.

United States Department of Agriculture. (1982). *Consumptive Use of Water by Major Crops in the Southwestern United States*.

APPENDIX 4A
CONSUMPTIVE USE OF WATER BY CROPS AND EFFECTIVE PRECIPITATION
PRESCOTT ACTIVE MANAGEMENT AREA

Crop	Consumptive Use		Effective Precipitation (inches/acre)
	acre-inches	acre-feet	
Grain Crops			
Barley	23.0	1.92	6.6
Oats for Grain	26.0	2.17	3.7
Sorghum, Grain	22.0	1.83	4.8
Wheat, Winter	23.0	1.92	6.6
Pinto Beans	15.7	1.31	6.1
Corn, Grain	24.0	2.00	6.6
Forage Crops			
Alfalfa	41.0	3.42	7.2
Clover	37.0	3.08	7.2
Corn, Ensilage	22.0	1.83	4.8
Oats for Hay	20.0	1.67	3.7
Sorghum, Ensilage	21.0	1.75	6.6
Sudan/Sudex Grass	18.0	1.50	6.6
Permanent Pasture (fescue or tall wheat grass)	51.0	4.25	7.2
Native Pasture	18.0	1.50	7.2
Vegetable Crops			
Beets, Table	25.4	2.12	3.7
Carrots	15.8	1.31	3.7
Chili Peppers	32.7	2.72	6.1
Corn, Sweet	18.6	1.55	4.8
Cucumbers	19.4	1.61	6.1
Garlic	25.4	2.12	6.1
Onions, Dry	22.1	1.84	6.1
Onions, Green	16.6	1.39	3.7

APPENDIX 4A
CONSUMPTIVE USE OF WATER BY CROPS AND EFFECTIVE PRECIPITATION
PRESCOTT ACTIVE MANAGEMENT AREA

Crop	Consumptive Use		Effective Precipitation (inches/acre)
	acre-inches	acre-feet	
Potatoes	23.1	1.92	6.1
Tomatoes	25.4	2.12	6.1
Truck Crops	22.5	1.87	6.1
Fruit Crops			
Apricots	32.0	2.67	7.2
Peaches	32.0	2.67	7.2
Plums	32.0	2.67	7.2
Cherries	37.0	3.08	7.2
Apples	37.0	3.08	7.2
Grapes	29.0	2.42	7.2
Miscellaneous Crops			
Christmas Trees-Nursery Stock (Mondel and Scotch Pine)	27.0	2.25	7.
Cut Flowers	22.1	1.84	

Sources: (Food and Agriculture Organization of the United Nations, 1977)
(United States Department of Agriculture, 1982)

APPENDIX 4B
BEST MANAGEMENT PRACTICES PROGRAM
APPROVED BEST MANAGEMENT PRACTICES

BMP CATEGORY 1. WATER CONVEYANCE SYSTEM IMPROVEMENTS

Description: A farm's water conveyance system allows water to be conveyed from an irrigation district delivery point or a well head for irrigation of each field. This category includes water conveyance system improvements that qualify as approved BMPs.

Approved Water Conveyance Improvements

BMP 1.1 Concrete-lined ditch

A means of transporting water to farm fields via a concrete-lined ditch (open channel) in order to minimize transmission losses through seepage.

BMP 1.2 Pipelines

Any type of low or high-pressure pipeline (closed conduit) used to convey water to a farm field in order to reduce or eliminate water loss prior to the act of irrigation. Pipelines may be constructed of PVC, ABS, concrete, aluminum, and or steel.

BMP 1.3 Drainback system

Level irrigation system technology utilizing headland channel conveyance which is designed and maintained to "drain" excess water applications from one irrigated field to the next down gradient field.

Point Value Determination for BMP Category 1

An applicant for the BMP Program must select one or more of the water conveyance system improvement BMPs described above in the application for the BMP Program. A BMP may be selected only if it is being implemented on the farm at the time the application is filed. The total points for the BMP or BMPs selected in this category shall be calculated by estimating the percentage of the farm's irrigated acreage served by the selected BMP or BMPs, and then determining the point value for that percentage in the Category 1: Water Conveyance System – Point Table below. For purposes of this determination, "irrigated acreage" means those acres within the farm that will be irrigated while the applicant is regulated under the BMP Program. If the applicant selects more than one BMP in this category, an acre shall not be counted twice in determining the total percentage of the farm's irrigated acreage served by the BMPs. In this category, the maximum number of points allowed is three and the minimum number is one.

Category 1: Water Conveyance System – Point Table

Percentage of the farm's total irrigated acreage served by the approved BMPs	Point Value
50-54	1.0
55-59	1.2
60-64	1.4
65-69	1.6
70-74	1.8
75-79	2.0
80-84	2.2
85-89	2.4
90-94	2.6
95-99	2.8
100	3.0

APPENDIX 4B
BEST MANAGEMENT PRACTICES PROGRAM
APPROVED BEST MANAGEMENT PRACTICES

BMP CATEGORY 2. FARM IRRIGATION SYSTEMS **Description:** Farm irrigation systems are the methods by which a farm field is irrigated. Farm irrigation systems include slope, modified slope, level or near level, sprinkler, trickle or drip, or any combination thereof. This category includes farm irrigation systems that qualify as approved BMPs.
Approved Farm Irrigation Systems
BMP 2.1 Slope systems without uniform grades with tailwater reuse - (1 Point) Definition: Sloped fields without uniform grades with a constructed recovery system that allows for the reuse of water that runs off the end of the field after an irrigation event.
BMP 2.2 Uniform slope systems without tailwater reuse - (1 Point) Definition: Sloped fields that have been engineered to uniform grades with no means of reusing the water that runs off the end of the field after an irrigation event.
BMP 2.3 Uniform slope systems with tailwater reuse - (2 Points) Definition: Sloped fields that have been engineered to uniform grades with a constructed recovery system that allows for the reuse of water that runs off the end of the field after an irrigation event.
BMP 2.4 Uniform slope within an irrigation district that captures and redistributes return flows - (2 Points) Definition: Sloped fields that have been engineered to uniform grades enabling an irrigation district to collect the water that leaves a farm field after an irrigation event for distribution to another farm field.
BMP 2.5 Modified slope systems - (2 Points) Definition: Sloped fields that have been engineered to uniform grades in the upper portion of the field, with the bottom portion generally having a field slope of 0.0 to 0.2 feet of total fall in the direction of irrigation. All irrigation water is retained on the field.
BMP 2.6 High pressure sprinkler systems - (2 Points) Definition: Side-roll, linear, center-pivot, and solid set designs that operate at mainline water pressures of 10 pounds per square inch (psi) or more.
BMP 2.7 Near level systems - (2.5 Points) Definition: Sloped fields that have been engineered to uniform grades between 0.2 to 0.5 feet of total fall in the direction of irrigation over the entire length of the field. All irrigation water is retained on the field.
BMP 2.8 Level systems - (3 Points) Definition: Level border or level furrow system where the field slope may vary from 0.0 to 0.2 feet of total fall in the direction of irrigation over the entire length of the field. Either all irrigation water is retained on the field or a level drainback system is used.
BMP 2.9 Low pressure sprinkler systems - (3 Points) Definition: Linear and center-pivot sprinkler designs that operate at water pressures measured at the high end of the mainline of no greater than 10 psi.
BMP 2.10 Trickle irrigation systems - (3 Points) Definition: Pressurized drip or subsurface irrigation capable of applying precise amounts of water to the crop root zone (also referred to as drip irrigation).

APPENDIX 4B
BEST MANAGEMENT PRACTICES PROGRAM
APPROVED BEST MANAGEMENT PRACTICES

Point Value Determination for BMP Category 2
An applicant for the BMP Program must select one or more of the farm irrigation systems BMPs described above in the application for the BMP Program. A BMP may be selected only if it is being implemented on the farm at the time the application is filed. The points for a BMP selected in this category shall be calculated by multiplying the points assigned to the BMP as shown above by the percentage of the farm's irrigated acreage served by the irrigation system described in the BMP. For purposes of this determination, "irrigated acreage" means those acres within the farm that will be irrigated while the applicant is regulated under the BMP Program. If the applicant selects more than one BMP in this category, an acre shall not be counted twice in determining the total percentage of the farm's irrigated acreage served by the BMPs. In this category, the maximum number of points allowed is three and the minimum number is two.

BMP CATEGORY 3. IRRIGATION WATER MANAGEMENT PRACTICES
Description: Irrigation water management practices include management practices that, when implemented properly, will increase a farm's overall efficiency of water application in a growing season. This category includes irrigation water management practices that qualify as approved BMPs.
Approved Irrigation Water Management Practices
BMP 3.1 Laser touch-up - (1 Point) Definition: Annual re-establishment of precision laser grades to ensure good advancement of applied irrigation water. Must be applied to a minimum of 20 percent of the near level and level basin acreage irrigated the prior year.
BMP 3.2 Alternate row irrigation - (1 Point) Definition: The practice of irrigating every other cultivated row during either single or multiple irrigation events to minimize the surface area of applied water. Annually, must be used on at least 20 percent of the acreage irrigated in row crops for at least one irrigation.
BMP 3.3 Furrow checks - (1 Point) Definition: Manually applied or installed devices placed in rows to raise the water level in the row reducing the velocity to prevent erosion and enhance infiltration rates. Annually, must be used on at least 20 percent of irrigated acreage for at least one irrigation.
BMP 3.4 Angled rows/contour farming - (1 Point) Definition: Annual practice of reducing row fall through row angling and/or contouring to enhance water advancement and infiltration rates. This practice may also minimize or eliminate tailwater runoff. Annually, must be used on at least 20 percent of irrigated acreage.
BMP 3.5 Surge irrigation - (1 Point) Definition: The practice of applying irrigation water to a field by intermittent surges or pulses of water rather than by a continuous flow rate. The irrigation water advances down the field (or furrow), in stages, allowing uniform water penetration and avoiding tailwater runoff. A gradual sealing and soil conditioning occurs with each progressive surge allowing a more efficient water application. Annually, must be used on at least 20 percent of irrigated acreage.

APPENDIX 4B
BEST MANAGEMENT PRACTICES PROGRAM
APPROVED BEST MANAGEMENT PRACTICES

Approved Irrigation Water Management Practices (BMP Category 3 cont.)
BMP 3.6 Temporary sprinklers - (1 Point) Definition: Utilization of portable, roller and/or solid set sprinkler system for meeting pre-irrigation needs, seedling germination to establish a crop, and/or pre-harvest irrigation for maintaining crop quality. This practice reduces water use when compared to conventional flood irrigation techniques that require excessive water applications for seedling germination and/or crop quality. Annually, must be used on at least 20 percent of irrigated acreage.
BMP 3.7 Participation in an educational irrigation water management program - (1 Point) Definition: Enrollment in a private or Department sponsored educational irrigation water management program that includes irrigation water management topics such as soil water replacement needs, application rates, and irrigation scheduling. Must participate in such a program throughout the entire crop season annually.
BMP 3.8 Participation in a consultant or irrigation district sponsored irrigation scheduling service - (1 Point) Definition: Enrollment in a consultant or Department sponsored irrigation scheduling service that provides recommendations on soil moisture monitoring, soil water replacement needs, irrigation application rates, and irrigation scheduling dates based on soil moisture monitoring or real-time evapotranspiration data. Must participate in such a program throughout the entire crop season annually.
BMP 3.9 Participation in an irrigation district program to increase the flexibility of water deliveries - (1 Point) Definition: Enrollment in a cooperative program set up by the irrigation district to assist a farmer with timely irrigation deliveries and shut off, constant flow rates, and other water order guidelines developed by the irrigation district. Must participate in such a program throughout the entire crop season annually.
BMP 3.10 Measure flow rates to determine the amount of water applied - (1 Point) Definition: Measure flow rates to determine the amount of water applied for each irrigation event on each field for the purpose of achieving good application efficiencies.
BMP 3.11 Soil moisture monitoring - (1 Point) Definition: Use of a number of accepted methods to monitor/measure soil moisture for the purpose of determining soil water replacement needs, application rates, and irrigation scheduling on each field (accepted methods may include core sampling, resistance blocks, neutron probe, tensiometers) throughout the entire crop season.
BMP 3.12 Computer based model using meteorological data - (1 Point) Definition: Use of a computer based irrigation scheduling program that incorporates real-time meteorological data (e.g. AZMET) for the purpose of determining irrigation event schedules on each field throughout the entire crop season.
Substitute Irrigation Water Management Practices
Substitute Practice - (1 Point) Definition: A new or existing irrigation water management practice not listed above that the director determines will likely result in water savings on the farm at least equivalent to the water savings that would result from implementation of one of the approved BMPs described in this category.

APPENDIX 4B
BEST MANAGEMENT PRACTICES PROGRAM
APPROVED BEST MANAGEMENT PRACTICES

Point Value Determination for BMP Category 3
An applicant for the BMP Program must select one or more of the irrigation water management BMPs described above in the application for the BMP Program. A BMP may be selected only if it will be implemented on an annual basis while the applicant is regulated under the BMP Program. In this category, the maximum number of points allowed is three and the minimum number is one.

BMP CATEGORY 4. AGRONOMIC MANAGEMENT PRACTICES
Description: Agronomic management practices include combinations of plant and soil management practices that, if implemented properly, will conserve water over the length of the growing season. This category includes agronomic management practices that qualify as approved BMPs.
Approved Agronomic Management Practices
BMP 4.1 Crop rotation - (1 point) Definition: Periodic rotation of crop types on a given farm field to ensure the non-degradation of soil tilth. Annually, at least 20 percent of the acreage irrigated the prior year needs to be rotated to a different crop.
BMP 4.2 Crop residue management - (1 point) Definition: Incorporation of crop residue into the soil profile to increase soil nutrients, soil water holding capacities, and increase the available soil moisture to a crop. Annually, must be employed on at least 20 percent of the total irrigated acreage.
BMP 4.3 Soil and water quality testing - (1 point) Definition: Annual soil testing to determine: 1) residual amounts of fertilizer, 2) soil salinity for leaching needs, and 3) water intake rates and water holding capacity. Soil testing is required on at least 50 percent of the irrigated acreage. Water quality testing for needs such as estimating leaching requirements or avoiding potential injury to crops. Testing must include a “blend” analysis of irrigation water used from all sources.
BMP 4.4 Pre-irrigation surface conditioning - (1 point) Definition: Mechanical means (i.e. driving rows, soil torpedoes, etc.) by which rows or borders are prepared prior to an initial irrigation to smooth flow of water to avoid unwanted deep percolation during dry conditions or to enhance water advancement rates. Annually, must be used on at least 20 percent of irrigated acreage.
BMP 4.5 Transplants - (1 point) Definition: Use of established seedlings transplanted into a field. This practice eliminates excessive applications of water to germinate crops in the field from seeds. Annually, must be used on at least 20 percent of irrigated acreage.
BMP 4.6 Mulching - (1 point) Definition: Use of organic matter or plastic sheets to cover plant beds (plastic mulch) and/or use of plastic material laid over hoops suspended above the plant beds (floatable row covers) to reduce evaporation losses. Annually, must be used on at least 20 percent of irrigated acreage.
BMP 4.7 Shaping furrow or bed - (1 point) Definition: Use of mechanical means such as a row former to make the bed profile more shallow to minimize time of infiltration and minimize the wetted surface area along the rows. Annually, must be used on at least 20 percent of irrigated acreage.

APPENDIX 4B
BEST MANAGEMENT PRACTICES PROGRAM
APPROVED BEST MANAGEMENT PRACTICES

Approved Agronomic Management Practices (BMP Category 4 cont.)
BMP 4.8 Planting in bottom of furrow - (1 point) Definition: Practice of planting in the bottom of the furrow as opposed to planting along the top of the row bed to minimize impacts of salt build up and wetting (subbing) requirements for germination. Annually, must be used on at least 20 percent of irrigated acreage.
Substitute Agronomic Management Practices
Substitute Practice - (1 Point) Definition: A new or existing agronomic management practice not listed above that the director determines will likely result in water savings on the farm at least equivalent to the water savings that would result from implementation of one of the approved BMPs described in this category.
Point Value Determination for Category 4
An applicant for the BMP Program must select one or more of the agronomic management BMPs described above in the application for the BMP Program. A BMP may be selected only if it will be implemented on an annual basis while the applicant is regulated under the BMP Program. In this category, the maximum number of points allowed is three and the minimum number is one.

CHAPTER FIVE:
MUNICIPAL

5.1 INTRODUCTION

Historically, the goal of the Municipal Conservation Program has been to assist the Prescott Active Management Area (PRAMA) in moving toward safe-yield by: (1) gradually reducing per-capita water consumption; (2) encouraging the use of the best available water conservation practices; and (3) maximizing the efficient use of all water supplies, including the direct use of reclaimed water.

What is a Municipal Water Provider? The municipal water use sector includes water use by municipal water providers. Municipal water providers are cities, towns, private water companies, and irrigation districts that deliver groundwater for non-irrigation uses (such as residential, commercial, governmental, industrial, and construction uses). Municipal water providers can also include well co-operatives, mobile home parks, or improvement districts. ADWR regulates those water providers serving more than 250 acre-feet of water for non-irrigation use annually as large municipal providers. Those providers serving 250 acre-feet or less annually are regulated as small municipal providers.

ADWR does not regulate uses of water by small, private, domestic wells. Exempt well uses are not subject to reporting and water conservation requirements. Water demand associated with domestic wells is estimated to have been more than twice the reported small municipal provider demand in the PRAMA in 2012.

Municipal Conservation Program Requirements
All large municipal providers not designated as having an assured water supply will be regulated under the Non-Per Capita Conservation Program (NPCCP) for the fourth management period. Large municipal providers with a Designation of Assured Water Supply (DAWS) are regulated under the Total Gallons Per Capita per Day (GPCD) Program, but may elect to be regulated under the NPCCP as an alternative to the Total GPCD Program. The Total GPCD Program assigns a Total GPCD requirement to each large municipal provider based on water use characteristics within the water service area and water conservation potential. Providers regulated under the NPCCP must implement a required number of best management practices within their service areas. Small municipal providers are required to reduce waste and improve water use efficiency within their service areas during the fourth management period.

All municipal providers must also comply with monitoring, reporting and distribution system requirements. Information on water use, growth, and system losses, for example, must be reported to ADWR on an annual basis.

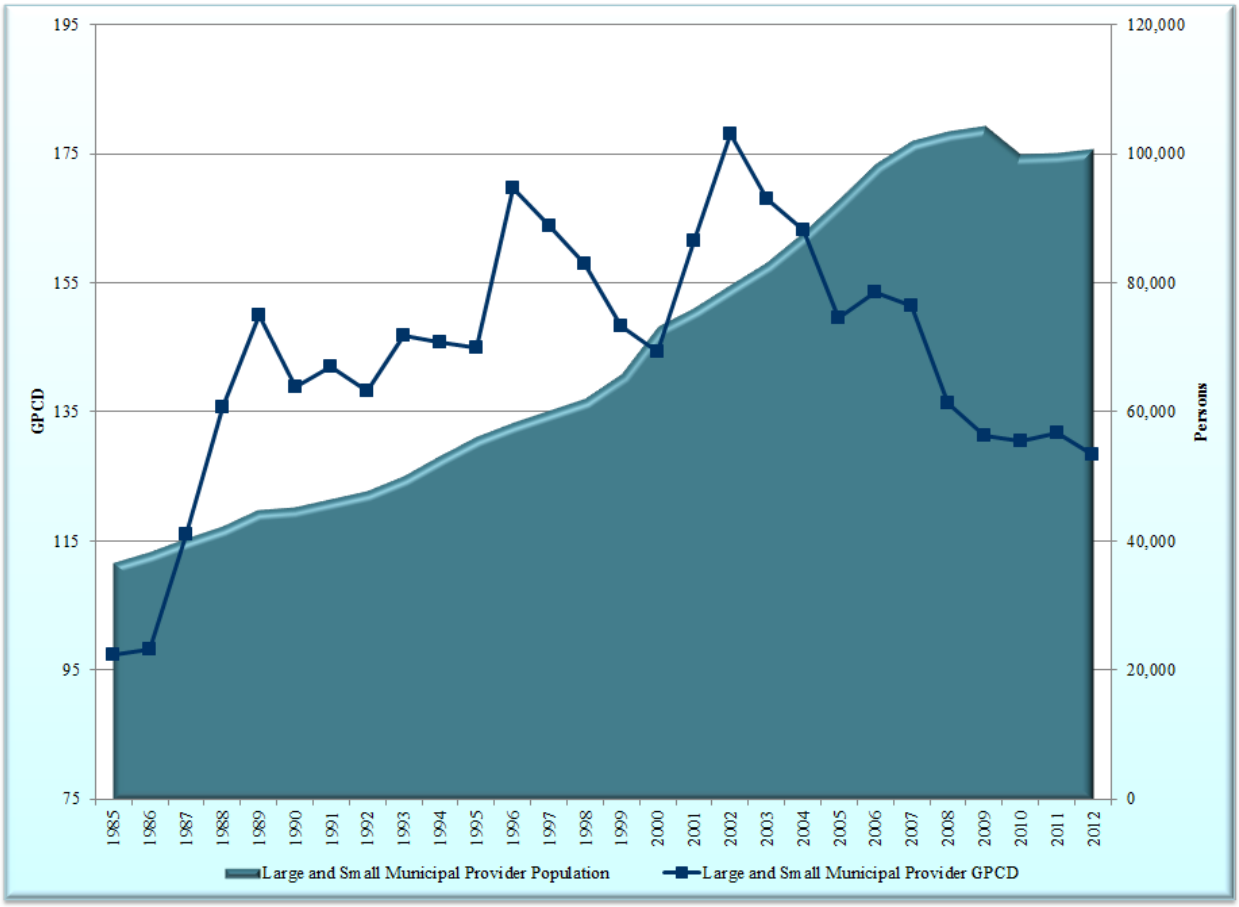
Municipal Program Goal and Objectives for Fourth Management Plan
For the fourth management period, ADWR is increasing its efforts to solve water management issues and remove obstacles in order to further progress towards the achievement of the PRAMA goal. The fourth management period Municipal Conservation Program continues to encourage the equitable distribution of water in an environmentally and economically sound manner through long-range planning, cooperative regional efforts, technical assistance, public education, and regulatory programs. The efficient use of all sources of water, and replacement of PRAMA groundwater uses with alternative supplies, will help ensure a sustainable and secure water supply for the future.

PRAMA Municipal Sector Description
Municipal water use in the PRAMA has grown from less than 5,000 acre-feet per year in 1985 to close to 14,500 acre-feet in 2012. Municipal demand over the historical period peaked in 2007 at 17,317 acre-feet, but has been lower from 2008 through 2012. This closely matches the period of economic downturn in those years; however, some of this reduction is likely due to conservation, and potentially weather conditions as well. In 1985, municipal water use was 15 percent of the total PRAMA water use, but by 2012 it increased to 72 percent. Municipal water use has increased significantly in volume, while total

water use in the agricultural and industrial water use sectors has remained stable or declined from 1985 through 2012. In the PRAMA, large and small municipal provider population has increased an average of 3.8 percent per year, from 1985 through 2012. Factors affecting municipal water demand and supply, as well as historical municipal water use, are described in Chapter 3.

The PRAMA municipal uses currently depend largely on groundwater to meet water demand. Direct use of reclaimed water increased between 1988 and 1996, and has been fairly constant in the municipal sector in PRAMA since 2001. Most direct use of reclaimed water in the municipal sector is by turf-related facilities. There have been few new turf-related facilities established in the PRAMA during the historical period, however there have been some. Additional infrastructure may be needed to increase the number of turf-related facilities using reclaimed water in the PRAMA.

FIGURE 5-1
HISTORICAL MUNICIPAL GPCD AND POPULATION
PRAMA



History of PRAMA Municipal Regulatory programs / Fourth Management Plan Goals Summarized
Conservation programs have been instituted by municipal water providers in response to regulatory requirements of the previous management plans. GPCD rates in the PRAMA increased during the late 1980s and 1990s, but have been declining since 2002 (*See Figure 5-1)*. A firm commitment to the continued implementation of conservation measures and implementation of additional measures will result in further reductions in per capita use rates and increased water use efficiency in the municipal sector. Additional efforts will be necessary to achieve the safe-yield goal of the PRAMA by the year 2025 and to continue to maintain safe-yield thereafter, as well as promote more effective and efficient water

management within the PRAMA to maximize the availability of PRAMA water supplies. These include, but are not limited to, the following: increased conservation efforts; redistribution of PRAMA water supplies, which may in part be accomplished through artificial recharge and recovery within the area of impact where the water was stored; supply augmentation through importation of additional water supplies; and changes in groundwater pumping regimes and supply augmentation.

The Non-Per Capita Conservation Program and the MODIFIED NON-PER CAPITA CONSERVATION PROGRAM - History and Background

The initial Third Management Plan (3MP) included the original NPCCP in addition to the Total GPCD Program, the Alternative Conservation Program and the Institutional Provider Program. The original NPCCP was intended to allow providers experiencing disproportionate increases in their non-residential per capita rate a way to meet the requirement to achieve additional water conservation outside of the Total GPCD and ACP programs. Some providers in other Active Management Areas (AMAs) applied for regulation under the original NPCCP during the third management period. However, the City of Prescott and Town of Prescott Valley continued in the Total GPCD Program until the Modified NPCCP (MNPCCP) was adopted.

The MNPCCP came about as a result of the desire to consider alternatives to the Total GPCD Program that would better meet the needs and capabilities of the regulated municipal water providers, as well as those of ADWR. Between 2006 and 2008, ADWR conducted an evaluation of the 3MP regulatory programs for large municipal water providers. The initial phase of the evaluation included an informal information gathering effort to identify concerns and to solicit comments and suggestions from large municipal water providers in each of the AMAs, as well as from various staff members at ADWR. The public meeting phase of this stakeholder process began with all large municipal water providers within the state's five AMAs being invited to further participate in the process through a series of public meetings *(see Municipal Conservation Program-Third Management Plan Review)*. In April 2007, legislation was passed to add a new regulatory program to the 3MP for AMAs- the MNPCCP. On April 1, 2008, the director issued orders modifying the 3MP for each Active Management Area (AMA) to include the MNPCCP consistent with A.R.S. 45-566.01. The modification became effective on May 20, 2008, and the program is described in the Second Modification to Chapter 5 of the 3MP *(see Third Management Plan-Second Modification)*. The first year of provider program implementation was 2010.

For the Fourth Management Plan (4MP), there is only one non-per capita program – the NPCCP that is required by A.R.S. § 45-567.01 and that corresponds to the MNPCCP in the 3MP. Throughout this chapter, references to the NPCCP mean that program. All large municipal providers that have been designated as having an assured water supply, including municipal providers previously regulated under the original NPCCP, will be regulated under the Total GPCD Program for the 4MP, pursuant to A.R.S. §§ 45-567(A)(2), unless they notify the director that they elect to be regulated under the NPCCP and the director approves their entry into the NPCCP. All large municipal providers that are not designated as having an assured water supply will be regulated under the NPCCP.

5.2 RELATIONSHIP OF THE MUNICIPAL SECTOR TO ACHIEVEMENT OF THE PRAMA WATER MANAGEMENT GOAL

Physical description

In the PRAMA municipal pumping has historically been concentrated in the Chino Valley and Prescott Valley areas. The City of Prescott's primary well field is located in the Chino Valley area. The City of Prescott and the Town of Chino Valley are located in the Little Chino subbasin. The Town of Prescott Valley is located in the Upper Agua Fria subbasin. An ongoing issue in the AMAs is the stored water recovery location relative to the water storage location. Drought planning and encouraging the recovery

of stored water closer to the water storage location are water management objectives for the fourth management period.

There is potential for significant additional development in the PRAMA. The 485 square mile area of the AMA includes more than 260 square miles of private land and more than 100 square miles of state trust land. These 360 square miles of land are potentially developable. ADWR estimates that only about 70 square miles of this area has been developed or subdivided and approved for development. This leaves a potential 290 square miles of land for which development interests may seek an Assured Water Supply Determination (AWS).

TABLE 5-1
HISTORICAL MUNICIPAL DEMAND AND COMMITTED DEMAND (AF)
PRAMA

Year	Demand	Groundwater Demand	Surface Water	Reclaimed Water	Additional Committed	Cumulative Committed Demand
1985	4,004	3,794	210	-	637	637
1986	4,234	3,958	276	-	28	665
1987	5,259	5,000	259	-	109	774
1988	6,459	6,150	121	187	60	834
1989	7,541	7,365	-	176	152	986
1990	7,054	6,710	-	344	118	1,104
1991	7,418	6,706	-	712	42	1,146
1992	7,436	6,786	-	650	58	1,204
1993	8,260	7,483	-	777	52	1,256
1994	8,729	8,729	-	-	103	1,359
1995	9,137	9,137	-	-	738	2,097
1996	11,089	10,247	-	842	186	2,283
1997	11,070	10,414	-	656	202	2,485
1998	10,990	10,252	-	738	213	2,698
1999	10,939	10,892	-	47	1,245	3,943
2000	11,837	10,999	825	12	3,257	7,200
2001	13,789	11,434	688	1,667	-	7,200
2002	15,903	13,732	-	2,171	6	7,206
2003	15,634	12,842	1,064	1,729	28	7,234
2004	16,035	13,358	864	1,813	72	7,306
2005	15,571	12,271	1,548	1,752	102	7,408
2006	16,946	14,843	229	1,875	85	7,493
2007	17,317	15,199	-	2,119	75	7,568
2008	15,814	11,331	2,331	2,152	11	7,579
2009	15,342	11,810	1,569	1,963	-	7,579
2010	14,595	9,913	2,784	1,898	-	7,579
2011	14,786	11,911	548	2,327	-	7,579
2012	14,472	11,865	445	2,163	-	7,579

Assessment
The PRAMA Assessment (ADWR, 2011) projects large and small municipal provider population growth of between about 47,000 and 57,000 people between 2010 and 2025 and groundwater demand increases of between 2,200 and 3,900 acre-feet in the municipal sector. Even at per capita water use rates well below current levels, there may be more developable land in the PRAMA than an AWS can be issued for.

After the 1999 Declaration of groundwater mining in PRAMA, new applications for AWS have been required to meet the criterion of consistency with the management goal of the PRAMA. To date this has been accomplished almost exclusively with the pledging of extinguishment credits towards the new demand. It is unlikely that there are sufficient extinguishment credits available to allow the development of the 290 acres of undeveloped land within the PRAMA. This means that new development in the PRAMA will ultimately need to use water supplies other than PRAMA groundwater.

Table 5-1 shows the historical annual groundwater demand and committed demand from 1985 to 2012. Committed demand is associated with subdivisions for which an AWS has been issued. Some of the committed demand shown in Table 5-1 has been realized and so moved from committed to current demand. However, much of the committed demand in the table is for subdivisions that have not been built out or have not begun construction. Committed demand represents future groundwater use that must be considered in addition to current demand when evaluating the availability of groundwater for additional applications for AWS.

History

Since the beginning of the first management period, groundwater use in the municipal sector has expanded with increasing demand in the PRAMA. Table 5-1 illustrates the municipal sector's increasing reliance on groundwater to meet demands in the PRAMA between 1985 and 2012. ADWR does not have data for reclaimed water for the years 1994, 1995, and is missing some of the reclaimed use data in the years 1999 and 2000. Surface water use fluctuates based on the availability of surface water in Watson and Willow Lakes that the City of Prescott annually stores and recovers from its Chino Valley wellfield. Surface water use shown between 1985 and 1988 was direct use of surface water from Goldwater Lake, located south of the City of Prescott.

5.3 ASSURED WATER SUPPLY ROLE IN THE MUNICIPAL CONSERVATION PROGRAM

Since the Declaration of groundwater mining in the PRAMA in 1999, approximately 12,000 acre-feet of extinguishment credits have been pledged to subdivisions in the PRAMA to meet the consistency with goal criterion. This does not include that volume of extinguishment credits pledged to the City of Prescott's DAWS from subdivisions served or to be served by City.

About 164,000 acre-feet of unpledged extinguishment credits remain in the AMA that could be pledged to support AWS applications, enough to meet a demand of 1,640 acre-feet per year for 100 years. If all remaining active groundwater rights in the PRAMA had been extinguished in the year 2012, they could have generated a maximum of an additional 92,000 acre-feet of extinguishment credits, which would be sufficient for an additional annual demand of 924 acre-feet per year for 100 years. For additional new subdivision development to occur over and above this 2,564 acre-feet per year, a supply source other than groundwater would need to be utilized. Alternative supplies include: recovered long-term storage credits from underground storage of reclaimed water, provided the proposed location of recovery demonstrated physical availability of the water supply; renewable water stored and recovered within the area of impact of the storage; or imported water supplies.

Subdivisions platted prior to the 1999 Declaration are not required to meet the consistency with goal criterion of the Assured Water Supply Rules, nor are lot splits that do not meet the statutory definition of a subdivision. Therefore, there is significant potential for additional municipal demand without a requirement to replenish any groundwater use back into the aquifer (See Chapter 12 for additional discussion of this issue).

In addition to the consistency with goal criteria, the lack of a 100-year supply of groundwater that is physically available may limit development in many areas of the PRAMA. Recovering stored water within the area of impact of where the water was stored is a method to add physical availability to an area; however, not all areas have the potential for underground storage due to geologic and groundwater flow conditions. Recovery of stored water is also limited to areas where groundwater level declines are less than four feet per year *(see Chapter 8 of this plan).*

Highly conserving subdivisions will require less water to meet demand; however ADWR's Office of Assured and Adequate Water Supply requires Covenants, Conditions and Restrictions limiting exterior water use to be in place at the time of application for a CAWS, or ordinances on the part of a City or Town applying for a DAWS before approving an application with a projected water demand per capita rate less than the models for new development. Further, ADWR must rely on the local platting authority to enforce or ensure that the new development would adhere to CCR's or ordinances for 100 years.

5.4 INCENTIVES FOR THE USE OF RENEWABLE SUPPLIES AND REMEDIATED GROUNDWATER

Since the adoption of the Groundwater Code (Code), a number of incentives have been developed in both the management plans and statutes to increase the use of non-groundwater supplies. For instance, the management plans have exempted reclaimed water (directly used or stored underground and recovered from within the area of impact) from the per capita use rate for municipal providers under the Total GPCD Program. Spill water (surface water, other than Colorado River water, that is released for beneficial use from storage, diversion or distribution facilities to avoid overtopping the facilities) also is not counted in the annual per capita use rate for municipal providers regulated under the Total GPCD Program, per statutory changes that occurred in 1991. See the definition of "Municipal Use" in A.R.S § 45-561.

In 1997, the Legislature enacted legislation significantly revising the Water Quality Assurance Revolving Fund (WQARF) program to provide incentives for the use of remediated groundwater to facilitate the treatment of contaminated groundwater. Among other provisions, the WQARF legislation provides that when determining compliance with management plan conservation requirements, ADWR shall account for groundwater withdrawn pursuant to approved remedial action projects under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or Title 49, Arizona Revised Statutes, consistent with its accounting for surface water (See Chapter 7, Section 7.4.4.6.3). Laws 1997, Ch. 287, § 51(B). Groundwater withdrawn pursuant to an approved remedial action project retains its legal character as groundwater for all other purposes under Title 45, Arizona Revised Statutes, including all other laws regulating groundwater withdrawal and use, such as: (1) the assessment of withdrawal fees pursuant to A.R.S. § 45-611 *et seq.*; (2) regulation of water exchanges as set forth in A.R.S. § 45-1001 *et seq.*; (3) transportation of groundwater as set forth in A.R.S. § 45-541 *et seq.;* (4) withdrawals of groundwater for transportation to active management areas as set forth in A.R.S. § 45-551 *et seq.;* and (5) underground water storage, savings, and replenishment as set forth in Title 45, Chapter 3.1, Arizona Revised Statutes.

As of 2012, no WQARF projects have been identified in the PRAMA. If a WQARF project were to be approved in the future, the annual amount of groundwater eligible for the remediated groundwater accounting incentive would be equal to the maximum annual volume of groundwater that may be withdrawn pursuant to the project, as specified in the consent decree or other document approved by the EPA or ADEQ. However, if the project was approved prior to June 15, 1999, and the maximum annual volume of groundwater that may be withdrawn pursuant to the project is not specified in a consent decree or other document approved by the EPA or ADEQ, the annual amount of groundwater that is eligible for

the remediated groundwater accounting incentive is the highest annual use of groundwater withdrawn pursuant to the project prior to January 1, 1999. The director may modify the annual amount of groundwater eligible for the accounting incentive if an increase in withdrawals is necessary to further the purpose of the project or if a change is made to the consent decree or other document approved by the EPA or ADEQ.

In order to qualify for the remediated groundwater accounting incentive, a person must notify the director in writing of the anticipated withdrawal of the groundwater prior to its withdrawal. The notification must include a copy of a document approved by ADEQ or the EPA, such as the Remedial Action Plan (RAP), Record of Decision (ROD), or consent decree. Unless specified in the document, the notification must include the volume of groundwater that will be pumped annually pursuant to the project, the time period to which the document applies, and the annual authorized volume of groundwater that may be withdrawn pursuant to the project. The notification must also include the purpose for which the remediated groundwater will be used and the name and telephone number of a contact person. Additionally, at the time the notice is given, the person must be using remediated groundwater pursuant to the approved remedial action, or must have agreed to do so through a consent decree or other document approved by ADEQ or the EPA. Remediated groundwater that qualifies for the accounting must be metered and reported separately from groundwater not qualifying for the accounting *(see section 5-712 of the Municipal Conservation Requirements).*

5.5 NON-REGULATORY EFFORTS

ADWR has a program for water management assistance in the AMAs. Funding for the program comes from a portion of the annual withdrawal fees levied and collected from all non-exempt groundwater users in the AMAs. Since the Water Management Assistance Program (WMAP) began, the PRAMA has funded several projects promoting prudent water management within the PRAMA *(see Chapter 9 of this plan).*

5.6 PROGRAM DESCRIPTIONS

The director has included two regulatory programs for large municipal providers in the 4MP: the NPCCP, a best management practices program; and the Total GPCD Program, with a total GPCD requirement for large municipal providers that are designated as having an assured water supply and that do not elect to be regulated under the NPCCP. A conservation program for small municipal providers is also included, as are requirements for the distribution of water for non-irrigation use by cities, towns, private water companies and irrigation districts. Table 5-2 lists the municipal water providers in the PRAMA and whether they are a large municipal provider or a small municipal provider.

5.6.1. Non-Per Capita Conservation Program

5.6.1.1 Introduction

The NPCCP is a performance-based program designed to achieve water use efficiency in the municipal provider’s service area, equivalent to the water use efficiency assumed by the director in establishing the per capita conservation requirements under the Total GPCD Program. Each year while regulated under the NPCCP, a provider must implement a basic public information program and one or more additional best management practices (BMPs) that are reasonably relevant to the provider’s existing service area characteristics or water use patterns.

TABLE 5-2
MUNICIPAL WATER PROVIDERS
PRAMA

Provider Number	Provider Name	Provider Type
56-003001.0001	SUNSET VILLAGE MHP	SMALL
56-003002.0002	MOUNTAIN VIEW PARK	SMALL
56-003003.0000	CHINO MEADOWS II WATER COMPANY	SMALL
56-003004.0000	DELL'S WATER COMPANY	SMALL
56-003005.0000	WILHOIT WATER COMPANY (BLUE HILLS)	SMALL
56-003006.0000	WILHOIT WATER COMPANY (CHINO)	SMALL
56-003007.0000	GRANITE DELLS WATER COMPANY	SMALL
56-003008.0000	HIGHLAND PINES DOMESTIC WATER IMPROVEMENT DISTRICT	SMALL
56-003009.0000	HOLIDAY HILLS DOMESTIC WATER IMPROVEMENT DISTRICT	SMALL
56-003010.0000	HUMBOLDT WATER COMPANY	SMALL
56-003013.0000	SHERMAN PINES HOMEOWNER'S ASSOCIATION	SMALL
56-003014.0001	DIAMOND VALLEY WATER DISTRICT	SMALL
56-003015.0000	QUAIL RIDGE DOMESTIC WATER IMPROVEMENT DISTRICT	SMALL
56-003016.0000	ROADRUNNER MOBILE HOME PARK	SMALL
56-003017.0000	**CITY OF PRESCOTT**	**LARGE**
56-003018.0000	HANELY PARK	SMALL
56-003019.0000	BRADSHAW WATER COMPANY	SMALL
56-003020.0000	GRANITE OAKS WATER USERS ASSOCIATION	SMALL
56-003021.0000	APPALOOSA WATER COMPANY	SMALL
56-003022.0001	TOWN OF CHINO VALLEY	SMALL
56-003023.0000	**TOWN OF PRESCOTT VALLEY**	**LARGE**
56-003024.0000	GRANITE MOUNTAIN WATER COMPANY	SMALL
56-003025.0000	H & R ENTERPRISES	SMALL

The provider must select the additional BMPs from the list of BMPs approved by the director in Appendix 5C. The number of additional BMPs that must be implemented depends on the total number of residential and non-residential service connections to the provider's water distribution system. Providers regulated under the NPCCP must submit a Provider Profile before entering the program and must also submit a Conservation Efforts Report (CER) along with their Annual Water Withdrawal and Use Reports. A municipal BMP Advisory Committee was established in 2009 to assist ADWR in the evaluation of the effectiveness of the program throughout all five AMAs. The Advisory Committee was selected based on stakeholder recommendations to include a mix of policy staff and conservation practitioners and:

- at least one representative from each AMA and each tier (number of service connections tier) of the NPCCP
- several representatives from private water companies
- at least one representative each from municipalities that have a DAWS and those that do not
- a representative from the agricultural use sector
- a representative from the Arizona Corporation Commission.

Current members of the municipal BMP Advisory Committee are found on ADWR's website: http://www.azwater.gov/AzDWR/Watermanagement/AMAs/ModifiedNon-PerCapita.htm.

5.6.1.2 Regulated Parties

Large municipal providers that do not have a DAWS are required to be regulated under the NPCCP (i.e., Prescott Valley). Regulation under the NPCCP is optional for large providers that have a DAWS (i.e., Prescott, which elected to be regulated under the NPCCP program during the third management period).

Large municipal providers with DAWS (including those regulated under the original NPCCP during the third management period) will be regulated under the Total GPCD Program for the fourth management period unless they elect to be regulated under the NPCCP. If they choose to be regulated under the NPCCP for the fourth management period, they will be required to notify the director in writing that they elect to be regulated under the NPCCP for the fourth management period and include in that notice a Provider Profile containing the information required by A.R.S. § 45-567.01(E). The provider must begin complying with the NPCCP upon approval of the Provider Profile by the director.

A new large municipal provider, including a small municipal provider whose deliveries expand to qualify as a large municipal provider during the fourth management period, that does not have a DAWS, must submit a Provider Profile within six months after receiving notice of its conservation requirements as a large municipal provider from the director. The provider must begin complying with the NPCCP upon approval of the Provider Profile by the director.

Small providers that consolidate to the degree that the consolidated entity now qualifies as a large municipal provider and that does not have a DAWS must submit a Provider Profile to the director within 60 days after the consolidation becomes effective. The consolidated provider will be regulated under the NPCCP upon approval of the Provider Profile by the director.

5.6.1.3 General requirements

Large municipal providers regulated under the NPCCP must also comply with individual user requirements, municipal distribution system requirements and monitoring and reporting requirements. Conservation requirements for Individual Users have not changed from those in the 3MP. These requirements pertain to turf-related facilities, large-scale cooling facilities, and landscaping in publicly owned rights-of-way that receive groundwater from a large municipal provider.

Distribution system requirements (lost and unaccounted for water must be 10% or less) have not changed. Monitoring and reporting requirements for large municipal providers have not changed (*see Section 5-711*), except that providers regulated under the NPCCP are required to report additional information pertinent to the NPCCP requirements in their annual CER.

Providers in the NPCCP will be placed in tiers based on the providers' combined total of residential and non-residential service connections. For municipal providers with multiple systems, each system having a separate Service Area Right will be treated separately and only the service connections within that system will be counted to determine the system's tier. The number of BMPs that providers must implement is based on which tier they are in:

- Tier 1 – up to 5,000 service area connections: one additional BMP
- Tier 2 – 5,001 – 30,000 service area connections: five additional BMPs
- Tier 3 – more than 30,000 service area connections: ten additional BMPs

5.6.1.4 Provider Profile

A Provider Profile (Profile) is required of all large municipal providers regulated under the NPCCP. The Profile must contain the following information:

1. A description of the provider's existing service area characteristics and water use patterns;

2. The total number of service connections to the provider's water distribution system;

3. A description of the conservation measures the provider is currently implementing;

4. A description of the public education program and additional BMPs that the provider intends to implement to comply with the NPCCP; and

5. An explanation of how the additional BMPs are relevant to the provider's existing service area characteristics or water use patterns.

The director must either approve or disapprove the Profile and send written notice of the decision to the provider. If the director does not send written notice approving or disapproving a Profile within 90 days after receiving it, the Profile will be deemed approved. A.R.S. § 45-567.01(F).

Profiles submitted by providers with a DAWS:

A large municipal provider with a DAWS that elects to be regulated under the NPCCP must include a Provider Profile with the notice it submits to the director. Regulation under the NPCCP begins on the date that the provider's Profile is approved by the director. If the director does not approve a Profile submitted by a provider with a DAWS, the provider has three options: 1) submit a revised Profile, 2) continue to be regulated under the Total GPCD program, or 3) appeal the decision pursuant to Title 41, Chapter 6, Article 10, Arizona Revised Statutes. If the director disapproves a revised Profile, the provider may appeal the decision.

Profiles submitted by providers without a DAWS

Large municipal providers that do not have a DAWS and that are serving water when the 4MP is adopted must submit a Provider Profile to the director by July 1, 2016, regulation under the NPCCP begins on January 1, 2017 or the date that the provider's Profile is approved by the director, whichever is later. New large municipal providers that do not have a DAWS and large municipal providers that have a DAWS when the 4MP is adopted but whose DAWS is terminated while they are regulated under the Total GPCD Program must submit a Provider Profile to the director within six months after receiving notice of their conservation requirements as a large municipal provider or notice of the termination of their DAWS, whichever applies. Regulation under the NPCCP being on the date the provider's Profile is approved by the director. If the director disapproves a Profile submitted by a provider that does not have a DAWS, the provider has two options: 1) submit a revised Profile within 90 days after receiving written notice of the disapproval or 2) appeal the decision pursuant to Title 41, Chapter6, Article 10, Arizona Revised Statutes. If the provider appeals the director's decision and the decision is upheld on appeal, the provider must submit a revised Profile within 90 days after the director's decision is final. If a revised Profile is not approved, the provider is out of compliance with its conservation requirements beginning on the date the director's decision disapproving the revised Profile is final until a resubmitted Profile is approved.

If the total number of service connections to the provider's water distribution system increases to a higher tier while the provider is regulated under the NPCCP, the provider must submit a new Profile. ADWR recommends that providers submit an updated Profile every three years.

5.6.1.5 Basic public information program
All providers regulated under the NPCCP must implement a public education program *(see Appendix 5C, section I)* that includes the following components:

1. Communicating to customers at least twice a year:
   Providers are required to inform customers about the importance of water conservation and how they can obtain conservation information from the provider. Examples of ways to communicate with customers include messages on water bills or water bill inserts; provider web page, post cards, newsletters or print pieces.

2. Providing free conservation materials to customers:
   Providers are required to make available to all customers free written information on water conservation (i.e., pamphlets, brochures), have the materials available in their office, and send information to customers on request. Providers are also encouraged to distribute water conservation information at other locations (libraries, chamber of commerce, town hall).

5.6.1.6 Best Management Practices (BMPs)
The provider must select additional BMPs from the list of approved BMPs in Appendix 5C, section II or any future modifications of the list approved by the director.
All of the BMPs selected for implementation must be reasonably relevant to the provider's existing service area characteristics or water use patterns.

The provider must begin implementing all of the BMPs described in its Profile upon approval by the director. A provider may discontinue implementing a BMP identified in its Profile, other than the public education program, and begin implementing a substitute BMP if both of the following criteria are met:

1. The substitute BMP is on the list of approved BMPs described in Appendix 5C, section I, or any modifications of the list.

2. The provider determines that the substitute BMP is reasonably relevant to its existing service area characteristics or water use patterns.

If a provider begins implementing a substitute BMP, the provider may discontinue implementing that substitute BMP and begin implementing a new substitute BMP under the criteria set forth above. A provider that substitutes a BMP must notify the director of the substitution in its next CER *(see Section 5.6.1.7)*. If the director determines that the substitute BMP is not reasonably relevant to the provider's existing service area characteristics or water use patterns, it will notify the provider of that determination and the provider must resume implementing the discontinued BMP or a substitute BMP that the director approves. The director's determination is an appealable agency action.

5.6.1.7 Conservation Efforts Report
A large municipal provider regulated under the NPCCP must include a CER for the previous calendar year with its Annual Water Withdrawal and Use Report (Annual Report) filed by March 31 of each year. The CER must include the following information:

1. A description of the basic public information program and additional BMPs implemented during the year.

2. An assessment of each BMP implemented as to what works and what needs modification.

3. The provider's plan for implementation of BMPs during the current year.

4. If the provider substituted a BMP during the year, a description of the BMP that was discontinued, a description of the substitute BMP and an explanation of how the substitute BMP is relevant to the provider's existing service area characteristics or water use patterns.

5.6.1.8 Water Rate Structure

A large municipal provider regulated under the NPCCP must include a copy of its current water rate structure in its Annual Report due by March 31 of each year, unless no changes have been made to the rate structure since it was last submitted to the director.

5.6.1.9 Records Retention

A large municipal provider regulated under the NPCCP must keep and maintain accurate records verifying that the provider implemented the BMPs required to be implemented during a year and records of its water use during the year. The records for a given calendar year must be kept and maintained for at least five years following that year.

5.6.1.10 Individual User Requirements, Distribution System Requirements and Monitoring and Reporting Requirements

A large municipal provider regulated under the NPCCP must comply with the Individual User requirements in Section 5-709, the conservation requirements for municipal distributions systems in Section 5-710 and the monitoring and reporting requirements in Section 5-711.

5.6.1.11 Review of NPCCP

The director is required to periodically review the program, including the list of approved BMPs, to evaluate its effectiveness. The director is authorized to establish an advisory committee, and to contract with an independent researcher, to assist the director in the evaluation. If the director determines that changes are appropriate to improve the effectiveness of the program, the director must modify the program pursuant to A.R.S. § 45-572 if the changes are consistent with the existing statutory provisions. If the changes that the director determines should be made are not consistent with the existing statutory provisions, the director must give written notice of the appropriate changes to the Speaker of the House of Representatives, the President of the Senate and the Governor.

5.6.2 Total Gallons Per Capita per Day Conservation Program

For the 4MP, the Code allows the director to determine if additional conservation requirements are needed above those assigned in the 3MP. Pursuant to this statutory requirement, ADWR analyzed information from Annual Reports including water deliveries, monthly water use by sector, water source, and number of housing units added to each large municipal provider service area annually. Additional information that was reviewed included: US Census data; Arizona Department of Administration and local associations of governments population projection data; and individual interviews with large municipal providers to assess existing water conservation programs and determine water conservation potential. In the 4MP, ADWR will calculate a total GPCD requirement for each large municipal provider not regulated under the NPCCP. Each large municipal provider will be noticed of its total GPCD requirement for its service area. Municipal providers may apply for variance from or administrative review of the conservation requirements within 90 days following the notice. Alternatively, a large municipal provider who has a DAWS may elect to be regulated under the NPCCP. A large municipal provider who has a DAWS and who does not enroll in the NPCCP will be regulated under the Total GPCD Program.

5.6.2.1 Total GPCD Program Description

A large municipal provider regulated under the Total GPCD Program must limit the annual gallons per capita per day water usage within its service area to the amount allowed under its total GPCD requirement. For the fourth management period, the component method of calculating the annual total GPCD requirement previously employed by ADWR will not be used. Instead, a large municipal provider regulated under this program will be required to meet its individual total GPCD requirement as shown in Appendix 5A. For each year in which the provider is regulated under the Total GPCD Program, the actual amount of water withdrawn, diverted, or received by the provider for non-irrigation use will be compared to the amount allowed by its total GPCD requirement to determine compliance during that year. Compliance is determined pursuant to a flexibility account, which allows providers to use more water than their total GPCD requirement in some years, subject to a maximum negative account balance. Reclaimed water used directly from a treatment plant or stored underground and recovered within the area of impact of storage is not counted when determining a provider's compliance with its total GPCD requirement.

5.6.2.2 Total GPCD Program Development

Analysis of Water Conservation Potential

Conservation potential, based on historical water use, is an estimate of the amount of reduction in per capita water use that a municipal provider can achieve from implementing BMPs or water conservation programs. To determine the conservation potential of each large municipal provider in the 4MP, ADWR performed a statistical analysis of the historical per capita trend for each provider. ADWR set the GPCD requirement at the statistical median minus two standard deviations. However, the GPCD target will not be set lower than a computed minimum target. The computed minimum target is calculated based on updated conservation models for new single family development based on the use of EPA "WaterSense" fixtures (see http://www.epa.gov/watersense/) and updated landscaping assumptions, the provider's 3MP non-residential component, and ten percent lost and unaccounted for water. This GPCD target was assumed to be the lowest GPCD rate the provider can reasonably achieve.

Total GPCD Compliance

Annual Population Estimates

Each time there is a decennial US Census ADWR compiles a US Census base population for each provider. ADWR uses the provider's water distribution lines to select Census blocks likely served by the provider. Once ADWR determines the US Census base population for each provider, persons per housing unit and occupancy characteristics are obtained from the US Census American Community Survey at the tract or block group level of geography and are assigned to each provider's service area. Each year after the Census year, the provider's annual service area population is estimated based on the number of housing units the provider reports each year as having been added to its distribution system and multiplying those added housing units by the occupancy and persons per housing unit rates from the American Community Survey data assigned to the provider. The figures are corrected following each decennial Census.

Flexibility Account

To allow water providers flexibility for variations in weather, the flexibility account ADWR included in the 3MP will continue into the 4MP. The flexibility account allows large municipal providers regulated in the Total GPCD Program to accumulate a 30 GPCD credit or incur debits up to 10 GPCD.

Compliance Calculation
A large municipal provider's annual compliance with its total GPCD requirement will be determined by first calculating the total amount of water that the municipal provider is allocated for municipal use during the year. This allocation is calculated by multiplying the municipal provider's total GPCD requirement for the year by the municipal provider's service area population for the year and then multiplying the product by the number of days in the year.

The amount of water allocated to the municipal provider for municipal use is then compared to the total amount of water, from any source except direct use reclaimed water or reclaimed water recovered within the area of impact, withdrawn, diverted, and received by the municipal provider for municipal use during the year. If the allocated amount is greater than the amount withdrawn, diverted, and received, the difference is credited to the municipal provider's flexibility account, subject to the maximum positive account balance. If the allocated amount is less than the amount withdrawn, diverted, and received, the difference is debited to the municipal provider's flexibility account. The large municipal provider is out of compliance for the year if the debit causes the flexibility account to exceed the negative account balance limitation.

5.6.3 Lost and Unaccounted for Water
Large municipal providers must limit the amount of lost and unaccounted for water in their groundwater distribution systems to no more than 10 percent of the total quantity of water that enters its groundwater distribution system, calculated on an annual or three-year average basis *(see Section 5-710).*

5.6.4 Conservation Requirements for New Large Municipal Providers
A new large municipal provider is defined as a city, town, private water company, or irrigation district that begins supplying in excess of 250 acre-feet of water for non-irrigation use per year after the date of adoption of the 4MP. All new large providers that have a DAWS will initially be notified for regulation under the Total GPCD Program. Their total GPCD requirement will be calculated consistent with the statistical methodology used for existing large municipal providers. ADWR will establish the base year for the municipal provider as the year preceding the year in which the provider began serving greater than 250 acre-feet per year, unless the director determines that water usage during that year is not representative of its historic water use. Additionally, ADWR will collect residential and non-residential water use data during the base year and the total gallons of water withdrawn, diverted, or received by the provider in the service area.

A new large provider regulated under the Total GPCD Program may apply for an administrative review requesting a temporary adjustment to its total GPCD requirement in order to serve a turf-related facility. A temporary adjustment will be allowed if the provider demonstrates that direct use reclaimed water, or reclaimed water recovered within the area of impact, is committed to serve the turf-related facility beginning in four years, but a longer period is necessary for sufficient reclaimed water to be produced to serve the entire facility. The adjustment will remain in effect until sufficient direct use reclaimed water, or reclaimed water recovered within the area of impact, is available to serve the entire facility, but not longer than eight years, and may be adjusted as the volume of reclaimed water use increases. The adjustment will be terminated if the infrastructure necessary to deliver the reclaimed water is not in place at the beginning of the fourth year following the provider commencing service to the facility. If a new large municipal provider who has a DAWS cannot serve a turf-related facility under its existing per capita requirement, and direct use reclaimed water or reclaimed water recovered within the area of impact will not be physically available to serve the facility within a reasonable period of time, the provider may enroll in the NPCCP if it wishes to serve the facility.

A new large municipal provider that does not have a DAWS will be regulated under the NPCCP described in section 5-705. The provider must submit a Provider Profile containing the information described in section 5-705(B)(1) within six months after receiving written notice of its conservation requirements from the director. The provider must begin complying with the NPCCP upon approval of the Provider Profile pursuant to section 5-705(B)(2) or (B)(3).

5.6.5 Conservation Requirements for Consolidated Municipal Providers and Providers that Acquire or Convey a Portion of a Service Area

If two or more municipal providers consolidate their service areas and the consolidated provider qualifies as a large municipal provider will be regulated as follows:

1 If the consolidated provider has a DAWS, it will be assigned to the Total GPCD Program and its GPCD will be calculated by prorating the respective per capita targets, populations, and water use as appropriate. The consolidated provider may elect to be regulated under the NPCCP.

2. If the consolidated provider does not have a DAWS, the provider must submit a Provider Profile to the director as described in section 5-705(B)(1) within 60 days after the consolidation becomes effective. The consolidated provider will be regulated under the NPCCP described in section 5-705 upon approval of the Provider Profile by the director.

Providers that acquire or convey a portion of a service area continue to be regulated under the conservation program they were regulated under prior to the acquisition or conveyance. However, if the conveying or acquiring provider does not have a DAWS, it will be regulated under the NPCCP regardless of whether it was regulated under that program prior to the conveyance or acquisition. If the conveying or acquiring provider is regulated under the NPCCP after the conveyance or acquisition, and it was regulated under that program immediately prior to the conveyance or acquisition, the provider must submit a new Provider Profile to the director if either: (1) the conveyance or acquisition resulted in the total number of service area connections to the provider's water distribution system increasing or decreasing to a new tier level; or (2) the director determines that the provider's service area characteristics or water use patterns have changed.

5.6.6 Conservation Requirements for Small Municipal Providers

During the fourth management period, small providers will continue to be required to minimize waste of all water supplies, maximize efficiency in outdoor watering, encourage reuse of water supplies, and improve water use efficiency as feasible.

5.6.7 Regulatory Requirements for All Municipal Providers

The following requirements are established for all municipal providers: Individual User requirements, distribution system requirements, and monitoring and reporting requirements. Each of these is described in this section.

5.6.7.1 Individual User Requirements

An Individual User is an entity that receives water from a municipal provider for non-irrigation use. For the 4MP, the director is authorized to establish "additional conservation requirements for non-irrigation uses..." (A.R.S. § 45-567 (A)(2)). In the 3MP, Individual User requirements were established for turf-related facilities, publicly owned rights-of-way, and large cooling towers. These requirements have been retained for the 4MP.

Either the Individual User or the municipal provider serving the Individual User is responsible for complying with the Individual User requirement. See Section 5-709(B) for determining responsibility for compliance with the Individual User requirements.

5.6.7.2 Distribution System Requirements

Lost and unaccounted for water is defined as the total water from any source, withdrawn, diverted, or received in a year that enters a municipal provider's groundwater distribution system, minus the total amount of authorized deliveries from the groundwater distribution system made by the municipal provider in that year. Lost and unaccounted for water includes line leakage, meter under-registration, evaporation or leakage from storage ponds or tanks, system and hydrant leaks or breaks, and illegal connections.

All municipal providers are required to meet an efficient lost and unaccounted for water standard in their service areas. Lost and unaccounted for water will be determined for each municipal provider based on the total quantity of metered and unmetered water deliveries during a calendar year and the total quantity of water that enters the provider's groundwater distribution system during the year. Small municipal providers must maintain lost and unaccounted for water at or below 15 percent. Large municipal providers are required to maintain their system so as to not exceed 10 percent lost and unaccounted for water. A provider is in compliance with its municipal distribution system requirements if it limits its lost and unaccounted for water to the maximum percentage on an annual or three-year average basis.

For the fourth management period, ADWR will allow providers to exclude water that is metered or estimated using approved estimating procedures and used pursuant to other regulatory requirements, such as well purging and line flushing, from the lost and unaccounted for water calculation. Providers may also exclude estimated water uses such as construction (truck loads for dust control) or fire services, but all other uses of water within a distribution system must be metered. Appendix 5B provides a complete list of uses considered in the lost and unaccounted for water calculation, including those uses which can be estimated to determine the volume.

5.6.7.3 Monitoring and Reporting Requirements

All municipal providers, including providers regulated under the NPCCP, are required to annually: (1) report to ADWR information on the total quantity of water withdrawn, diverted or received that enters the groundwater distribution system during the year; 2) report the total quantity of water used within the service area, and the total volume of water delivered for various municipal purposes; (3) report the total number of housing units, by unit type, added to the service area from December 31 of the previous calendar year to December 31 of the reporting year; and (4) report all movements of water made by the provider during the year, including water accepted from another entity (received) that was subsequently sent (delivered) to be stored at a GSF or underground storage facility, and stored water that was recovered during the year, whether annual or long-term credit recovery, regardless of the water type. Providers must also report annually the volume of water ordered from an irrigation district that was released by the irrigation district from a storage or distribution facility but not accepted by the municipal provider or delivered to any other person. All wells operated by the municipal provider should appear on the provider's Annual Report, regardless of the type of water withdrawn from the well.

Large municipal providers are required to separately measure and report the amount of water delivered via the provider's groundwater distribution system each month for: irrigation uses; residential uses, separated by single family and multifamily; and non-residential uses, separated by water use categories, including turf-related facility use, commercial use, industrial use, government use, construction use, surface water treatment, and other uses.

All municipal providers are required to submit to ADWR, on an annual basis, an updated water service area and distribution system map delineating all distribution lines greater than 4 inches, all treatment works, and all well sites.

A large municipal provider regulated under the NPCCP must submit a CER, as described in Section 5-705(E), and must also report the total number of service connections within the provider's water distribution system as of the end of the reporting year.

5.7 MUNICIPAL CONSERVATION REQUIREMENTS AND MONITORING AND REPORTING REQUIREMENTS

5-701. Definitions

In addition to the definitions set forth in Chapters 1 and 2 of Title 45 of the Arizona Revised Statutes, unless the context otherwise requires, the following words and phrases used in this chapter shall have the following meanings:

1. *"4MP" means the Fourth Management Plan for the Prescott Active Management Area.*

2. *"5MP" means the Fifth Management Plan for the Prescott Active Management Area.*

3. *"ADWR" means the Arizona Department of Water Resources.*

4. *"ADWR's Low Water Use/Drought Tolerant Plant List for the PRAMA" means the list of low water / drought tolerant plants found on ADWR's website, http://www.azwater.gov/azdwr/WaterManagement/AMAs/PrescottAMAFourthManagementPlan.htm, including any modifications to the list.*

5. *"CER" means the Conservation Efforts Report required to be filed by a large municipal provider regulated under the Non-Per Capita Conservation Program as provided in Section 5-705, subsection E.*

6. *"Common area" means a recreational or open space area or areas owned and operated as a single integrated facility and maintained for the benefit of the residents of a housing development.*

7. *"Construction use" means a use of water for construction purposes, including the use of water for dust control, compaction and preparation of building materials on construction sites.*

8. *"Direct use reclaimed water" means effluent that is transported directly from a facility regulated pursuant to Title 49, Chapter 2, Arizona Revised Statutes, to an end user. Direct use reclaimed water does not include effluent that has been stored pursuant to Title 45, Chapter 3.1, Arizona Revised Statutes.*

9. *"Existing Individual User" means an Individual User that was receiving water from a municipal provider as of the date the 4MP was adopted.*

10. *"Existing large municipal provider" means a large municipal provider that was in operation and was serving water on or before the date of adoption of the 4MP.*

11. *"Exterior water use" means non-residential or residential uses of water for landscaping, pools, evaporative cooling systems, decorative fountains and other outdoor uses of water.*

12. *"GPCD" means gallons of water per capita per day.*

13. *"Groundwater distribution system" means a system of pipes, canals or other works within a municipal provider's service area which are owned and operated by the*

provider to collect, store, treat or deliver groundwater for non-irrigation use, regardless of whether other types of water are also present in the system.

14. *"Housing unit" means a group of rooms or a single room occupied as separate living quarters. Housing unit includes a single family home, a patio home, a townhouse, a condominium, an apartment, a permanently set-up mobile home or a unit in a multifamily complex. Housing unit does not include a mobile home in an overnight or limited-stay mobile home park or a unit in a campground, motel, hotel or other temporary lodging facility. A housing unit may be occupied by a family, a family and unrelated persons living together, two or more unrelated persons living together, or by one person.*

15. *"Individual User" means a person receiving groundwater from a municipal provider for non-irrigation uses to which specific conservation requirements apply, including turf-related facilities, large-scale cooling facilities, and publicly-owned rights-of-way.*

16. *"Interior water use" means non-residential or residential indoor uses of water, including toilet flushing, bathing, drinking, and washing.*

17. *"Landscapable area" means the entire area of a lot less any areas covered by structures, parking lots, roads and any other area not physically capable of being landscaped.*

18. *"Large municipal provider" means a municipal provider serving more than 250 acre-feet of water for non-irrigation use during a calendar year.*

19. *"Large-scale cooling facility" means a facility which has control over cooling operations with a total combined cooling capacity greater than or equal to 1,000 tons. For the purposes of this definition, the minimum cooling tower size which shall be used to determine total facility cooling capacity is 250 tons. A large-scale cooling facility does not include a large-scale power plant that utilizes cooling towers to dissipate heat.*

20. *"Lost and unaccounted for water" means the total quantity of water from any source that enters a municipal provider's groundwater distribution system during a calendar year less the total quantity of authorized deliveries of water from the groundwater distribution system during the calendar year that are metered deliveries or deliveries that the municipal provider accounts for by a method of estimating water use approved by the director.*

21. *"Multifamily housing unit" means a mobile home in a mobile home park and any permanent housing unit having one or more common walls with another housing unit located in a multifamily residential structure, and includes a unit in a duplex, triplex, fourplex, condominium development, town home development, or apartment complex.*

22. *"Municipal distribution system" means a system of pipes, canals or other works within a municipal provider's service area which are owned and operated by the provider to collect, store, treat or deliver water for non-irrigation use.*

23. *"Municipal provider" means a city, town, private water company or irrigation district that supplies water for non-irrigation use.*

24. *"NPCCP" means the Non-Per Capita Conservation Program.*

25. *"New Individual User" means an Individual User that begins receiving water from a municipal provider after adoption of the 4MP.*

26. *"New large municipal provider" means a municipal provider that begins serving more than 250 acre-feet of water for non-irrigation use during a calendar year after the date of adoption of the 4MP.*

27. *"Non-residential customer" means a person who is supplied water by a municipal provider for a non-irrigation use other than a residential use.*

28. *"Reclaimed water" has the same definition as effluent in A.R.S. § 45-101*

29. *"Reclaimed water recovered within the area of impact" means reclaimed water that has been stored pursuant to Title 45, Chapter 3.1, Arizona Revised Statutes, and recovered within the area of impact of storage. For purposes of this definition, "area of impact" has the same meaning as prescribed by A.R.S. § 45-802.01.*

30. *"Reclaimed water recovered outside the area of impact" means reclaimed water that has been stored pursuant to Title 45, Chapter 3.1, Arizona Revised Statutes, and recovered outside the area of impact of storage. For purposes of this definition, "area of impact" has the same meaning as prescribed by A.R.S. § 45-802.01.*

31. *"Residential customer" means a person who is supplied water by a municipal provider for a residential use.*

32. *"Residential use" means a non-irrigation use of water related to the activities of a single family or multifamily housing unit or units, including exterior water use.*

33. *"Service area" has the definition prescribed by A.R.S. § 45-402.*

34. *"Service area population" means the number of people residing in housing units connected to distribution lines maintained by the municipal provider within its service area which are being served as of December 31 of the applicable year, as determined pursuant to section 5-703, subsection C.*

35. *"Service connection" means a coupling of a municipal provider's distribution system and its customer's water system.*

36. *"Single family housing unit" means a detached dwelling, including mobile homes not in mobile home parks.*

37. *"Small municipal provider" means a municipal provider that supplies 250 acre-feet or less of water for non-irrigation use during a calendar year.*

38. *"Turf-related facility" means any facility, including a school, park, cemetery, golf course, or common area of a housing development, with a water-intensive landscaped area of 10 or more acres.*

39. *"Water-intensive landscaped area" means, for a calendar year, an area of land which is watered with a permanent water application system and planted primarily with plants not listed in ADWR's Low Water Use Plant List or modifications to the list, and the total surface area of all bodies of water filled or refilled with water from any source, including reclaimed water, that are an integral part of the landscaped area. Bodies of water used primarily for swimming purposes are not an integral part of a landscaped area.*

40. *"Water movement" means, the receipt or delivery of any type of water for direct use by customers, for use within a municipal water service area, or to or from another entity, including underground and groundwater savings facility storage and annual or long-term credit recovery. Water movements also include deliveries and receipts from other entities that are not required to file an annual water withdrawal and use report, such as the Central Arizona Water Conservation District, local or regional wastewater treatment plants owned by a county or other entity, and Indian reservations.*

5-702. Large Municipal Providers - Conservation Programs

A. *Except as provided in subsection D of this section, beginning with calendar year 2017 or the calendar year specified in Section 5-707(A)(1) and continuing thereafter until the first compliance date for any substitute municipal conservation requirement in the 5MP, a large municipal provider designated as having an assured water supply shall be regulated under the Total Gallons Per Capita Per Day (GPCD) Program described in section 5-703, unless the provider elects to be regulated under the NPCCP described in section 5-705 as provided in subsection B of this section.*

B. *A large municipal provider designated as having an assured water supply may elect to be regulated under the NPCCP described in section 5-705 at any time after adoption of the 4MP by giving the director written notice of the election together with a Provider Profile pursuant to section 5-705(A)(2)(a). If the provider elects to be regulated under the NPCCP, the provider shall continue complying with the conservation requirements in effect for the provider at the time it notifies the director of the election until the director approves the provider's Provider Profile pursuant to section 5-705(B)(2) or (B)(3), at which time the provider shall comply with the NPCCP.*

C. *A large municipal provider that is not designated as having an assured water supply shall submit a Provider Profile to the director as prescribed in section 5-705(A). The provider shall be regulated under the NPCCP described in section 5-705 beginning on January 1, 2017 or the date the director approves the provider's Provider Profile pursuant to section 5-705(B)(2) or (3), whichever is later, and continuing thereafter until the first compliance date for any substitute municipal conservation requirement in the 5MP. Until the provider is regulated under the NPCCP as provided in this subsection, the provider shall continue to be regulated under the conservation program under which it was regulated at the time the 4MP was adopted.*

D. *If the director designates a large municipal provider as having an assured water supply while the provider is regulated under the NPCCP described in section 5-705, the provider shall continue to be regulated under the NPCCP unless the provider gives written notice to the director that it elects to be regulated under the Total GPCD Program described in section 5-703. If the provider elects to be regulated under the Total GPCD Program, the director shall give written notice to the provider of its total GPCD requirements and the provider shall*

comply with the total GPCD requirements beginning on the date specified in the notice and continuing thereafter until the first compliance date for any substitute municipal conservation requirement in the 5MP.

E. *All municipal providers shall comply with Individual User requirements, distribution system requirements, and applicable monitoring and reporting requirements as prescribed in sections 5-709, 5-710, and 5-711.*

5-703. Large Municipal Provider Total Gallons Per Capita per Day Program

A. Total Gallons Per Capita per Day Requirement

Beginning with the calendar year specified in Section 5-102, subsection A or D, or Section 5-707, subsection A, paragraph 1, whichever applies, and continuing until the first compliance date for any substitute municipal conservation requirement in the 5MP, a large municipal provider regulated under the Total GPCD Program shall withdraw, divert or receive water from any source, except direct use reclaimed water and reclaimed water recovered within the area of impact, for non-irrigation use during a year at or below its total GPCD requirement as calculated by the director using the methodology set forth in Appendix 5A. The total GPCD requirements calculated by the director for existing large municipal providers that are designated as having an assured water supply on the date the 4MP is adopted are shown in Appendix 5A.

B. Compliance with Total Gallons Per Capita per Day Requirement

The director shall determine if a large municipal provider is in compliance with its total GPCD requirement for a calendar year pursuant to the flexibility account provisions in section 5-704, using the provider's service area population for the year as calculated in subsection C of this section.

C. Calculation of Large Municipal Provider's Service Area Population

The director shall calculate a large municipal provider's service area population for a calendar year as follows, unless the director has approved an alternative methodology for calculating the provider's service area population prior to the calendar year in question:

1. *Determine the number of single family and multifamily housing units added to the provider's distribution system between December 31 of the previous calendar year and December 31 of the calendar year in question, less any units removed from the system during that period.*

2. *Adjust these totals by the respective average annual vacancy rate for single family housing units and multifamily housing units as calculated from the most recent United States Census Bureau American Community Survey data for the geographic area most closely corresponding to the provider's service area or other source of information approved by the director.*

3. *Multiply the adjusted number of single family housing units calculated in 2 above by the average number of persons per occupied single family housing unit as calculated in accordance with the most recent United States Census Bureau American Community*

Survey data for the geographic area most closely corresponding to the provider's service area or other source of information approved by the director. The result is the provider's new single family population for the year in question.

4. *Multiply the adjusted number of multifamily housing units calculated in 2 above by the average number of persons per occupied multifamily housing unit as calculated in accordance with the most recent United States Census Bureau American Community Survey data for the geographic area most closely corresponding to the provider's service area or other source of information approved by the director. The result is the provider's new multifamily population for the calendar year in question.*

5. *Add the results of 3 and 4 to the provider's new single family population and new multifamily population for each year since the most recent decennial US Census year, and add that sum to the provider's decennial US Census service area population. The sum is the provider's service area population for the calendar year in question.*

5-704. Compliance with Total Gallons Per Capita per Day Requirement - Flexibility Account

A. Total GPCD Program Flexibility Account

The director shall determine if a large municipal provider regulated under the Total GPCD Program is in compliance with its total GPCD requirement through the maintenance of a flexibility account for the provider which shall operate as follows:

1. *Each provider regulated under the Total GPCD Program shall be assigned a flexibility account. The beginning balance in the flexibility account of a provider that was regulated under the Total GPCD Program in the 3MP shall be the ending balance in the flexibility account maintained for the provider under section 5-106 of the 3MP. The beginning balance in the flexibility account of all other large municipal providers shall be zero.*

2. *Following each calendar year in which the provider withdraws, diverts or receives groundwater for non-irrigation use, beginning with the first calendar year in which the provider is regulated under the Total GPCD Program as provided in Section 5-702, subsection A or D or Section 5-707, subsection A, paragraph 1, the director shall adjust the provider's flexibility account as follows:*

    a. *Determine the total gallons of water from any source, except direct use reclaimed water and reclaimed water recovered within the area of impact, withdrawn, diverted or received by the provider during the calendar year for non-irrigation use, and then subtract that amount from the provider's total GPCD allotment for the year, as calculated in subparagraph d of this paragraph.*

    b. *If the result in subparagraph a above is negative, debit the flexibility account by this volume.*

    c. *If the result in subparagraph a above is positive, credit the flexibility account by this volume.*

    d. *The provider's total GPCD allotment for a calendar year is calculated by multiplying the provider's total GPCD requirement for the calendar year, as assigned to the*

provider by the director using the methodology in Appendix 5A, by the provider's service area population as of December 31 of the year, as calculated pursuant to section 5-703 subsection C, and then multiplying the product by the number of days in the calendar year.

3. *The account balance existing in a provider's flexibility account after the adjustment provided for in paragraph 2 of this subsection is made shall carry forward subject to the following limitations:*

   a. *The maximum positive account balance allowed in the flexibility account of a provider regulated under the Total GPCD Program shall be calculated by multiplying the provider's service area population as of December 31 of the previous calendar year by a GPCD rate of 30, and then multiplying that product by the number of days in the calendar year. If the account balance exceeds the maximum positive account balance after any credits are registered, the balance carried forward shall equal the maximum positive account balance allowed in the provider's flexibility account for that year.*

   b. *The maximum negative account balance allowed in the flexibility account of a provider regulated under the Total GPCD Program shall be calculated by multiplying the provider's service area population as of December 31 of the previous calendar by a GPCD rate of -10, and then multiplying that product by the number of days in the calendar year. If the account balance exceeds the maximum negative account balance after any debits are registered, the balance carried forward shall equal the maximum negative account balance allowed in the provider's flexibility account for that year.*

B. Compliance Status

If the adjustment to a large municipal provider's flexibility account following a calendar year as provided for in subsection A of this section causes the account to have a negative account balance which exceeds the maximum negative account balance allowed in the provider's flexibility account for the year as calculated in subsection A, paragraph 3, subparagraph B the provider is out of compliance for that calendar year.

5-705. Non-Per Capita Conservation Program

A. Provider Profile – Submittal Date

1. *Large municipal providers not designated as having an assured water supply*

   a. *An existing large municipal provider that is not designated as having an assured water supply shall submit a Provider Profile to the director as described in subsection B, paragraph 1 of this section no later than July 1, 2016.*

   b. *A new large municipal provider that is not designated as having an assured water supply and that receives written notice of the NPCCP from the director shall submit a Provider Profile to the director as described in subsection B, paragraph 1 of this section no later than six months after the date of the notice.*

2. *Large municipal providers designated as having an assured water supply*

   a. *A large municipal provider that is designated as having an assured water supply and that elects to be regulated under the NPCCP shall submit a Provider Profile to the director as described in subsection B, paragraph 1 of this section at the time the provider submits written notice to the director that the provider elects to be regulated under the NPCCP.*

   b. *A large municipal provider that is designated as having an assured water supply and whose designation of assured water supply is terminated while the provider is regulated under the Total GPCD Program described in section 5-703 shall submit to the director a Provider Profile as described in subsection B, paragraph 1 of this section no later than six months after the designation is terminated.*

B. Provider Profile – Contents; Review; Approval or Disapproval

1. *A Provider Profile required by subsection (A) of this section shall contain the following information:*

   a. *A description of the provider's existing service area characteristics and water use patterns.*

   b. *The total number of service connections to the provider's water distribution system, including residential and non-residential connections.*

   c. *A description of the conservation measures currently being implemented by the provider.*

   d. *A description of the conservation measures that the provider intends to implement to comply with subsection (D)(1) of this section.*

   e. *An explanation of how each of the conservation measures that the provider will implement to comply with subsection (D)(1)(b)of this section is relevant to the provider's existing service area characteristics or water use patterns.*

2. *Within 90 days after receiving a large municipal provider's Provider Profile, the director shall approve or disapprove the Provider Profile and send written notice of the decision to the provider. The director shall approve the Provider Profile if the director determines that the profile contains information demonstrating that the provider will implement at least the minimum number of best management practices required pursuant to subsection (D)(1) of this section and that the conservation measures to be implemented pursuant to subsection (D)(1)(b) of this section are reasonably relevant to the provider's existing service area characteristics or water use patterns. If the director disapproves the Provider Profile, the director shall include with the written notice of the decision the reasons for the disapproval. A decision of the director disapproving a Provider Profile is an appealable agency action pursuant to Title 41, Chapter 6, Article 10. If the director fails to send the provider written notice approving or disapproving the Provider Profile within 90 days after receiving the Provider Profile, the Provider Profile shall be deemed approved.*

3. *If the director disapproves the Provider Profile submitted by a large municipal provider that is not designated as having an assured water supply, within 90 days after the date of the director's written notice disapproving the Provider Profile, or within 90 days after the director's decision is final if the provider files a timely notice of appeal of the decision pursuant to Title 41, Chapter 6, Article 10, the provider shall revise the Provider Profile to correct the deficiencies identified by the director in the written notice and submit the revised Provider Profile to the director. If the director disapproves the Provider Profile submitted by a large municipal provider that is designated as having an assured water supply, the provider may revise the Provider Profile to correct the deficiencies identified by the director in the written notice disapproving the Provider Profile and may submit the revised Provider Profile to the director. The director shall approve or disapprove a revised Provider Profile submitted under this paragraph pursuant to paragraph 3 of this subsection. If the director disapproves the revised Provider Profile:*

    a. *The decision is an appealable agency action pursuant to Title 41, Chapter 6, Article 10.*

    b. *If the provider is not designated as having an assured water supply, the provider is in violation of A.R.S. § 45-567.01 beginning on the date the director's decision is final until the provider submits a Provider Profile that is approved by the director.*

C. Commencement of Regulation under Non-Per Capita Conservation Program

1. *An existing large municipal provider that is not designated as having an assured water supply shall be regulated under the NPCCP beginning January 1, 2017 or the date the provider's Provider Profile is approved by the director pursuant to subsection B of this section, whichever is later.*

2. *A new large municipal provider that is not designated as having an assured water supply shall be regulated under the NPCCP beginning on the date the provider's Provider Profile is approved by the director pursuant to subsection B of this section.*

3. *A large municipal provider that is designated as having an assured water supply and that elects to be regulated under the NPCCP shall be regulated under the program beginning on the date the director approves the provider's Provider Profile pursuant to subsection B of this section.*

D. Required Best Management Practices

1. *A large municipal provider regulated under the Non-Per Capita Conservation Program shall implement all of the following best management practices while regulated under the program:*

    a. *The Basic Public Information Program described in Appendix 5C.*

    b. *One or more additional best management practices selected from the list of additional best management practices in Appendix 5C or any modification of the list made pursuant to the modification procedure described in Appendix 5C as posted on ADWR's website. The additional best management practices shall be reasonably*

relevant to the provider's service area characteristics or water use patterns. The exact number of additional best management practices required to be implemented under this sub-paragraph shall be determined based on the total number of service connections to the provider's water distribution system and the following three tier levels:

Total number of service connections (includes both residential and non-residential)	***Required number of additional best management practices***
Tier 1- 5,000 or fewer connections	*One*
Tier 2- 5,001 to 30,000 connections	*Five*
Tier 3- Over 30,000 connections	*Ten*

2. *Except as provided in paragraphs 4 and 5 of this subsection, a large municipal provider regulated under the NPCCP shall implement the best management practices required by paragraph 1 of this subsection as described by the provider in the provider's approved Provider Profile.*

3. *If the total number of service connections to the provider's water distribution system increases to a higher tier level as described in paragraph 1(b) of this subsection after the director approves the provider's Provider Profile pursuant to subsection (B)(2) or (B)(3) of this section, the provider shall submit a new Provider Profile to the director within sixty days after the provider becomes aware of the increase and shall include in the profile the information required by subsection (B)(1). The provisions in subsection (B)(2) and (B)(3) shall apply to the new Provider Profile when it is submitted to the director. Until the new Provider Profile is approved by the director, the provider shall continue implementing the best management practices described by the provider in its previously approved Provider Profile. Upon approval of the new Provider Profile by the director, the provider shall implement all of the best management practices described in the newly approved Provider Profile.*

4 *A large municipal provider regulated under the NPCCP may discontinue implementing a best management practice identified in the provider's approved Provider Profile, other than the Basic Public Information Program required by paragraph (1)(a) of this subsection, and begin implementing a substitute best management practice if all of the following apply:*

   a. *The substitute conservation measure is a measure described on the list of additional best management practices set forth in Appendix 5C, or any modification of the list made pursuant to the modification procedure described in Appendix 5C as posted on ADWR's website.*

   b. *The provider determines that the substitute best management practice is reasonably relevant to the provider's existing service area characteristics or water use patterns.*

5. *If a large municipal provider regulated under the NPCCP implements a substitute best management practice pursuant to paragraph 4 of this subsection, the provider may discontinue implementing that substitute best management practice and begin*

implementing a new substitute best management practice if all of the following apply:

a. The new substitute conservation measure is a measure described on the list of additional best management practices set forth in Appendix 5C, or any modification of the list made pursuant to the modification procedure described in Appendix 5C as posted on ADWR's website.

b. The provider determines that the new substitute best management practice is reasonably relevant to the provider's existing service area characteristics or water use patterns.

6. If a provider substitutes a best management practice pursuant to paragraph 4 or 5 of this subsection, both of the following shall apply:

a. The provider shall notify the director of the substitution in the CER filed by the provider for the year in which the substitution occurred, as provided in subsection (E)(4) of this section.

b. If the director determines that the substitute best management practice is not reasonably relevant to the provider's existing service area characteristics or water use patterns, the director shall give written notice of that determination to the provider and the provider shall begin implementing the discontinued best management practice or a substitute best management practice from the list of additional best management practices set forth in Appendix 5C, or any modification of the list made pursuant to the modification procedure described in Appendix 5C as posted on ADWR's website, that the director determines is reasonably relevant to the provider's existing service area characteristics or water use patterns. The director's determination is an appealable agency action pursuant to Title 41, Chapter 6, Article 10.

E. Conservation Efforts Report

In addition to any information required by section 5-711, a large municipal provider regulated under the NPCCP shall include with its annual reports required by A.R.S. § 45-632 a CER containing the following information:

1. A description of each best management practice implemented during the previous year and the results (i.e., what was accomplished).

2. An assessment of each best management practice implemented as to what worked and what needs modification.

3. The provider's plan for implementation of best management practices during the current year.

4. If the provider substituted a best management practice pursuant to subsection (D)(4) or (D)(5) of this section during the reporting year, a description of the best management practice that was discontinued, a description of the substitute and an explanation of how the substitute is relevant to the provider's existing service area characteristics or water use patterns.

F. Water Rate Structure

A large municipal provider regulated under the NPCCP shall include in its annual reports filed pursuant to A.R.S. § 45-632 a copy of the provider's current water rate structure unless no changes have been made to the rate structure since it was last submitted to the director.

G. Records Retention

For at least five years after a year in which a large municipal provider is regulated under the Non-Per Capita Conservation Program, the provider shall keep and maintain the following records:

1. *Accurate records verifying that the provider implemented the best management practices that it was required to implement during that year.*

2. *Accurate records of the provider's water use during the year.*

5-706. Consolidation of Municipal Provider Service Areas; Acquisition of a Portion of another Municipal Provider's Service Area

A. Notification

1. *If two or more municipal providers consolidate their service areas into one service area, the consolidated provider shall notify ADWR of the consolidation within 30 days after the consolidation becomes effective.*

2. *If a municipal provider acquires a portion of another municipal provider's existing service area, both the acquiring provider and the conveying provider shall notify ADWR of the acquisition within 30 days after the acquisition becomes effective.*

B. Regulation of Consolidated Provider

1. *Upon consolidation, a consolidated provider that qualifies as a large municipal provider and that is designated as having an assured water supply shall be regulated under the Total GPCD Program described in section 5-703, unless the consolidated provider elects to be regulated under the Non-Per Capita Conservation Program described in section 5-705 as provided in section 5-705(A)(2)(a).*

2. *If the consolidated provider is designated as having an assured water supply and is regulated under the Total GPCD Program, the director shall establish a total GPCD requirement for the consolidated provider consistent with the methodology used by the director to establish the consolidating providers' total GPCD requirements as set forth in Appendix 5A. The director shall also establish and maintain a flexibility account for the consolidated provider in accordance with section 5-704, subsection A, with a beginning balance to be established by the director based on the ending balances in the flexibility accounts of the consolidating providers.*

3. *If the consolidated provider qualifies as a large municipal provider and is not designated as having an assured water supply, the consolidated provider shall submit to the director*

a Provider Profile pursuant to section 5-705(B) within 60 days after the consolidation becomes effective. The consolidated provider shall be regulated under the NPCCP described in section 5-705 beginning on the date the director approves the Provider Profile.

C. Regulation of Acquiring Provider

1. *Except as provided in paragraph 2 of this subsection, a large municipal provider that acquires a portion of another provider's existing service area shall continue to be regulated under the conservation program that the acquiring provider was regulated under immediately prior to the acquisition.*

2. *If the acquiring provider is not designated as having an assured water supply after the acquisition, or if the acquiring provider was regulated under the NPCCP immediately prior to the acquisition, both of the following shall apply:*

   a. *The acquiring provider shall be regulated under the NPCCP after the conveyance. If the acquiring provider becomes designated as having an assured water supply after the acquisition, the provider may elect to be regulated under the Total GPCD Program described in section 5-703 by providing the director with written notice of the election as provided in Section 5-702(D).*

   b. *If the acquiring provider was regulated under the NPCCP immediately prior to the acquisition, the following shall apply:*

      1) *If the total number of service connections to the provider's water distribution system increases to a higher tier level as described in section 5-705(D)(1)(b) as a result of the acquisition, the provider shall submit to the director a new Provider Profile pursuant to section 5-705(B)(1) within 60 days after the acquisition.*

      2) *If the director determines that the provider's service area characteristics or water use patterns have changed, the director may require the provider to submit a new Provider Profile pursuant to section 5-705(B)(1).*

      3) *If the provider submits a new Provider Profile, section 5-705(B)(2) and (B)(3) shall apply to the new Provider Profile. The provider shall continue implementing the best management practices described by the provider in its previously approved Provider Profile until the director approves the new Provider Profile. Upon the director's approval of the new Provider Profile, the provider shall implement all of the best management practices described in the newly approved Provider Profile.*

3. *If the acquiring provider is regulated under the Total GPCD Program after the acquisition, the director shall establish a new total GPCD requirement for the acquiring provider consistent with the methodology used to establish the provider's total GPCD requirement in Appendix 5A, taking into account the addition to the provider's service area. The director may also adjust the balance in the acquiring provider's flexibility account maintained under section 5-704, subsection A, to take into account the balance in the conveying provider's flexibility account at the time of the conveyance.*

D. Regulation of Conveying Provider

1. Except as provided in paragraph 2 of this subsection, a large municipal provider that conveys a portion of its service area to another provider and that qualifies as a large municipal provider after the conveyance shall continue to be regulated under the conservation program that the provider was regulated under immediately prior to the conveyance.

2. If the conveying provider is not designated as having an assured water supply after the conveyance, or if the conveying provider was regulated under the NPCCP immediately prior to the conveyance, both of the following shall apply:

a. The conveying provider shall be regulated under the NPCCP after the conveyance. If the conveying provider becomes designated as having an assured water supply after the conveyance, the provider may elect to be regulated under the Total GPCD Program described in section 5-703 by providing the director with written notice of the election as provided in Section 5-702(D).

b. If the conveying provider was regulated under the NPCCP immediately prior to the conveyance, the following shall apply:

1) If the total number of service connections to the provider's water distribution system decreases to a lower tier level as described in section 5-705(D)(1)(b) as a result of the conveyance, the provider shall submit to the director a new Provider Profile pursuant to section 5-705(B)(1) within 60 days after the conveyance.

2) If the director determines that the provider's service area characteristics or water use patterns have changed, the director may require the provider to submit a new Provider Profile pursuant to section 5-705(B)(1).

3) If the provider submits a new Provider Profile, section 5-705(B)(2) and (B)(3) shall apply to the new Provider Profile. The provider shall continue implementing the best management practices described by the provider in its previously approved Provider Profile until the director approves the new Provider Profile. Upon the director's approval of the new Provider Profile, the provider shall implement all of the best management practices described in the newly approved Provider Profile.

3. If the conveying provider is regulated under the Total GPCD Program after the conveyance, the director shall establish a new total GPCD requirement for the provider consistent with the methodology used to establish the total GPCD requirement in Appendix 5A, taking into account the reduction in the provider's service area. The director may also adjust the balance in the conveying provider's flexibility account maintained under section 5-704 to take into account the reduction in the provider's service area.

5-707. Conservation Requirements for New Large Municipal Providers

A. Total GPCD Program

1. *A new large municipal provider that is designated as having an assured water supply shall be assigned to the Total GPCD Program described in section 5-703 and shall comply with its annual total GPCD requirement beginning with the second full calendar year after the provider is given written notice of the requirement by the director, and for each calendar year thereafter until the first compliance date for any substitute municipal conservation requirement in the 5MP.*

2. *A new large municipal provider's total GPCD requirement for a year shall be calculated by the director using the methodology in Appendix 5A.*

3. *The director shall determine if a new large municipal provider is in compliance with its total GPCD requirement pursuant to the flexibility account provisions in section 5-704.*

B. Non-Per Capita Conservation Program

1. *A new large municipal provider that is not designated as having an assured water supply shall be regulated under the NPCCP in accordance with section 5-705. If the director designates the provider as having an assured water supply while the provider is regulated under the NPCCP, the provider may elect to be regulated under the Total GPCD Program as provided in section 5-702(D).*

2. *A new large municipal provider that is designated as having an assured water supply may elect to be regulated under the Non-Per Capita Conservation Program in accordance with section 5-705.*

5-708. Conservation Requirements for Small Municipal Providers

A. *By January 1, 2017, or upon commencement of service of water, whichever is later, and until the first compliance date for any substitute requirements in the 5MP, a small municipal provider shall adopt and implement a program to achieve the following goals:*

1. *Minimize waste of all water supplies.*

2. *Maximize efficiency in outdoor watering.*

3. *Encourage reuse of water supplies.*

4. *Increase overall water use efficiency as feasible.*

5-709. Individual User Requirements for Municipal Providers and Individual Users

A. *Individual User Requirements*

The municipal provider or Individual User responsible for compliance with the Individual User requirements under subsection B of this section shall comply with the following, as applicable:

1. *The municipal provider or Individual User shall serve water to, or use water within, a turf-related facility only in accordance with sections 6-1401 through 6-1404 of the Industrial Chapter of the 4MP, and shall comply with the monitoring and reporting*

requirements set forth in sections 6-1303 and 6-1405 of the Industrial Chapter, as though the Individual User were an industrial user. The person responsible for compliance shall also comply with the conservation requirements contained in section 6-1302 of the Industrial Chapter, if applicable, as though the Individual User were an industrial user.

2. *The municipal provider or Individual User shall serve water to, or use water within, a large-scale cooling facility only if the person using water at the facility complies with all applicable conservation requirements and monitoring and reporting requirements contained in sections 6-1701 and 6-1702 of the Industrial Chapter of the 4MP as though the person was an industrial user. The person responsible for compliance shall also comply with the applicable monitoring and reporting requirements contained in sections 6-1303 and 6-1703 and the conservation requirements contained in section 6-1302 of the Industrial Chapter, if applicable, as though the Individual User were an industrial user.*

3. *The municipal provider or Individual User shall serve or use groundwater for the purpose of watering landscaping plants planted on or after January 1, 1987 within any publicly owned right-of-way of a highway, street, road, sidewalk, curb or shoulder which is used for travel in any ordinary mode, including pedestrian travel, only if the plants are listed in ADWR's Low Water Use/Drought Tolerant Plant List for the Prescott Active Management Area. The director may waive this requirement upon request from the municipal provider or Individual User if the municipal provider or Individual User demonstrates to the satisfaction of the director that plants listed in ADWR's Low Water Use/Drought Tolerant Plant List for the Prescott Active Management Area, cannot grow in the publicly owned right-of-way because of high elevation or low-light conditions, such as a freeway underpass. This requirement does not apply to any portion of a residential lot that extends into a publicly owned right-of-way.*

4. *The municipal provider or Individual User shall not serve or use groundwater for the purpose of maintaining a water feature installed after January 1, 2002 within any publicly owned right-of-way of a highway, street, road, sidewalk, curb or shoulder which is used for travel in any ordinary mode, including pedestrian travel. This requirement does not apply to any portion of a residential lot that extends into a publicly owned right-of-way.*

B. Responsibility for Compliance with Individual User Requirements

1. *Beginning January 1, 2017 and continuing thereafter until the first compliance date for any substitute municipal conservation requirement in the 5MP,* a *municipal provider shall be responsible for complying with an Individual User requirement set forth in subsection A of this section that is applicable to an existing Individual User unless one of the following applies:*

   a. *The provider identified the existing Individual User to the director on a form provided by ADWR and received by the director no later than 90 days before the adoption of the 4MP.*

   b. *The director gave written notice of the Individual User requirement to the Individual User within 30 days after the adoption of the 4MP.*

   c. *The municipal provider did not identify the existing Individual User to the director on*

a form provided by ADWR and received by the director no later than 90 days before the adoption of the 4MP, and the director gave written notice of the Individual User requirement to the Individual User more than 30 days after the adoption of the 4MP. If this subparagraph applies, the municipal provider shall comply with the Individual User requirement applicable to the existing Individual User beginning January 1, 2017 and continuing thereafter until the first date on which the Individual User is required to comply with the requirement under paragraph 2 of this subsection.

2. *An existing Individual User that has been given written notice of an Individual User requirement by the director within 30 days after the adoption of the 4MP shall be responsible for complying with the Individual User requirement beginning January 1, 2017 and continuing thereafter until the first compliance date of any substitute municipal conservation requirement in the 5MP. An existing Individual User that is given written notice of an Individual User requirement by the director more than 30 days after adoption of the 4MP shall be responsible for complying with the Individual User requirement beginning January 1 of the calendar year following the first full year after the date of the notice and continuing thereafter until the first compliance date of any substitute conservation requirement in the 5MP.*

3. *A municipal provider shall be responsible for complying with an Individual User requirement set forth in subsection A of this section that is applicable to a new Individual User beginning on the date the new Individual User first receives water from the provider and continuing thereafter until the first compliance date for any substitute municipal conservation requirement in the 5MP, unless one of the following applies:*

    a. *The municipal provider identifies the new Individual User to the director in writing on a form provided by the director. If the provider identifies the new Individual User to the director within 90 days after the provider begins serving water to the new Individual User, the municipal provider shall not be responsible for complying with the Individual User requirement applicable to the new Individual User at any time. If the provider identifies the new Individual User to the director more than 90 days after the provider begins serving water to the new Individual User, the provider shall be responsible for complying with the Individual User requirement beginning on the date the new Individual User first receives water from the provider until the end of the calendar year in which the provider identifies the Individual User to the director.*

    b. *The municipal provider does not identify the new Individual User to the director in writing on a form provided by the director, within 90 days after the provider begins serving water to the new Individual User, and the director gives written notice of the Individual User requirement to the Individual User. If this subparagraph applies, the municipal provider shall comply with the Individual User requirement for the new Individual User beginning on the date the Individual User first receives water from the provider and continuing thereafter until the first date on which the Individual User is required to comply with the requirement under paragraph 4 of this subsection.*

4. *A new Individual User that is given written notice of an Individual User requirement by the director shall be responsible for complying with the Individual User requirement beginning on the date specified in the notice.*

C. Notification of New Individual User by Municipal Provider

Beginning January 1, 2017, or upon commencement of service of water, whichever is later, and continuing thereafter until the first compliance date for any substitute municipal conservation requirement in the 5MP, a municipal provider shall notify a new Individual User in writing of the applicable Individual User requirements as set forth in subsection A of this section before commencement of service of water to the Individual User.

5-710. Conservation Requirements for Municipal Distribution Systems

Beginning with calendar year 2017, or the calendar year in which the provider commences service of water, whichever is later, and for each calendar year thereafter until the first compliance date for any substitute distribution system requirement in the 5MP:

1. *A large municipal provider shall not operate a groundwater distribution system in a manner such that lost and unaccounted for water exceeds 10 percent of the total quantity of water from any source that enters the provider's groundwater distribution system, as calculated on an annual or three-year average basis.*

2. *A small municipal provider shall not operate its groundwater distribution system in a manner such that lost and unaccounted for water exceeds 15 percent of the total quantity of water from any source that enters the provider's groundwater distribution system, as calculated on an annual or three-year average basis.*

5-711. Monitoring and Reporting Requirements for Municipal Providers and Individual Users

Beginning with calendar year 2017, or the calendar year in which the municipal provider commences service of water, whichever is later, and for each calendar year thereafter until the first compliance date for any substitute monitoring or reporting requirement in the 5MP:

1. *A municipal provider, regardless of the conservation program under which the provider is regulated, shall report the following in its annual report required by A.R.S. § 45-632:*

    a. *The total quantity of water from any source, including reclaimed water, disaggregated by each source, withdrawn, diverted or received by the provider for non-irrigation use during the reporting year, as separately measured with a measuring device in accordance with paragraph 5 of this subsection.*

    b. *The total quantity of water from any source, including reclaimed water, withdrawn, diverted or received by the provider for irrigation use during the reporting year.*

    c. *The total quantity of reclaimed water, disaggregated by direct use reclaimed water, reclaimed water recovered from within the area of impact, and reclaimed water recovered outside the area of impact, served by the provider during the reporting year for non-irrigation use.*

    d. *The number of single family housing units added to the provider's service area from December 31 of the previous calendar year to December 31 of the reporting year.*

e. The number of multifamily housing units added to the provider's service area from December 31 of the previous calendar year to December 31 of the reporting year.

f. The total number of single family housing units and multifamily housing units served by the provider as of December 31 of the previous year.

g. The total quantity of water from any source, including reclaimed water which was delivered to be stored at an underground storage facility or groundwater savings facility, or recovered as annual or long-term storage credits.

h. The total quantity of water ordered by the municipal provider from an irrigation district and released by the irrigation district from a storage or distribution facility but not accepted by the municipal provider or delivered to any other person.

2. A large municipal provider shall separately measure and report in its annual reports required by A.R.S. §§ 45-468 and 45-632 for the calendar year, the total quantity of water from any source that enters its groundwater distribution system during the reporting year.

3. A large municipal provider shall separately measure and report in its annual reports required by A.R.S. §§ 45-468 and 45-632 for the calendar year, the total quantity of water from any source delivered via its groundwater distribution system each month for: a) irrigation uses; b) residential uses by category, including single family and multifamily; and c) non-residential uses by category, including turf-related facility uses, commercial uses, industrial uses, government uses, construction uses and other uses.

4. In addition to the information required by paragraphs 1 and 2 of this section, a large municipal provider regulated under the Non-Per Capita Conservation Program described in section 5-705 shall include the following in its annual report required by A.R.S.§ 45-632:

a. A CER as prescribed by section 5-705(E).

b. The total number of connections to the providers water distribution system as of the end of the reporting year, including residential and non-residential connections.

5. A large municipal provider shall meter water deliveries to all service connections on its municipal distribution system, except connections to fire services, dwelling units in individual multifamily units, mobile homes in a mobile home park with a master meter, and construction users.

6. A municipal provider shall make all water use measurements using measuring devices in accordance with ADWR's measuring device rules, R12-15-901, et seq., Arizona Administrative Code.

7. An Individual User shall comply with the monitoring and reporting requirements prescribed in section 5-709(A).

5-712. Remediated Groundwater Accounting for Conservation Requirements

A. Accounting

Groundwater withdrawn pursuant to an approved remedial action project under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or Title 49, Arizona Revised Statutes, and used by a person subject to a conservation requirement established under this chapter, shall be accounted for consistent with the accounting for surface water for purposes of determining the person's compliance with the conservation requirement, subject to the provisions of subsections B through D of this section.

B. Amount of Groundwater Eligible for Accounting

For each approved remedial action project, the annual amount of groundwater that is eligible for the remediated groundwater accounting provided in subsection A of this section is the project's annual authorized volume. The annual authorized volume for a remedial action project approved on or after June 15, 1999 is the maximum annual volume of groundwater that may be withdrawn pursuant to the project, as specified in a consent decree or other document approved by the United States Environmental Protection Agency (EPA) or the Arizona Department of Environmental Quality (ADEQ). The annual authorized volume for a project approved prior to June 15, 1999 is the highest annual use of groundwater withdrawn pursuant to the project prior to January 1, 1999, except that if a consent decree or other document approved by the EPA or ADEQ specifies the maximum annual volume of groundwater that may be withdrawn pursuant to the project, the project's annual authorized volume is the maximum annual volume of groundwater specified in that document. The director may modify the annual authorized volume for a remedial action project as follows:

1. *For an approved remedial action project associated with a treatment plant that was in operation prior to June 15, 1999, a person may request an increase in the annual authorized volume at the same time the notice is submitted pursuant to subsection C of this section. The director shall increase the annual authorized volume up to the maximum treatment capacity of the treatment plant if adequate documentation is submitted to the director demonstrating that an increase is necessary to further the purpose of the remedial action project and the increase is not in violation of the consent decree or other document approved by the EPA or ADEQ.*

2. *A person may request an increase in the annual authorized volume of an approved remedial action project at any time if it is necessary to withdraw groundwater in excess of the annual authorized volume to further the purpose of the project. The director shall increase the annual authorized volume up to the maximum volume needed to further the purpose of the project if adequate documentation justifying the increase is submitted to the director and the increase is not in violation of the consent decree or other document approved by the EPA or ADEQ.*

3. *The director shall modify the annual authorized volume of an approved remedial action project to conform to any change in the consent decree or other document approved by the EPA or ADEQ if the person desiring the modification gives the director written notice of the change within thirty days after the change. The notice shall include a copy of the legally binding agreement changing the consent decree or other document approved by the EPA or ADEQ.*

C. Notification

To qualify for the remediated groundwater accounting provided in subsection A of this section, the person desiring the accounting must notify the director in writing of the anticipated withdrawal of groundwater pursuant to an approved remedial action project under CERCLA or Title 49, Arizona Revised Statutes, prior to the withdrawal. A municipal provider may submit notice on behalf of an Individual User. At the time the notice is given, the person desiring the accounting must be using remediated groundwater pursuant to the approved remedial action project or must have agreed to do so through a consent decree or other document approved by the EPA or ADEQ. The notice required by this subsection shall include all of the following:

1. *A copy of a document approved by ADEQ or the EPA, such as the Remedial Action Plan (RAP), Record of Decision (ROD) or consent decree, authorizing the remediated groundwater project. Unless expressly specified in the document, the person shall include in the notice the volume of groundwater that will be pumped annually pursuant to the project, the time period to which the document applies, and the annual authorized volume of groundwater that may be withdrawn pursuant to the project.*

2. *The purpose for which the remediated groundwater will be used.*

3. *The name and telephone number of a contact person.*

4. *Any other information required by the director.*

D. Monitoring and Reporting Requirements

To qualify for the remediated groundwater accounting for conservation requirements as provided in subsection A of this section, groundwater withdrawn pursuant to the approved remedial action project must be metered separately from groundwater withdrawn in association with another groundwater withdrawal authority for the same or other end use. A person desiring the remediated groundwater accounting for conservation requirements shall indicate in its annual report under A.R.S. § 45-632 the volume of water withdrawn and used during the previous calendar year that qualifies for the accounting.

Bibliography

ADWR. (2011). *Water Demand and Supply Asessment 1985-2025, Prescott Active Management Area*. ADWR.

APPENDIX 5A
METHODOLOGY FOR CALCULATING TOTAL GPCD REQUIREMENTS FOR LARGE MUNICIPAL PROVIDERS
PRESCOTT ACTIVE MANAGEMENT AREA

The total GPCD requirement for a large municipal provider for the fourth management period shall be the provider's median total GPCD for the period 2000-2009 minus two standard deviations. However, if the median total GPCD minus two standard deviations is less than the provider's minimum total GPCD requirement, the provider's total GPCD requirement shall be the minimum total GPCD requirement. The minimum total GPCD requirement shall be calculated as follows:

1. *Divide 55 gallons per housing unit per day by the 2010 US Census persons per household for the provider's service area, and add 40 GPCD to that figure,*

2. *Add to the result from paragraph 1 above the provider's 3MP non-residential component target. If the provider is a new large municipal provider, the non-residential component target is the lesser of:*

   a. *The provider's 2010 non-residential GPCD rate or*
   b. *21 GPCD.*

3. *Multiply the result from paragraph 2 above by the 2010 US Census population for the provider's service area,*

4. *Multiply the result from paragraph 3 above by 365 days in a year,*

5. *Divide the result from paragraph 4 above 0.9,*

6. *Divide the result paragraph 5 above by 365 days in a year,*

7. *Divide the result from paragraph 6 above by the 2010 US Census population for the provider's service area.*

Table 5A below shows the total GPCD requirement calculated for each large municipal provider that was designated as having an assured water supply when the 4MP was adopted. A large municipal provider listed in Table 5A must comply with its assigned total GPCD requirement (far right column) beginning January 1, 2017 and continuing until the effective date of any substitute requirement in the 5MP, unless the provider elects to be regulated under the NPCCP.

TABLE 5A
TOTAL GPCD REQUIREMENTS FOR LARGE MUNICIPAL PROVIDERS
PRESCOTT ACTIVE MANAGEMENT AREA
FOURTH MANAGEMENT PERIOD

Provider	*2000-2009 Median Total GPCD*	*Median Minus Two Standard Deviations*	*Minimum Total GPCD Requirement*	***Assigned Total GPCD Requirement***
City of Prescott	*189*	*155*	*133*	***155***

APPENDIX 5B
LOST & UNACCOUNTED FOR WATER AND ALLOWABLE ESTIMATED USES

Lost & Unaccounted For Water Includes:

Leaks:
- *Distribution Lines*
- *Sewer Lines*
- *Storage Tanks*
- *Storage Ponds*
- *Hydrants*
- *Other*

Breaks:
- *Distribution Lines*
- *Sewer Lines*
- *Mains*
- *Hydrants*
- *Other*

Measurement Errors:
- *Meter Under-Registration*
- *Source Meter Errors*
- *Flumes/Weirs Errors*

Evaporation

Illegal Connections/Water Theft

Phreatophyte Uses

Water System Uses Include:

Residential Metered Deliveries
Non-Residential Metered Deliveries
Standpipe Uses

(1) Fire Flow
(1) Hydrant Meter Reading
(1) Hydrant Flow Tests
(1) Fire Sprinkler System Flow Tests
(1) Construction
(1) Dust Control
(1) Line Flushing (distribution, sewer, or treatment facility)
(1) Street Cleaning
(1) Storm Drain Flushing
(1) Water Tests & Pressure Tests
(1) Well Purging

(1) Estimates can be provided, using a method approved by the director. Documentation must be submitted with annual report.

APPENDIX 5C

NON-PER CAPITA CONSERVATION PROGRAM BEST MANAGEMENT PRACTICES PRESCOTT ACTIVE MANAGEMENT AREA

Introduction

A large municipal water provider regulated under the Non-per Capita Conservation Program (NPCCP) must implement a basic public information program and one or more additional water conservation best management practices. A best management practice (BMP) is a measure that results in reduced water consumption or increased water use efficiency. The number of BMPs that a water provider must implement is based on the provider's size as defined by its total number of water service connections. The provider must select the additional BMPs from Section II below.

At any time while regulated under the NPCCP, a provider may choose to discontinue implementation of a selected BMP (other than the required public information program) and implement a substitute BMP instead. The substitute BMP must be on the list of approved BMPs in Section II of this appendix, and the provider must determine that the substitute BMP is reasonably relevant to its existing service area characteristics or water use patterns. A provider that substitutes a BMP must notify the director of the substitution in its next Conservation Efforts Report (CER).

The director may modify the list to include additional BMPs pursuant to the procedure set forth in Section III of this appendix. A copy of the most recent list of additional BMPs shall be posted on the ADWR's website and shall be on file with ADWR.

***I. Basic Public Information Program** (formerly called "public education program")*

All large municipal providers regulated under the NPCCP are required to implement a basic public information program that includes the following components:

1. At least twice a year, the water provider shall communicate to customers the importance of water conservation and notify them of the water conservation materials and programs available from the provider and how they may obtain the materials or more information. Channels through which this information is communicated to customers shall include one or more of the following: water bill inserts messages on water bills, provider website, post cards, newsletters or print pieces.

2. The water provider shall make available to customers free written information on water conservation (e.g. pamphlets, brochures, fact sheets, etc.). The information shall be available in the provider's office, sent to customers on request or provided online for customers who prefer this method. The provider is encouraged to distribute water conservation information at other locations (e.g., libraries, chamber of commerce, town hall, etc.) and on their websites.

II. Additional Best Management Practices (BMPs)

Category 1: Public Awareness/Public Relations

Programs in this category are designed to increase awareness of the need for and importance of water conservation, to inform customers about the availability of conservation resources and services, and to encourage the public to reduce their water consumption.

1.1 Local or Regional Conservation Campaign
The water provider actively participates in an advertising or social marketing campaign to raise awareness of the need for water conservation and to encourage the efficient use of water. The campaign must reach local or regional customers using methods such as traditional media (television, radio or print), websites, social media and promotional materials (e.g., brochures, vehicle wraps, bookmarks, magnets, etc.). A provider that implements multiple campaigns may be eligible to receive credit for more than one BMP if the campaigns can be shown to be separate and distinct from one another. The provider must submit documentation with its CER that describes the campaign and results.

1.2 Special Events/Programs and Community Presentations
The water provider provides speakers, conducts tours for the public, or participates in community events to display, provide or present information about water conservation and inform the public about the programs and resources. To receive credit for this measure, a provider must participate in at least three events per year and describe them in the CER.

1.3 Market Surveys to Identify Customer Information Needs or Assess the Success of Conservation Messages
The water provider conducts a market survey to be used to improve the water provider's current water conservation activities or to plan future activities. The survey is designed to gather data regarding customers' information needs, program preferences or responses to conservation messages. The provider must submit documentation with its CER stating the objectives of the survey, data collection methods, analysis of results and how the results were communicated.

Credit for this BMP is limited to only one year. In subsequent years, the provider must replace this BMP with another BMP from categories 1 through 7 that is appropriate for its service area.

1.4 Distribution Plan for Water Conservation Materials
The water provider develops and implements a two-year distribution plan to effectively market its water conservation materials and programs. The provider must submit documentation with its CER that describes the following:

- *the goals and objectives for the distribution of materials over a two-year period, beginning the year following plan development*
- *a description of the conservation materials to be distributed*
- *how the materials will be distributed (libraries, landscape architects, nurseries, realtors, master gardeners, etc.)*
- *how the materials or programs will be marketed (water bill inserts, on-hold phone messages, e-mail messages, public events, workshops, websites, local publications, etc.*
- *a timetable for distribution; and*
- *a mechanism for tracking the distribution of materials.*

Credit for this BMP is limited to only one year. In subsequent years, the provider must replace this BMP with another BMP from categories 1 through 7 that is appropriate for its service area.

Category 2: Conservation Education and Training

Programs in this category are designed to provide customers with the knowledge and skills they need to utilize water efficiently and reduce consumption.

2.1 Adult Education or Training Program
The water provider implements an education or training program for adults within the provider's service area that includes active personal participation. Examples include regularly scheduled workshops for

homeowners or training programs for landscape professionals or non-residential water users. A provider that implements multiple adult programs may be eligible to receive credit for more than one BMP if the programs can be shown to be separate and distinct from one another.

2.2 Youth Education Program
The water provider works with schools in its service area to provide or support programming that increases students' understanding of water resources and promotes water conservation. Examples of youth education programs include teacher trainings, classroom presentations, educational materials, assembly programs, water festivals and guided field trips to water facilities. A provider that implements multiple youth programs may be eligible to receive credit for more than one BMP if the programs can be shown to be separate and distinct from one another.

2.3 New Homeowner Landscape Information
The water provider distributes low water- use landscape information packets to all owners of newly constructed homes, either through direct distribution (mail or delivery), delivery by the home builder, or online distribution if requested by the homeowner. The provider also notifies all new owners of existing homes (resale) that information on low water use landscaping is available and must provide such information on request. The number of notifications sent and packets mailed must be recorded and noted in the provider's CER.

2.4 Xeriscape Demonstration Garden
The water provider installs and maintains a low water use or water-efficient demonstration garden. The garden must be available to the public and include interpretive signage or literature about low water use plants or water-efficient landscape practices.

Category 3: Outreach Services

Programs in this category are designed to provide customers with consultations, audits or retrofits designed to conserve water or improve water use efficiency.

3.1 Residential Audit Program
The water provider offers an audit program to all residential customers within the provider's service area. The audit can be either a self-audit (provider offers self-audit kits) or conducted by the provider or designated representative. The audit may include indoor components (e.g., toilets, faucets, showerheads, etc.) and outdoor components (e.g., irrigation system, pool, water feature, etc.) or both. Audits conducted by the provider may include a meter check and instructions on how to read the meter and use it to determine if there is a leak. Self-audit kits shall include written instructions on how to conduct an audit and how to read the meter and use it to determine if there is a leak. The number of audits or self-audit kits provided must be recorded and noted in the provider's CER.

3.2 Landscape Consultations (Residential or Non-Residential)
The water provider or a designated representative offers landscape consultation services to residential or non-residential customers located in those portions of the provider's service area with the greatest potential for savings. Examples of services include an evaluation of the irrigation system, controller, plant selection and turf conversion possibilities, as well as providing information about other related services or programs (e.g. rebates, educational materials, workshops). The consultation may include a meter check and instructions on how to read the meter and use it to determine if there is a leak. The individual providing the consultation shall provide either on-site written or verbal suggestions, and provide a follow-up visit or interview. Landscape consultations must be recorded and noted in the provider's CER.

3.3 Water Budgeting Program
The water provider offers assistance in developing a monthly or annual water budget to one or more non-residential water user groups (e.g., homeowner associations, industries, commercial properties, government facilities, parks, schools, etc.) or to apartment complexes. The water budget shall establish target amounts for outdoor or indoor water use that reflect efficient water use/application rates. These rates should meet or exceed water use efficiencies required for similar uses as described in the Third Management Plan. If they are not addressed in the plan, water use rates should be commensurate with state of the art water efficiency standards found elsewhere in the body of water conservation literature. Descriptions of the water-budgeting assistance provided must be recorded and noted in the provider's CER.

3.4 Residential Interior Retrofit Programs
The water provider offers free or low cost plumbing fixtures or retrofits (e.g., faucet aerators, low-flow showerheads, toilets, toilet dams, etc.) to residential customers living in homes built prior to 1990 that have not been updated to today's water efficiency standards. The provider must offer the program to all residential customers meeting the above criteria unless the provider can demonstrate that targeting certain portions of its water service area is likely to yield the highest participation or potential water savings. The provider must select appropriate communication channels to advertise the program, and must keep a record of the number of retrofits provided and report this information in the CER.

3.5 Non-Residential Interior Retrofit Programs
The water provider offers free or low cost plumbing fixtures or fixture retrofits (e.g., faucets, faucet aerators, low flow showerheads, toilets, urinals, toilet dams, etc.) to non-residential customers with facilities built prior to1990 that have not been updated to today's water efficiency standards. The provider must offer the program to all non-residential customers meeting the above criteria unless the provider can demonstrate that targeting certain portions of its water service area is likely to yield the highest participation or potential water savings. The provider must select appropriate communication channels to advertise the program, and must keep a record of the number of retrofits provided and report this information in the CER.

3.6 Customer High Water Use Inquiry Resolution
The water provider designs and implements a program to assist customers who inquire about their water bill increase or high water use. The program may include a site inspection to discover the cause of a water bill increase and a meter check to inform the customer on how to read the meter and check for leaks. The provider must follow-up on every customer inquiry, keep a record of inquiries and the type of assistance provided, and report this information in the CER.

3.7 Customer High Water Use Notification
The water provider develops a program to identify customers with high water use and contact them by telephone, email, door hanger, mail or in person. The notification must include information on provider services that could benefit the customer, such as audits, educational materials, or rebate programs. The type of notification and the criteria used for determining which customers are advised must be recorded and noted in the provider's CER.

3.8 Water Waste Investigations and Information
The water provider designs and implements a program to investigate water waste complaints and assist citizens in preventing water waste. An investigation would typically include a site inspection and some type of follow-up action, such as customer education to prevent water waste and a letter explaining enforcement (if applicable). The provider must follow-up on every water waste complaint, keep a record

of complaints and follow-up activities, and report this information in the CER.

Category 4: Physical System Evaluation and Improvement

These programs ensure that the water system is being well-maintained and is running at optimal efficiency or will become more water efficient as a result of one or more physical water system improvements.

4.1 Leak Detection Program
The water provider implements a systematic evaluation of its water distribution system to identify and fix leaks. The provider must implement this program throughout its service area unless the provider can demonstrate that targeting certain portions of its water service area is likely to yield the highest water savings potential. A description of the program and its results must be noted in the provider's CER.

4.2 Meter Repair or Replacement Program
The water provider implements a program to systematically assess the meters or submeters in its water service area to identify malfunctioning meters and to repair or replace them. A description of the program and each year's results must be noted in the provider's CER.

4.3 Comprehensive Water System Audit Program
The water provider conducts a systematic audit of its water distribution system, systems control equipment, and water records to identify and quantify water losses, and develops a plan for corrective measures. The audit can be a precursor to a leak detection program or meter repair/replacement program. The provider must submit documentation with its CER that describes the audit, its objectives, methods and results. Credit for this BMP is limited to only one year unless the provider can provide justification for an ongoing or multi-year program. In subsequent years, the provider must replace this BMP with another BMP from categories 1 through 7 that is appropriate for its service area.

Category 5: Ordinances / Conditions of Service / Tariffs

Programs in this category are designed to reduce water use within the service area by limiting or reducing water used for specific purposes. Ordinances apply to cities and towns, and tariffs apply to private water companies regulated by the Arizona Corporation Commission. A water provider that is not part of a municipality can receive credit if it works with local or county jurisdictions to implement a new ordinance.

Note: BMPs that are part of curtailment tariffs for private water utilities do not qualify for the NPCCP because they are only implemented as a response to water shortage or potential water shortage, and do not apply at all times.

5.1 Low Water Use Landscaping Requirements
Single-family, multi-family, non-residential facilities or common areas are either required to include low-water use landscapes in all or part of their property or have limitations on water- intensive landscaping or turf.

5.2 Water Tampering / Water Waste Ordinances.
Water waste or water tampering are prohibited on residential or non-residential properties.

5.3 Plumbing Requirements Stricter than Current Arizona Code.

Plumbing requirements for new residential or non-residential properties are stricter than those currently in the Arizona code or include restrictions not currently in the Arizona code.

5.4 Limitations on Water Features (fountains, waterfalls, ponds and other artificial water structures).
Residential or non–residential properties have limitations on or water conservation requirements for water features.

5.5 Requirement for Water-efficient Landscapes in Model Homes
Landscaping at model homes in new residential developments is required to be water-efficient, is limited as to the size of water-intensive landscaped areas, or requires water-intensive landscaping to be used for functional areas only.

5.6 Requirements for Graywater or Rainwater Systems
Residential or non-residential facilities are required to have on-site plumbing or systems for collecting and utilizing graywater or rainwater.

5.7 Conservation Requirements for Car Washes
Commercial car washes are required to recycle water and to implement additional measures to increase water use efficiency and reduce water consumption. Examples of additional measures include using low flow nozzles, repairing leaks, watering landscape with reclaimed water, installing low water use landscapes or using automatic shut-off valves on hoses and faucets.

5.8 Landscape Watering Restrictions
The watering of landscapes is restricted to certain times of day. (This may be seasonal.)

5.9 Requirements for Water-efficient Hot Water Devices or Systems
Water-efficient plumbing design, "on-demand" hot water recirculation devices or other devices or designs for providing hot water efficiently are required in new residential and/or non-residential buildings.

5.10 Retrofit on Resale
Owners of single-family homes, multi-family home complexes or non-residential facilities are required to replace or retrofit all indoor plumbing fixtures (e.g., toilets, showerheads, faucets) that do not conform to current water efficiency standards. This could be implemented by the seller prior to sale or by the buyer subsequent to the sale.

5.11 Landscape Water Use Efficiency Standards for Non-residential Customers
New or rehabilitated non- residential facility landscaping of a particular size is required to meet specified standards for maximum water allowance, plant selection, irrigation design, grading or other components that result in improved landscape water use efficiency.

5.12 Requiring a Water Use Plan for Non-residential Users
All new commercial, industrial, and institutional customers with projected annual water use of 10 acre-feet or more per year are required to submit a water use plan that identifies all anticipated water uses by the customer and the water efficiency measures associated with the uses. The water use plan must include at least three of the following:

1. *Statement of water efficiency policy.*
2. *Water conservation education/training for employees.*
3. *Identification of on-site recycling and reuse strategies.*

4. *Total cooling capacity and operating total dissolved solids or conductivity for cooling towers.*
5. *Identification of best available technologies used for process, cooling, and domestic water uses.*
6. *Landscape watering system distribution uniformity and landscape water budget.*
7. *Total annual water budget for the facility.*

Category 6: Rebates/Incentives

Programs in this category are designed to provide users with an incentive for implementing a water conservation practice. The program can include rebates or other incentives such as grants, fee reductions or waivers.

1. Residential

6.1 Toilet Rebate Program for High Water Use Toilets
The water provider offers a financial rebate or incentive for the replacement of a high water- use toilet with a toilet that uses less than 1.6 gallons of water per flush. This incentive shall be offered to all owners of single-family or multi-family homes in its service area that were constructed prior to 1990 and have not been updated to today's water efficiency standards. A description of the program and its results must be noted in the provider's CER.

6.2 Rebate Program for Toilet that meets or exceeds the U.S. Environmental Protection Agency WaterSense Standards
The water provider offers a financial rebate or incentive to all owners of single-family or multi-family homes in its service area to replace a toilet with one that is more water-efficient and meets or exceeds the U.S. Environmental Protection Agency WaterSense standards. A description of the program and its results must be noted in the provider's CER.

6.3 Toilet Replacement Program
The water provider implements a program to replace toilets with ones that are more efficient and use 1.6 gallons of water per flush or less in single-family or multi-family homes in its service area. A description of the program and its results must be noted in the provider's CER.

6.4 Water Fixture Replacement/Rebate/Incentive Program for Older Homes
The water provider shall offer to replace fixtures (e.g., showerheads, aerators, toilet flappers) or provide a financial rebate or incentive for homeowners to replace fixtures in all single-family or multi-family homes within its service area constructed prior to 1990 that have not been updated to today's water efficiency standards. A description of the program and its results must be noted in the provider's CER.

6.5 Rebate for Water-efficient Hot Water Devices or Systems
The water provider shall offer a financial rebate or incentive to single-family or multi-family customers for water-efficient plumbing design, "on-demand" hot water recirculation devices, or other devices or designs for providing hot water efficiently. A description of the program and its results must be noted in the provider's CER

6.6 Water- Efficient Appliance or Fixture Rebate/Incentive Program
The water provider shall offer customers a financial rebate or incentive for the purchase and installation of water efficient appliances or fixtures. A description of the program and its results must be noted in the provider's CER.

6.7 Graywater Retrofit Rebate or Other Incentive
The water provider offers customers a financial rebate or other incentive for the installation of graywater systems, fixtures, or retrofits along with related educational material that includes information on the benefits of using graywater. A description of the program and its results must be noted in the provider's CER.

6.8 Rainwater Harvesting Retrofit Rebate or Incentive
The water provider offers customers a financial rebate or incentive for the installation of active or passive rainwater harvesting systems (e.g. gutters, downspouts, landscape designs, containers, etc.) along with information about water harvesting techniques. A description of the program and its results must be noted in the provider's CER.

6.9 Landscape Conversion Rebate or Incentive
The water provider offers customers a financial rebate or other incentive for the conversion of landscape to reduce water usage. Examples include replacing turf with xeriscape or converting a high water use landscape to a low water use landscape. Educational information about landscape conversions must be provided to customers. A description of the program and its results must be noted in the provider's CER.

6.10 Rebate or Incentive for Installing Xeriscapes in New Landscapes
The water provider offers customers installing new landscapes a financial rebate or incentive for installing a xeriscape landscape. A description of the program and its results must be noted in the provider's CER.

2. <u>Non-residential</u>

6.11 Commercial and Industrial Rebate or Incentive Program
The water provider identifies commercial and industrial customers with the highest conservation potential and implements a water conservation program for those customers. The program may include rebates, replacements, retrofits, audits, incentives and grants. A description of the program and its results must be noted in the provider's CER.

6.12 Large Landscape Conservation Program
The water provider implements a program to provide non-residential customers with support and incentives to improve their landscape water use efficiency. A description of the program and its results must be noted in the provider's CER.

6.13 No or Low Interest Loans for Implementing Water Conservation Measures
The water provider offers assistance to customers wishing to invest in projects intended to reduce existing water use or bring new uses in at high efficiency rates. A description of the program and its results must be noted in the provider's CER.

Category 7: Research/Innovation Program

Programs in this category are designed to encourage water providers to conduct systematic evaluations of conservation measures already implemented, to implement state of the art water conservation technologies and techniques, or to develop or try new technologies and techniques.

7.1 Implementation of an Emerging Technology
The provider implements an emerging technology that is designed to improve water efficiency or result in water savings. The provider must submit with its CER documentation that includes a description of the

technology, any available information on water savings, a description of how the technology was implemented within the provider's service area and the results. This documentation shall be made available for public distribution.

7.2 Applied Research to Enhance Decision Making
The provider conducts or provides support for projects that will enhance their conservation program decision making and development (e.g., an analysis of certain water users in their service area). The provider must submit with its CER documentation that describes the research objectives, methods, results and the provider's involvement and method of support. This documentation shall be made available for public distribution. Credit for this BMP is limited to only one year unless the provider can offer justification for an ongoing or multi-year program. In subsequent years, the provider must replace this BMP with another BMP from categories 1 through 7 that is appropriate for its service area.

7.3 Evaluation of New or Emerging Technologies and Practices
The provider conducts or provides support for an evaluation of a new or emerging technology or practice designed to reduce water use or improve water use efficiency. The provider must submit documentation with its CER stating the objectives of the evaluation, methods used to conduct the evaluation, a description of the provider's participation, and results of the investigation. This documentation shall be made available for public distribution. Credit for this BMP is limited to only one year unless the provider can offer justification for an ongoing or multi-year program. In subsequent years, the provider must replace this BMP with another BMP from categories 1 through 7 that is appropriate for its service area.

7.4 Analyzing a Best Management Practice (BMP) for Actual Water Savings
The provider conducts a quantitative analysis of a BMP that yields results regarding actual water savings. The provider must submit documentation with its CER stating the objectives, methods used to conduct the analysis and the results of the investigation. This documentation shall also be made available for public distribution. Credit for this BMP is limited to only one year unless the provider can offer justification for an ongoing or multi-year program. In subsequent years, the provider must replace this BMP with another BMP from categories 1 through 7 that is appropriate for its service area.

7.5 Implementation of Smart Irrigation Technology
The provider installs smart irrigation technology and submits documentation with its CER describing the project location, implementation methods and estimates of irrigation efficiency.

7.6 Participation in Industry or Regional Partnerships for Water Conservation
The provider contributes financial support or in-kind services and actively participates in an industry or regional partnership that implements a collaborative program designed to increase water use efficiency or reduce water consumption. The provider must describe the partnership, program objectives, ongoing and future efforts, and submit the information in its CER.

7.7 Development of New Conservation Technologies and Products
The provider contributes financial support or in-kind services for the research and development of new conservation technologies or products. The provider must describe its involvement/participation and method(s) of support, research objectives, methods, and results in its CER. Credit for this BMP is limited to only one year unless the provider can offer justification for an ongoing or multi-year program. In subsequent years, the provider must replace this BMP with another BMP from categories 1 through 7 that is appropriate for its service area.

7.8 Piloting a New Initiative, Program, or Best Management Practice

The provider implements a new initiative, program or potential new best management practice designed to improve water use efficiency or reduce water consumption. The provider must submit documentation with its CER that includes a description of the project or program, how it was implemented within the provider's service area, and the results. Credit for this BMP is limited to only one year unless the provider can offer justification for an ongoing or multi-year program. In subsequent years, the provider must replace this BMP with another BMP from categories 1 through 7 that is appropriate for its service area.

III. Procedure for Adding a Best Management Practice to the List of Additional Best Management Practices

1. A large municipal provider may apply to the director to add a best management practice to the list of additional best management practices set forth in Section II of this Appendix.

2. Upon receipt of an application submitted pursuant to paragraph 1 above, the director shall review the application and may request additional information from the applicant. The director may seek information from other sources as deemed necessary to determine if the best management practice should be added to the list.

3. If the director approves the application, the director shall add the best management practice to the list of additional best management practices set forth in Section II of this Appendix, post the modified list of additional best management practices on ADWR's web site and file the modified list within the ADWR's active management area office.

4. The director may add a best management practice to the list of additional best management practices set forth in Section II of this Appendix.

CHAPTER SIX:
INDUSTRIAL

6.1 INTRODUCTION

The Industrial Conservation Program for the Fourth Management Plan (4MP) is the same as in the Third Management Plan (3MP), with the addition of a conservation program for Large-Scale Power Plants. This program has been added in the 4MP in event of the addition of a large-scale power plant in the Prescott Active Management Area (PRAMA) in the future. The Industrial Conservation Program/Large-Scale Power Plant program is similar to the program in the 4MP for the other four Active Management Areas (AMAs). The historical objective of the Industrial Conservation Program has been to move industrial users within the PRAMA to the greatest level of water use efficiency economically attainable given the use of the latest available water conservation technology. Efficient use of groundwater and the replacement of groundwater sources with renewable supplies contribute towards the achievement and maintenance of the PRAMA safe-yield goal.

What is an Industrial User?
An industrial user is a person who uses groundwater withdrawn pursuant to a Type 1 or Type 2 non-irrigation grandfathered right (GFR) or a withdrawal permit for an industrial use *(See http://www.azwater.gov/AzDWR/WaterManagement/Assessments/documents/PRAMAAssessmentVersion2.pdf)*. These GFRs and permits (collectively referred to in this chapter as "industrial rights") have annual volumetric groundwater allotments. The total volume of Type 2 GFRs in the PRAMA was set immediately following enactment of the Code. The total volume of water associated with Type 1 GFRs can increase over time as agricultural land with IGFRs is retired from agricultural production and the IGFRs are converted to Type 1 GFRs. General Industrial Use (GIU) permits are issued by ADWR if water service cannot be secured from a municipal provider and if the use of surface water or reclaimed water, or the purchase or lease of a GFR is not economically feasible. Permits expire after a specified period of years.

An industrial user may receive groundwater from an irrigation district. However, an industrial user may not receive groundwater from an irrigation district in excess of the amount it was entitled to receive on June 12, 1980 unless it has obtained a GFR or a GIU permit. A.R.S. § 45-497(B).

There are also groundwater users that, although served by a municipal water provider, are subject to industrial program conservation requirements through the Municipal Conservation Program. These users include turf-related facilities, public rights-of-way and large-scale cooling facilities not part of a large-scale power plant, and are referred to in the Municipal Conservation Program as "individual users."

Industrial Conservation Program Requirements
The 4MP Industrial Conservation Program includes general conservation requirements that apply to all industrial users. For those Industrial Conservation Programs where a water conservation plan was required by the 3MP, an update to that plan is required within 180 days after the industrial user receives written notice from ADWR of its 4MP conservation requirements. In addition there are specific conservation requirements that apply to the following current or potential industrial users in the PRAMA:

- Turf-Related Facilities (≥10 acres)
- Sand and Gravel Facilities (>100 acre-feet/year)
- Large-Scale Power Plants (>25 megawatts)
- Large-Scale Cooling Facilities (>1,000 tons)
- New Large Landscape Users (>10,000 square feet of water intensive landscape)
- New Large Industrial Users (>100 acre-feet/year)

In addition, all industrial users are required to comply with certain conservation requirements, including avoiding waste and making diligent efforts to recycle water.

Industrial Program Goal and Objectives for the 4MP

ADWR's objective during the fourth management period is to identify water management issues in each water demand sector in each Active Management Area (AMA) and develop solutions that will increase progress in achieving the AMA goal. The industrial sector in PRAMA has historically used less groundwater than the Municipal or Agricultural sectors, and has used only about one seventh of the total legal withdrawal authority of industrial rights in the PRAMA. An industrial user may use renewable supplies; however, the majority of Industrial water use is groundwater. ADWR continues to encourage the efficient use of all sources of water, and replacement of PRAMA groundwater uses with alternative supplies in the industrial sector.

PRAMA Industrial Sector Description

Industrial water users with water rights or permits accounted for five percent of the AMA water use in 2012, or approximately 1,011 acre-feet. The industrial sector in PRAMA uses nearly all groundwater. There is only one facility, a sand and gravel operation, which has historically used surface water. All other industrial users rely on groundwater to meet their demand.

Industrial uses of groundwater in the PRAMA consist primarily of golf course and landscape watering. Turf-related facilities accounted for 64 percent of industrial water demand, followed by "other" industrial uses at 22 percent. "Other" industrial uses include turf irrigation of less than ten acres, commercial businesses, small sand and gravel operations and plant nurseries. Sand and gravel operations made up the remaining 14 percent of Industrial demand.

History of PRAMA Industrial Regulatory Programs/4MP Goals Summarized

The Industrial Conservation Programs for the various sub-sectors are based on the requirement in the Code to include a conservation program for all non-irrigation uses of groundwater. Conservation requirements are based on the use of the latest commercially available conservation technology consistent with reasonable economic return. For the 4MP the Code authorizes ADWR to include additional conservation requirements for non-irrigation uses if feasible.

Industrial Conservation Programs – History and Background

All previous ADWR management plans have included conservation requirements for industrial users. The 1MP requirements stressed water use efficiency and contained other general requirements. There were specific conservation programs only for metal mines, turf-related facilities, electric power plants and sand and gravel facilities. As a result of consultant studies done for the 2MP, additional conservation requirements were added for new large-scale cooling users, dairies, cattle feedlots, new large industrial users, and new large landscape users. In addition, there was a more specific reclaimed water incentive provision for turf-related facilities. In the 3MP, separate Industrial Conservation Program categories were created for large-scale cooling facilities, new large landscape users and new large industrial user subsectors. These three industrial water use groups were included in the "all industrial users" category in the 2MP, but were separated out to more clearly present the water use characteristics and specific conservation requirements for the third management period. The 4MP includes the same programs that made up the 3MP Industrial Conservation Program. Programs for dairies and cattle feedlots were not included in the PRAMA 3MP because those types of facilities do not exist in the PRAMA. There are six Industrial Conservation Program subsectors in the 4MP for the PRAMA: (1) turf-related facilities, (2) sand and gravel facilities, (3) large-scale power plants, (4) large-scale cooling facilities, (5) new large landscape users and (6) new large industrial users.

6.2 RELATIONSHIP OF THE INDUSTRIAL SECTOR TO ACHIEVEMENT OF THE AMA WATER MANAGEMENT GOAL

Physical description

The majority of industrial water use in the PRAMA is golf course use, followed by sand and gravel facilities. Other industrial users are various types of non-irrigation, non-domestic uses such as commercial purposes. PRAMA golf courses are located in the southern portions of the PRAMA in the Prescott and Prescott Valley areas and between the Prescott Valley and Dewey-Humboldt areas *(See Figure 6-1).* Four of the six golf courses in the PRAMA use 100 percent reclaimed water. Prescott Country Club and Quailwood Green Golf Club, both located between Prescott Valley and Dewey-Humboldt, rely on groundwater for turf-related watering. Antelope Hills Golf Course, the Hassayampa Golf Club, Stoneridge Golf Course and Prescott Lakes Golf Course rely on reclaimed water to meet their turf irrigation demands. The City of Prescott provides reclaimed water to all of these facilities except Stoneridge, which is provided reclaimed water by the Town of Prescott Valley. Since these four courses are considered municipally served, their demand does not appear in Table 6-1 in this chapter, however their use of water is depicted in the reclaimed use by the municipal sector as described in Chapters 3 and 5 of this plan. Although these four courses have used 100 percent reclaimed water historically, they still qualify as turf-related facilities and an allotment is still assigned to them. However, since they do not use any groundwater, the regulatory requirements of the Turf Program in this chapter are not imposed on them. However, their water demand is tracked for purposes of determining total PRAMA water use, and in particular, total PRAMA reclaimed water use.

Assessment

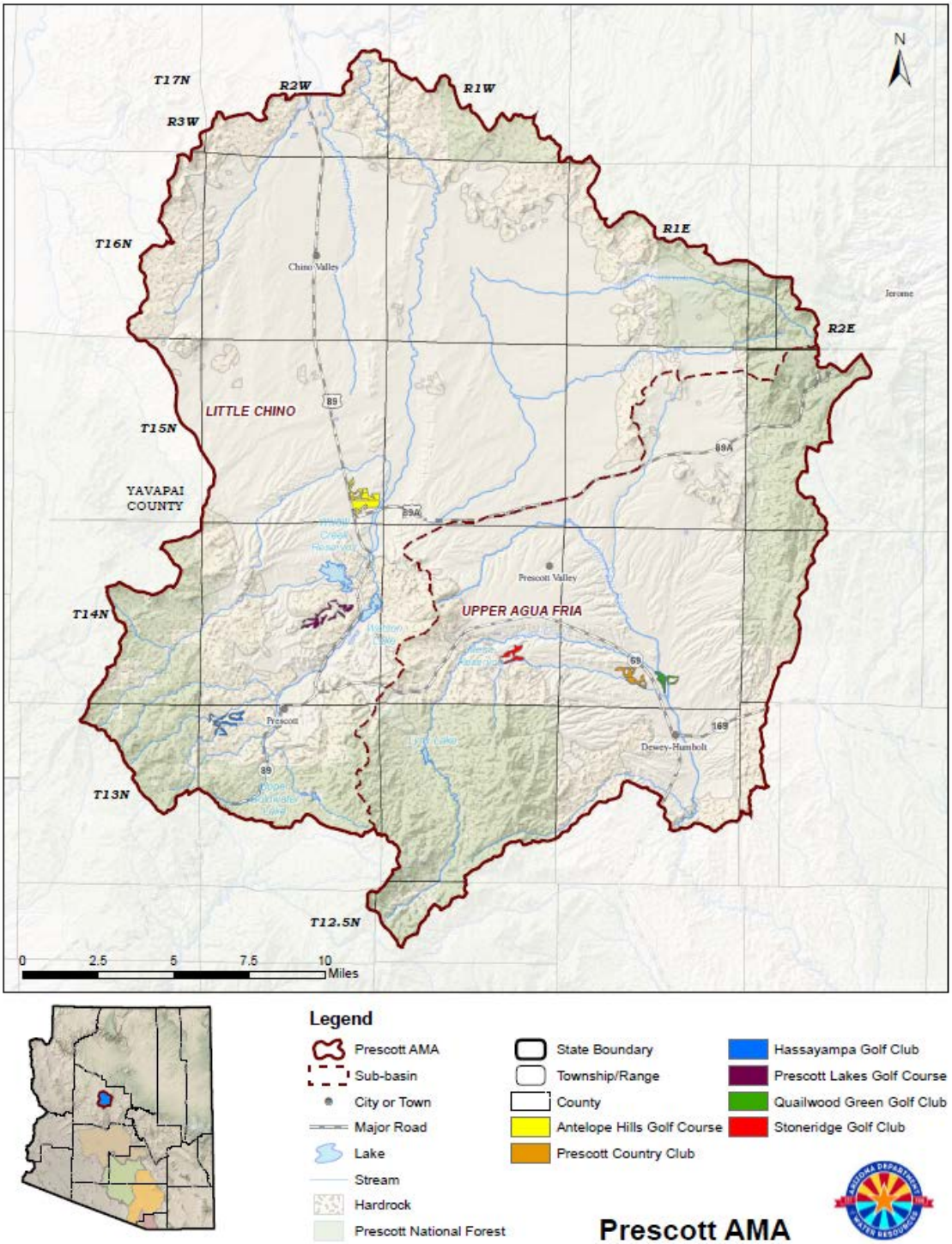
Industrial demand projections in the Assessment (ADWR, 2011) project an increase of between 400 and 1,600 acre-feet between 2010 and 2025, and an increase in industrial groundwater demand of between 350 and 1,500 acre-feet. Table 6-1 shows the historical industrial demand by source from 1985 to 2012 in the PRAMA. The industrial sector in PRAMA has historically been dependent on groundwater to meet its demand. The sum of the annual water allotments for GFRs and permits is also shown in Table 6-1. The volume of the allotment has slowly increased over the historical period to a peak in the year 2003. Allotments increase as IGFRs are conveyed to Type I GFRs. The sum of the allotments may decrease due to non-irrigation rights becoming inactive and developed, or through extinguishment of GFRs. As of 2012, the annual industrial use was only 17 percent of the total allotment. The allotment represents an allowable use of groundwater under the Code. It also represents a potential for extinguishment. Under the AWS Rules, GFRs may be extinguished to generate credits that may be used to meet the consistency with management goal criterion of the AWS Rules. Extinguishment of a Type I GFR is based on the Type I acres. Extinguishment of a Type 2 GFR is based on the Type 2 allotment. Extinguishment credits reduce over time based on the year 2025 minus the year the right is extinguished. Mineral extraction Type 2 GFRs and Groundwater Withdrawal Permits do not qualify for extinguishment credits. The portion of the 2012 industrial allotment that was used for mineral extraction purposes or was withdrawn pursuant to mineral extraction permits was 86 acre-feet.

6.3 INCENTIVES FOR THE USE OF RENEWABLE SUPPLIES AND REMEDIATED GROUNDWATER

Incentives have been developed to increase the use of non-groundwater supplies. For example, ADWR has included a reclaimed water adjustment for turf-related facilities in the management plans. When determining a turf-related facility's compliance with its maximum annual water allotment, ADWR will count each acre-foot of direct use reclaimed water or reclaimed water recovered within the area of impact of storage that is used by the facility as 0.6 acre-foot of water. This adjustment does not apply to reclaimed water recovered outside the area of impact of the stored water. In addition to the reclaimed

water adjustment, facilities using reclaimed water may apply to ADWR for an allotment addition to allow for leaching of salts below the root zone.

FIGURE 6-1
LOCATION OF GOLF COURSES
PRAMA



During the fourth management period, ADWR will continue to support the increased use of reclaimed water in all sectors including the industrial sector, although reclaimed water has not been put to use in the industrial sector in PRAMA historically.

TABLE 6-1
HISTORICAL INDUSTRIAL DEMAND AND ALLOTMENT
PRAMA

Year	Demand	Groundwater Demand	Surface Water	Reclaimed Water	Allotment
1985	641	641	0	0	4,414
1986	779	779	0	0	4,414
1987	895	895	0	0	4,715
1988	523	523	0	0	4,901
1989	669	669	0	0	4,910
1990	476	476	0	0	4,900
1991	516	516	0	0	4,956
1992	805	805	0	0	5,010
1993	704	704	0	0	4,997
1994	778	778	0	0	5,108
1995	696	696	0	0	5,106
1996	796	796	0	0	5,296
1997	731	731	0	0	5,316
1998	1,035	1,035	0	0	5,408
1999	926	926	0	0	5,413
2000	967	967	0	0	5,631
2001	1,550	1,309	241	0	5,646
2002	1,411	1,411	0	0	5,976
2003	1,608	1,542	66	0	7,927
2004	1,591	1,541	50	0	7,845
2005	1,496	1,442	54	0	7,771
2006	1,486	1,360	126	0	7,618
2007	1,630	1,562	68	0	7,934
2008	1,425	1,362	63	0	7,928
2009	1,312	1,263	49	0	7,788
2010	1,218	1,153	65	0	7,553
2011	925	895	30	0	6,137
2012	1,011	964	47	0	5,937

6.4 NON-REGULATORY EFFORTS

ADWR has a program for water management assistance in the PRAMA. Funding for the program comes from a portion of the annual withdrawal fees levied and collected from most persons withdrawing groundwater from non-exempt wells in the PRAMA. Since the Water Management Assistance Program (WMAP) began, the PRAMA has funded several projects promoting prudent water management within the PRAMA *(See Chapter 9 of this plan)*.

6.5 INDUSTRIAL CONSERVATION PROGRAMS DESCRIPTION

The 4MP includes regulatory programs for six sub-sectors of industrial uses:

- All Industrial Users
- Turf-Related Facilities
- Sand and Gravel Facilities
- Large-Scale Power Plants
- Large-Scale Cooling Facilities
- New Large Landscape Users
- New Large Industrial Users

Each Industrial Conservation Program is discussed under a separate subsection. The industrial sub-sector regulatory requirements follow the sub-sector program descriptions, in the same order in which each industrial sub-sector is discussed, and last are any applicable appendices. In general, each of the subsections contains all or some of the following: (1) an introduction, (2) program goals and objectives (3) water use history by the subsector, (4) issues and objectives, (5) program description.

6.6 ALL INDUSTRIAL USERS CONSERVATION PROGRAM DESCRIPTION

6.6.1 Introduction

The conservation requirements in this section apply to all industrial water users. In addition to these requirements, certain industrial users are also required to comply with conservation requirements specific to their type of water use under other sections of this chapter. For example, a sand and gravel facility must comply with the requirement in this section to use plants from the ADWR Low Water Use/Drought Tolerant Plant List for the PRAMA *(see http://www.azwater.gov/azdwr/WaterManagement/AMAs/PrescottAMAFourthManagementPlan.htm)* for any landscaping at the facility, if applicable, and, in addition, must comply with the conservation requirements in Section 6.13 of this chapter.

The following industrial users are required to comply with the conservation requirements for all industrial users in this section, as well as conservation requirements for their specific type of water use in other sections of this chapter: turf-related facilities, sand and gravel facilities, large-scale power plants, large-scale cooling facilities, new large landscape users, and new large industrial users. All remaining industrial users are referred to in this section as “other industrial users” and are required to comply only with the conservation requirements for all industrial users in this section.

6.6.2 Water Use by “Other Industrial Users”

Many different types of commercial and manufacturing uses are included in the “other industrial user” category. “Other industrial users” include health care facilities, resorts, restaurants, office buildings, shopping malls, and laundries. Water uses associated with this category commonly include cooling, landscaping, sanitary, kitchen, and industrial process use.

It is uncertain whether water use by other industrial users will grow. ADWR held other industrial use constant in two of the projection scenarios in the Assessment and included modest growth by other industrial users in the third scenario. It is anticipated that most future industrial development will be served by municipal providers because commercial and industrial development generally occurs within their service areas.

6.6.3 All Industrial User Program Description

The 4MP conservation program for all industrial users is identical to the 3MP program. All industrial users are required to avoid waste and make diligent efforts to recycle water. Single-pass cooling or heating is not allowed unless the water is reused.

Industrial users that are not regulated as turf-related facilities or new large landscape users are required to use plants listed in the ADWR Low Water Use/Drought Tolerant Plant List for the PRAMA for landscaping where feasible and water with efficient irrigation systems. Improving irrigation efficiency can be a source of major water savings whether the plants have high or low water needs. ADWR encourages all facilities to irrigate efficiently regardless of the type of vegetation planted. In addition, since January 1, 2002, industrial users have been prohibited from serving groundwater to vegetation planted in a public right-of-way on or after January 1, 2002 unless the plants are on the ADWR Low Water Use/Drought Tolerant Plant List for the PRAMA, and have been prohibited from serving groundwater to a water feature in the right-of-way if installed on or after January 1, 2002.

6.7 TURF-RELATED FACILITIES

6.7.1 Introduction

A turf-related facility is a facility with 10 or more acres of water-intensive landscaped area. Golf courses, parks, schools, cemeteries, and common areas within residential developments are examples of facilities that often qualify as turf-related facilities. Because “irrigation” is defined in the Code as water applied for the purpose of growing crops for sale or consumption, turf-related watering for recreational and aesthetic purposes is considered a non-irrigation water use rather than an irrigation use. Turf-related facilities apply water for growing turfgrass and other landscaping plants and for filling and maintaining water levels in bodies of water. Water application efficiency is determined by the type of water application system that is utilized, maintenance of the system, water application scheduling, site topography, soil type, weather conditions, and water quality.

Turf-related facilities regulated under the Industrial Conservation Program obtain groundwater pursuant to Type 1 or Type 2 non-irrigation grandfathered rights or groundwater withdrawal permits. In addition, some turf-related facilities are served groundwater by municipal water providers and are subject to the conservation requirements set forth in this section through provisions of the Municipal Conservation Program *(see Chapter 5 of this plan)*. Municipally-served facilities are called individual users.

6.7.2 Turf Program Goals and Objectives

For the 4MP, the Code allows ADWR to include additional conservation requirements for non-irrigation uses if feasible. ADWR has not changed the Turf-Related Facilities Program from the program included in the 3MP. Since the 1MP, the Turf-Related Facilities Program has included a maximum annual allotment for turf-related facilities, stressed water use efficiency and provided an incentive for the use of reclaimed water. ADWR allows facility managers flexibility in selecting conservation techniques most appropriate to each facility. During the development of each management plan through the 3MP, ADWR conducted extensive data collection and analysis to determine whether additional reductions in turf-related facility allotments appeared feasible. Flexibility has been given in each management plan to turf-related facilities to account for varying weather conditions. First, a three year averaging of water use was incorporated and then later, in some AMAs, a turf-related facility flexibility account. In each management plan prior to the 4MP, ADWR has increased the incentive to use reclaimed water for landscape irrigation. The objective is to reduce groundwater pumping for turf-related watering and replace that groundwater with reclaimed water to the maximum extent feasible to assist in moving the PRAMA to achieve its goal of safe-yield by 2025.

6.7.3 Turf-Related Water Use History

ADWR has identified six turf-related facilities in the PRAMA, all golf courses. Four of the six golf courses in the PRAMA rely entirely on reclaimed water from large municipal water providers to meet their landscape watering needs. Although ADWR identifies them as turf-related facilities, they are not required to comply with an allotment if no groundwater is used for landscape watering purposes at a the facility during a year. The other two golf courses are industrial users and do use groundwater. Parks,

cemeteries, schools and residential common areas with 10 or more acres of water-intensive landscaping are also subject to regulation as turf-related facilities, but none have been identified to date within the PRAMA. ADWR has information indicating that there are some schools in the PRAMA that have more than 10 acres of water intensive landscaping. During the fourth management period, ADWR will seek to identify any additional turf-related facilities in the PRAMA and notice them of the appropriate conservation requirements. Historical water use in each of the industrial subsectors is shown in Table 6-2.

TABLE 6-2
HISTORICAL INDUSTRIAL DEMAND BY SUBSECTOR
PRAMA

Year	Turf	Sand & Gravel	Other	TOTAL
1985	0	135	506	641
1986	0	90	689	779
1987	0	70	825	895
1988	438	34	51	523
1989	389	74	205	669
1990	349	83	45	476
1991	399	53	63	516
1992	313	377	114	805
1993	343	115	246	704
1994	357	254	167	778
1995	391	152	153	696
1996	502	107	187	796
1997	434	83	215	731
1998	409	402	223	1,035
1999	456	235	235	926
2000	463	149	355	967
2001	819	241	490	1,550
2002	872	0	539	1,411
2003	802	66	740	1,608
2004	776	50	765	1,591
2005	783	54	659	1,496
2006	793	126	567	1,486
2007	649	175	806	1,630
2008	645	186	594	1,425
2009	594	167	551	1,312
2010	576	133	509	1,218
2011	612	130	184	925
2012	646	147	218	1,011

6.7.4 Turf-Related Facilities Program Description

6.7.4.1 Maximum Annual Water Allotment

Base Allotment
The core of the conservation program for turf-related facilities is the maximum annual water allotment. The allotment is calculated differently for different types of facilities, but in most cases there is a direct relationship between the number of acres to which water is applied and the volume of the allotment. The

total acreage of turf, low water use landscaped area and water surface area is multiplied by an acre-foot per acre rate to determine the allotment.

The allotment for all turf-related facilities in the PRAMA is calculated by determining the actual acreage within the facility in each of the three landscaping categories mentioned above, and then multiplying the number of acres by the appropriate application rate *(See Table 6-3)*. The approach used for these facilities allows expansion of landscaped area. Beginning with the 1MP, ADWR recognized that the latest conservation technology for golf courses includes course design which concentrates water-intensive landscaping into areas which come into play and water management practices which adjust water application schedules for weather conditions and seasons of highest play. The allotment for golf course acreage that came into existence after December 31, 1984 is therefore capped to encourage efficient design, construction, water application, and overseeding practices. These caps are described below.

Pre-1985 golf courses. Several limitations apply to the maximum annual water allotment for pre-1985 golf courses. In determining the number of water surface acres in existence within a facility, the total surface area of any bodies of water added to the facility after December 31, 1984 and not filled and refilled entirely with direct use reclaimed water or reclaimed water recovered within the area of impact of a storage project is limited to an area calculated by multiplying the number of holes present within the turf acres that came into existence within the facility after December 31, 1984 by 0.14 acre per hole. Also, the allotment for any turf acres and low water use landscaped area that were added to the facility after December 31, 1984 cannot exceed an amount calculated by multiplying the number of holes present within those acres by 24.5 acre-feet of water per hole, plus any allotment additions.

TABLE 6-3
ANNUAL APPLICATION RATES FOR TURF-RELATED FACILITIES
PRAMA

Type of Use	Applicable Rate (acre-feet per acre)
Turf	4.9
Water Surface Acres	5.5
Low Water Use Landscaping	1.5

Post-1984 golf courses. Several limitations also apply to the maximum annual water allotment for post-1984 golf courses. In determining the number of water surface acres in existence within a facility, the total surface area of all bodies of water not filled and refilled entirely with direct use effluent and effluent recovered within the area of impact is limited to an area calculated by multiplying the number of holes present within the facility during the year by 0.14 acre per hole. Also, the allotment for turf acres and low water use landscaped area within a post-1984 golf course cannot exceed an amount calculated by multiplying the number of holes present within the facility by 24.5 acre-feet of water per hole, plus any allotment additions.

Golf courses may expand or develop any number of water-intensive landscaped acres and low water use landscaped area. However, water use must not exceed the maximum annual water allotment, which assumes acreage restrictions. Although the allotment is calculated on a per acre basis, the facility manager has discretion on how to apply the allotment within the facility.

Golf courses may expand or develop any number of water-intensive landscaped acres and low water use landscaped area. However, water use must not exceed the maximum annual water allotment, which assumes acreage restrictions. Although the allotment is calculated on a per acre basis, the facility manager has discretion on how to apply the allotment within the facility.

Allotment Additions

Under certain circumstances, a turf-related facility is entitled to an addition to its base allotment. In some cases, the allotment addition is effective only for one year; in other cases, the allotment addition is effective for a longer period. The following are the allotment additions allowed in the 4MP:

Allotment Addition for Establishment of Newly Turfed Area

An allotment addition is given to turf-related facilities for the establishment of newly planted turf. The allotment addition is equal to 0.8 acre-feet of water per acre of newly turfed area, and is limited to the year in which the turf is planted. For golf courses, the allotment addition is limited to an amount calculated by multiplying the number of holes present within the newly turfed area by four acre-feet of water.

Allotment Addition for Revegetation

A revegetation allotment addition is available to facilities that want to establish low water use or other site-adapted landscaping plants which will need only temporary supplemental water application after construction of a new or renovated facility. This allotment addition of up to 1.5 acre-feet per acre for up to a maximum of three calendar years is quantified and granted on an individual basis through an application process. The quantity and duration of the allotment adjustment is determined through ADWR's evaluation of each application. This adjustment is separate from the low water use landscaping component included in the maximum annual water allotment calculation, and is not included in the allotment cap for new landscaped areas within golf courses.

Allotment Addition for Filling Bodies of Water

New turf-related facilities receive a one-time allotment addition to fill bodies of water used within the facility. The allotment addition is equal to the volume used for initial filling of the body of water and is given only for the year in which the body of water is filled. Any facility may also apply for an allotment addition to refill a body of water which has been emptied for maintenance work to eliminate or reduce seepage losses. The allotment addition may be given only for the year in which the body of water is refilled. The allotment addition will not be granted for any body of water or portion of a body of water that is excluded from the calculation of a golf course's maximum annual water allotment.

Removed Acreage Addition

Conservation requirements for the fourth management period also provide an incentive to remove turfed acreage from a pre-1985 turf-related facility. If turfed acreage or water surface area in existence as of December 31, 1984 is removed, the allotment for the facility does not decrease.

Allotment Addition for Leaching

When high levels of total dissolved solids are present in the water supply, a turf-related facility may need an additional amount of water for leaching, or deep percolation, to prevent salts from accumulating in the root zone. If salts are allowed to accumulate in the soil, salinity may eventually reach levels toxic to turfgrass. If a facility's water supply has a concentration of 1,000 milligrams per liter of total dissolved solids (approximately 1.5 millimhos per centimeter of electrical conductivity) or greater, the turf-related facility may apply to ADWR for an allotment addition for leaching.

6.7.4.2 Additional Conservation Requirements

All post-1984 turf-related facilities are required to update their water conservation plan within 180 days after notification of the conservation requirements. The plan update must outline the water management practices and technologies the facility will utilize to maximize water use efficiency. All turf-related facilities that are not golf courses are required to design, construct, and maintain grounds in a manner that will minimize water-intensive landscaped areas consistent with reasonable use and enjoyment of the

facility. Golf courses have a capped maximum annual allotment which assumes water-efficient design and management.

6.7.4.3 Reclaimed Water Use Adjustment

Currently in the PRAMA, no reclaimed water is used by industrial turf-related facilities. However, most municipally served turf-related facilities in PRAMA use 100 percent reclaimed water. Reclaimed water's high nutrient content makes it an excellent supply for turf-related watering, as long as the nutrient load is carefully matched to plant needs and over-application of potential groundwater pollutants is avoided.

To encourage the maximum use of reclaimed water on turf-related facilities during the fourth management period, ADWR has maintained the reclaimed water incentive that was included in the 3MP. While the maximum annual water allotment will not change, each acre-foot of reclaimed water will be counted as 0.6 acre-foot of water when compliance with the maximum annual water allotment is determined. This adjustment does not apply to reclaimed water stored in a storage facility pursuant to a water storage permit and recovered outside the area of impact of the stored water. In addition to the reclaimed water adjustment, facilities using reclaimed water may apply to ADWR for an allotment addition to allow for leaching of salts below the root zone.

6.7.4.4 Monitoring and Reporting Requirements

The 4MP includes monitoring and reporting requirements for all turf-related facilities. All turf-related facility water use will be assumed to be for landscape watering purposes unless other water uses are metered separately. For example, if water for domestic uses at a park is not metered, it will count against the facility's allotment. This provision encourages facilities to install enough meters to ensure that turf-related watering is accurately measured and reported.

6.8 SAND AND GRAVEL FACILITIES

6.8.1 Introduction

Sand and gravel facilities are facilities that produce sand and gravel and use more than 100 acre-feet of water from any source in a calendar year. Sand and gravel facilities mine unconsolidated stream deposits to produce construction materials. The aggregate must be sorted according to grain size and washed to remove fine-grained particles. Aggregate washing accounts for the bulk of water use by sand and gravel producers. In addition to using water for washing, water is used for the following purposes: (1) to produce ready-mix concrete, bricks, blocks, and asphaltic concrete; (2) to control dust; (3) to wash the outside of vehicles; (4) to wash the inside of mixer drums; (5) to wash other equipment; (6) to cool equipment; (7) to cool material; and (8) for domestic purposes.

Presently, there are two sand and gravel facilities in the PRAMA; however, one uses 100 percent surface water and the other has relied entirely on reclaimed water supplied by the City of Prescott for the past few years.

6.8.2 Sand and Gravel Facility Program Description

ADWR has not changed the Sand and Gravel Facility Program from the program included in the 3MP. The 4MP includes requirements for recycling wash water because implementation of recycling improves water use efficiency. All sand and gravel operations can apply these techniques. In addition to recycling wash water, sand and gravel facility operators must implement two additional conservation measures, one related to water used for dust control and the other related to cleanup activities. The facility operator must choose the conservation measure to be implemented in each category from a list of approved measures. The measures chosen must be the most appropriate for the facility for the fourth management period.

As in the 3MP, sand and gravel operators will be required to evaluate specific water-saving methods and submit a conservation plan to ADWR during the fourth management period. The conservation plan must be submitted to the director within 180 days after notification of the conservation requirements.

Implementation of water conservation practices or technologies can result in increased profits. Sand and gravel facility operators will analyze conservation methods to identify those which will result in a positive economic return. Operators will be required to perform an economic feasibility analysis of three potential conservation practices; disposal pond surface area reduction, use of clarifiers and the use of an alternative water supply to groundwater. The following potential costs and savings must be analyzed in the economic feasibility analysis:

- Labor (including planning, construction, operation, maintenance, and management time);
- Equipment (values amortized over the projected life of the equipment);
- Land value (including value of mineral reserves);
- Water costs (including pumping costs, well maintenance, and withdrawal taxes);
- Costs for chemicals and raw materials;
- Fuel or energy costs;
- Industrial wastewater disposal costs;
- Sewage disposal costs;
- Changes in revenue caused by changing production rate, minimizing "down-time," or increasing the size of reserves;
- Costs associated with regulatory permitting.

6.9 LARGE-SCALE POWER PLANTS

6.9.1 Introduction

ADWR regulates power plants that produce or are designed to produce more than 25 megawatts of electricity. Two types of electric power plants are regulated in the 4MP: steam electrical plants and combustion turbine plants. Steam electrical plants use cooling towers to dissipate excess heat that builds up in the steam electrical generation process. Combustion turbine plants do not use steam to generate electricity. Rather than using steam to drive a turbine, combustion turbines use compressed air. Steam electric power plants use more water than combustion turbine plants. Regardless of whether the plant is a steam electric power plant or a combustion turbine plant, the major consumptive use of water at electrical plants is evaporation from cooling towers. Because of the large volume of water used in towers to condense steam, conservation requirements for the electric power plants require facilities to achieve a high level of efficiency in cooling tower operation. Some large-scale power plants such as combustion turbines utilize cooling towers for dissipation of heat for auxiliary loads. These are regulated in this sub-sector, but the conservation requirements are similar to the Large-Scale Cooling Facility Program.

Currently there are no large-scale power plants located in the PRAMA. This program has been added to the PRAMA for the 4MP in the event that a large-scale power plant is built in the PRAMA during the fourth management period. The conservation program for Large-Scale Power Plants is similar to the program described in the 4MP for the other four AMAs.

6.9.2 Large-Scale Power Plant Conservation Program Description

6.9.2.1 Steam electric power plants

The 4MP requires steam electric power plants to achieve an annual average of 15 cycles of concentration in cooling towers. The cycles of concentration requirement applies only when cooling towers are dissipating heat created during the generation of electricity. In addition to achieving 15 cycles of

concentration, facilities must divert the maximum possible volume of on-site wastewater (other than blowdown water and sanitary wastewater) to the cooling process so long as this steam does not have a negative impact on the cycles of concentration or any other environmental requirement.

Facilities may be granted adjustments to their full cycles of concentration requirements in cases where, due to the quality of recirculating water, adhering to the 15 cycles of concentration standard is likely to result in equipment damage or blowdown water exceeding environmental discharge standards. Cooling towers at power plants are exempted from cycles of concentration requirements during the first 12 months in which reclaimed water constitutes more than 50 percent of tower water supply. After this period, facilities may request an adjustment to full cycles of concentration requirements for reclaimed water-served towers based on the water quality of the reclaimed water supply.

Facilities may apply to the director to use alternative conservation technologies in place of achieving 15 cycles of concentration if the use of the proposed alternative technologies will result in equal or greater water savings. Facilities may also request a waiver from conservation requirements on the basis that cooling tower blowdown water is completely reused. Facilities must periodically measure and annually report blowdown water volumes, make-up water volumes, and the chemical concentration of blowdown and make-up water. In addition, facilities must report the amount of electricity generated, periods when they are not generating electricity, and the volume of water used for purposes other than electric power generation.

6.9.2.2 Combustion Turbine Plants

Cooling towers associated with combustion turbine power plants with a capacity of 250 tons or more have the following requirements:

- Fully operational cooling towers with 250 tons or more of cooling capacity must achieve either 120 mg/L of silica or 1,200 mg/L of total hardness in recirculating water, whichever is reached first, before blowing down;
- If needed, a facility may apply for an alternative blowdown standard for any towers using reclaimed water. During the initial 12-month period during which 50 percent or more of the water used by a tower is reclaimed water, the tower is exempt from blowdown standards;
- If needed, a facility may apply for an alternative blowdown standard for any tower if compliance with blowdown requirements would likely result in damage to cooling towers or associated equipment or exceedence of environmental discharge standards because of the accumulation of limiting constituent other than silica or total hardness.
- Facilities must record monthly and report annually the volumes of tower make-up water and blowdown water and the concentrations of silica, total hardness, or approved alternative constituent, in both make-up water and blowdown water.

6.10 LARGE-SCALE COOLING FACILITIES

6.10.1 Introduction

Currently, there are no large-scale cooling facilities subject to conservation requirements in the PRAMA. However, ADWR has elected to continue to include this program in the 4MP. For the 4MP ADWR has not changed the Large-Scale Cooling Facility Conservation Program from the program included in the 3MP.

The purpose of cooling tower operation is to cool water that has absorbed the heat load of a heat-generating process. Cooling towers are present at a variety of commercial, industrial, and institutional facilities. Large-scale cooling facilities are defined as facilities with an aggregate cooling capacity of a

minimum of 1,000 tons. The minimum cooling unit that is added to create the aggregate total of 1,000 tons is 250 tons in size. Most large-scale cooling facilities are served by municipal water providers. These facilities are termed individual users. Water providers are responsible for the individual users' compliance with industrial conservation requirements unless they have notified ADWR of the existence of the individual user as provided in section 5-709 of the Municipal Conservation Requirements *(See Chapter 5 of this plan*) or ADWR has given the Individual user notice of the conservation requirements, in which case the individual user is responsible for compliance. Large-scale cooling facilities served by their own wells are regulated directly by ADWR and are responsible for complying with industrial conservation requirements.

6.10.2 Large-Scale Cooling Facility Conservation Program

The following 4MP conservation requirements apply to cooling towers that are located at large-scale cooling facilities and that have 250 tons or more of cooling capacity:

- Fully operational cooling towers with 250 tons or more of cooling capacity must achieve either 120 mg/L of silica or 1,200 mg/L of total hardness in recirculating water, whichever is reached first, before blowing down;
- If needed, a facility may apply for an alternative blowdown standard for any towers using reclaimed water. During the initial 12-month period during which 50 percent or more of the water used by a tower is reclaimed water, the tower is exempt from blowdown standards;
- If needed, a facility may apply for an alternative blowdown standard for any tower if compliance with blowdown requirements would likely result in damage to cooling towers or associated equipment or exceedence of environmental discharge standards because of the accumulation of limiting constituent other than silica or total hardness.
- Facilities must record monthly and report annually the volumes of tower make-up water and blowdown water and the concentrations of silica, total hardness, or approved alternative constituent, in both make-up water and blowdown water.

6.11 NEW LARGE LANDSCAPE USERS

6.11.1 Introduction

No new large landscape users served by their own wells, rather than a municipal water provider, were identified during the third management period. However, ADWR has elected to continue to include this program in the 4MP. For the 4MP, ADWR has not changed the New Large Landscape Users Program included in the 3MP.

New large landscape users are industrial users with a substantial water-intensive landscaped area that was planted after January 1, 1990. The conservation program differentiates between two types of new large landscape users: non-residential facilities that are hotels or motels, and non-residential facilities that are not hotels or motels. If the facility is not a hotel or motel, conservation requirements apply to landscapable areas in excess of 10,000 square feet. If the facility is a hotel or motel, requirements apply to areas in excess of 20,000 square feet. If a facility has ten or more acres of water-intensive landscaped area it is defined as a turf-related facility and is subject to specific conservation requirements discussed in Section 6.7 of this chapter.

6.11.2 New Large Landscape User Conservation Program Description

In addition to the requirements that apply to all industrial users, new large landscape users must limit the percentage of water-intensive landscaped area above a specified square footage. The facility must limit its water intensive landscaped area to the greater of the following: 1) 10,000 square feet (20,000 square feet for hotels and motels) plus twenty percent of the area in excess of 10,000 square feet (20,000 square feet

for hotels and motels); or 2) the total surface area of all bodies of water within the facility that qualify as water intensive landscaped area and that are allowed under the Lakes Bill, A.R.S. § 45-131, *et seq*.

Water-intensive landscaping includes not only high water using plants such as turf but also bodies of water such as ponds. However, it does not include any area of land watered exclusively with direct use reclaimed water or reclaimed water recovered within the area of impact, bodies of water used primarily for swimming, bodies of water filled and refilled exclusively with direct use reclaimed water or reclaimed water recovered within the area of impact and bodies of water allowed under an interim water use permit pursuant to the Lakes Bill (A.R.S. §§ 45-131-139) if the body of water will be filled and refilled exclusively with direct use reclaimed water or reclaimed water recovered within the area of impact after the permit expires. If 100 percent wastewater is used to water the landscape, the requirements do not apply. For example, if there is sufficient cooling tower blowdown water and grey water available from the operations of a hotel, this wastewater could be used to water any amount of water-intensive landscaped area up to 10 acres. Once a water-intensive landscaped area equals or exceeds 10 acres in size, it is defined as a turf-related facility and is subject to regulation under that program.

6.12 NEW LARGE INDUSTRIAL USERS

6.12.1 Introduction

ADWR has not identified any new large industrial users in the PRAMA. However, ADWR has elected to continue to include this program in the 4MP. For the 4MP ADWR has not modified the New Large Industrial Users Program included in the 3MP.

New large industrial users are industrial users that use in excess of 100 acre-feet of water per year and commenced use after January 1, 2015.

6.12.2 New Large Industrial User Conservation Program Description

In addition to the requirements that apply to all industrial users, new large industrial users must prepare and submit a water conservation plan to the director. However, if the user is required to submit a conservation plan under another section of this chapter, it can combine and submit one plan.

The water conservation plan must show how much water conservation can be achieved at the facility. It must identify how water is used at the facility and what can be done to conserve it in major water use areas. The plan must also detail an employee water conservation education program at the facility and describe when conservation measures will be implemented.

6.13 INDUSTRIAL CONSERVATION REQUIREMENTS AND MONITORING AND REPORTING REQUIREMENTS FOR ALL INDUSTRIAL USERS

6-1301 Definitions

In addition to the definitions set forth in Chapters 1 and 2 of Title 45 of the Arizona Revised Statutes, unless the context otherwise requires, the following words and phrases used in this chapter shall have the following meanings:

1. *"1MP" means First Management Plan for the PRAMA.*
2. *"2MP" means Second Management Plan for the PRAMA.*
3. *"3MP" means Third Management Plan for the PRAMA.*
4. *"4MP" means Fourth Management Plan for the PRAMA.*
5. *"5MP" means the Fifth Management Plan for the PRAMA.*
6. *"ADWR's Low Water Use/Drought Tolerant Plant List for the PRAMA" means the list of low water use / drought tolerant plants found on ADWR's website, http://www.azwater.gov/azdwr/WaterManagement/AMAs/PrescottAMAFourthManagementPlan.htm including any modifications to the list.*
7. *"Industrial process purposes" means water that is used by an industrial user directly in the creation or manufacture of a product.*
8. *"Industrial use" means a non-irrigation use of water not supplied by a city, town or private water company, including animal industry use and expanded animal industry use.*
9. *"Industrial user" means a person who uses water for industrial uses.*
10. *"PRAMA" means the Prescott Active Management Area.*
11. *"Reclaimed water" has the same definition as effluent in A.R.S.§ 45-101*
12. *"Single pass cooling and heating" means the use of water without recirculation to increase or decrease the temperature of equipment, a stored liquid or a confined air space.*
13. *"Wastewater" means water that is discharged after an industrial or municipal use, excluding reclaimed water.*

6-1302 Conservation Requirements

Beginning January 1, 2017, or upon commencement of water use, whichever is later, and continuing thereafter until the first compliance date for any substitute conservation requirement in the 5MP, an industrial user who uses groundwater shall comply with the following requirements:

1. *Avoid waste; use only the amount of water from any source, including reclaimed water, reasonably required for each industrial use; and make diligent efforts to recycle water.*

2. *Do not use water for non-residential single-pass cooling or heating purposes unless the water is reused for other purposes.*

3. *Use plants listed in the ADWR Low Water Use/Drought Tolerant Plant List for the PRAMA for landscaping to the maximum extent feasible, and water with a water efficient irrigation system. An industrial user regulated as a turf-related facility under sections 6-1401, et seq., or as a new large landscape user under section 6-1801, et seq., is exempt from this requirement.*

4. *Do not serve or use groundwater for the purpose of watering landscaping plants planted on or after January 1, 2002 within any publicly owned right-of-way of a highway, street, road, sidewalk, curb or shoulder which is used for travel in any ordinary mode, including pedestrian travel, unless the plants are listed in ADWR's Low Water Use/Drought Tolerant Plant List for the PRAMA. The director may waive this requirement upon request from the industrial user if the industrial user demonstrates to the satisfaction of the director that plants listed in ADWR's Low Water Use/Drought Tolerant Plant List for the PRAMA cannot grow in the publicly owned right-of-way because of high elevation or low light conditions, such as a freeway underpass. This requirement does not apply to any portion of a residential lot that extends into a publicly owned right-of-way.*

5. *Do not serve or use groundwater for the purpose of maintaining water features, including fountains, waterfalls, ponds, watercourses, and other artificial water structures, installed after January 1, 2002 within any publicly owned right-of-way of a highway, street, road, sidewalk, curb or shoulder which is used for travel in any ordinary mode, including pedestrian travel. This requirement does not apply to any portion of a residential lot that extends into a publicly owned right-of-way.*

6-1303 Monitoring and Reporting Requirements

A. Requirements

For calendar year 2017, or the calendar year in which the facility first begins to use water, whichever is later, and for each calendar year thereafter until the first compliance date for any substitute monitoring and reporting requirement in the 5MP, an industrial user who uses groundwater shall, except as provided for in subsection B below, include the following information in its annual report required by A.R.S. § 45-632:

1. *The total quantity of water by source, including reclaimed water, withdrawn, diverted or received during the reporting year for industrial process purposes, as measured with a measuring device in accordance with ADWR's measuring device rules, A.A.C. R12-15-901, et seq.*

2. *The total quantity of water by source, including reclaimed water, withdrawn, diverted or received during the reporting year for purposes other than industrial process purposes, as measured with a measuring device in accordance with ADWR's measuring device rules, A.A.C. R12-15-901, et seq.*

3. *An estimate of the quantity of wastewater generated during the reporting year.*

4. *An estimate of the quantity of wastewater recycled during the reporting year.*

5. *A description of the primary purposes for which water from any source, including reclaimed water, is used.*

6. *The number of acres of land that were planted with plants listed in ADWR's Low Water Use/Drought Tolerant Plant List for the PRAMA during the calendar year as a result of removal of plants not listed on ADWR's Low Water Use/Drought Tolerant Plant List for the PRAMA. An industrial user regulated as a turf-related facility under section 6-1401, et seq., or as a new large landscape user under section 6-1801, et seq., is exempt from this requirement.*

B. Exemption

An industrial user who holds a Type 1 or Type 2 non-irrigation grandfathered right or a groundwater withdrawal permit in the amount of 10 or fewer acre-feet per year, is exempt from the requirements set forth in subsection A of this section, unless the industrial user holds more than one such right or permit in the aggregate amount of more than 10 acre-feet per year and withdraws more than 10 acre-feet of groundwater during the calendar year pursuant to those rights or permits.

6-1304 Remediated Groundwater Accounting for Conservation Requirements

A. Accounting

Groundwater withdrawn pursuant to an approved remedial action project under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or Title 49, Arizona Revised Statutes, and used by a person subject to a conservation requirement established under this chapter, shall be accounted for consistent with the accounting for surface water for purposes of determining the person's compliance with the conservation requirement, subject to the provisions of subsections B through D of this section.

B. Amount of Groundwater Eligible for Accounting

For each approved remedial action project, the annual amount of groundwater that is eligible for the remediated groundwater accounting provided in subsection A of this section is the project's annual authorized volume. The annual authorized volume for a remedial action project approved on or after June 15, 1999 is the maximum annual volume of groundwater that may be withdrawn pursuant to the project, as specified in a consent decree or other document approved by the United States Environmental Protection Agency (EPA) or the Arizona Department of Environmental Quality (ADEQ). The annual authorized volume for a project approved prior to June 15,1999 is the highest annual use of groundwater withdrawn pursuant to the project prior to January 1, 1999, except that if a consent decree or other document approved by the EPA or ADEQ specifies the maximum annual volume of groundwater that may be withdrawn pursuant to the project, the project's annual authorized volume is the maximum annual volume of groundwater specified in that document. The director may modify the annual authorized volume for a remedial action project as follows:

1. *For an approved remedial action project associated with a treatment plant that was in operation prior to June 15, 1999, a person may request an increase in the annual*

authorized volume at the same time the notice is submitted pursuant to subsection C of this section. The director shall increase the annual authorized volume up to the maximum treatment capacity of the treatment plant if adequate documentation is submitted to the director demonstrating that an increase is necessary to further the purpose of the remedial action project and the increase is not in violation of the consent decree or other document approved by the EPA or ADEQ.

2. *A person may request an increase in the annual authorized volume of an approved remedial action project at any time if it is necessary to withdraw groundwater in excess of the annual authorized volume to further the purpose of the project. The director shall increase the annual authorized volume up to the maximum volume needed to further the purpose of the project if adequate documentation justifying the increase is submitted to the director and the increase is not in violation of the consent decree or other document approved by the EPA or ADEQ.*

3. *The director shall modify the annual authorized volume of an approved remedial action project to conform to any change in the consent decree or other document approved by the EPA or ADEQ if the person desiring the modification gives the director written notice of the change within thirty days after the change. The notice shall include a copy of the legally binding agreement changing the consent decree or other document approved by the EPA or ADEQ.*

C. Notification

To qualify for the remediated groundwater accounting provided in subsection A of this section, the person desiring the accounting must notify the director in writing of the anticipated withdrawal of groundwater pursuant to an approved remedial action project under CERCLA or Title 49, Arizona Revised Statutes, prior to the withdrawal. At the time the notice is given, the person desiring the accounting must be using remediated groundwater pursuant to the approved remedial action project or must have agreed to do so through a consent decree or other document approved by the EPA or ADEQ. The notice required by this subsection shall include all of the following:

1. *A copy of a document approved by ADEQ or the EPA, such as the Remedial Action Plan (RAP), Record of Decision (ROD) or consent decree, authorizing the remediated groundwater project. Unless expressly specified in the document, the person shall include in the notice the volume of groundwater that will be pumped annually pursuant to the project, the time period to which the document applies, and the annual authorized volume of groundwater that may be withdrawn pursuant to the project.*

2. *The purpose for which the remediated groundwater will be used.*

3. *The name and telephone number of a contact person.*

4. *Any other information required by the director.*

D. Monitoring and Reporting Requirements

To qualify for the remediated groundwater accounting for conservation requirements as provided in subsection A of this section, groundwater withdrawn pursuant to the approved remedial action project must be metered separately from groundwater withdrawn in

association with another groundwater withdrawal authority for the same or other end use. A person desiring the remediated groundwater accounting for conservation requirements shall indicate in its annual report under A.R.S. § 45-632 the volume of water withdrawn and used during the previous calendar year that qualifies for the accounting.

6.14 INDUSTRIAL CONSERVATION REQUIREMENTS AND MONITORING AND REPORTING REQUIREMENTS FOR TURF-RELATED FACILITIES

6-1401 Definitions

In addition to the definitions set forth in Chapters 1 and 2 of Title 45 of the Arizona Revised Statutes, and section 6-1301 of this chapter, unless the context otherwise requires, the following words and phrases used in sections 6-1401 through 6-1405 shall have the following meanings:

1. *"Body of water" means a constructed body of water or interconnected bodies of water, including a lake, pond, lagoon, or swimming pool, that has a surface area greater than 12,320 square feet when full, and that is filled or refilled primarily for landscape, scenic, recreational purposes or regulatory storage.*

2. *"Common area" means an area or areas which is owned and operated as a single integrated facility and which is used for recreational or open space purposes. A common area is maintained for the benefit of the residents of a housing development.*

3. *"Contiguous" means in contact at any point along a boundary, or part of the same master planned community. Two parcels of land are contiguous if they are separated only by one or more of the following: a road, easement or right-of-way.*

4. *"Direct use reclaimed water" means reclaimed water transported directly from a facility regulated pursuant to Title 49, Chapter 2, Arizona Revised Statutes, to an end user. Direct use reclaimed water does not include reclaimed water that has been stored pursuant to Title 45, Chapter 3.1, Arizona Revised Statutes.*

5. *"Golf course" means a turf-related facility used for playing golf with a minimum of nine holes and including any practice areas.*

6. *"Hole" means a component of a golf course consisting of a tee and a green. A practice area or driving range is not a hole.*

7. *"Landscape watering" means the application of water from any source, including reclaimed water, to a water-intensive landscaped area, a low water use landscaped area or revegetation acres within a turf-related facility.*

8. *"Low water use landscaped area" means an area of land of at least one acre in aggregate, which is an integral part of a turf-related facility, watered by a permanent water application system and planted primarily with plants listed in ADWR's Low Water Use/Drought Tolerant Plant List for the PRAMA, http://www.azwater.gov/azdwr/WaterManagement/AMAs/PrescottAMAFourthManagementPlan.htm including any modifications to the list. Mature vegetation planted in a low water use landscaped area must cover at least 50 percent of the area.*

9. *"Newly turfed area" means, for a calendar year, an area of land planted with a turfgrass species which was not planted with any turfgrass species during the preceding calendar year.*

10. *"Post-1984 turf-related facility" means a turf-related facility that was neither in operation as of December 31, 1984 nor substantially commenced as of December 31, 1984.*

11. *"Pre-1985 turf-related facility" means a turf-related facility that was either in operation as of December 31, 1984, or substantially commenced as of December 31, 1984, and includes any expanded or modified portion of such a facility.*

12. *"Reclaimed water recovered within the area of impact" means reclaimed water that has been stored pursuant to Title 45, Chapter 3.1, Arizona Revised Statutes and recovered within the area of impact of the stored water. For purposes of this definition, "area of impact" has the same meaning as prescribed by A.R.S. § 45-802.01.*

13. *"Revegetation acres" means acreage contiguous to a turf-related facility that has been approved by the director as qualifying for a revegetation allotment addition.*

14. *"Substantially commenced as of December 31, 1984" means, with regard to the construction of a turf-related facility, that the owner or operator of the facility had obtained all pre-construction permits and approvals required by federal, state or local governments for the facility by December 31, 1984, or had made a substantial capital investment in the physical on-site construction of the facility by December 31, 1984.*

15. *"Total cemetery area" means an area of land being used for cemetery-related purposes, including any area of land covered by grave markers or by cemetery-related buildings, walks, pathways, and landscaping, but not including roads, parking lots, and any areas of land being held for future expansion of the cemetery.*

16. *"Turf acres" means an area of land that is watered with a permanent water application system and planted primarily with plants not listed in ADWR's Low Water Use/Drought Tolerant Plant List for the PRAMA.*

17. *"Turf-related facility" means any facility, including a school, park, cemetery, golf course or common area of a housing development, with a water-intensive landscaped area of ten or more acres.*

18. *"Water-intensive landscaped area" means, for a calendar year, the turf acres and water surface acres within a turf-related facility.*

19. *"Water surface acres" means the total surface area of all bodies of water that are an integral part of a turf-related facility. Bodies of water used primarily for swimming purposes are not an integral part of the water-intensive landscaped area of a turf-related facility.*

6-1402 Conservation Requirements for Turf-Related Facilities

A. Maximum Annual Water Allotment

Beginning with calendar year 2017, or the calendar year in which landscape watering commences, whichever is later, and for each calendar year thereafter until the first compliance date for any substitute conservation requirement in the 5MP, an industrial user who uses groundwater at a turf-related facility during the calendar year shall not withdraw, divert or receive water for landscape watering purposes at the facility during a calendar year in an amount which exceeds the turf-related facility's maximum annual water allotment for the year as calculated pursuant to section 6-1403.

B. Conservation Plan for Post-1984 Turf-Related Facilities

No later than 180 days after receiving official notice of these conservation requirements, an industrial user who uses groundwater at a post-1984 turf-related facility shall prepare an updated conservation plan for the facility which contains an accurate and detailed description of the conservation technologies, including management practices, that are applied at the facility when water is used for landscape watering purposes. The industrial user shall maintain the plan until the first compliance date for any substitute conservation requirement in the 5MP.

C. Limiting Water-Intensive Landscaped Area Within Post-1984 Turf-Related Facilities that are not Golf Courses

1. *Beginning on January 1, 2017, or upon commencement of landscape watering, whichever occurs later, and continuing until the first compliance date for any substitute requirement in the 5MP, an industrial user who uses groundwater at a turf-related facility that is not a golf course shall design, construct, and maintain the grounds of the facility in a manner that minimizes the water-intensive landscaped area of the facility consistent with the use of the facility. All of the facility's water-intensive landscaping shall be located in those areas directly associated with the turf-related facility's primary purpose.*

2. *Beginning on January 1, 2017, or upon commencement of landscape watering, whichever is later, and continuing until the effective date of any substitute conservation requirement in the 5MP, an industrial user who uses groundwater at a turf-related facility that is a cemetery shall limit the water-intensive landscaped area within any portion of the facility that was neither in operation as of December 31, 1984 nor substantially commenced as of December 31, 1984 so that no more than 75 percent of the total area within that portion of the cemetery is planted with plants not listed in ADWR's Low Water Use/Drought Tolerant Plant List for the PRAMA. This requirement shall not apply to any expanded portion of a cemetery that was in operation as of December 31, 1984 or that was substantially commenced as of December 31, 1984 if the expanded portion of the cemetery was under the same ownership as the cemetery as of December 31, 1984.*

6-1403 Calculation of Maximum Annual Water Allotment for Turf-Related Facilities

A. Turf-Related Facilities that are Not Golf Courses

For each calendar year, the maximum annual water allotment for a turf-related facility that is not a golf course shall be calculated by multiplying the number of acres in existence within the facility during the calendar year in each of the categories listed in Table 6-4, by the applicable application rate listed in Table 6-4 and then adding together the products plus any allotment additions as determined under subsection D of this section.

B. Pre-1985 Turf-Related Facilities that are Golf Courses

For each calendar year, the maximum annual water allotment for a pre-1985 turf-related facility that is a golf course shall be calculated by multiplying the number of acres in existence within the facility during the calendar year in each of the categories listed in Table 6-4 by the applicable application rate listed in Table 6-4 and then adding together the products plus any allotment additions as determined under subsection D of this section. The maximum annual water allotment is subject to the following limitations:

1. *In determining the number of water surface acres in existence within the facility during the calendar year, the total surface area of any bodies of water added to the facility after December 31, 1984 and not filled and refilled exclusively with direct use reclaimed water or reclaimed water recovered within the area of impact shall be limited to an area calculated by multiplying the number of holes added to the facility after December 31, 1984 by 0.14 acre per hole. For purposes of this paragraph, a body of water filled and refilled pursuant to an interim water use permit issued under A.R.S. § 45-133 shall be deemed to be filled and refilled exclusively with direct use reclaimed water or reclaimed water recovered within the area of impact if the body of water will be filled and refilled exclusively with one of those types of reclaimed water after the permit expires.*

2. *The total allotment for any turf acres and low water use landscaped area added to the facility after December 31, 1984 shall not exceed an amount calculated by multiplying the number of holes added to the facility after December 31, 1984 by 24.5 acre-feet of water per hole, plus any allotment additions allowed under subsection D of this section.*

C. Post-1984 Turf-Related Facilities that are Golf Courses

The maximum annual water allotment for a post-1984 turf-related facility that is a golf course shall be calculated by multiplying the number of acres in existence within the facility during the calendar year in each of the categories listed in Table 6-4 by the applicable application rate listed in Table 6-4 and then adding together the products, plus any allotment additions as determined under subsection D of this section. The maximum annual water allotment is subject to the following limitations:

1. *In determining the number of water surface acres in existence within the facility during the year, the total surface area of all bodies of water not filled and refilled exclusively with direct use reclaimed water or reclaimed water recovered within the area of impact shall be limited to an area calculated by multiplying the number of holes present within the facility during the year by 0.14 acre per hole. For purposes of this paragraph, a body of water filled and refilled pursuant to an interim water use permit issued under A.R.S. § 45-133 shall be deemed to be filled and refilled exclusively with direct use reclaimed water or reclaimed water recovered within the area of impact if the body of water will be filled and refilled exclusively with one of those types of reclaimed water after the permit expires.*

2. *The total allotment for turf acres and low water use landscaped area within the facility during the year shall not exceed an amount calculated by multiplying the number of holes present within the facility during the year by 24.5 acre-feet of water per hole, plus any allotment additions allowed under subsection D of this section.*

D. Allotment Additions

1. *Newly Turfed Area Establishment Addition*

   For any year in which a turfgrass species is planted at a turf-related facility, the facility shall receive an allotment addition of 0.8 acre-foot of water per acre of newly turfed area. For golf courses, the newly turfed area establishment addition shall not exceed an amount calculated by multiplying the number of holes present within the newly turfed area by 4 acre-feet of water.

2. *Revegetation Addition*

   The owner or operator of a turf-related facility may apply to the director for an allotment addition to revegetate areas within and around the facility after initial construction or renovation of new acres. The director may allow up to an additional 1.5 acre-feet of water per acre for up to three years if the following conditions apply to the acres for which the revegetation addition is sought:

   a. *The plants which are planted within the revegetation area are listed in ADWR's Low Water Use/Drought Tolerant Plant List for the PRAMA or were adapted to the site conditions prior to construction;*

   b. *The aggregate area to be watered exceeds one acre and has at least 50 percent vegetative cover at maturity;*

   c. *An allotment is not provided for the revegetation area under subsection A, B or C of this section; and*

   d. *All of the water applied to the revegetation acres is measured and reported as part of the total water use of the facility.*

3. *Body of Water Fill and Refill Addition*

   a. *A turf-related facility shall receive a one-time body of water fill allotment addition equal to the volume of water used for the initial filling of any new body of water added after January 1, 2017 within the facility. The facility shall receive the allotment addition only for the calendar year in which the body of water is filled. An allotment addition shall not be given for any body of water or portion of a body of water within a golf course that is excluded from the calculation of a golf course's maximum annual water allotment under subsection B, paragraph 1 or subsection C, paragraph 1.*

   b. *If a body of water at a turf-related facility is drained or partially drained to allow for repairs to reduce water losses, the owner or operator of the facility may apply to the director for an addition to the facility's maximum annual water allotment in the amount of water necessary to refill the body of water. The director shall grant the allotment addition if the director determines that draining the body of water was necessary to allow for repairs to reduce water losses. The facility shall receive the allotment addition only for the calendar year in which the body of water is filled. An allotment addition shall not be given for any body of water or portion of a body of water within a golf course that is excluded from the calculation of the golf course's*

maximum annual water allotment under subsection B, paragraph 1 or subsection C, paragraph 1.

4. *Removed Acreage Addition*

   A pre-1985 turf-related facility that removes acres of water-intensive landscaped area that were in existence within the facility on or before December 31, 1984, shall receive an allotment addition equal to the allotment the acres would have received pursuant to the 4MP if they had not been removed, provided that the acres were given a water allotment in the 1MP, the 2MP, or the 3MP.

5. *Leaching Allotment Addition*

   The owner or operator of a turf-related facility may apply to the director for an allotment addition for leaching purposes. The director shall approve the application if the water supply used for landscape watering at the facility contains at least 1,000 milligrams per liter of total dissolved solids. If the director approves an allotment addition for leaching purposes, the director shall calculate the additional allotment as follows:

   Leaching Allotment Addition:

$$\left(\frac{1}{1 - \left(\frac{EC_w}{5EC_e - EC_w}\right)} - 1\right) \times \frac{CU}{0.75}$$

   Where:

   Ec_w = electrical conductivity of water used

   Ec_e = Tolerance of the grass species grown to the soil salinity in electrical conductivity of the soil saturation extract

   CU = Consumptive use requirement for the grass species

   Any allotment addition granted under this paragraph shall remain in effect until the water supply used for landscape watering at the facility contains less than 1,000 milligrams per liter of total dissolved solids, or until the first compliance date for the facility's conservation requirements in the 5MP, whichever occurs first.

E. Combined Allotments for Contiguous Facilities

The maximum annual water allotments for contiguous turf-related facilities under one ownership or operation may be combined. All or a portion of the combined maximum water allotment may be applied to any part of the contiguous facilities.

F. *Nothing in this section shall be construed as authorizing the use of more groundwater or surface water than may be used pursuant to any groundwater or appropriable water rights or permits associated with the use. Nor shall this section be construed as authorizing the use of groundwater or surface water in any manner that violates Chapter 1 or Chapter 2 of Title 45, Arizona Revised Statutes.*

6-1404 Compliance with Maximum Annual Water Allotment

A. Reclaimed Water Use Adjustment

For purposes of determining compliance with the maximum annual water allotment requirement, the director shall count each acre-foot of direct use reclaimed water or reclaimed water recovered within the area of impact used at the facility for landscape watering purposes during the calendar year as 0.6 acre-foot of water.

B. *A turf-related facility is in compliance with its maximum annual water allotment for a given calendar year if the director determines that either of the following apply:*

1. *The amount of water from any source, including reclaimed water, used by the facility for landscape watering purposes during that calendar year does not exceed the facility's maximum annual water allotment for that year, or*

2. *The aggregate amount of water from any source, including reclaimed water, used by the facility for landscape watering purposes during that calendar year and the preceding two calendar years divided by three does not exceed the sum of the maximum annual water allotments for those three years divided by three.*

6-1405 Monitoring and Reporting Requirements

A. *An industrial user who uses water at a turf-related facility that commences landscape watering within any new turfed acres, low water use landscaped area or water surface acres after January 1, 2017 shall submit to the director documentation of the new acres no later than 90 days after commencing landscape watering to the new acres or receiving notice of these conservation requirements, whichever is later. The scale of the submitted documents, extent of turf acres, water surface acres, and low water use landscaped area must clearly be shown. Documentation may consist of one or more of the following:*

1. *As-built plans certified by a registered professional such as a civil engineer, golf course designer or landscape architect.*

2. *Aerial photography at a scale no smaller than 1"=200'.*

3. *A survey of the facility certified by a registered professional such a civil engineer or land surveyor.*

4. *Any other documentation upon approval by the director.*

B. *For calendar year 2017, or the calendar year in which landscape watering commences, whichever occurs later, and for each calendar year thereafter until the first compliance date for any substitute monitoring and reporting requirement in the 5MP, an industrial user who uses groundwater at a turf-related facility shall include in the annual reports required by A.R.S. § 45-632 the following information:*

1. *The total quantity of water by source, disaggregated by source, withdrawn, diverted, or received during the calendar year for landscape watering purposes at the facility, as measured with a measuring device in accordance with ADWR's measuring device rules, A.A.C. R12-15-901, et seq.*

2. *The total amount of reclaimed water, disaggregated by source, direct use reclaimed water, reclaimed water recovered within the area of impact, and reclaimed water recovered outside the area of impact that was withdrawn or received during the calendar year for landscape watering purposes at the facility as measured with a measuring device in accordance with ADWR's measuring device rules, A.A.C. R12-15-901, et seq.*

3. *The number of turf acres within the facility during the calendar year, not including newly turfed area.*

4. *The number of acres of total water surface area within the facility during the calendar year.*

5. *The number of acres of low water use landscaped area within the facility during the calendar year.*

6. *The number of acres of newly turfed area within the facility during the calendar year.*

7. *The number of turf acres removed within the facility during the calendar year.*

8. *The number of acres of total water surface area added or removed within the facility during the calendar year.*

9. *The number of acres of low water use landscaped area added or removed within the facility during the calendar year.*

10. *If the facility is a golf course, the length of the course as measured from the back of each tee ground farthest from the associated green, then down the center line of the hole to the center of the green.*

11. *The number of acres approved by the director for a revegetation addition pursuant to section 6-1403, subsection D, paragraph 2 within the facility during the calendar year.*

12. *The quantity of water used to fill or refill a body of water within the facility during the calendar year for which an allotment addition is sought pursuant to section 6-1403, subsection D, paragraph 3.*

13. *If the facility is a golf course, the number of holes within the facility during the calendar year.*

14. *If the facility is a golf course, the number of holes added during the calendar year.*

15. *If the facility is a golf course that qualifies as a pre-1985 turf-related facility, the number of acres of turf acres, low water use landscaped area and water surface acres added to the facility after December 31, 1984, and the number of holes added to the facility after December 31, 1984.*

16. *An estimate of the quantity of water from any source, including reclaimed water, used for each purpose other than landscape watering purposes at the facility during the reporting year. Any water used at the facility that is not measured separately from the water used for landscape watering shall be counted by the director as water used by the facility for*

landscape watering for purposes of calculating the compliance with the maximum annual water allotment.

C. *A single annual report may be filed for contiguous turf-related facilities if the maximum annual water allotments of the facilities are combined pursuant to section 6-1403, subsection E. The annual report shall report water use and landscaped areas of the contiguous facilities as required in subsection B of this section.*

TABLE 6-4
APPLICATION RATES FOR TURF-RELATED FACILITIES
PRESCOTT ACTIVE MANAGEMENT AREA

From 2016 until the first compliance date for any substitute requirement in the 5MP

	Application Rate - Turf Acre
All Facilities	*4.9 acre-feet per acre per calendar year*

	Application Rate - Total Water Surface Area
All Facilities	*5.5 acre-feet per acre per calendar year*

	Application Rate - Low Water Use Landscaped Area
All Facilities	*1.5 acre-feet per acre per calendar year*

6.15 INDUSTRIAL CONSERVATION REQUIREMENTS AND MONITORING AND REPORTING REQUIREMENTS FOR SAND AND GRAVEL FACILITIES

6-1501 Definitions

In addition to the definitions set forth in Chapters 1 and 2 of Title 45 of the Arizona Revised Statutes and section 6-1301 of this chapter, unless the context otherwise requires, the following words and phrases used in sections 6-1502 and 6-1503 shall have the following meanings:

1. *"Alternative water supply" means a water source other than groundwater of drinking water quality.*

2. *"Sand and gravel facility" means a facility that produces sand and gravel and that uses more than 100 acre-feet of water from any source per calendar year. For purposes of this definition, the annual water use shall include all water used by the facility regardless of the nature of the use.*

3. *"Rock out method" means agitating rock inside concrete truck mixer drums for the purpose of cleaning excess concrete from the drums.*

4. *"Wash water" means water used for washing or sorting sand, gravel, or other aggregates.*

6-1502 Conservation Requirements

A. Standard Conservation Requirements

Beginning on January 1, 2017, or upon commencement of water use, whichever occurs later, and continuing thereafter until the first compliance date for any substitute conservation requirements in the 5MP, an industrial user who uses groundwater at a sand and gravel facility shall comply with the following conservation requirements:

1. *If sufficient land area for construction and operation of disposal ponds is available at a reasonable price, the industrial user shall construct disposal ponds at the sand and gravel facility. All wash water, all water used for wet scrubbers at asphalt plants, all runoff from cleanup operations and all drainage from sand and gravel piles shall be discharged or diverted into the disposal ponds unless prohibited by state or federal environmental regulations. The disposal ponds shall contain a barge pump or sump pump of sufficient capacity, together with any necessary additional equipment, to assure the maximum reclamation of the water. The water shall be reclaimed and reused at the sand and gravel facility unless prohibited by state or federal regulations.*

2. *If sufficient land area for the construction and operation of disposal ponds is not available at a reasonable price, clarifiers shall be used at the sand and gravel facility for reclaiming wash water, all water used for wet scrubbers at asphalt plants, runoff from cleanup operations and all drainage from sand and gravel piles. The clarifiers shall be designed and operated to assure the maximum reclamation of water. The water shall be reclaimed and reused at the sand and gravel facility unless prohibited by state or federal regulations.*

3. *At least one of the following techniques or technologies designed to reduce water use for dust control shall be implemented at the sand and gravel facility:*

    a. *The placement of binding agents on all haul roads;*

    b. *The paving of all haul roads;*

    c. *The placement of recycled asphalt on all haul roads;*

    d. *The placement of medium sized aggregate or "pea gravel" on all haul roads; or*

    e. *A technology or technique designed to reduce water use for dust control not included in subparagraphs a through d of this paragraph that demonstrates water savings equivalent to any of the technologies or techniques listed in subparagraphs a through d, and that has been approved by the director.*

    The industrial user shall have sole discretion in determining whether to implement more than one of the above technologies.

4. *At least one of the following techniques or technologies designed to reduce water use for cleaning shall be implemented at the sand and gravel facility:*

    a. *Use of metered timers for truck washing and other cleanup activities;*

b. Use of the "rock out method" of cleaning concrete from truck mixer drums;

c. Use of concrete set-arresting agent chemical applications to clean concrete from truck mixer drums; or

d. A technology or technique designed to reduce water use for cleaning that is not included in subparagraphs a through c of this paragraph that demonstrates water savings equivalent to any of the measures listed in subparagraphs a through c and that has been approved by the director.

The industrial user shall have sole discretion in determining whether to implement more than one of the above technologies.

B. Substitute Conservation Requirements

1. An industrial user who uses groundwater at a sand and gravel facility may apply to the director to use conservation technologies other than the standard conservation requirements prescribed in subsection A of this section. The director may approve the use of substitute conservation technologies if both of the following apply:

a. The industrial user has submitted a detailed description of the proposed substitute technologies and the water savings that can be achieved by the use of those technologies, and;

b. The director determines that the proposed substitute conservation technologies will result in a water savings equal to or greater than the savings that would be achieved by the standard conservation requirements prescribed in subsection A.

2. If the director approves an industrial user's request to use conservation technologies other than the standard conservation requirements prescribed in subsection A of this section, the industrial user shall comply with the substitute conservation technologies approved by the director beginning on the date determined by the director and continuing until the first compliance date for any substitute conservation requirement in the 5MP.

C. Conservation Plan

1. Not later than 180 days after receiving notice of these conservation requirements, an industrial user who uses water at a sand and gravel facility, including an industrial user who acquires ownership of an existing sand and gravel facility after the first compliance date of the 4MP, shall submit to the director a plan to improve the efficiency of water use at the facility on a form provided by the director. The plan shall analyze the economic feasibility of implementing all of the following at the facility:

a. Disposal pond surface area reduction;

b. The use of clarifiers for recycling water;

c. Use of a renewable water supply if such a supply is available within a one mile radius of the facility.

2. *The economic analysis must analyze the potential costs and savings associated with the following:*
   a. *Labor (including planning, construction, operation, maintenance, and management time);*
   b. *Equipment (values amortized over the projected life of the equipment);*
   c. *Land value (including value of mineral reserves);*
   d. *Water costs (including pumping costs, well maintenance, and withdrawal taxes);*
   e. *Costs for chemicals and raw materials,*
   f. *Fuel or energy costs;*
   g. *Industrial wastewater disposal costs;*
   h. *Sewage disposal costs;*
   i. *Changes in revenue caused by changing production rate, minimizing "down-time" or increasing the size of reserves;*
   j. *Regulatory permitting costs.*

6-1503 Monitoring and Reporting Requirements

For calendar year 2017, or the calendar year in which the sand and gravel facility first commences using water, whichever is later, and for each calendar year thereafter until the first compliance date for any substitute monitoring and reporting requirement in the 5MP, an industrial user who uses water at a sand and gravel facility shall include the following information in its annual reports required by A.R.S. § 45-632.

1. *The quantity of water reclaimed from disposal ponds or clarifiers during the calendar year, as measured with a measuring device in accordance with ADWR's measuring device rules, A.A.C. R12-15-901, et seq.*

2. *The quantity of water from any source, including reclaimed water, supplied to the wash plant during the calendar year, as measured with a measuring device in accordance with ADWR's measuring device rules, A.A.C. R12-15-901, et seq.*

3. *The quantity of water from any source, including reclaimed water, supplied to the asphalt plant during the calendar year, as measured with a measuring device in accordance with ADWR's measuring device rules, A.A.C. R12-15-901, et seq.*

4. *The aggregate surface area of any disposal ponds.*

5. *The average depth of any disposal ponds.*

6. *The estimated quantity of water from any source, including reclaimed water, used during the calendar year for:*

   a. *Industrial process purposes. Water used for industrial process purposes includes water used for sanitary waste disposal but does not include water for cooling and cleaning purposes.*

   b. *Non-domestic cooling purposes.*

   c. *Non-domestic cleaning purposes. Water use for non-domestic purposes includes truck washing, truck mixer drum washing, or other non-domestic cleaning purposes.*

d. Road dust control.

e. Landscape watering.

f. Other purposes.

7. The tonnage of material washed during the calendar year.

6.16 INDUSTRIAL CONSERVATION REQUIREMENTS AND MONITORING AND REPORTING REQUIREMENTS FOR LARGE-SCALE POWER PLANTS

6-1601 Definitions

In addition to the definitions set forth in Chapters 1 and 2 of Title 45 of the Arizona Revised Statutes and section 6-1301 of this chapter, unless the context otherwise requires, the following words and phrases shall have the following meanings:

1. "Blowdown water" means water discharged from a cooling tower recirculating water stream to control the buildup of minerals or other impurities in the recirculating water.

2. "Combustion turbine electric power plant" means an industrial facility that produces or is designed to produce more than 25 megawatts of electricity by utilizing an internal combustion engine in which the expanding gases from the combustion chamber drive the blades of a turbine which turns a generator to produce electricity

3. "Conservative mineral constituent" means a component of recirculating water in a cooling tower, the concentration of which is not significantly modified by precipitation, loss to the atmosphere or the addition of treatment chemicals.

4. "Continuous blowdown and make-up" means patterns in cooling tower operation that include continuous blowdown and make-up or frequent periodic blowdown and make-up of recirculating water.

5. "Cycles of concentration" means the ratio of the concentration of total dissolved solids, other conservative mineral constituent or electrical conductivity in the blowdown water to the concentration of this same constituent or electrical conductivity in the make-up water. This can be calculated by dividing the total make-up water by the total blowdown water.

6. "Reclaimed water-served cooling tower" means a cooling tower served by a make-up water supply that on an annual average basis consists of 50 percent or more reclaimed water.

7. "Fully operational cooling tower" means a cooling tower that is functioning to dissipate heat from a large-scale power plant that is generating electricity.

8. "Large-scale power plant" means an industrial facility that produces or is designed to produce more than 25 megawatts of electricity including Steam electric power plants and combustion turbine plants.

9. *"Limiting constituent" means a chemical, physical, or biological constituent present in recirculating cooling tower water that, due to potential physical or biological factors or due to potential exceedence of any federal, state, or local environmental standards upon discharge as blowdown, should not be allowed to accumulate in recirculating cooling tower water above a certain concentration.*

10. *"Make-up water" means the water added back into the cooling tower recirculating water stream to replace water lost to evaporation, blowdown, or other mechanisms of water loss.*

11. *"Steam electric power plant" means an industrial facility that produces or is designed to produce more than 25 megawatts of electricity by utilizing the Rankin Steam Cycle in which water is heated, turns into steam and spins a steam turbine which drives an electrical generator.*

6-1602 Conservation Requirements for Steam Electric Power Plants

A. Conservation Requirements

Beginning on January 1, 2017 or upon commencement of water use, whichever occurs later, and continuing thereafter until the first compliance date for any substitute conservation requirement in the 5MP, an industrial user who uses groundwater at a steam electric power plant shall comply with the following requirements:

1. *An annual average of 15 or more cycles of concentration shall be achieved during periods when the steam electric power plant is generating electricity.*

2. *The maximum amount of wastewater feasible, excluding blowdown water and sanitary wastewater, shall be diverted to the cooling process so long as this stream does not have a negative impact on the cycles of concentration or any other environmental requirement.*

B. Cycles of Concentration Adjustment Due to the Quality of Recirculating Water

An industrial user who uses groundwater at a steam electric power plant may apply to the director for an adjustment to the cycles of concentration requirements set forth in subsection A of this section if compliance with the cycles of concentration requirements would likely result in damage to cooling towers or associated equipment or exceedence of federal, state or local environmental discharge standards because of the quality of recirculating water. To apply for an adjustment to the cycles of concentration requirements based on recirculating water quality, an industrial user shall submit a request in writing to the director that includes the following information:

1. *Historic, current and projected water quality data for the relevant constituent(s).*

2. *Documentation describing the potential damage to cooling towers or associated equipment, or documentation of environmental standards that are likely to be exceeded, whichever applies.*

The director shall grant the request if the director determines that compliance with the cycles of concentration requirements set forth in subsection A of this section would likely result in damage to cooling towers or associated equipment or exceedence of federal, state, or local

environmental discharge standards because of the quality of recirculating water. Any cycles of concentration adjustment granted pursuant to this subsection shall apply only while the quality of recirculating water would cause compliance with the cycles of concentration requirements to likely result in damage to cooling towers or associated equipment or exceedence of federal, state or local environmental discharge standards.

C. Exemption and Cycles of Concentration Adjustment Due to the Quality of Reclaimed Water Make-up Water Supplies

1. The cycles of concentration requirements set forth in subsections A and B of this section do not apply to any reclaimed water-served cooling tower at a steam electric power plant during the first 12 consecutive months in which more than 50 percent of the water supplied to the cooling tower is reclaimed water.

2. Within 30 days after the 12-month exemption period expires, the industrial user who uses water at the steam electric power plant may apply to the director for a cycles of concentration adjustment to lower the cycles of concentration requirement for the reclaimed water-served cooling tower if compliance with the requirement would not be possible due to the presence of a limiting constituent in the reclaimed water supplying the tower. To apply for an alternative cycles of concentration requirement to address such a limiting constituent, an industrial user shall submit a request in writing to the director that includes the following information:

a. The limiting constituent(s) that is present in the reclaimed water supplying the tower that results in the need to blow down a greater annual volume of water than that required in subsection A of this section.

b. Documentation describing the concentration at which this limiting constituent(s) should be blown down and the reason for the alternative cycles of concentration.

The director shall grant the request if the director determines that the presence of a limiting constituent in the reclaimed water supplying the cooling tower results in the need to blow down a greater annual volume of water than that required in subsection A of this section. Any cycles of concentration adjustment granted pursuant to this paragraph shall apply only while the tower qualifies as a reclaimed water-served cooling tower.

D. Substitute Conservation Requirements

1. An industrial user who uses groundwater at a steam electric power plant may apply to the director to use conservation technologies other than the standard conservation requirements prescribed in subsection A of this section. The director may approve the use of substitute conservation technologies if both of the following apply:

a. The industrial user has submitted a detailed description of the proposed substitute technologies and the water savings that can be achieved by the use of those technologies, and;

b. The director determines that the proposed substitute conservation technologies will result in a water savings equal to or greater than the savings that would be achieved by the standard conservation requirements prescribed in subsection A.

2. *If the director approves an industrial user's request to use conservation technologies other than the standard conservation requirements prescribed in subsection A of this section, the industrial user shall comply with the substitute conservation technologies approved by the director beginning on the date determined by the director and continuing until the first compliance date for any substitute conservation requirement in the 5MP.*

E. Waiver

An industrial user who uses groundwater at a steam electric power plant may apply to the director for a waiver of any applicable conservation requirement in subsection A of this section by submitting a detailed, long-term plan for beneficial reuse of 100 percent of blowdown water outside the cooling circuit, including an implementation schedule. Reuse of blowdown water includes the discharge of blowdown water into pipes, canals, or other means of conveyance if the discharged water is transported to another location at the plant or off the plant for reuse.

The director shall grant a waiver request if the director determines that implementation of the plan will result in the beneficial reuse of 100 percent of blowdown water outside the cooling circuit. If a waiver request is granted, the industrial user shall implement the plan in accordance with the implementation schedule submitted to and approved by the director.

6-1603 Conservation Requirements for Combustion Turbine Electric Power Plants

A. *Beginning on January 1, 2017 or upon commencement of water use, whichever occurs later, and continuing thereafter until the first compliance date for any substitute conservation requirement in the 5MP, an industrial user who uses groundwater at a combustion turbine electric power plant shall comply with the following requirement:*

Each fully operational cooling tower with greater than or equal to 250 tons of cooling capacity at the combustion turbine electric power plant facility shall achieve a cycles of concentration level that results in blowdown water being discharged at an average annual minimum of either 120 milligrams per liter (mg/L) silica or 1,200 mg/L total hardness, whichever is reached first.

B. Exemptions and Alternative Blowdown Standards

1. *The requirement set forth in subsection A of this section does not apply to a combustion turbine electric power plant in any year in which the beneficial reuse exceeds the conservation requirement.*

2. *The requirement set forth in subsection A of this section does not apply to any reclaimed water-served cooling tower at a combustion turbine electric power plant during the first 12 consecutive months in which more than 50 percent of the water supplied to the cooling tower is reclaimed water.*

   Within 30 days after the 12-month period expires, the person using water at the reclaimed water-served cooling tower may apply to the director to use an alternative blowdown level from that required in subsection A of this section if compliance with the blowdown requirement would not be possible due to the presence of a limiting constituent other than silica or total hardness in the reclaimed water supplying the cooling tower. To

apply for an alternative blowdown level to address such a limiting constituent, an industrial user shall submit a request in writing to the director which includes the following information:

a. The limiting constituent other than silica or total hardness that is present in the reclaimed water supplying the cooling tower which results in the need to blow down a greater annual volume of water than that required under subsection A of this section.

b. Documentation describing the concentration at which this limiting constituent should be blown down and the reason for the alternative blowdown level.

The director shall grant the request if the director determines that the presence of a limiting constituent other than silica or total hardness in the reclaimed water supplying the cooling tower results in the need to blow down a greater annual volume of water than that required under subsection A of this section. Any alternative blowdown level granted pursuant to this paragraph shall apply only while the cooling tower qualifies as a reclaimed water-served cooling tower.

3. A combustion turbine electric power plant may apply to the director to use an alternative blowdown level from that required in subsection A of this section if compliance with the blowdown requirement would likely result in damage to cooling towers or associated equipment or exceedence of federal, state or local environmental discharge standards because of the accumulation of a limiting constituent other than silica or total hardness in recirculating water. To apply for an alternative blowdown level for such a limiting constituent, an industrial user shall submit a request in writing to the director which includes the following information:

a. Historic, current and projected water quality data for the relevant limiting constituent(s).
b. Documentation describing the potential damage to cooling towers or associated equipment, or documentation of environmental standards that are likely to be exceeded, whichever applies.

The director shall grant the request if the director determines that compliance with the blowdown level set forth in subsection A of this section would likely result in damage to cooling towers or associated equipment or exceedence of federal, state, or local environmental discharge standards because of the accumulation of a limiting constituent other than silica or total hardness in recirculating water.

6-1604 Monitoring and Reporting Requirements

A. Monitoring and Reporting Requirements for Steam Electric Power Plants

1. For calendar year 2017 or the calendar year in which water use first commences, whichever is later, and for each calendar year thereafter until the first compliance date for any substitute requirement in the 5MP, an industrial user who uses groundwater at a steam electric power plant shall include in its annual report required by A.R.S. § 45-632 the following information:

a. Source of water providing make-up water to each cooling tower at the facility.

b. For each cooling tower at the facility that is exempt from cycles of concentration requirements pursuant to section 6-1602, subsection C, paragraph 1 or for which a cycles of concentration adjustment was granted pursuant to section 6-1602, subsection C, paragraph 2, the percentage of water served to the tower during the year that was reclaimed water.

c. For all fully operational cooling towers subject to cycles of concentration requirements under section 6-1602, subsection A:

i. The total quantity of blowdown water discharged from the cooling towers for each month or partial month when the facility was generating electricity during the calendar year.

ii. The total quantity of make-up water used at cooling towers for each month or partial month when the facility was generating electricity during the calendar year.

iii. The weighted average concentration of total dissolved solids or other conservative mineral constituent in make-up water and blowdown water at the cooling towers for each month or partial month when the facility was generating electricity during the calendar year, either:

1) Determined by direct analysis, or

2) Calculated based on average monthly electrical conductivity readings if the following conditions have been met: (a) correlations between electrical conductivity and total dissolved solids or between electrical conductivity and another conservative mineral constituent have been established over a period of one year or more in make-up and blowdown water and (b) documentation of these correlations has been provided to the director.

d. For each large-scale steam electric power plant that is exempt from cycles of concentration requirements pursuant to section 6-1602, subsection C, paragraph 1, or for which an adjusted cycles of concentration requirement was granted pursuant to section 6-1602, subsection B or section 6-1602, subsection C, paragraph 2:

i. The total quantity of blowdown water discharged from the cooling tower for each month or partial month when the facility was generating electricity during the calendar year.

ii. The total quantity of make-up water used at the cooling tower for each month or partial month when the facility was generating electricity during the calendar year.

iii. The weighted average concentration of total dissolved solids or other conservative mineral constituent in make-up water and blowdown water at the cooling tower for each month or partial month when the facility was generating electricity during the calendar year, either:

1) Determined by direct analysis, or

2) Calculated based on average monthly electrical conductivity readings if the following conditions have been met: (a) correlations between electrical conductivity and total dissolved solids or between electrical conductivity and another conservative mineral constituent have been established over a period of one year or more in make-up and blowdown water and (b) documentation of these correlation has been provided to the director.

e. The amount of electricity generated each month or each partial month when the facility was generating electricity during the calendar year.

2. All water measurements required in this section shall be made with a measuring device in accordance with ADWR's measuring device rules, A.A.C. R12-15-901, et. seq.

B. Monitoring and Reporting Requirements for Combustion Turbine Electric Power Plants

For calendar year 2017, or the calendar year in which water use first commences, whichever is later, and for each calendar year thereafter until the first compliance date for any substitute monitoring and reporting requirement in the 5MP, an industrial user who uses groundwater at a large-scale electric power plant that is a combustion turbine electric power plant shall include in its annual reports required by A.R.S. § 45-632 the following information for all cooling towers with 250 tons or more of cooling capacity at the facility:

1. Capacity in tons of each cooling tower.

2. For each cooling tower at the facility that is exempt from the requirements of 6-1603, subsection A pursuant to section 6-1603, subsection B, paragraph 2 or for which an alternative blowdown level has been granted, pursuant to section 6-1603, subsection B, paragraph 2, the percentage of water served to the cooling tower during the year that was reclaimed water.

3. The quantity of water from any source, specified by source, that was used for make-up water on an annual basis during the calendar year as measured with a measuring device in accordance with ADWR's measuring device rules. A.A.C. R12-15-901, et seq.

4. The quantity of water that was blown down on a annual basis during the calendar year as measured with a measuring device in accordance with ADWR's measuring device rules. A.A.C. R12-15-901, et seq.

5. The average annual concentrations of silica, total hardness or other approved limiting constituent established under section 6-1603, subsection B, paragraph 2 or 3, in make-up and blowdown water during the calendar year, reported in mg/L or other measurement units established under section 6-1603, subsection B, paragraph 2 or 3, and either:

a. Determined by direct analysis; or

b. Calculated based on average monthly electrical conductivity readings for those portions of each month when cooling towers were fully operational if the following conditions have been met: (a) correlations between electrical conductivity and silica, between electrical conductivity and total hardness or between electrical conductivity and another approved limiting constituent established pursuant to section 6-1603

subsection B, paragraph 2 or 3, have been established over a period of one year or more in make-up and blowdown water; and (b) documentation of these correlations has been provided to the director.

6.17 INDUSTRIAL CONSERVATION REQUIREMENTS AND MONITORING AND REPORTING REQUIREMENTS FOR LARGE-SCALE COOLING FACILITIES

6-1701 Definitions

In addition to the definitions set forth in Chapters 1 and 2 of Title 45 of the Arizona Revised Statutes and section 6-1301 of this chapter, unless the context otherwise requires, the following words and phrases used in section 6-1702 and 6-1703 shall have the following meanings:

1. *"Blowdown water" means water discharged from a cooling tower recirculating water stream to control the buildup of minerals or other impurities in the recirculating water.*

2. *"Conservative mineral constituent" means a component of recirculating water in a cooling tower, the concentration of which is not significantly modified by the addition of treatment chemicals.*

3. *"Cycles of concentration" means the ratio of the concentration of a conservative mineral constituent or electrical conductivity in the blowdown water to the concentration of this same constituent or electrical conductivity in the make-up water.*

4. *"Reclaimed water-served cooling tower" means a cooling tower served by a make-up water supply which on an annual average basis consists of 50 percent or more reclaimed water.*

5. *"Fully operational cooling tower" means a cooling tower that is functioning to dissipate heat.*

6. *"Large-scale cooling facility" means a facility that has control over cooling operations with a total combined cooling capacity greater than or equal to 1,000 tons. For the purposes of this definition, the minimum cooling tower size which shall be used to determine total facility cooling capacity is 250 tons. A large-scale cooling facility does not include a large-scale power plant that utilizes cooling towers to dissipate heat.*

7. *"Large-scale power plant" means an industrial facility that produces or is designed to produce more than 25 megawatts of electricity.*

8. *"Limiting constituent" means a chemical, physical, or biological constituent present in recirculating cooling tower water, which, due to potential physical or biological factors or due to potential exceedence of any federal, state, or local environmental standards upon discharge as blowdown, should not be allowed to accumulate in recirculating cooling tower water above a certain concentration.*

9. *"Make-up water" means the water added back into the cooling tower recirculating water stream to replace water lost to evaporation, blowdown, or other mechanisms of water loss.*

6-1702 Conservation Requirements

A. Conservation Requirements for Large-Scale Cooling Facilities

Beginning on January 1, 2017, or upon commencement of water use, whichever occurs later, and continuing thereafter until the first compliance date for any substitute conservation requirement in the 5MP, an industrial user who uses water at a large-scale cooling facility shall comply with the following requirement:

Each fully operational cooling tower with greater than or equal to 250 tons of cooling capacity at the facility shall achieve a cycles of concentration level that results in blowdown water being discharged at an average annual minimum of either 120 milligrams per liter (mg/L) silica or 1,200 mg/L total hardness, whichever is reached first.

B. Exemptions and Alternative Blowdown Standards

1. *The requirement set forth in subsection A of this section does not apply to a large-scale cooling facility in any year in which 100 percent of facility blowdown water is beneficially reused.*

2. *The requirement set forth in subsection A of this section does not apply to any reclaimed water-served cooling tower at a large-scale cooling facility during the first 12 consecutive months in which more than 50 percent of the water supplied to the cooling tower is reclaimed water.*

   After the 12-month period expires, the person using water at the reclaimed water-served cooling tower may apply to the director to use an alternative blowdown level from that required in subsection A of this section if compliance with the blowdown requirement would not be possible due to the presence of a limiting constituent other than silica or total hardness in the reclaimed water supplying the cooling tower. To apply for an alternative blowdown level to address such a limiting constituent, an industrial user shall submit a request in writing to the director which includes the following information:

   a. *The limiting constituent other than silica or total hardness that is present in the reclaimed water supplying the cooling tower which results in the need to blow down a greater annual volume of water than that required under subsection A of this section.*

   b. *Documentation describing the concentration at which this limiting constituent should be blown down and the reason for the alternative blowdown level.*

   The director shall grant the request if the director determines that the presence of a limiting constituent other than silica or total hardness in the reclaimed water supplying the cooling tower results in the need to blow down a greater annual volume of water than that required under subsection A of this section. Any alternative blowdown level granted pursuant to this paragraph shall apply only while the cooling tower qualifies as a reclaimed water-served cooling tower.

3. *An industrial user may apply to the director to use an alternative blowdown level from that required in subsection A of this section if compliance with the blowdown requirement would likely result in damage to cooling towers or associated equipment or*

exceedence of federal, state or local environmental discharge standards because of the accumulation of a limiting constituent other than silica or total hardness in recirculating water. To apply for an alternative blowdown level for such a limiting constituent, an industrial user shall submit a request in writing to the director which includes the following information:

a. Historic, current and projected water quality data for the relevant limiting constituent(s).
b. Documentation describing the potential damage to cooling towers or associated equipment, or documentation of environmental standards that are likely to be exceeded, whichever applies.

The director shall grant the request if the director determines that compliance with the blowdown level set forth in subsection A of this section would likely result in damage to cooling towers or associated equipment or exceedence of federal, state, or local environmental discharge standards because of the accumulation of a limiting constituent other than silica or total hardness in recirculating water.

6-1703 Monitoring and Reporting Requirements

For calendar year 2017, or the calendar year in which water use first commences, whichever is later, and for each calendar year thereafter until the first compliance date for any substitute monitoring and reporting requirement in the 5MP, an industrial user who uses groundwater at a large-scale cooling facility shall include in its annual reports required by A.R.S. § 45-632 the following information for all cooling towers with 250 tons or more of cooling capacity at the facility:

1. Capacity in tons of each cooling tower.

2. Number of days per month that each cooling tower was fully operational.

3. For each cooling tower at the facility that is exempt from cycles of concentration requirements under section 6-1702, subsection B, paragraph 2 or for which an alternative blowdown level has been granted pursuant to section 6-1702, subsection B, paragraph 2, the percentage of water served to the cooling tower during the year that was reclaimed water.

4. The quantity of water from any source, specified by source, that was used for make-up water on a monthly basis during the calendar year as measured with a measuring device in accordance with ADWR's measuring device rules. A.A.C. R12-15-901, et seq.

5. The quantity of water that was blown down on a monthly basis during the calendar year as measured with a measuring device in accordance with ADWR's measuring device rules. A.A.C. R12-15-901, et seq.

6. The average monthly concentrations of silica, total hardness or other approved limiting constituent established under section 6-1702, subsection B, paragraph 2 or 3, in make-up and blowdown water for those portions of each month when cooling towers were fully operational during the calendar year, reported in mg/L or other measurement units established under section 6-1702, subsection B, paragraph 2 or 3, and either:

a. Determined by direct analysis; or

b. Calculated based on average monthly electrical conductivity readings for those portions of each month when cooling towers were fully operational if the following conditions have been met: (a) correlations between electrical conductivity and silica, between electrical conductivity and total hardness or between electrical conductivity and another approved limiting constituent established pursuant to section 6-1702 subsection B, paragraph 2 or 3, have been established over a period of one year or more in make-up and blowdown water; and (b) documentation of these correlations has been provided to the director.

6.18 INDUSTRIAL CONSERVATION REQUIREMENTS AND MONITORING AND REPORTING REQUIREMENTS FOR NEW LARGE LANDSCAPE USERS

6-1801 Definitions

In addition to the definitions set forth in Chapters 1 and 2 of Title 45 of the Arizona Revised Statutes and section 6-1301 of this chapter, unless the context otherwise requires, the following words and phrases used in sections 6-1802 and 6-1803 shall have the following meanings:

1. "Direct use reclaimed water" means reclaimed water that is transported directly from a facility regulated pursuant to Title 49, Chapter 2, Arizona Revised Statutes, to an end user. Direct use reclaimed water does not include reclaimed water that has been stored pursuant to Title 45, Chapter 3.1, Arizona Revised Statutes.

2. "Landscapable area" means the entire area of a lot less any areas covered by structures, parking lots, roads or any other area not physically capable of being landscaped.

3. "New large landscape user" means a non-residential facility that has a water-intensive landscaped area in excess of 10,000 square feet and that has landscaping planted and maintained after January 1, 1990, or bodies of water, other than bodies of water used primarily for swimming purposes, filled and maintained after January 1, 1990, or both. The following facilities are excluded from this definition: schools, parks, cemeteries, golf courses, common areas of housing developments and public recreational facilities.

4. "Reclaimed water recovered within the area of impact" means reclaimed water that has been stored pursuant to Title 45, Chapter 3.1, Arizona Revised Statutes, and recovered within the area of impact of storage. For the purposes of this definition, "area of impact" has the same meaning as prescribed by A.R.S. § 45-802.01.

5. "Water-intensive landscaped area" means, for the calendar year in question, all of the following areas within a non-residential facility:

a. Any area of land that is planted primarily with plants not listed in ADWR's Low Water Use/Drought Tolerant Plant List for PRAMA, http://www.azwater.gov/azdwr/WaterManagement/AMAs/PrescottAMAFourthManagementPlan.htm including any modifications to the list, and watered with a permanent water application system, except any area of land that is watered exclusively with direct use reclaimed water or reclaimed water recovered within the area of impact.

b. The total water surface area of all bodies of water within the facility, except bodies of water used primarily for swimming purposes, bodies of water filled and refilled exclusively with direct use reclaimed water or reclaimed water recovered within the area of impact, and bodies of water allowed under an interim water use permit pursuant to A.R.S. § 45-133 if the bodies of water will be filled and refilled exclusively with direct use reclaimed water or reclaimed water recovered within the area of impact after the permit expires.

6-1802 Conservation Requirements

A. Conservation Requirements for New Large Landscape Users that are not Hotels or Motels

Beginning on January 1, 2017, and continuing thereafter until the first compliance date for any substitute conservation requirement in the 5MP, the water-intensive landscaped area within a new large landscape user that is not a hotel or motel shall not exceed the greater of the following: 1) an area calculated by adding 10,000 square feet plus 20 percent of the facility's landscapable area in excess of 10,000 square feet; or 2) the total water surface area of all bodies of water within the facility that are allowed under A.R.S. § 45-131, et seq., and that qualify as water-intensive landscaped area.

B. Conservation Requirements for New Large Landscape Users that are Hotels or Motels

Beginning on January 1, 2017, and continuing thereafter until the first compliance date for any substitute conservation requirement in the 5MP, the water-intensive landscaped area within a new large landscape user that is a hotel or motel shall not exceed the greater of the following: 1) an area calculated by adding 20,000 square feet plus 20 percent of the facility's landscapable area in excess of 20,000 square feet; or 2) the total water surface area of all bodies of water within the facility that are allowed under A.R.S.§ 45-131, et seq, and that qualify as water-intensive landscaped area.

C. Waiver of Conservation Requirements for the Use of 100 Percent Wastewater

The conservation requirements set forth in subsections A and B of this section shall not apply to a new large landscape user in any year in which all of the water used for landscaping purposes within the facility is wastewater.

6-1803 Monitoring and Reporting Requirements

For calendar year 2017, or the calendar year in which the facility first begins to use water, whichever is later, and for each calendar year thereafter until the first compliance date for any substitute monitoring and reporting requirement in the 5MP, an industrial user that applies groundwater to a new large landscape user shall include the following information in its annual reports required by A.R.S. § 45-632:

1. The total quantity of water from any source, including reclaimed water, withdrawn, diverted or received for use on the facility during the calendar year for landscape watering purposes, including bodies of water filled or refilled during the calendar year, as measured with a measuring device in accordance with ADWR's measuring device rules, A.A.C. R12-15-901, et seq.

2. The total amount of landscapable area within the facility.

3. *The total amount of water-intensive landscaped area at the facility broken down into the area planted primarily with plants not listed in ADWR's Low Water Use/Drought Tolerant Plant List for PRAMA (except any area watered exclusively with direct use reclaimed water or reclaimed water recovered within the area of impact) and the surface area of all bodies of water (except bodies of water used primarily for swimming purposes, bodies of water filled and refilled exclusively with direct use reclaimed water or reclaimed water recovered within the area of impact, and bodies of water allowed under an interim water use permit if the bodies of water will be filled and refilled exclusively with direct use reclaimed water or reclaimed water recovered within the area of impact after the permit expires).*

6.19 INDUSTRIAL CONSERVATION REQUIREMENTS FOR NEW LARGE INDUSTRIAL USERS

6-1901 Definitions

In addition to the definitions set forth in Chapters 1 and 2 of Title 45 of the Arizona Revised Statutes and section 6-1301of this chapter, the phrase "new large industrial user" as used in section 6-1902 shall mean an industrial user that begins using more than 100 acre-feet of water per year for industrial purposes after January 1, 2015.

6-1902 Conservation Requirements

A. *No later than 180 days after receiving official notice of these conservation requirements, or within 180 days after the end of the first calendar year in which the facility first uses more than 100 acre-feet of water for industrial purposes, whichever is later, a new large industrial user shall submit to the director a plan to improve the efficiency of water use by the facility. The plan shall:*

1. *Specify the level of water conservation that can be achieved assuming the use of the latest commercially available technology consistent with reasonable economic return;*

2. *Identify water uses and conservation opportunities within the facility, addressing water used for the following categories as appropriate: landscaping; space cooling; process-related water use, including recycling; and sanitary and kitchen uses;*

3. *Describe an ongoing water conservation education program for employees; and*

4. *Include an implementation schedule.*

B. *If a person required to submit a plan under subsection A of this section is required to submit a conservation plan under another section of this chapter, the person may combine the plans into a single conservation plan.*

Bibliography

ADWR. (2011). *Draft Verson 2 Demand and Supply Assessment, Prescott Active Management Area.* ADWR.

CHAPTER SEVEN:
WATER QUALITY

7.1 INTRODUCTION

Water quality is an important component of Prescott Active Management Area (PRAMA) water supply management. ADWR's role in water quality relates to the impacts of water quality on available water supplies. Protecting and managing water quality maximizes the overall quantity of usable water, and matching the best use to the quality of water is a significant aspect of meeting ADWR's water management objectives. This chapter describes ADWR's role and authority in meeting groundwater quality management objectives during the fourth management period and addresses water quality impacts on the management of water supplies in the PRAMA.

ADWR's responsibilities in groundwater quality include enhancement of groundwater quality protection programs, assistance in the clean-up of contaminated areas, and assistance in matching water quality with the highest beneficial use. During the fourth management period, ADWR will continue to play a role in water quality issues.

In general, groundwater in the PRAMA is of acceptable quality for most uses. Most of the groundwater supplies in the PRAMA meet federal and state drinking water standards, though contaminant levels exceed primary safe drinking water standards in a few areas. Groundwater contamination in the PRAMA is generally associated with leaking underground storage tanks at gas stations. These sites are monitored to ensure that contaminants do not adversely impact nearby groundwater quality. The PRAMA contained no specific contaminated areas identified on the Water Quality Assurance Revolving Fund (WQARF) Registry or the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) National Priority List (NPL) until August 2008, when the United State Environmental Protection Agency (USEPA) added the Iron King Mine and Humboldt Smelter site to the NPL.

7.2 GOALS AND OBJECTIVES

The use of remediated groundwater has not been a prevalent issue in the PRAMA as it is in other AMAs; however, the PRAMA must be prepared to handle issues related to remediated water in the Fourth Management Plan. Spills and other accidental releases of contaminants cannot be predicted, putting greater pressures on water resources if the release were to impact groundwater. Increased development raises the likelihood for releases of contaminants to groundwater.

To implement its groundwater quality management responsibilities, ADWR will "coordinate and confer" with the Arizona Department of Environmental Quality (ADEQ) regarding "water plans, water resource planning, water management, wells, water rights and permits, and other appropriate provisions of Title 45 pertaining to remedial investigations, feasibility studies, site prioritization, selection of remedies and implementation of the WQARF program pursuant to title 49, chapter 2, article 5." A.R.S. § 45-105(B)(4)(c).

ADWR's goals and objectives for groundwater quality management for the fourth management period are the following:

- to ensure that remediation of contaminated groundwater uses the minimal amount of groundwater necessary to facilitate the objectives of each remedial action project.

- to ensure that end uses of remediated groundwater minimize groundwater withdrawals and are consistent with the safe-yield goal. Toward this end, ADWR will favor end uses that minimize changes in groundwater storage, such as reinjection and recharge, over those that reduce groundwater in storage. Where remediated groundwater cannot be practicably or cost-effectively re-injected or recharged, ADWR will emphasize replacing existing groundwater uses with

remediated water and discourage new permanent uses which would not have occurred without the poor quality groundwater accounting and which would continue to rely on groundwater after the poor quality groundwater is no longer available.

ADWR's objectives are designed to ensure that remedial action projects are not an impediment to achieving the safe-yield management goal for the PRAMA and that cleanups are performed in a prudent and efficient manner from a water management perspective.

7.3 STATUTORY PROVISIONS

ADEQ is the agency primarily responsible for regulating water quality in Arizona. ADWR also has certain limited responsibilities in this area. Statutory provisions pertaining to ADWR's limited authority to regulate groundwater quality are discussed below.

The Code grants ADWR authority to regulate groundwater. Under the Code, ADWR has the following authority and responsibilities relating to water quality:

- "[T]he director may ... [f]ormulate plans and develop programs for the practical and economical development, management, conservation and use of surface water, groundwater and the watersheds in this state, including the management of water quantity and quality." A.R.S. § 45-105(A)(1).

- "[T]he director may ... [c]onduct feasibility studies and remedial investigations relating to groundwater quality and enter into contracts and cooperative agreements under § 104 of the comprehensive environmental response, compensation, and liability act [CERCLA] of 1980 (P.L. 96-510) to conduct such studies and investigations." A.R.S. § 45-105(A)(15).

- For the fourth management period, the director "[m]ay include in each plan, if feasible, in cooperation with the department of environmental quality, an assessment of groundwater quality in the active management area and any proposed program for groundwater quality protection." A.R.S. § 45-567(A)(6).

- "[T]he director shall consult with the department of environmental quality on water quality considerations in developing and implementing management plans under this article." A.R.S. § 45-573.

WQARF legislation, revised in 1997, expanded ADWR's role in water quality management. ADWR's responsibilities and authority under WQARF are as follows:

- "[T]he director of water resources, in consultation with the director of environmental quality, may inspect wells for vertical cross-contamination of groundwater by hazardous substances and may take appropriate remedial actions to prevent or mitigate the cross-contamination ...." A.R.S. § 45-605(A).

- "[T]he director [of water resources] shall notify an applicant for a permit or a person who files a notice of intent to drill a new or replacement well if the location of the proposed well is within a sub-basin where there is a site on the registry [with existing or anticipated future groundwater contamination presenting a risk of vertical cross-contamination by the well]." The director is also required to adopt rules relating to vertical cross-contamination for new and replacement wells. A.R.S. § 45-605(E).

- "[T]he director of environmental quality and the director of water resources shall coordinate their efforts to expedite remedial actions, including obtaining information pertinent to site investigations, remedial investigations, site management and beneficial use of remediated water." A.R.S. § 49-290.01(C).

- The director of water resources may waive permits, approvals or authorizations if they "unreasonably limit the completion of a remedial action." A.R.S. § 49-290.01(A). The director of water resources may also waive any regulatory requirement under title 45 if the requirement conflicts with the selected remedy in a remedial action as long as the waiver does not "result in adverse impacts to other land and water users." A.R.S. § 49-290.01(D).

- "The department of water resources shall include in its management plans ...provisions to encourage the beneficial use of groundwater that is withdrawn pursuant to approved remedial action projects ...." Laws 1997, Ch. 287, § 51(A). In order to encourage the beneficial use of remediated groundwater, "the department of water resources shall account for groundwater withdrawn pursuant to approved remedial action projects under CERCLA or title 49, Arizona Revised Statutes, consistent with the accounting for surface water" for purposes of determining compliance with management plan conservation requirements. Laws 1997, Ch. 287, § 51(B).

- "For each calendar year until 2025, the use of up to an aggregate of sixty-five thousand acre-feet of groundwater withdrawn within all active management areas pursuant to approved remedial action projects under CERCLA or title 49, Arizona Revised Statutes, shall be considered consistent with the management goal of the active management area as prescribed in section § 45-576 subsection I, paragraph 2, Arizona Revised Statutes." Laws 1997, Ch. 287, § 52(A). Additionally, in the fourth management period, twenty-five percent (25%) of the total volume of groundwater withdrawn pursuant to remedial action projects and in excess of the aggregate volume of sixty-five thousand acre-feet shall be considered consistent with the management goal of the AMA. Laws 1997, Ch. 287, § 52(B).

- "The department of environmental quality and the department of water resources shall develop a method of sharing data, including cooperative data base development and integration between the departments, that will provide the departments with the information necessary to protect the resources of the state." Laws 1997, Ch. 287, § 53.

- "The directors of environmental quality and water resources shall enter into an agreement to coordinate the well inspection and remediation programs and to rank wells within an area of contamination according to each well's potential to act as a conduit to spread contamination and to determine the appropriate remedial action regarding the wells with a potential to act as a conduit, including well reconstruction, well abandonment or no action." Laws 1997, Ch. 287, § 54.

7.4 THE REGULATION OF GROUNDWATER QUALITY IN ARIZONA

To understand ADWR's role in regulating groundwater quality, it is important to understand the broad framework of laws and programs impacting both groundwater and surface water quality. Since groundwater quantity and quality issues are so interrelated, ADEQ and ADWR work together to prevent and mitigate groundwater quality and quantity problems. ADEQ has primary responsibility for protecting the State's groundwater and surface water quality, while ADWR secondarily manages groundwater quality concerns. This section will discuss the regulatory agencies responsible for administering laws impacting groundwater and surface water quality as well as the federal laws and state programs impacting groundwater quality and secondarily surface water quality.

7.4.1 Water Quality Regulatory Agencies

Water quality protection programs in Arizona are based on both federal and state law and are primarily administered by either ADEQ or the United States Environmental Protection Agency (EPA) Region IX. ADEQ has the responsibility to administer state water quality programs pursuant to state statutes and to administer federal water quality programs for which the EPA has delegated its authority to the state, referred to as state primacy. EPA has the responsibility to administer federal water quality programs pursuant to federal statutes. The EPA delegates its authority to states where the state demonstrates that it can adequately administer the program and the federal statute allows delegation of the authority.

ADEQ has authority pursuant to the Environmental Quality Act (EQA) of 1986 (A.R.S. § 49-101 *et seq*.) to set water quality standards and to regulate discharges that have the potential to impact the quality of groundwater by requiring that discharges are subject to aquifer protection permits (APP). ADEQ has authority under the Clean Water Act (CWA) to set Arizona's surface water quality standards and to certify that discharges subject to federal permits do not violate state water quality standards.

EPA Region IX delegated authority to administer the CWA National Pollutant Discharge Elimination System (NPDES) permit and the pretreatment program to Arizona in 2002. The ADEQ program is called the Arizona Pollutant Discharge Elimination System (AZPDES).The United States Army Corps of Engineers (Corps), Los Angeles District, retains authority to administer CWA permits for the discharge of dredge or fill materials in Arizona's waters. EPA Region IX also has authority to require groundwater monitoring and remediation in accordance with CERCLA.

7.4.2 Federal Laws Impacting Groundwater Quality

The Safe Drinking Water Act (SDWA) is the primary federal law regulating drinking water quality which including groundwater. The CWA, which regulates surface water, also impacts groundwater quality. CERCLA and the Resource Conservation and Recovery Act (RCRA) impact groundwater management through the regulation of hazardous waste and sites contaminated by hazardous waste. The following is a brief overview of these federal laws and their impacts on ADWR's water quality management.

7.4.2.1 Safe Drinking Water Act

The SDWA was enacted in 1974 to regulate drinking water. ADEQ has been delegated authority by the EPA to implement the SDWA and "to ensure that all potable water distributed or sold to the public through public and semi-public water systems is free from unwholesome, poisonous, deleterious, or other foreign substances and filth or disease causing substances or organisms."
A.R.S. § 49-351(A).

Although ADWR does not regulate drinking water quality, the presence of contaminants in groundwater does negatively impact water quality for municipal providers and poses significant water management issues for drinking water systems.

7.4.2.2 Clean Water Act

The CWA, first passed in 1972, is the comprehensive federal statute regulating surface water quality. It provides for area-wide, long-range planning processes to mitigate water quality control problems in selected areas which result from urban and industrial wastewater. Because such planning processes provide a comprehensive review of wastewater treatment and reuse options, ADWR participates in such planning and provides technical assistance to local councils of government who administer the plans.

7.4.2.3 Comprehensive Environmental Response, Compensation and Liability Act

CERCLA and the Superfund Amendments and Reauthorization Act, commonly referred to as the federal Superfund program, authorize investigation and remediation of groundwater contaminated by releases of hazardous substances. In Arizona, CERCLA establishes a comprehensive response program which is

administered by ADEQ in cooperation with the EPA. ADWR also plays an advisory role in this process. ADWR regularly participates in CERCLA program activities. ADWR's concern regarding CERCLA sites is that any groundwater that is withdrawn and remediated must be put to reasonable and beneficial use. ADWR may participate on CERCLA technical committees and serve in an advisory capacity for monitoring and extraction well installation, source control projects, and permitting.

7.4.2.4 Resource Conservation and Recovery Act

RCRA established a national hazardous waste management program in 1976. Under RCRA, hazardous waste permits are issued for the treatment, storage, and disposal (TSD) of hazardous wastes. Individual permits issued to these facilities specify design, performance, and operational standards which include groundwater monitoring. Hazardous waste facilities also undergo a closure process once operations are reduced or terminated. Moreover, corrective action may be required at TSD facilities and may include groundwater monitoring and remediation.

ADEQ has been delegated authority for the implementation of RCRA requirements in Arizona. ADWR's participation at RCRA sites is important for water management activities, particularly in regard to well siting, use permits, and end use issues.

7.4.3 ADEQ Programs that Impact ADWR Groundwater Quality Activities

The EQA established the ADEQ and created a strong and comprehensive water quality management structure. ADEQ's programs that protect groundwater resources include water quality assessments, groundwater monitoring, pollutant discharge, permitting activities, and remediation activities. The following are selected water quality protection programs which fall under the jurisdiction of ADEQ and have a direct impact on ADWR activities.

7.4.3.1 Aquifer Protection Program

The most comprehensive ADEQ groundwater protection program is the Aquifer Protection Program (APP), established by the EQA in 1986 and implemented by rule in 1989. An individual or general permit is required for any person who discharges or who owns or operates a facility that discharges a pollutant from a facility either directly into an aquifer or to the land surface or the vadose zone in such a manner that there is a reasonable probability that the pollutant will reach an aquifer. A.R.S. §§ 49-201(11), 49-241. ADWR may coordinate with ADEQ to review APP applications for potential harmful water quality impacts on groundwater conditions. ADEQ advises ADWR of each APP application received for a facility that is an underground storage and recovery project. One of the conditions for the issuance of an underground storage facility permit is that ADEQ must determine that the facility is not in a location which will result in pollutants being leached to the groundwater table so as to cause unreasonable harm. A.R.S. § 45-811.01(C). Facilities exempt from APP provisions may be required by ADWR, in consultation with ADEQ, to meet other requirements to mitigate harmful water quality impacts to the aquifer.

7.4.3.2 Wellhead Protection Program

An important addition to Arizona's groundwater protection program has been the development of the Wellhead Protection Program which fulfills federal requirements of section 1428 of the SDWA by designating Wellhead Protection Areas around public drinking water systems. The Wellhead Protection Program is a voluntary program which encourages the protection of all wells, not just public drinking water system wells. Local entities that have the authority to control land use and exercise other management options can implement wellhead protection, therefore encouraging the creation of local programs.

7.4.3.3 Reuse Permits

Reuse permits are issued by ADEQ to facilities which provide wastewater for reuse. A reuse permit specifies the amount of reclaimed water to be reused and its chemical quality. ADEQ wastewater reuse rules (A.A.C. R18-9-701 *et seq.*) set the criteria for the use of treated reclaimed water, or reclaimed water,

for purposes such as agricultural irrigation, turf irrigation, and recharge. The current reuse rules prescribe numeric reclaimed water quality criteria and monitoring requirements for specific reuse applications. In general, these rules prescribe allowable limits for pH, total fecal coliform, turbidity, enteric viruses, and certain parasites. Reuse may be limited depending on the quality of source water and the intended use.

Wastewater reuse rules undergo periodic updating through ADEQ's rule making process. ADWR reviews any proposed changes to the wastewater reuse rules to ensure the protection of public health and groundwater supplies while maximizing the use of a significant renewable water supply. ADWR evaluates reclaimed water reuse permits issued by ADEQ and encourages the use of treated reclaimed water where appropriate.

7.4.3.4 Underground Storage Tanks

ADEQ's Underground Storage Tank (UST) program was developed to ensure the proper operation of underground storage tanks and to prevent and remediate releases. Under state regulation and RCRA amendments, the UST program consists of notification requirements, technical standards for new and existing USTs, leak detection and closure criteria, corrective actions for remediation, and financial responsibility demonstrations. Leaking USTs in a concentrated area can present detrimental impacts on groundwater quality and supplies.

ADWR has the authority to issue poor quality groundwater withdrawal permits for water contaminated by leaking USTs. ADWR can provide guidance for leaking UST site remediation projects to ensure the beneficial use of remediated water.

7.4.3.5 Water Quality Assurance Revolving Fund

The WQARF Program, sometimes referred to as the state Superfund program, was created as part of the EQA. WQARF monies are used to protect the waters of our state against hazardous substances, and may be used in conjunction with federal funds. Funds can be used for statewide water quality monitoring, health and risk assessment studies, and remediating hazardous substances which threaten the waters of the state. Mitigation of non-hazardous substances is also allowed under specified conditions. A.R.S. § 49-286. ADEQ has developed a list of environmentally threatened sites which qualify for WQARF monies. Funds are used at those sites to mitigate existing contamination or to prevent further spread of pollutants which may threaten Arizona's water supplies. A registry of sites is maintained by ADEQ. Sites are added to the registry based on criteria such as the degree of risk to the environment and other available funding sources.

ADEQ follows a process for management and cleanup of WQARF sites that consists of site identification and characterization, site prioritization, remedy selection, identification of end uses, implementation and monitoring, and closure. ADWR will coordinate with ADEQ in the planning and implementation of any groundwater cleanup actions under WQARF in the PRAMA.

7.4.3.6 Water Infrastructure Finance Authority

In 1989, the Arizona Legislature created the Wastewater Management Authority to administer funds granted to the state pursuant to the federal CWA. These funds, which required a 20 percent state match, are loaned to wastewater treatment systems in the state for assistance in meeting requirements of the CWA. ADEQ made loans for this purpose from monies in the ADEQ wastewater treatment revolving fund. In 1997, this administrative body was amended by the Legislature and renamed the Water Infrastructure Finance Authority (WIFA).

The authority for WIFA was expanded to make loans available to drinking water systems in addition to wastewater treatment systems for assistance in meeting requirements of the SDWA. ADWR participates on

the advisory board which oversees the WIFA and has an interest in viability of water systems and SDWA compliance.

7.4.4 ADWR Programs Related to Groundwater Quality

ADWR protects groundwater quality by considering groundwater quality issues in its permitting process and water quantity management programs. As a result of WQARF reform legislation of 1997, ADWR has increased its responsibility in its program to coordinate and provide assistance with WQARF activities. Among other things, the legislation provides for:

- annual funding for ADWR WQARF activities;
- database development and coordination with ADEQ;
- groundwater withdrawn pursuant to certain cleanups to be accounted for in the same manner as surface water for the purpose of determining compliance with conservation requirements;
- amendment of the Assured Water Supply (AWS) Rules;
- advisory participation by ADWR in site assessment, remediation, management, operation, and planning strategies;
- a WQARF Advisory Board on which ADWR has a seat; and
- a well inspection program through which wells that are contributing to vertical cross-contamination may be identified and modified.

ADWR's existing permits and programs which consider groundwater quality protection are discussed in the following section.

7.4.4.1 Poor Quality Groundwater Withdrawal Permits

Appropriate use of poor quality groundwater conserves the existing supply of potable groundwater. ADWR issues poor quality groundwater withdrawal permits to allow the withdrawal of groundwater which, because of its quality, has no other beneficial use at the present time. A.R.S. § 45-516. Withdrawal permits are issued by ADWR, and the withdrawal must be consistent with the AMA management plans. Permits are usually issued in conjunction with CERCLA, WQARF, or leaking UST sites for pump and treat operations. To increase the appropriate uses of poor quality groundwater during the fourth management period, ADWR will continue to encourage matching poor quality groundwater with beneficial uses within the AMA.

As of 2012, no poor quality groundwater withdrawal permits have been issued in the PRAMA.

7.4.4.2 Assured Water Supply

The AWS Program is a consumer protection program that ensures that new subdivisions have a secure supply of water with adequate quality for at least 100 years. Pursuant to A.R.S. § 45-576, before land may be subdivided, the developer of the property must either obtain a Certificate of Assured Water Supply for the subdivision from ADWR, or a written commitment of water service for the subdivision from a city, town, or private water company with a Designation of Assured Water Supply (DAWS).

Pursuant to rules governing the AWS Program set forth at A.A.C. R12-15-701 *et seq.*, in order to establish an AWS, the applicant must prove that a supply of water is physically, legally, and continuously available for the 100-year period to meet the demands of the development that will be the subject of the certificate, or in the case of a designation, to meet current and committed demands of the water provider for the 100-year period. The applicant must also establish that projected water use will be consistent with achievement of the management goal for the active management area and that the applicant has the financial capability

to construct the physical facilities necessary to serve the development. In addition, the applicant must establish that the water supply pledged for AWS purposes is of adequate quality.

In assessing the quality of a groundwater supply pledged for AWS purposes, ADWR works closely with ADEQ to determine whether the groundwater supply meets ADEQ standards for the purposes for which the water is pledged. If the groundwater is not of adequate quality, the applicant may need to find alternative water sources or to expend additional resources treating the groundwater to meet the ADEQ standards.

As of 2012, the City of Prescott is the only entity that has a DAWS in the PRAMA.

7.4.4.3 Underground Water Storage and Recovery

Underground water storage, commonly referred to as artificial recharge, plays an important role in achieving the PRAMA's goal of safe-yield. Recharge projects store surface water that is currently not used directly. Credits for recharged surface water will then be available to water providers and developers to establish an AWS. In addition, recharge of reclaimed water is used as a tool to allow more complete use of that resource.

The underground water storage program is administered by ADWR. Permits must be obtained from ADWR prior to undertaking recharge activities. ADWR coordinates closely with ADEQ to ensure that underground water storage does not adversely impact existing aquifer water quality and does not cause movement of existing groundwater contamination. If reclaimed water is stored underground, the applicant must obtain an APP from ADEQ, in addition to the underground storage permits required from ADWR. APPs specify monitoring requirements to assure that recharge waters are not negatively impacting the native groundwater.

As of 2012, the PRAMA has four permitted underground storage facilities with permitted volumes totaling up to 17,670 acre-feet per year. The facilities are Prescott's Reclaimed Water Recharge Facility at the Prescott Airport, the Town of Prescott Valley's Upper Agua Fria Constructed Facility and Upper Agua Fria Facilities, and Chino Valley's Old Manor Home Facility. Five entities have long-term storage accounts with total recoverable balances totaling more than 30,000 acre-feet as of 2011. The potential volume recoverable per year pursuant to recovery well permits is variable.

7.4.4.4 Well Spacing/Impact Analysis

A.R.S. § 45-598 and ADWR's Well Spacing Rules [R12-15-1301 *et.* seq.] are in place to prevent unreasonable increasing damage to surrounding land or other water users due to the concentration of wells in an AMA. Specifically, these Rules require well impact studies to evaluate the potential for new non-exempt wells and new withdrawals to cause damage to land and other water users due to drawdown, additional regional land subsidence, and migration of poor quality groundwater from a remedial action site. An applicant may submit a hydrologic report to demonstrate the proposed wells impact on surrounding well, but is not automatically required to do so. The director may require the applicant to submit a hydrologic report if it is needed for the director to make a determination under the Rules. The well permit application may be denied if ADWR determines that the proposed well will cause an unreasonable increasing damage on surrounding wells, additional regional land subsidence, or migration of poor quality groundwater.

The Notice of Intention to Drill statute [A.R.S. 45-596] was modified in 2006 to allow the director to deny the drilling of a well if the director determines that withdrawals from the well will cause the migration of contaminated groundwater from a remedial action site to another well, resulting in unreasonably increasing damage to the owner of the well, or persons using water from the well. The statute specifies that the

director shall use the same applicable criteria in the Well Spacing Rules used for wells inside of the AMA in making this determination.

7.4.4.5 Well Construction and Abandonment Requirements and Licensing of Well Drillers

If wells are not constructed, sealed, or abandoned properly they may act as conduits for contaminant flow from the surface to groundwater or between aquifers. ADWR's Rules governing well construction, abandonment, and driller licensing, set forth at A.A.C. R12-15-801 *et. seq.*, are summarized below.

- Minimum well construction and abandonment requirements prevent entry of fluids at and near the surface and minimize the possibilities of migration and inadvertent withdrawal of poor quality groundwater. These requirements also prohibit the use of hazardous materials in the construction of wells.

- Installation, modification, abandonment, or repair of all wells in Arizona must be performed by a driller licensed by ADWR. The licensing procedure includes the administration of written examinations to test the applicant's knowledge of state regulations, hydrologic concepts, and well construction principles and practices.

- Disposal site restriction prevents the use of wells as disposal facilities for any material that may pollute groundwater.

- Special standards may be required by ADWR if the minimum well construction requirements do not adequately protect the aquifer or other water users.

- Open wells must be capped with a water-tight steel plate.

- Except for monitor and piezometer wells, no well shall be drilled within 100 feet of any septic tank system, sewage disposal area, landfill, hazardous waste facility or storage area, or petroleum storage areas and tanks, unless authorized by the director.

Wells drilled prior to the enactment of the Well Construction Rules (effective March 5, 1984) were not required to be constructed in accordance with minimum well construction standards. If a pre-rule well is replaced or modified, however, the new or modified well must meet the current well construction standards. *See A.R.S. § 45-594*.

7.4.4.6 ADWR's Role in the WQARF Program

ADWR's involvement in groundwater remediation has been redefined as a result of a stakeholder process conducted during the second management period, designed to promote groundwater cleanup and groundwater quality management activities at remedial action sites.

Department Activities in the WQARF Site Cleanup and Management Process

ADEQ's WQARF site cleanup and management process and ADWR's role in that process are described in the following discussion.

Site Identification, Prioritization, and Characterization

Existing WQARF sites have been identified and are being managed by ADEQ. Additional sites may be identified in the future based on a preliminary investigation by ADEQ to determine the potential risk to public health, welfare, or the environment. The results of the preliminary investigation will be used by ADEQ for site scoring using a method to be established in rules adopted by the director of ADEQ. The completed preliminary investigation will be used by ADEQ to either make a determination of no further action on a site, or to prepare the site for inclusion on the Site Registry. In this latter case, a Site Registry

report is prepared containing a description of the site, with its geographical boundaries indicated, and the site score.

After a site is added to the Registry, characterization is important because the nature and extent of contamination must be understood before remedies can be selected and implemented. An important part of site characterization is an evaluation of how contamination impacts current and future groundwater uses.

ADWR will assist ADEQ by providing resource data such as well location and groundwater withdrawal records, water rights information, and any other appropriate data recorded by ADWR. Other ADWR roles may include activities such as site inspections and evaluations, review of investigations, field work such as well inspection, identification of potential water management issues, and any other characterization as appropriate. Department computer models may be useful in characterizing groundwater flow patterns.

Remedy Selection
ADEQ has established a list of response actions to be considered when managing a site. Based on the potential impact on current and future water uses, a potential remedy must be evaluated and designed. Each remedy is site-specific. ADWR may assist in defining potential remedies to ensure that the remedy is consistent with ADWR management plans and sound groundwater management practices that are publicly acceptable. Ultimately, ADWR's level of assistance will vary based on the remedy selected.

ADWR is committed to the beneficial use of groundwater withdrawn and treated at WQARF sites, along with other areas that have degraded groundwater quality, and will assist ADEQ with the identification and facilitation of designated end uses for remedial projects. These end uses should be consistent with those determined for existing sites as well as the development of new end uses to match the intended use.

Implementation and Monitoring
The implementation and monitoring phase of a site activity includes construction, startup, monitoring, operation and maintenance, and any other appropriate activities. ADWR will assist ADEQ in this phase through the following activities where appropriate: field work, review of groundwater analyses, appropriate accounting for AWS determinations and for determining compliance with conservation requirements, and any other appropriate activities.

Site Closure
ADEQ must certify that site goals have been attained in order to discontinue cleanup activities. ADWR staff assists in evaluation of sites and certification of site closure. ADWR assists and may need to identify alternative water sources to replace remediated water when sites are closed.

Department Policies for WQARF Site Cleanup and Management
In general, site plans should be consistent with the management goal of the AMA in which the site is located. A.R.S. §§ 49-282.06(F); 45-105(B)(4)(c). Therefore, ADWR will implement policies during the fourth management period for the management and cleanup of remedial sites in cooperation with the ADEQ. These policies will ensure that AMA goals are addressed when remedial actions are planned. ADWR supports proposed remedial projects when they are appropriate, but believes that remedies must make sense from a groundwater management perspective. The principles which will be used to formulate these policies are described below.

Water should be used consistent with water allocation concepts in Title 45
This policy requires that entities using water withdrawn pursuant to cleanups, whether under CERCLA, WQARF, RCRA, voluntary, or other sites, possess appropriate authorities for the use of groundwater (such as permits or water rights).

ADWR supports source control cleanups to protect water sources
Source control, which controls pollution at its source, can be a cost effective and practicable approach to cleanups. Many wells have been rendered unsuitable for potable use due to migrating contamination. Source control projects to protect wells that are threatened by contaminant migration are generally supported by ADWR.

Any groundwater withdrawn must be put to reasonable and beneficial use
Reasonable and beneficial use of groundwater withdrawn is a policy that applies to all cleanups. Any withdrawals of 100 acre-feet or less annually may qualify for *de minimis* status and be exempted from beneficial use requirements, but ADWR will evaluate *de minimis* exemptions from this policy on a case-by-case basis. In the case of leaking UST sites, ADWR generally exempts sites that annually pump less than 10 or 15 acre-feet.

Contaminated groundwater represents a resource that will be important
Even if groundwater is contaminated, it represents a resource that can be used for both potable and non-potable uses. Potable uses must meet the state AWQS and federal drinking water standards which govern public consumption of potable water. ADEQ and the Arizona Department of Health Services intend to develop end use standards for non-potable uses that, if implemented, will make large volumes of groundwater usable again. ADWR will cooperate in the development of non-potable end use standards and will develop policies for appropriate end uses based on the new standards.

Containment remedies that involve massive groundwater withdrawals to achieve regional groundwater flow control are generally inappropriate and will not be supported by ADWR.

Statutory Mandates for ADWR's Participation in the WQARF Program
The 1997 WQARF reform legislation mandates that ADWR implement certain water quality programs and provides for expanded Department involvement in water quality management. ADWR programs and responsibilities based on the 1997 WQARF reform legislation include the following:

- Coordination with ADEQ in Evaluating Proposed Remedial Actions - Pursuant to A.R.S. § 45-105(B)(4)(c), ADWR is required to coordinate and confer with ADEQ in evaluating proposed remedial actions to provide ADEQ with information regarding water resource considerations. ADWR will coordinate and confer with ADEQ prior to ADEQ's approval or denial of a proposed remedial action plans. Once a remedial action plan is approved by ADEQ or the EPA pursuant to CERCLA or Title 49, Arizona Revised Statutes, ADWR will account for remediated groundwater in accordance with Laws 1997, Ch. 287, §§ 51 and 52. Among other things, ADWR will consider the following factors relating to proposed remedial actions in its recommendations to ADEQ:

- Volume of remediated groundwater to be withdrawn - ADWR will encourage remedial actions that use the least amount of groundwater necessary to facilitate a project's remedial goal and will discourage remedial actions that are not prudent and efficient from a groundwater management perspective.

- End uses to which remediated groundwater will be put - ADWR will encourage end uses that minimize groundwater withdrawals and that are consistent with the safe-yield goal because they will result in no change in groundwater storage. Where remediated groundwater cannot be practicably or cost-effectively re-injected or recharged, ADWR will encourage replacing existing groundwater uses with remediated groundwater and discourage new permanent uses which would not have occurred without the incentive to use remediated groundwater and which would continue to rely on groundwater after the remediated groundwater is no longer available.

While circumstances will be evaluated on a case-by-case basis, generally, ADWR's beneficial end use preferences are the following, listed in order from most to least preferred based on the impact on the active management area's management goal and the amount of groundwater in storage:

Neutral to local aquifer
a. Re-inject or recharge in the same local area.
b. Replace existing groundwater uses in the same local area.

Neutral to groundwater basin
c. Re-inject or recharge in the same active management area.
d. Replace existing groundwater uses in the same active management area.

Reduce groundwater in storage
e. Replace existing non-groundwater use in the same active management area.
f. Beneficial uses of water for new purposes.
g. Artificial wetlands or artificial lakes.
h. Dispose to the sewer (unless the resulting reclaimed water is re-injected, recharged or replaces an existing groundwater use).

- Achievement of maximum beneficial use of waters and viability of proposed remedial action

- Remedial actions must assure the protection of public health and welfare and the environment; to the extent practicable, provide for the control, management or cleanup of hazardous substances so as to allow the maximum beneficial use of the waters of the state; and be reasonable, necessary, cost-effective, and technically feasible. A.R.S. § 49-282.06(A).

- Consistency with Title 45 - Groundwater withdrawn pursuant to an approved remedial action must be withdrawn and used consistent with Title 45, Arizona Revised Statutes.

Construction of New Wells in and Near Remedial Action Sites
ADWR will ensure that new or replacement wells in areas of known groundwater contamination are constructed in such a manner that cross-contamination does not occur. ADWR staff will screen Notices of Intent to Drill that are submitted to ensure that wells are properly constructed. ADWR will establish policies and procedures to implement this directive, including procedures to effectively communicate with well owners and drillers. ADWR will coordinate review of these notices of intent with ADEQ.

Abandonment of Wells In and Near WQARF Sites
ADWR staff will review and evaluate Notices of Intent to Abandon to ensure that abandonment of wells is done in accordance with Department rules and that potential for cross-contamination is minimized. ADWR will coordinate review of these notices of intent with ADEQ.

7.5 WATER QUALITY ASSESSMENT

A comprehensive water quality assessment was included in the third management plans. The assessment provided detailed characterization of water quality and an overview of water quality concerns in the PRAMA. A water quality assessment for the 4MP will be qualitative. The following sections discuss goals and objectives of the assessment for the fourth management period and water quality of renewable and groundwater supplies in the PRAMA.

7.5.1 Assessment Goals and Objectives

The primary goal of this Water Quality Assessment is to provide a qualitative evaluation of groundwater and surface water quality conditions in the PRAMA based on the comprehensive assessment performed during the third management period and to identify potential threats to groundwater quality and its link with the regional water supply. The impact of water quality on water resource management has become more important in recent years as water quality standards become more stringent and due to such factors as conjunctive use of water supplies, groundwater management at remediation sites, and increasing levels of public concern.

The municipal, agricultural, and industrial sectors have distinctive demand patterns and water quality requirements. For example, state law prohibits direct use of treated reclaimed water for potable use, but treated reclaimed water is used for turf irrigation, agricultural irrigation, cooling towers, and groundwater recharge. Water high in total dissolved solids (TDS) may be inappropriate for agricultural irrigation but may be usable for some industrial applications. Conversely, water that is high in nitrate could provide a good end use for agriculture, but does not meet potable standards. During the fourth management period, ADWR will continue to encourage matching of water quality characteristics with appropriate end uses while ensuring compliance with applicable laws and rules for each end use.

7.5.2 Renewable Water Supplies

Renewable water supplies include surface water and reclaimed water. All CAP water allocations within the PRAMA have been sold to the City of Scottsdale and are no longer available to the AMA. The quality of renewable water supplies in the PRAMA is discussed in this section.

7.5.2.1 Surface Water

Surface water quality in the PRAMA is generally good. Most surface water is stored at Watson and Willow Lakes, where it has been historically diverted downstream from Granite Creek to the Chino Valley Irrigation District for agricultural irrigation. Surface water throughout the PRAMA contains total dissolved solids (TDS) levels below 500 mg/l (milligrams per liter). TDS concentrations are generally a good indicator of overall water quality. Other constituent parameters of surface water generally meet applicable water quality standards with appropriate treatment.

7.5.2.2 Reclaimed water

A.R.S. § 45-101(4) provides the following definition for ‘reclaimed water’ (effluent):

> water that has been collected in a sanitary sewer for subsequent treatment in a facility that is regulated pursuant to title 49, chapter 2. Such water remains reclaimed water until it acquires the characteristics of groundwater or surface water.

Sanitary sewers are comprised of any pipe or other enclosed conduit that carries any waterborne human wastes from residential, commercial, and industrial facilities. A.R.S. § 45-101(8).

Reclaimed water treated at municipal wastewater treatment plants is a significant source of renewable water supply in the PRAMA. Although not suitable for human consumption without advanced treatment, reclaimed water is suitable for turf irrigation, some agricultural irrigation, sand and gravel washing, and several other industrial applications. Wastewater reuse rules are developed by ADEQ and establish parameters for wastewater reuse options. Wastewater discharges require a NPDES permit to ensure that water quality parameters are being met.

The City of Prescott operates two treatment facilities in the Little Chino Subbasin, the Sundog and Prescott Airport wastewater treatment plants. Treated reclaimed water from the Sundog facility was originally discharged into Watson Lake. This practice was discontinued in 1985, because at that time, NPDES

standards would have required further treatment of the reclaimed water prior to discharge that was considered cost-prohibitive. Subsequently, reclaimed water from both facilities is either delivered for irrigation purposes to Antelope Hills Golf Course, or is recharged on-site at the Prescott Airport facility through infiltration basins. Another wastewater treatment plant is operated by the Town of Prescott Valley in the Agua Fria Subbasin, where treated reclaimed water is discharged into the Agua Fria River pursuant to a NPDES permit issued by the Corps of Engineers, and a constructed underground storage facility permit issued by ADWR.

7.5.3 Groundwater Supplies

Groundwater is one of the most important sources of water in Arizona and in the PRAMA. Groundwater in the PRAMA is generally of acceptable quality for most uses; however, in some areas, it has been degraded due to contamination, and potentially threatening public health and the environment. Contaminants can migrate into areas of potable groundwater due to natural regional groundwater flow patterns, and may be facilitated by groundwater pumping. Many areas of the PRAMA are projected to remain dependent on groundwater pumping, thereby potentially causing migration of contaminants. ADWR's role in managing potential contaminant migration is through involvement in site-specific and non-site-specific water quality management.

Naturally occurring radon has caused the closure of some domestic wells which produce groundwater from granitic aquifers. These instances are primarily confined to individual dry lots located along the mountain front regions of the PRAMA. The EPA is currently in the process of developing a Maximum Contaminant Level (MCL) standard for radon, which could require more domestic well closures. Since radon is a naturally occurring substance within the granitic formations, a remedial response is not possible. Although no major groundwater well fields are threatened by radon exposure, the proliferation of dry lot developments in threatened areas may be impacted to some extent by the adoption of a radon MCL.

Another potential limitation stems from the presence of a large number of septic systems within the PRAMA. In some areas, municipal actions have been taken to help address potential water quality concerns from septic systems. For example, during the last decade the Town of Chino Valley developed new regulations on the installation of septic systems within the Town's municipal service area and also extended septic leachate collection lines and built a new waste water treatment plant. However, there are many areas within the AMA where no municipal water system or waste water treatment facilities exist, and the concentration of individual septic systems which overlap areas of where shallow groundwater pumping from domestic wells also occurs, can pose a health hazard.

The most significant threats to groundwater quality in the PRAMA come from leaking underground storage tanks (USTs) at gas stations and other industrial facilities and from other remedial action sites such as the Iron King Mine-Humboldt smelter CERCLA site near Humboldt-Dewey.

USTs leak volatile organic compounds (VOCs) which could cause a water quality problem if they were to contaminate local aquifers. Prescott's current source of municipal water supply is situated near Chino Valley, which is located a considerable distance away from any leaking UST sources.

According to the ADEQ, ninety-eight UST facilities are in the PRAMA. Of those, 21 facilities had experienced leaks that have impacted groundwater. Twelve cases have been closed, but 9 facilities are still active leaking UST sites. Most of the sites are within the boundaries of the city of Prescott.

The Iron King Mine and Humboldt Smelter Superfund Sites is a 335-acre site near Dewey-Humboldt. The site was placed on the National Priority List in 2008. At that time, EPA initiated a Remedial Investigation (RI) to determine the nature and extent of contamination and to gather sufficient information to select a

remedy. Areas of concern at the Site include tailings, rock piles, retention ponds, mine shafts, smelter ash, and slag. The contaminants of concern are arsenic, lead, and sulfate in site waste piles and soils.

EPA conducted extensive air, soil, and groundwater sampling as part of the RI. Groundwater sampling results indicated that levels of contaminants of concern in public water supplies are below federal drinking water standards of 10 parts per billion (10 ppb), although some private wells have arsenic levels above the federal drinking water standard. The levels of arsenic found in the private wells were similar to those found in groundwater across Arizona and were not indicative of contamination from the site. Nevertheless, a human health and ecological risk assessment indicated that the site could pose health risks to the nearby community and many plant and groups.

The results of the RI indicate that a cleanup action is necessary to protect human health and the environment. As an interim measure, EPA has engaged in a residential yard cleanup at a number of parcels near the site, as well as other cleanup activities on the site. The site cleanup is ongoing and additional investigation work is planned, including groundwater sampling (EPA website, Pacific Southwest, Region 9, Superfund Sites, http://www.epa.gov/region09/superfund/superfundsites.html, April 11, 2012).

7.6 FUTURE DIRECTIONS

ADWR's long range plans for groundwater quality management will focus on two areas: (1) evaluation of groundwater quality issues on a non-site-specific level in order to understand the impact of groundwater quality issues on water resource management on a broader level and (2) preservation of AMA management goals with emphasis on implementing incentives to use remediated groundwater.

7.6.1 Non-Site-Specific Water Quality Management

Non-site-specific groundwater quality management refers to groundwater quality management activities which may occur in general areas located outside of an identified WQARF or CERCLA boundary.

Significant volumes of groundwater in Arizona have been contaminated or degraded to varying degrees due to human activities. Groundwater with high TDS or contaminated with substances such as nitrate and sulfate, generally result from non-point source pollution and can cause significant service problems for water providers and other water users. For example, groundwater containing high TDS can cause scaling problems in cooling towers, is unsuitable for use on some crops, and can cause aesthetic problems in drinking water.

The cessation or decrease of groundwater withdrawals in some areas due to groundwater quality concerns can cause water tables to rise, exposing groundwater to contaminated soils or plume migration to other wells. For example, this condition can exist when soil contaminated by a leaking underground storage tank comes in contact with rising groundwater levels. Contaminated soils associated with landfills may also be inundated by rising water tables. These conditions need to be monitored for impacts on groundwater quality. Ultimately, proper planning will ensure that the impacts of groundwater recharge projects do not contribute to the degradation of aquifer conditions.

To address and mitigate dispersed contamination over large areas, a broader management strategy is needed. Areas which may need more intensive management can include those where public supply wells have been or may be affected by contamination. For instance, areas that are in the vicinity of major population centers or agricultural areas can be affected by contamination, especially if large volumes of groundwater are pumped, creating cones of depression.

The concept of groundwater quality management on a non-site-specific scale (general areas outside of identified site boundaries) will be developed to enhance water management activities in critical areas. The

identification of source groundwater quality and the development of area-specific plans to match groundwater quality with the intended use will become an important aspect in the fourth management period. ADWR intends to study the development of area-specific plans that could employ a combination of strategies to evaluate and mitigate the effects of contamination in critical areas. These plans should be developed in coordination with ADEQ and with affected stakeholders. Any contaminant management on a non-site-specific scale will be voluntary and will not affect rights to groundwater, well ownership, delivery responsibilities, or existing permits.

7.6.2 Preservation of AMA Management Goals

In the fourth management period, ADWR will monitor water levels, subsidence, and effects on local water providers at remedial project sites in areas of intensive pumping, which generally are concentrated within the major urban centers of Arizona. While ADWR supports the remediation of contaminated groundwater, it also seeks to preserve the management goals of each AMA. Water quality management is a lengthy process which will likely continue far beyond the scope of the fourth management period. Long-term continued remedial activities are likely to result in considerable volumes of groundwater being pumped, treated, and subsequently used.

The net effect of continued remediated groundwater withdrawals could result in a substantial increase in the overall volume of groundwater put to use within an Active Management Area (AMA). Without proper coordination in both water resource and groundwater quality management, these actions could seriously jeopardize the goal of safe-yield by creating new groundwater uses. Consequently, ADWR will seek to preserve the intent of the Code and the PRAMA management goals to protect water resources while collaborating with ADEQ to promote groundwater quality management.

7.7 SUMMARY

Groundwater quality has not historically been a significant problem within the PRAMA. Increasing demands on water resources and expanding development, however, could raise the risk of possible future groundwater contamination.

During the fourth management period, ADWR will enact and implement the following provisions as outlined in this chapter, specifically:

- Integration of groundwater quality management into recharge planning and permitting, and the development of incentives to use remediated groundwater where appropriate.

- Evaluation of the need for additional incentives to withdraw and use remediated groundwater within the AMAs throughout the fourth management period in an effort to match quality with beneficial use. This evaluation will include treated groundwater that was contaminated with hazardous, non-hazardous, and naturally occurring substances. Incentives may involve amendments to Arizona Revised Statutes, Title 45, Department rules and policies, or a modification of the management plans.

- ADWR and ADEQ will continue to enter into an Interagency Service Agreement as necessary to establish the responsibilities of ADWR for implementation of the WQARF program, as well as database development and exchange.

ADWR, through its Groundwater Permitting and Wells Section, will work closely with ADEQ to resolve groundwater quantity and quality issues.

ADWR will continue to be involved in other remedial activities such as those associated with Superfund sites. This will ensure that remedial activities meet ADWR's water management objectives and are consistent with the AMA's safe-yield goal.

CHAPTER EIGHT: AUGMENTATION AND RECHARGE

8.1 INTRODUCTION

The purpose of the Augmentation and Recharge Program (ARP) is to encourage the development, delivery, use, and storage of renewable water supplies now and in the future. The ARP, in combination with conservation program efforts, is intended to support achievement of the safe-yield management goal for the PRAMA. Increasing the use of renewable supplies to replace groundwater mining will have the biggest impact on achieving safe-yield in the PRAMA.

For purposes of this chapter, "augmentation" means increasing the availability and use of renewable water supplies, such as reclaimed water, in lieu of groundwater. "Recharge" means storage of excess water (non-groundwater) supplies for future use pursuant to the Underground Water Storage, Savings and Replenishment Act, A.R.S. § 45-801, *et seq*.

Although the PRAMA groundwater management goal of safe-yield applies to the AMA as a whole, the objectives of the ARP during the fourth management period reflect an increased awareness and improved understanding of the importance of water management on a sub-AMA scale. An AMA-wide safe-yield balance between supply and demand of groundwater does not address local concerns regarding groundwater level declines, physical availability issues, and poor groundwater quality, because it allows for substantially variable water level conditions throughout the AMA. The 4MP incorporates a localized focus on water management by taking these site-specific areas into consideration, and proposes solutions to the problems where possible.

8.2 THE ARP

The augmentation and recharge of renewable water resources is a principal mechanism by which the AMA can reach both safe-yield and site-specific goals. In the 4MP, ADWR will use the authorities available and potentially pursue additional authorities to facilitate and encourage the development, efficient use, and recharge of renewable water supplies for the AMA. Additionally, the ARP can be an effective tool to mitigate local water supply problems, depending on where storage and recovery activities occur.

Recharge is an important regulatory tool in the 4MP. While the development and direct use of renewable water supplies is an important component of AMA water management during the fourth management period, underground water storage provides a cost-effective means of storing water that is currently available to the AMA but that has no direct use.

8.2.1 Overview of Recharge and Recovery

Recharge statutes and management plan provisions provide regulations under which water may be stored and rights to recover that water may be accrued. The statutes and policies when read together, establish a number of objectives. These objectives include:

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

- To allow for the efficient and cost-effective management of water supplies by allowing the use of storage facilities for filtration and distribution of surface water instead of constructing surface water treatment plants and pipeline distribution systems;

- To further the conjunctive management of the water resources of this 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 periods of shortage; and

- To augment the local water supply to allow future growth and development.

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

8.2.2 Primary Program Components

There are several key components of recharge and recovery. Rights to recover water may be exercised annually or long-term. Almost any water can be recovered within the same year in which it was stored. Stored water will be credited to a long-term storage account, which allows the account holder to recover the water at any point in the future, if certain conditions are met. These conditions greatly assist the achievement of water management goals by preventing an entity from storing water and earning long-term storage credits if the water could have been put to direct use. The statutes define what source water cannot be put to direct use, and therefore may be eligible to earn long-term storage credits. *See the definition of "Water that cannot reasonably be used directly" in A.R.S. § 45-802.01*.

No time limit exists on the right to recover long-term storage credits. Long-term storage credits may be assigned to another person if that person could meet the same provisions for earning credits as did the storer. In addition, once the water is recovered, it retains the same legal characteristics it had before storage.

The Underground Water Storage (UWS) Program is also the mechanism by which a groundwater replenishment district (GRD) replenishes water on behalf of its members. Currently, there is no GRD in the PRAMA.

Finally, in many cases, a certain percentage of the volume of water stored is made non-recoverable by statute to benefit the aquifer. These required non-recoverable volumes are called "cuts to the aquifer." The cuts apply to the storage of certain types of water for long-term storage credits. They do not apply to water that is stored and recovered annually. In the PRAMA, due to the type of recharge that has occurred and is projected to occur in the future, this particular offset to overdraft is minimal. During the historical period, there were only two years in which a cut to the aquifer occurred. In 2003 and 2004, a combined volume of less than 1,000 acre-feet was included as a cut to the aquifer.

Persons who elect to undertake recharge-related activities must obtain the necessary permits from ADWR. There are three recharge-related permit categories: (1) storage facility permits, composed of constructed or managed Underground Storage Facility (USF) permits and Groundwater Savings Facility (GSF) permits; (2) Water Storage (WS) permits; and (3) Recovery Well (RW) permits. For a detailed description of each of these permits, please see the *Water Demand and Supply Assessment 1985-2025, Prescott Active Management Area* (Assessment) on ADWR's website: http://www.azwater.gov/AzDWR/WaterManagement/Assessments/documents/PRAMAAssessmentVersion2.pdf.

8.3 PHYSICAL ASSESSMENT OF THE ACTIVE MANAGEMENT AREA

Attaining the safe-yield goal will not necessarily eliminate water supply problems facing the PRAMA water users such as localized groundwater declines and other physical availability problems. Varied

physical conditions and resulting impacts to AMA residents demonstrate a need to develop enhanced aquifer management strategies during the fourth management period.

8.3.1 Groundwater Overdraft

Total water demand in the PRAMA was approximately 20,211 acre-feet in 2012. About 82 percent of this, 16,563 acre-feet, was met by groundwater. Groundwater overdraft in the PRAMA has persisted over the historical period of 1985 through 2012. Net natural and incidental recharge offset overdraft each year to varying degrees. Historically, years of high net natural recharge have resulted in surplus conditions, where net natural recharge was greater than the volume of groundwater withdrawn in the AMA and the AMA aquifers were replenished to some extent, however, in most years groundwater overdraft of between 10,000 and 20,000 acre-feet has occurred in the PRAMA. To date, the majority of recharge in PRAMA has been annual storage and recovery of surface water and storage of reclaimed water at constructed USFs; neither of these storage activities requires a cut to the aquifer.

The PRAMA population increased from less than 45,000 to nearly 121, 000 people between 1985 and 2012, representing an increase of more than 76,000 persons. Municipal groundwater demand increased 213 percent over this period, to 11,865 acre-feet in 2012. The statutory goal of safe-yield does not appear achievable in the PRAMA without additional supplies, cooperative regional water resource management and/or a combination of water management programs, policies, rules and incentives.

8.3.2 Consequences of Groundwater Overdraft

Sustained groundwater mining in the PRAMA could have negative consequences in addition to the loss of the resource. Lower water levels could reduce well productivity, increase pumping costs, further compromise riparian habitat, and reduce stream flows. As water levels are lowered, water in storage is reduced and water supplies become jeopardized. Although land subsidence has not previously occurred in the PRAMA, lowered water levels could potentially cause future land subsidence.

As described in Chapter 2, groundwater overdraft is reflected in groundwater level declines. In Chapter 2, Figure 2-4 shows historical water level changes between 1994 and 2010. During this time period, maximum water level declines of between 10 and 60 feet were observed; however, other areas within the AMA saw significant water level rises as water tables recovered, resulting from the shifting of pumping to other locations. Table 8-1 summarizes the water storage and recovery through the year 2012 at the AMA level and for each of the two groundwater subbasins in the PRAMA. Note that the figures shown in Table 8-1 are the volumes of water that entered the storage facilities and do not represent the volume of recharge credits earned. To calculate recharge credits, ADWR subtracts water losses such as evaporation and other losses, debits (for example, for exceeding the permitted capacity of the storage facility, should that occur), and any "cuts to the aquifer" (for storage of Central Arizona Project water or reclaimed water stored at a managed underground storage facility) prior to calculating the acre-feet of long-term storage credits earned.

8.3.2.1 Little Chino Subbasin

The majority of the water service area of the City of Prescott and the majority of the active, irrigated agricultural land are within the Little Chino Subbasin of the PRAMA. As of 2012, more than 59,000 acre-feet of water had been delivered to underground storage facilities in the Little Chino Subbasin. Of this volume, 77 percent was reclaimed water. The remaining 23 percent was surface water. No groundwater savings facilities have been permitted in the PRAMA to date.

Nearly all the recovery of stored water has occurred in the Little Chino Subbasin, mostly by the City of Prescott and the Chino Valley Irrigation District (CVID). The volumes of recovered water have been fairly evenly split between surface water and reclaimed water. In addition to storing and annually recovering surface water, the City of Prescott stores reclaimed water, and through an agreement with the CVID, transfers long-term storage credits for reclaimed water to the CVID, which then recovers the water within the CVID for use by farms in the district. The City of Prescott has two wells located within the area of

impact of storage of reclaimed water and has recovered reclaimed water within the area of impact in recent years.

8.3.2.2 Upper Agua Fria Subbasin

The Town of Prescott Valley is the primary user of water in the Upper Agua Fria Subbasin of the PRAMA. The Town of Prescott Valley is the only entity who has stored water in the Upper Agua Fria Subbasin to date. AMA population is fairly evenly divided between the two subbasins as is municipal water demand. However, less than 20 percent of the actively irrigated agricultural land is located within the Upper Agua Fria Subbasin.

By the end of 2012, more than 17,000 acre-feet of water had been delivered to be stored at USFs in the Upper Agua Fria Subbasin, but very little recovery of the stored water has occurred.

TABLE 8-1
SUMMARY OF WATER STORAGE AND RECOVERY, 1986 - 2012
PRAMA

	Subbasin	Little Chino	Upper Agua Fria	AMA TOTAL
Delivered to be Stored through 2012	USF Reclaimed	45,690	17,330	63,020
	USF Surface Water	13,329	0	13,329
	TOTAL STORED	**59,019**	**17,330**	**76,349**
Recovered through 2012	Reclaimed	17,872	25	17,897
	Surface Water	12,978	0	12,978
	TOTAL RECOVERED	**27,106**	**25**	**30,875**
Recovered Water in 2012	Reclaimed	1,414	0	1,414
	Surface Water	445	0	445
	Total	1,859	0	1,859
	Within 1 mile of any storage location	**421**	**0**	**421**
Recovered Water in 2005	Reclaimed	1,234	6	1,240
	Surface Water	1,547	0	1,547
	Total	2,781	6	2,787
	Within 1 mile of any storage location	**0**	**0**	**0**

8.4 ALTERNATIVE WATER SUPPLIES ASSESSMENT

Reclaimed water and surface water are renewable sources of water that can replace the use of groundwater in order to achieve the management goal of safe-yield by the year 2025. Reclaimed water is water that has been collected in sanitary sewers for subsequent treatment in a regulated sewage system, disposal plant or wastewater treatment facility (WWTF). Surface water is the waters of all sources, flowing in streams, canyons, ravines or other natural channels, or in definite underground channels, whether perennial or intermittent, floodwater, wastewater or surplus water, and of lakes, ponds and springs on the surface. The PRAMA has limited access to surface water supplies.

Renewable resources can be used directly or they can be stored in the ground and recovered in the future. While it is important to use renewable water sources efficiently, ADWR encourages the use of renewable water sources in place of groundwater because it reduces groundwater overdraft in an aquifer.

In addition to augmentation of the PRAMA's water supply with reclaimed water and surface water, a limited supply of imported groundwater may be available to the AMA. While imported groundwater is not a renewable water supply, it is a valuable alternative to groundwater pumped from within the PRAMA.

8.4.1 Reclaimed Water

ADWR estimates that about 6,000 acre-feet of reclaimed water was generated in the PRAMA in the year 2012, compared to about 4,600 acre-feet in 2000. The City of Prescott's Sundog and Airport wastewater treatment plants have been treating wastewater and subsequently recharging the reclaimed water into the Little Chino subbasin since the 1980s. Increased reclaimed water generation is attributable in part to increased population, but also to the construction of a new wastewater treatment plant in the Town of Prescott Valley which began operation in 1994. The new plant replaced the use of septic systems in major portions of the Prescott Valley area. Table 8-2 provides a summary of reclaimed water generation by the two wastewater treatment plants operated by the City of Prescott and the plant operated by the Town of Prescott Valley, while Figure 8-1 displays their locations, as well as the location of the Town of Chino Valley water reclamation facility, within the PRAMA. The locations of underground storage facilities are also shown in Figure 8-1. There are other smaller wastewater treatment plants operating within the PRAMA which are not shown on the map. As the PRAMA population increases new plants will likely be constructed and existing plants expanded.

TABLE 8-2
ANNUAL WASTEWATER TREATMENT PLANT PRODUCTION (ACRE-FEET)
PRAMA

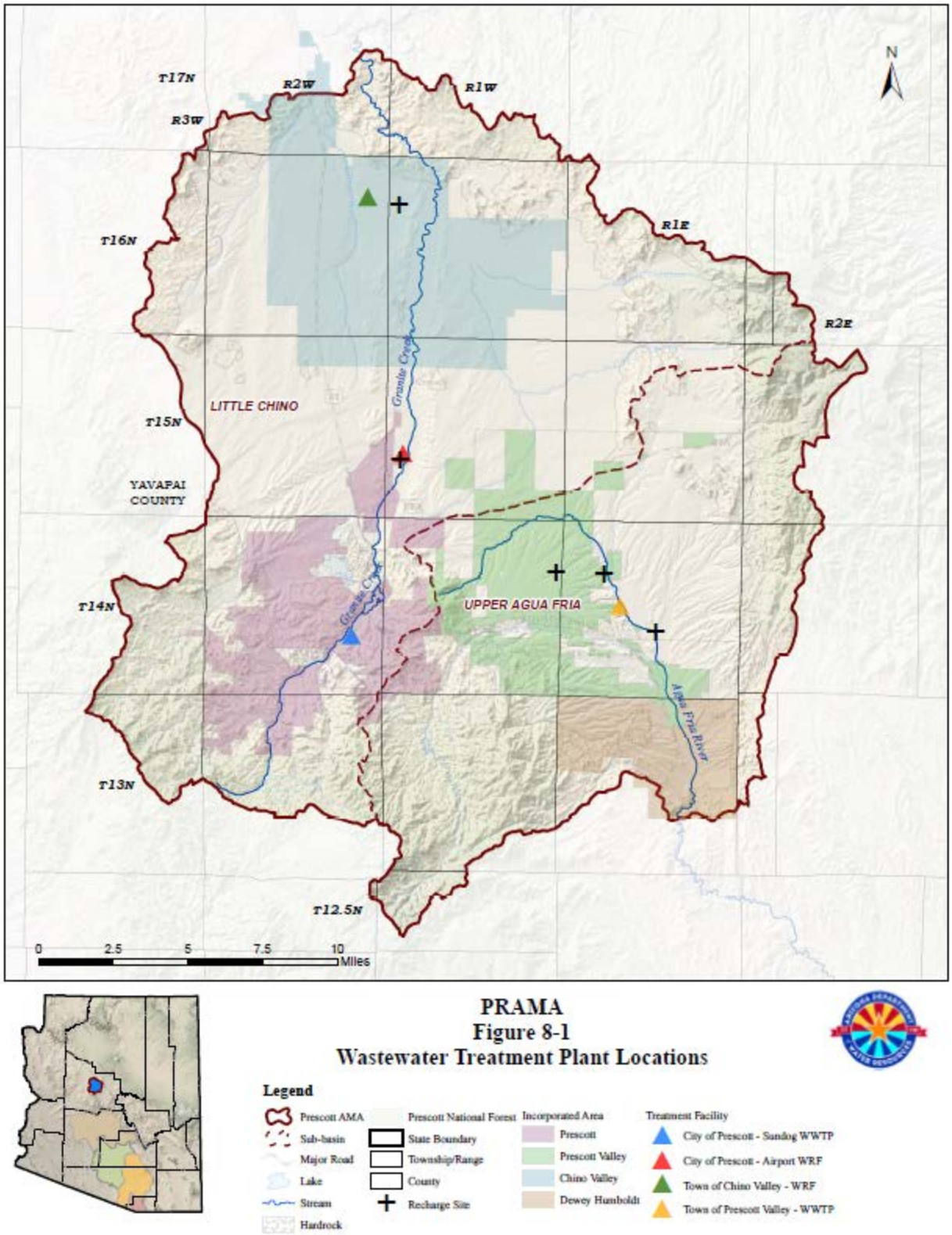
Year	Prescott Valley WWTF	Prescott WWTF (two facilities)
2002	1,771	3,538
2003	1,904	3,752
2004	1,837	4,083
2005	2,328	4,729
2006	2,550	3,853
2007	2,753	4,132
2008	2,687	4,488
2009	2,504	4,019
2010	2,639	4,417
2011	2,719	4,440
2012	2,712	3,915

Although there are many definitions for reclaimed water, the focus of this discussion is on the use of water generated from municipal WWTFs. Historically reclaimed water has been recognized as a valuable resource and has been used within the AMA for several years by the City of Prescott for turf and agricultural irrigation purposes.

The City of Prescott delivers reclaimed water directly to three golf courses and a sand and gravel operation. In the summer months, when turf watering needs are high, the City supplements the direct use reclaimed water with reclaimed water recovered within the area of impact of storage, which counts the same as direct use reclaimed water for turf-related facility conservation requirement compliance. Wastewater generated by the City is treated at the Sundog WWTF.

The Town of Prescott Valley currently delivers reclaimed water to refill lakes at Mountain Valley Park and to irrigate turf at Stoneridge Golf Course. As with the City of Prescott, the majority of the Town's reclaimed water is stored at USFs to generate long-term storage credits.

FIGURE 8-1
WASTEWATER TREATMENT PLANTS AND UWS FACILITIES
PRAMA



Three factors limit the ability to directly use all reclaimed water generated in the PRAMA. First, the quality of the reclaimed water is insufficient to directly introduce it into potable water supply systems. Direct use of reclaimed water, therefore, is currently limited to agricultural irrigation, turf watering, and some industrial applications. Second, reclaimed water demand for irrigation and turf watering purposes is seasonal; higher demand occurs in summer and lower demand in winter. Reclaimed water generation, however, is directly related to indoor water consumption which is relatively constant throughout the year. Third, over time, reclaimed water generation will exceed the demand for reclaimed water for irrigation and turf watering purposes.

8.4.2 Artificial Recharge

Artificial recharge allows reclaimed water to be stored during low demand periods and later recovered during high demand periods. Recharge also allows the possibility of indirect potable use of reclaimed water. The City of Prescott currently has a constructed USF permit for a reclaimed water recharge facility at Prescott Airport, which allows a maximum annual storage at the facility of 7,200 acre-feet. The City has two Water Storage permits for the storage of reclaimed water at the facility – one for long-term storage credits and one for non-recoverable water storage. No credits may be issued for the storage of non-recoverable water pursuant to A.R.S. §45-833.01 as the stored water does not retain its original legal characteristic, but instead becomes part of the available groundwater supply to the benefit of all AMA water users. The combined storage under both Water Storage permits is limited to 7,200 acre-feet per annum, which is the maximum annual storage volume allowed under the USF permit. All three permits expire on May 18, 2029. Recovery of the reclaimed water stored for long-term storage credits is allowed pursuant to a Recovery Well Permit issued to the City in January 1998, which allows the City to recover 1,600 acre-feet of recharged reclaimed water annually.

In May of 2012, the Town of Prescott Valley was issued an USF permit with maximum annual reclaimed water storage capacities at the In-Channel Site and North Plains Site of up to 1,200 acre-feet and 3,000 acre-feet, respectively. In addition, the Town has another facility that may store up to 5,150 acre-feet of reclaimed water. Long-term storage credits issued for the storage of reclaimed water represent a long-term alternative water source (subject to physical availability limitations) which could help offset the Town's dependence on groundwater. Presently, its WWTF has the capacity to treat 4,200 acre-feet of reclaimed water annually. Treated reclaimed water from this facility is currently discharged into the Agua Fria River, pursuant to a National Pollutant Discharge Elimination System (NPDES) permit.

The Town of Chino Valley has been issued a modified permit to store up to 1,120 acre-feet per year of reclaimed water at the Town's Old Home Manor constructed underground storage facility. The Town is actively pursuing increasing the number of sewer connections within its service area and connecting new subdivisions to its sewer system. The Town's WWTF has been expanded more than once since it was initially constructed. Further plant expansions are planned for the future.

Physical factors impacting recharge feasibility include: infiltration rates, available storage, and the existence and extent of lower permeability or impermeable layers in the vadose zone. In some urban areas of the PRAMA, there is insufficient space to develop recharge sites or land costs are too high for a project to be economically viable. There is potential for additional storage along Granite Creek, extending linearly north of the City of Prescott airport recharge facility for some distance. There is additional but less extensive potential for additional storage along the Agua Fria. (See *http://www.azwater.gov/azdwr/Hydrology/Modeling/documents/Prescott_AMA%20GW%20model%20report_3_31_2014.pdf*).

8.4.3 Surface Water

The use of CAP water is not economically feasible in the PRAMA due to the distance of the AMA's water users from the CAP aqueduct. Recognizing this, the City of Prescott and the Yavapai-Prescott Indian Tribe

sold their CAP allocations to develop a funding source for the acquisition of other alternative water supplies.

Historically, storm water runoff from Granite Creek and Willow Creek has been impounded at Watson Lake and Willow Lake. Until the late 1990's CVID diverted these waters to district lands for agricultural irrigation. The City of Prescott purchased these rights at that time, inheriting a pre-existing agreement between the CVID and Salt River Project (SRP) which stipulates that the City may only use the water (for annual storage and recovery) from the lakes between April 1 and November 30. If the City can amend this agreement with SRP it would allow the City greater water management flexibility, however, considerable legal complexities related to the use of water from Watson and Willow Lakes which would need to be overcome to allow a change in the use of this source water by the City of Prescott. The combined capacity of Watson and Willow Lakes is estimated to be roughly 11,000 acre-feet. The City expects to be able to annually store and recover about 1,500 acre-feet of surface water per year, however, since the year 2000, the City has averaged about 1,200 acre-feet of annual surface water recovery. Due to statutory requirements, when this water is stored, it must be recovered on or before the last day of the following month or within the same calendar year, whichever is earlier.

The City of Prescott has no plans to directly use the surface water from Watson and Willow Lakes at this time. The City also possesses surface water rights for Banning Creek (Goldwater Lake), the Hassayampa River, and along Del Rio Springs. Although base flows at Del Rio Springs are used to irrigate land both inside and outside of the PRAMA, the City could execute its water rights and begin using the flows at this site.

Future water exchanges involving surface water may be possible. Details of how this could occur have not yet been explored, but would likely involve some type of water exchange including surface water along the Verde River watershed, possibly from the Granite Creek drainage system, and stored water from Watson and Willow Lakes. Additionally, through severance and transfer of water rights to Lynx Lake, there exists about 500 acre-feet of surface water that could potentially be used annually as municipal water supply for the Town of Prescott Valley and/or for recreational purposes.

Table 8-3 illustrates the long-term storage credit balances (as of December 31, 2011) for entities located in the PRAMA.

TABLE 8-3
LONG-TERM STORAGE ACCOUNT CREDITS
PRAMA

Credits as of December 31, 2011			
LTSA HOLDER	**LTSA No.**	**Reclaimed Water**	**Surface Water**
Prescott	70-421123.0000	22,417	0.00
Prescott Valley	70-421124.0000	10,668	0.00
CVID	70-421125.0000	>1	0.00
North Nuggett	70-421126.0000	528	0.00
Chino Valley	70-421127.0000	693	0.00
TOTALS:		**34,306**	**0.00**

8.4.4 Imported Groundwater from the Big Chino Subbasin

Groundwater importation from the Big Chino Subbasin of the Verde River Groundwater Basin, which is located completely outside the AMA, is allowable per statute *(See A.R.S. § 45-555).* The Groundwater Transportation Act reserved groundwater supplies in the Big Chino Subbasin for use in the PRAMA and authorized the transfer of those supplies across subbasin boundaries. The Groundwater Transportation Act allows municipalities in the PRAMA to withdraw groundwater in the Big Chino Subbasin to meet

municipal and industrial demand under certain conditions. Private water companies are restricted from using this provision and, therefore, cannot directly acquire imported groundwater.

The City of Prescott has purchased land in the Big Chino Subbasin on which it intends to eventually construct a well field. The City and the Town of Prescott Valley have entered into an agreement to share imported Big Chino groundwater and the costs of importation. As of mid-year 2013, construction of Big Chino wells and a Big Chino pipeline has not begun. ADWR has projected the possible impact of importing Big Chino groundwater on the ability to achieve and maintain safe-yield in the PRAMA *(See Chapter 11).*

8.5 4MP AUGMENTATION PROGRAM GOALS AND OBJECTIVES

The ARP for the fourth management period is intended to move the PRAMA toward its goal of safe-yield and to enhance AMA water management by emphasizing the following objectives:

- Maximize the recharge of alternative water supplies, including reclaimed water, which cannot be used directly.
- Develop a regional recharge plan to coordinate storage and recovery of alternative water supplies in a manner consistent with the AMA's management goal and objectives, which also recognizes the importance of the recovery of stored water within the area of impact of underground storage.
- Expand the existing groundwater and surface water monitoring program for the PRAMA to facilitate effective implementation of regional water management strategies and the AMA's conservation and augmentation programs.
- Explore the benefit to the AMA of interregional water exchanges.
- 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.
- Identify and assess the potential to develop alternative water supplies from outside the PRAMA.

The possibilities and need for augmentation during the fourth management period differ substantially among the five AMAs. During the fourth management period, ADWR will continue to assist water users in identifying and developing additional water supplies and maximize the use of existing alternative water supplies in meeting the PRAMA management goal. ADWR will also continue to work to develop avenues from which local water interests can work together to promote improved water resource management and secure the long-term availability of water supplies to support existing and new uses.

8.6 THE 4MP AUGMENTATION AND RECHARGE PROGRAM

ADWR is required to include in the 4MP "if feasible, a program for additional augmentation of the water supply of the active management area, including incentives for artificial groundwater recharge." A.R.S. § 45-567(A)(5). Pursuant to A.R.S. 45-561(2), "Augmentation means 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." The ARP must be consistent with this statute, but, as described in the introduction, for purposes of this chapter *augmentation* means increasing the availability and use of renewable supplies such as reclaimed water in lieu of groundwater and *recharge* means storage of water pursuant to Title 45, Chapter 3.1, the Underground Water Storage, Savings and Replenishment Act. The ARP therefore includes provisions for maximizing the use of renewable supplies and for storage of renewable water.

The principal responsibility for developing water supplies and for storing that water for future uses lies with the PRAMA's water users. ADWR's responsibility under A.R.S. § 45-567(A)(5) is to design a 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. The ARP, however, must also allow ADWR to use the authorities granted by the Legislature to prevent unreasonable harm to third parties and to avoid aggravating existing local water supply problems.

The ARP for the 4MP contains the statutory requirements for storing and recovering water within an AMA. The key statutory provisions for storage facilities relate to hydrologic feasibility, A.R.S. § 45-811.01(C)(2); protection of land and other water users from unreasonable harm, A.R.S. § 45-811.01(C)(3); and avoidance of water quality impacts, A.R.S. § 45-811.01(C)(5). Although the Underground Water Storage, Savings and Replenishment Act contains statutory requirements for water storage and for recovery, it also includes requirements linking storage and recovery to the AMA's management plan and management goal. The provision that governs non-recoverable storage, found in A.R.S. § 45-833.01(A), includes a requirement that non-recoverable water storage must be consistent with the AMA's ARP. The provisions governing recovery are found in A.R.S. § 45-834.01. Those provisions allow stored water to be recovered outside the area of impact of the stored water only if certain conditions are met. One of the conditions is that the director must determine that recovery at the proposed location is consistent with the management plan and management goal of the AMA. A.R.S. § 45-834.01(A)(2)(b)(ii).

ADWR has developed the ARP for the 4MP based on the statutory authorities and tools available to address the goals and objectives identified in the previous section. The program components will be presented in the order listed.

8.6.1 Storage and Recovery Siting Criteria

The benefits to water management through the ARP depend on where the water is stored and recovered. Non-recoverable water storage is discussed in the next section.

For storage and recovery, unless stored water is recovered by the storer within the area of impact, 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." A.R.S. § 45-834.01(A)(2)(b)(ii). Recovery of stored water *within* the area of impact of the stored water is always considered consistent with the management plan and management goal of the AMA.

Because the statute requires that recovery outside the area of impact be consistent with the AMA's management plan and management goal, the locations of storage and recovery of water are inherently linked. Both must be considered when determining whether the future recovery of stored water meets the requirement for consistency with the management plan and management goal of the AMA. It cannot be determined whether recovery outside the area of impact of storage is consistent with water management objectives of the AMA unless the storage location is also considered. Water management benefits to the AMA would depend greatly on whether water recovered from an existing recovery well was stored in a remote area of the AMA or in a large pumping center of the AMA. Therefore, the criteria to determine whether the recovery location is consistent with the management plan and goal for the AMA must also consider where water was stored.

The locations of storage and recovery are important factors in addressing local and regional supply problems, particularly in areas experiencing severe water level declines, subsidence, or other aquifer management issues, and in attempting to balance the supplies in the AMAs during the fourth management period. For example, the future water supplies of the AMA may be diminished if water storage occurs in a remote location with no future demand for the stored water and recovery occurs outside the area of impact

of storage. In addition, recovery outside the area of impact of water storage could aggravate problems if the area of recovery was experiencing rapidly dropping groundwater levels or if groundwater supplies were already fully committed under the Assured Water Supply (AWS) Program. On the other hand, if storage occurs in an area experiencing high water levels and recovery occurs away from the area of impact, the water storage will contribute to those high water levels. If dewatering is required as a *direct* result of water storage or savings, 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 credits.

The 4MP criteria protect groundwater supplies already committed for an AWS Determination from an entity who wishes to recover water *outside* the area of impact.

The 4MP criteria also link future use benefits to determinations under the AWS Program. If storage occurs in an area that has a committed and projected demand through a Designation of Assured Water Supply or Certificate of Assured Water Supply, then it is deemed to contribute to groundwater supplies that will be used in the future. If the storage does not occur within such an area, the director must determine that the storage will otherwise be beneficial to the AMA if recovery is to occur outside the area of impact of the storage. If a storage facility is found not to meet these criteria, the permit will include a notice to potential water storers that recovery of the stored water will be allowed only within the area of impact of storage until such time that the director determines there is a demand for groundwater within the area of impact of the storage.

The requirement that recovery outside the area of impact of storage must be consistent with the AMA's management plan and management goal continues to be a requirement even after the recovery well permit has been issued. Thus, previously permitted recovery wells are subject to the criteria of the 4MP and future management plans. Recovery from within the area of impact is not required to meet management plan and management goal consistency requirements.

8.6.2 Criteria for Storage of Non-Recoverable Water

Pursuant to A.R.S. § 45-833.01(A),

> At the request of the applicant, 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.

The director may make this designation only upon application by a proposed water storer.

Only in few instances has this designation been applicable to date. In the second management period, non-recoverable storage occurred in association with certain augmentation grants that included storage of water to test the hydrologic feasibility of a recharge site. The City of Prescott City Charter speaks to the permanent recharge of reclaimed water generated by new development where future annexations are greater than or equal to 250 acres. The City of Prescott holds a non-recoverable water storage permit in addition to its other water storage permits. Under the 4MP, non-recoverable water storage may also occur as a result of an enforcement action associated with non-compliance of conservation requirements.

Water that is stored under a permit with this designation 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 associated with a GRD. The same considerations discussed in the preceding section that shaped the criteria for recovery location have shaped the criteria for siting non-recoverable storage.

8.7 REGULATORY INCENTIVES

Provisions established in the Agricultural, Municipal, and Industrial Conservation Programs of this management plan provide incentives for water users to utilize renewable resources. The inclusion of renewable supply incentives is somewhat controversial due to the perception that encouraging the use of a renewable supply may result in an inefficient use of the supply. The Programs to increase the use of renewable water supplies should not be perceived as an alternative to conservation.

The Code (particularly through the AWS provisions) and the management plans require a long-term perspective on supply and demand. In the long term, efficient use of all water supplies is necessary. The distinctions that are now being made among sources of water, including incentives that allow increased use of certain renewable sources, may seem ill-advised in hindsight. It would be inappropriate not to build a conservation ethic into the structure of the PRAMA communities, even as they move towards the use of renewable supplies.

Achievement of the water management goals over the long term is only possible in the context of serious, long-term conservation efforts and increased utilization of renewable supplies. The debate is not between conservation and augmentation, but rather, whether the concept of “efficient use” can be integrated into the regulatory system and the community ethic. Matching the resources to the most appropriate demand will continue to require sophisticated management, including conjunctive management of groundwater, surface water, and reclaimed water. It is difficult to design incentives that are administratively workable without causing equity problems and weakening the conservation message that is crucial in protecting our resources for the future.

Table 8-2 lists the 4MP incentives to use alternative supplies. Because many of these incentives encourage use of alternative supplies at the expense of conservation, the incentives may need to be scaled back in the future to achieve safe-yield.

Although the need to include specialized incentives to address subregional conditions has been identified, the only regulatory tool to date for addressing localized areas of decline is the limitation on recovery of recharged water if it is recovered outside the area of impact of the stored water. The compliance approach described in Table 8-4 may result in encouraging recharge in specific locations to address local hydrologic concerns.

8.7.1 Enhanced Aquifer Management

As described in Chapter 2 and summarized in the physical assessment section of this chapter, certain areas within the AMA are experiencing water management problems that are more serious than in other areas of the AMA. These areas could continue to experience severe water management problems even if safe yield is achieved on an AMA-wide basis unless a more localized approach to water management is implemented. Therefore, ADWR will work to develop strategies to address the problems within its current legal authority. ADWR’s efforts may include: (1) developing local/state partnerships; (2) identifying stakeholders; (3) identifying problems; (4) identifying groundwater pumping issues; (5) conducting hydrogeologic investigations as necessary; (6) examining new legislation and/or local ordinances to remove barriers to problem mitigation; (7) developing programs; and (8) creating incentives that contribute to a solution. This will be discussed further in Chapter 12.

8.8 CONCLUSION

The focus of this chapter has been on defining ADWR's role in augmenting the water supplies of the PRAMA for the fourth management period. The augmentation issues summarized in this chapter show that there is continuing need for active participation by ADWR in augmentation activities to facilitate

achievement of the PRAMA's water management goal and objectives. An augmentation and recharge program has been developed that will use regulatory incentives, technical and planning assistance, coordination and facilitation of cooperative efforts, resolution of legal and institutional barriers, financial assistance, and storage and recovery location criteria to enhance ADWR's ability to reduce reliance on PRAMA groundwater and encourage the use of alternative water supplies in the PRAMA. Strategies to address local water levels and the need for additional new water supplies will be explored by ADWR, with input from the PRAMA during the fourth management period to ensure that the PRAMA's management goal can be achieved.

TABLE 8-4
RENEWABLE WATER SUPPLY UTILIZATION INCENTIVES
PRAMA

Sector	Incentive
Municipal	Delivery of reclaimed water by a municipal water provider does not count against the gallons per capita per day (GPCD) requirement, unless the reclaimed water is stored in one location and recovered outside the area of impact. This is an incentive for municipal providers to invest in reclaimed water systems *(Chapter 5, section 703.A).*
Industrial	Reclaimed water use is discounted when calculating compliance with the annual allotment for a turf-related facility. For the 4MP, ADWR has retained the 40 percent discount that was included in the 3MP *(Chapter 6, section 6-1404(A)).* If 100 percent of the water used at a facility in a year is from a non-groundwater source, no compliance is required with the annual allotment for that year.
Industrial	Cooling Towers Cooling towers that beneficially reuse 100 percent of their blowdown water are exempt from meeting the blowdown concentration requirements *(Chapter 6, section 6-1702(B)(1)).* Cooling towers that convert to at least 50 percent reclaimed water are exempt from the blowdown concentration requirements for one full year. If it is shown that they cannot meet the requirements, amended blowdown concentration levels may be applied *(Chapter 6, section 6-1702)(B)(.2)).*
Agricultural	Pursuant to A.R.S. § 45-467, reclaimed water use cannot contribute to a farm exceeding its allotment in any year. In determining whether a farm exceeds its maximum annual groundwater allotment for a year, total water use, including groundwater, reclaimed water, and surface water, is counted and any reclaimed water used that year is subtracted from the amount of groundwater that otherwise would have exceeded the farm's allotment.

Alternative supplies are available for beneficial use within the PRAMA. Sources of reclaimed water, surface water, imported groundwater, and extinguished grandfathered rights for AWS determinations comprise a sufficient volume of supply to meet future growth based on current demand trends. However, the access to alternative water supplies is not equitably distributed throughout the PRAMA, and environmental issues have delayed the development of some water supplies within the state. The management challenge is to determine how alternative water supplies can be put to maximum beneficial use by water users within the PRAMA. This will also entail exploring how to connect large concentrations of domestic wells, which face a greater threat of well failures, with existing or new potable water delivery systems in an affordable manner.

8.9 AUGMENTATION AND RECHARGE REQUIREMENTS

8-901 Storage and Recovery Siting Criteria

During the fourth 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 active management area:

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 of 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 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 active management area; 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 active management area.*

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. R12-15-716 after considering: (1) the maximum proposed withdrawals from the recovery well; (2) withdrawals for current, committed, and projected demands associated with determinations made under A.R.S. § 45-576 that are reliant on the water which the recovery well will withdraw; and (3) withdrawals for other current or projected demands that are reliant on the water which 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 an 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 active management area; or

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

8-902 Criteria for Storage of Non-Recoverable Water

During the fourth management period, water storage that is designated as non-recoverable is consistent with the AMA's Augmentation and Underground Water StorageProgram if one of 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 active management area; 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 active management area.

APPENDIX 8
DECLINE RATE METHODOLOGY

In evaluating an application for a proposed recovery well permit, ADWR considers many factors in determining consistency with the average water level decline rate siting criteria. The time frame for which the average is calculated may vary based on data availability and the hydrologic characteristics of the area. Major trends in precipitation, water supply utilization over time, hydrogeologic data, and the 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, ADWR examines the historic static water level data for the period of record for wells located in the section in which the proposed recovery well is located and in the eight sections that surround the section where the proposed well is located. The specific area examined depends on the availability and quality of water level data and the hydrogeology of the area. Bedrock outcrops, large pumping centers, and other features may affect the determination of pertinent data. Generally, wells that are screened in the aquifer of concern and regularly monitored using consistent methods for static water level data are good reference points (such as ADWR's statewide monitoring or index wells). ADWR examines the well hydrographs (graphs 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. A horizontal line on the hydrograph indicates that water levels remained stable over time. ADWR identifies what activities may have caused the groundwater changes over time to see whether the activity still exists or has been reduced, eliminated, or increased over time.

This approach provides more flexibility and protection of the groundwater resource than would be provided by a simplistic evaluation of decline rates calculated for all water level data within a set radius and during the entire period of record. For example, if a recovery well is proposed for an area which historically had a rapid decline in groundwater levels due to activities that no longer exist (e.g., retirement of agriculture after heavy agricultural use in the 1940s and 1950s), and if the proposed area is not at high risk for subsidence, the proposed recovery well might be deemed consistent with the average decline rate criteria by looking at the period of time after the historic change in use. Similarly, if water levels in the vicinity of the proposed recovery well were stable for decades, but recently a new use caused rapid rates of decline, the proposed recovery well may be deemed inconsistent with the criteria.

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

The most current procedures for establishing the average groundwater level decline rate in the vicinity of a proposed recovery well will be published in ADWR's Recovery Well Application Packet, however the general procedure is described below.

Decline Rate Procedure Description

To evaluate the four-foot decline criteria, ADWR will review water level data from all available, reliable sources of water level data in the vicinity of the proposed recovery well. Some sources include the ADWR GWSI database, water levels submitted with the recovery well application from the applicant, or other water level data available.

The entire period of record for each well in the vicinity of the proposed recovery well is plotted on a hydrograph. The entire period of record of measurements is often used in the evaluation; however, sometimes the hydrograph reveals a pronounced inflection in average slope of the hydrograph, indicating

that the entire period of record may not be representative of current conditions. The inflection may be attributed to conditions such as urbanization of previously irrigated acreage or the introduction of a new water source. The latest portion of the hydrograph that is most representative of current conditions, and will likely continue in the future, is then used in the analysis.

The average annual rate of decline for a given well is calculated by dividing the total change in water level for the selected period of record by the period of record, in years. The water level change for each well is averaged to arrive at an average water level change in the vicinity of the proposed recovery well. Care is taken to select wells for averaging near the proposed recovery well that are representative of nearby aquifer conditions.

CHAPTER NINE: WATER MANAGEMENT ASSISTANCE

9.1 INTRODUCTION

The Water Management Assistance Program (WMAP) is intended to provide financial and technical resources to assist water users in the development and implementation of conservation programs, facilitate augmentation and renewable water supply utilization, and obtain information on hydrologic conditions and water availability in the PRAMA. A.R.S. §§ 45-567(A)(5) and (A)(7).

The WMAP is funded primarily from groundwater withdrawal fees collected from each person withdrawing groundwater in an Active Management Area (AMA) from a non-exempt well. A.R.S. § 45-611(C). Withdrawal fees are authorized by the Groundwater Code and determined by the director in amounts that are restricted by the acre-footage of groundwater withdrawn and beneficially used. A.R.S. § 45-611(A)(2).

From 1990 to 2010 WMAP financial and technical assistance in support of conservation, augmentation and monitoring projects benefitted the PRAMA. In 2010, the satellite AMA offices were closed and WMAP funds swept by the Arizona Legislature due to the state budget shortfall. During the fourth management period, it may be necessary to limit the WMAP program to projects that are focused on augmentation to further assist in achievement of the PRAMA management goal.

9.2 DESCRIPTION

Programs funded by the WMAP help water users achieve the efficient use of water supplies and help the PRAMA meet its water management goal. The water management goal of the PRAMA is to attain safe-yield by the year 2025.

9.2.1 Conservation Assistance

Conservation assistance helps water users plan and undertake conservation programs and lessens the number of enforcement actions related to conservation requirements. It is used for information and education services, including services that increase public awareness about of the importance of water conservation and the PRAMA's groundwater supplies. It also provides technical support designed to increase water use efficiency across the PRAMA. Conservation assistance supports ADWR's role as a central source for information on water conservation, augmentation, and recharge.

9.2.2 Augmentation

Augmentation assistance helps supplement the water supply of an AMA, and includes water importation, water storage, and artificial recharge. A.R.S. § 45-561(2). Augmentation assistance helps water users study, design and construct renewable resource facilities and provides information to resolve technical feasibility issues or to optimize recharge project operation. It also includes studies initiated or conducted by ADWR, cost sharing grants for augmentation projects, studies initiated or conducted by others; and planning and technical support for AMA-wide and local area water management strategies.

9.2.3 Monitoring and Assessment

Monitoring and assessment activities provide information and data that various water-using sectors can use to develop strategies for reaching safe-yield in the context of the hydrologic conditions in the PRAMA. Monitoring and assessment activities are also critical to developing water management strategies that take more localized water conditions into account and in the revision of the well spacing and impact rules. Examples of the information and data that can be obtained through monitoring and assessment activities include the following:

- Groundwater movement and volumes
- Locations of recharge and depletions

- Location and movement of poor quality water
- Impact of continued groundwater pumping, including water level declines and land subsidence
- Streamflows, snowmelt and precipitation data.

9.3 FUNDING

The WMAP is funded primarily from groundwater withdrawal fees levied and collected from each person withdrawing groundwater in an AMA from a non-exempt well. A.R.S. § 45-611(A). Other sources of funding include one-half of the annual surcharge collected from persons holding a permit for interim groundwater use in bodies of water within the AMA and application fees for underground storage facility permits, groundwater savings facility permits, water storage permits, and recovery well permits. A.R.S. § 45-133(E) and § 45-871.01(A).

No later than October 1 of each year, the director must set the groundwater withdrawal fee for the following calendar year. A.R.S. § 45-614. Prior to setting the fee, the Groundwater Users Advisory Council (GUAC) for the AMA recommends to the director how the fee should be set within the statutory limit. Within 30 days after setting the fee, the director is required to give written notice of the fee to all counties, cities, towns, private water companies, political subdivisions, and holders of groundwater withdrawal permits in the AMA. A.R.S. § 45-614(C). The fee is required to be paid to ADWR at the time the person withdrawing the water files an annual report pursuant to A.R.S. § 45-632. A.R.S. § 45-614(E).

The total fund amount for each year is known by April (after the receipt of annual reports in March). Total available funding for the programs varies from year to year depending on the amount of groundwater withdrawn and any carry-over of funds from previous years.

All fees received by ADWR for the WMAP must be transmitted to the state treasurer. A.R.S. § 45-615. The state treasurer is required to hold the fees in a separate fund and to maintain within the fund separate accounts for each AMA. A.R.S. § 45-615(1). Monies held in the fund for an AMA may be used only to finance the augmentation and conservation assistance programs for the AMA and to fund any projects that are authorized by the director for monitoring and assessing water availability within the AMA. A.R.S. § 45-613(A). Table 9-1 shows the total groundwater pumped, annual groundwater withdrawal feeds, and total fees collected from 1990 through 2012.

9.4 HISTORY

9.4.1 Second Management Period

The assistance program originated during the second management period (1990 – 2000) as an augmentation program, including incentives for artificial recharge. A.R.S. § 45-565(A)(6). A program for conservation assistance was required in 1990. A.R.S. § 45-615(1), as amended by Laws 1990, Ch. 320 § 9. In 1996, legislation authorized funding for monitoring and assessing water availability and subsidence in addition to augmentation and conservation assistance. A.R.S. § 45-611(A). The addition of monitoring and assessing resulted in changing the name of the program from the “Conservation and Augmentation Fund” (as in the Second Management Plan) to the “Water Management Assistance Program” (as in the Third Management Plan).

In the PRAMA, fees collected during the second management period (1990 – 2000) were used to fund two conservation projects: the development of a water conservation education and rebate program and a Natural Resource Conservation Service workshop scholarship. Through the 1997 grant cycle, no augmentation projects had been funded. A small percentage of total funds collected were used by ADWR to provide legal and administrative support to the program. Needs identified included additional monitoring and hydrologic research and a study of the impact of exempt wells on overall AMA water

supplies, along with the identification of areas that are at-risk for exempt wells.

TABLE 9-1
ANNUAL WITHDRAWWAL FEE[1] SUMMARY
PRAMA

Year	Groundwater Pumped (Acre-Feet)	Withdrawal Fee[2] ($/acre--foot)	Monies Collected
1997	17,181	$1.00	$17,181.44
1998	15,251	$1.00	$15,250.78
1999	16,231	$1.00	$16,230.78
2000	17,474	$1.00	$17,473.92
2001	16,967	$1.00	$16,967.10
2002	20,447	$1.00	$20,446.64
2003	16,405	$1.00	$16,405.12
2004	18,565	$1.00	$18,564.58
2005	15,779	$1.00	$15,779.40
2006	18,395	$1.00	$18,395.41
2007	19,757	$1.00	$19,757.30
2008	16,159	$1.00	$16,158.55
2009	15,903	$1.00	$15,902.57
2010	12,875	$1.00	$12,875.04
2011	15,784	$1.00	$15,783.63
2012	14,716	$1.00	$14,732.10

[1] Withdrawal fees and fees collected reflect only that portion of the groundwater withdrawal fee established to support the WMAP. Total withdrawal fees through 1997 have been greater than Table 1 fees, since the first one dollar per acre-foot of the annual withdrawal fee was established for general ADWR administrative purposes.

[2] The figures in the groundwater pumped column reflect the most recent information available in the AMA. This information may vary from the figures used at the time the groundwater withdrawal fees were actually collected.

9.4.2 Third Management Period

The Third Management Plan (3MP) (2000 -2010) required a program for "additional augmentation of the water supply of the AMA, if feasible, including incentives for artificial groundwater recharge" (A.R.S. §45-566(A)(6)) and a program for "conservation assistance to water users within the AMA." A.R.S. § 45-566(A)(8). The following objectives for the WMAP in the PRAMA were identified in the 3MP:

- Provide funds for the development of conservation assistance programs for agricultural, municipal, and industrial water users and for information and education on water conservation.
- Maximize the use of renewable sources of water such as surface water and effluent.
- Provide funds for the planning, design, and construction of such augmentation and recharge projects.
- Act as a central source for information on water conservation, augmentation, and recharge.
- Increase public awareness of the importance of water conservation and augmenting the AMA's groundwater supplies.
- Monitor and assess hydrologic conditions and the potential impacts of continued groundwater pumpage and water level declines.

The process for applying WMAP funds programs and projects changed during the third management period due to legislation enacted in 1999. A.R.S. §§ 41-2701 through 41-2706. As a result, Chapter 9 was modified in 2003 to meet the requirements for soliciting and awarding grants as required by the new legislation. The legislation requires state agencies to follow specific procedures in soliciting and awarding grants, including: 1) publishing notice of a request for grant applications; 2) appointing at least three peers

or other qualified individuals who are not members of the GUAC to evaluate the applications; and 3) keeping all information in the applications confidential until the grants are awarded. Table 9-2 lists the programs that were funded during the third management period.

TABLE 9-2
RECENT PROJECTS FUNDED, 2005 – 2010
PRAMA

Contract	Recipient	Amount
2005-2592	Northern Arizona University	$37,178.00
2006-2593	Department of Interior	$14,600.00
2007-2635	University of Arizona	$13,200.00
2007-2634	Department of Interior – USGS	$14,600.00
2008-2749	University of Arizona	$16,500.00
2009-2773	Department of Interior	$14,400.00

9.5 NEEDS, GOALS AND ISSUES FOR THE FOURTH MANAGEMENT PLAN

ADWR estimates that approximately $125,000 is likely to be generated for the WMAP during the fourth management period, based on the population and demand projections included in Chapter 11 of this plan. If more annual recovery or long-term storage credit recovery occurs than groundwater pumping during the fourth management period, that figure would be less. If demand is higher than projected and there is a corresponding increase in groundwater pumping, a higher volume of WMAP funding would be generated.

9.5.1 Future Needs Identified in the 3MP

The 3MP for the PRAMA identified the need for additional monitoring and hydrologic research and studies on the impact that withdrawal of water by exempt wells has on overall AMA water supplies, along with the identification of areas that are at-risk for exempt wells.

9.5.2 Yavapai County Water Advisory Committee

Following is a brief summary of issues and needs identified in 2011 by the Yavapai County Water Advisory Committee:

- Expected growth and increased demand for water will require additional or new supplies of water.
- Increased studies and knowledge about water resources are needed to make informed decisions.
- Innovative solutions to address conservation and a new regulatory framework for the development and management of water resources will be needed.
- Improved communication, education and action among all water-using sectors are necessary for an integrated approach to water management.

9.5.3 PRAMA Water Demand and Supply Assessment 1985 – 2025

The *DRAFT Version 2 Demand and Supply Assessment, Prescott Active Management Area* identified the following challenges and needs:

- Difficulty projecting the nature of the economy
- Climate/Drought and renewable supply availability
- Relationship between power cost and water cost
- Ability to obtain additional renewable supplies
- Financial capability to import water supplies

- Potential for any future water agreements
- Local/Regional Cooperative Water Management
- Localized Groundwater Management
- Location of Underground Storage vs. Location of Annual or LTS Credit Recovery
- Climate Change Planning and Response Program
- Short-Term Drought Response Program
- Additional Infrastructure and Funding
- Ability to respond positively to economic growth without increasing groundwater withdrawals
- Planning horizon beyond 2025

9.6 PROCEDURES

A WMAP may be included in the Fourth Management Plan (4MP); however, due to the recent reduction of ADWR staff, it may be necessary to limit projects to those that do not require extensive staff time for administration. The following is a description of how projects are funded, identified, solicited, and awarded. A flow chart summarizes the process *(See Figure 9-1)*.

9.6.1 Identifying Priority Projects

In an effort to apply available funding and technical assistance to the most important projects, ADWR identifies priorities with assistance from members of the water-using community and the GUAC. Information may potentially be gathered in the following ways:

- Soliciting public input at GUAC meetings and reviewing GUAC meeting minutes for recommendations and comments from the GUAC and the public.
- Soliciting ideas from conservation coordinators at state level water conservation information sharing meetings.
- Meeting with technical administrators of currently funded projects to assess project progress and anticipate future needs.
- Conducting surveys and/or requesting letters of intent so that stakeholders have the opportunity to put their ideas in writing.
- Documenting expressions of interest and inquiries received via phone, email, or in person.
- Meeting with appropriate water management staff to learn about agency needs, resources, and legal or financial changes such as industrial, municipal, municipal BMP, agricultural BMP, and Water Duty.
- Reviewing current focus areas of other funding agencies and/or meeting with grant coordinators (e.g. BOR) to identify needs, gaps, and/or areas for collaboration.

9.6.2 Applying Funds to WMAP Projects

ADWR identifies priorities for program assistance with input from members of the GUAC and the water-using community. Recommendations are made to the director about allocating funds among the program categories: conservation, augmentation, and monitoring hydrologic conditions or assessing water availability.

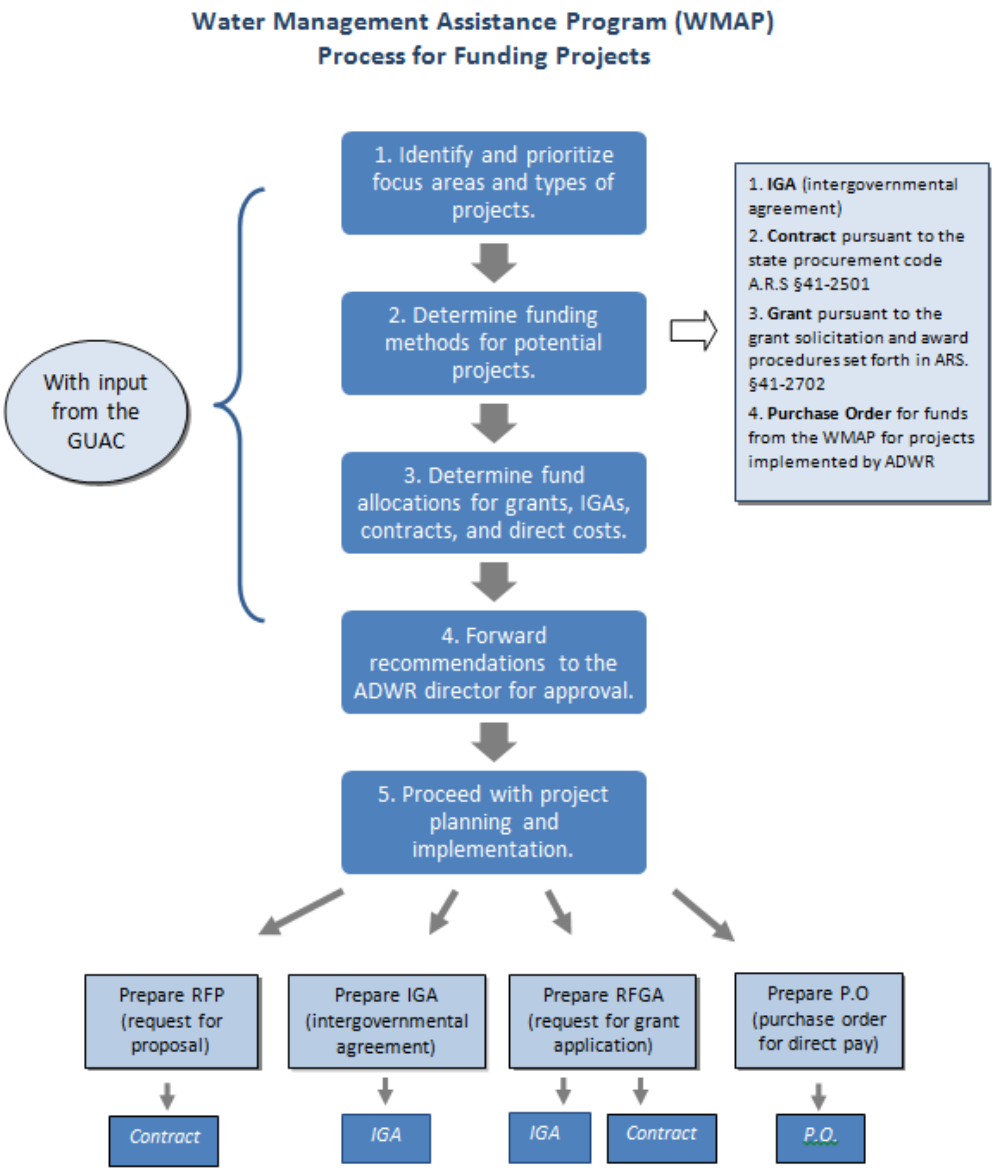
The type of project or program to be funded determines whether or not one of the following four methods are used to apply funds: Intergovernmental agreement (IGA), contract, grant, and direct use by ADWR.

A. Intergovernmental Agreement

ADWR may enter into an Intergovernmental Agreement or IGA with public agencies (as defined in A.R.S. § 11-951): "*'public agency' includes the federal government or any federal department or agency, Indian tribes, this state, any other state, all departments, agencies, boards and commissions of this state or any other state, counties, school districts, fire districts, cities, towns, all municipal*

corporations, and any other political subdivisions of this state or any other state." IGAs are appropriate when the source of the service requested is limited, and the awards do not have to be competitive. The project must involve a joint exercise of powers common to the parties or an agreement for joint or cooperative action.

FIGURE 9-1
WMAP PROCESS



B. Contract

ADWR may enter into a contract for specific services by issuing a Request for Proposal (RFP). An RFP is used for specific services or a narrow scope of work and where the lowest bid is not necessarily the winning bid. A.R.S § 41-2534. An RFP is used for purposes of procuring a specific end product in the form of materials, services or construction.

C. Grant

A grant process is used when selection requires a competitive process to be fair. It can be used for both governmental and non-governmental entities. The scope of the project should not be too specific as to single out only one or two possible entities and not too general so as to generate projects that do not meet project objectives. ARS § 41-2702 includes a set of requirements for the grants process including the following:

1. Preparation of a Request for Grant Application that includes scope, funding amount and evaluation criteria (RFGA);
2. Confidentiality of applications until an award or awards are made; and
3. Evaluation by at least three evaluators. Note that GUAC members may not serve as evaluators, but can be involved in their selection.

D. Direct use by ADWR

If a project is to be implemented by ADWR, it will use monies directly from the WMAP.

9.6.3 Contract Development, Monitoring and Support

Each person receiving monies for WMAP purposes through a grant, IGA or contract must enter into a contractual agreement with ADWR. Contracts, prepared by ADWR staff, describe what tasks are to be accomplished and set deadlines for task completion and fund disbursements. ADWR staff track progress and review deliverables for compliance with contract requirements. ADWR authorizes and issues payments, modifies contracts as needed, and provides other legal and administrative support.

9.6.4 ADWR's Role in the WMAP

Fund management and administration of grants and contracts are coordinated between ADWR's Administration Division and the AMAs. The Administration Division's functions include management of the separate funds for each AMA and contract administration. The following responsibilities may be assigned to ADWR staff:

A. Prioritize, review, provide input on and develop project proposals.

B. Analyze potential projects and identify appropriate funding methods (grant, IGA, procurement contract).

C. Administer IGAs, contracts, and grants.

D. Implement ADWR projects.

E. Provide technical and field assistance

F. Provide information and educational services. ADWR staff develop water conservation information materials, educational curricula and displays, and programs specific to water users within the AMAs. These materials and programs may be developed independently, with WMAP funding, or through partnerships with other government agencies, community groups or utilities. ADWR staff also maintain web-based or hard copy inventories of information and educational materials for distribution to water users, and provide water-related presentations to civic groups, schools and other groups.

9.6.5 GUAC Role in the WMAP

The GUAC advises the AMA director, makes recommendations on groundwater management programs and policies for the AMA and submits comments to the area director and to the director on draft

management plans. A.R.S. § 45-421. The following list describes the GUAC's role in the WMAP:

A. Providing recommendations regarding withdrawal fees.

B. Providing input and recommendations about the goals and priority focus areas for the PRAMA.

C. Assisting ADWR in selecting general project ideas for funding prior to the solicitation of applications or proposals.

D. Allowing public input and comment on potential projects at meetings.

E. Identifying sets of criteria for evaluating proposals and contracts.

F. In coordination with ADWR, participating in selecting evaluators for grants.

9.6.6 Criteria Used to Evaluate Projects

Specific sets of criteria are needed when developing RFGAs or RFPs. These criteria are established by ADWR with assistance from the GUAC. Certain criteria may be given greater weight, and any weighted system must be applied consistently. Following is a list of criteria to be considered:

A. Compatibility of the project with ADWR policies and programs and the management goal of the AMA.

B. Compliance of the project with applicable laws and administrative regulations. In the case of regulated water users, this includes the extent to which this project helps that regulated water user reach 4MP conservation requirements.

C. Cost effectiveness of the project. Positive factors include the ability to combine the project with other projects if that combination will result in cost and human resource savings; the ability to predict water demand reduction and the extent and duration of the reduction relative to project costs.

D. Extent to which the type of project is applicable to other users, other sectors, and other AMAs and the likelihood of community and/or sector support for the project.

E. Significance of the project's potential economic, environmental, and social impacts;

F. Extent to which the type of project has previously been proven feasible and effective, or the extent to which implementation of the project will provide information on feasibility and effectiveness, if not previously proven.

G. Evidence of a demonstrated need and that it is likely that the project would not be implemented without water management assistance funding.

H. Ability to monitor demand reductions during and after implementation of the project. This includes the ability to produce documented comparisons of pre-project and post-project water savings, scientific data collections and reporting methods, or pre-program and post-program surveys to verify project results.

I. Effectiveness of project, which includes factors such as a background on current and historic water use if applicable, a clear statement of purpose, goals, methodology, and list of deliverables (data collection, interim and final reports, etc.).

J. Whether the project is innovative and includes sufficiently researched budget information to determine if the requested funding is warranted (e.g. salary costs and benefits, retrofit device costs, equipment purchases, and supplies).

K. Ability to result in timely and efficient development of alternative renewable water supplies or contributions to regional or critical area water management solutions.

L. Likelihood of developing transferable information or technology.

CHAPTER TEN:
IMPLEMENTATION

10.1 INTRODUCTION

This chapter describes the process ADWR will follow when implementing, determining compliance with, and enforcing the Fourth Management Plan (4MP) requirements for the Prescott Active Management Area (PRAMA). These plan elements will be carried out in accordance with ADWR's overall regulatory approach, which is described in Appendix 10A. The following topics are discussed in the order listed:

- Notice of Conservation Requirements and Compliance Dates
- Variance and Administrative Review Process
- Plan Modification Procedures
- Groundwater Use Reporting Requirements
- Monitoring and Audit Procedures
- Compliance Approach

10.2 NOTICE OF CONSERVATION REQUIREMENTS - COMPLIANCE DATES

Within 30 days of adoption of the 4MP, ADWR will mail written notice of the irrigation water duties and conservation requirements established in the plan to the persons required to comply with the requirements. A.R.S. § 45-567(C). A person who receives notice of an irrigation water duty or conservation requirement established in the 4MP must begin complying with the requirement by the date specified in the notice, unless the person applies for and is granted a variance from or an administrative review adjustment to the requirement, as explained in section 10.3. A.R.S. § 45-567(D). A person who receives such a notice, must continue complying with the requirement until the effective date of any substitute irrigation water duty or conservation requirement established in the Fifth Management Plan (5MP). If a person receives notice of a 4MP irrigation water duty or conservation requirement that replaces an irrigation water duty or conservation requirement established for the person in the Third Management Plan (3MP), the person must continue complying with the 3MP irrigation water duty or conservation requirement until the effective date of the 4MP requirement.

The director may give written notice of a conservation requirement at any time to a person with a right or permit to withdraw, distribute, or use groundwater that was not in existence when the management plan was adopted. The person given written notice must comply with the conservation requirement not later than the compliance date specified in the notice, unless the person applies for and is granted a variance from or an administrative review adjustment to the requirement. A.R.S. § 45-571.01(B) and (D).

10.3 VARIANCE AND ADMINISTRATIVE REVIEW PROCESS

Upon receipt of a notice of a 4MP irrigation water duty or conservation requirement, a person may apply for a variance from or seek administrative review of the water duty or conservation requirement. In general, a variance gives a person additional time (not to exceed five years) to comply with an irrigation water duty or conservation requirement, while an administrative review takes place. The administrative review can result in an adjustment to the requirement for that management period. Each of these processes is described below.

10.3.1 Variance

If a person requires additional time to comply with a new irrigation water duty or conservation requirement, the person may apply for a variance. An application for a variance must be filed within 90 days of the

receipt of the notice of the irrigation water duty or conservation requirement. A.R.S. § 45-574(A). The director may grant a variance for up to five years upon a showing that "compelling economic circumstances" will prevent the person from complying with the new irrigation water duty or conservation requirement by the compliance date specified in the notice. A person granted a variance must continue complying with any existing irrigation water duty or conservation requirement during the variance period, unless the director establishes a schedule of intermediate water duties or conservation requirements to be reached at specified intervals during the variance period. A.R.S. § 45-574(C).

10.3.2 Administrative Review

If a person believes that an error or omission was made in calculating the person's irrigation water duty or conservation requirement, or that the person's irrigation water duty or conservation requirement is unreasonable because of circumstances unique to the person, the person may request an administrative review of the irrigation water duty or conservation requirement. If granted, an administrative review can result in a permanent adjustment to the irrigation water duty or conservation requirement. An application for administrative review must be filed within 90 days of the date of the notice of the irrigation water duty or conservation requirement if the application is based on circumstances in existence as of the date of the notice. A.R.S. § 45-575(A).

At any time while a 4MP irrigation water duty or conservation requirement is in effect, the person required to comply with the water duty or conservation requirement may seek administrative review of the person's irrigation water duty or conservation requirement based on a claim that "extraordinary circumstances not in existence as of the date of notice that was given thirty days after adoption of the management plan" justify an adjustment to the irrigation water duty or conservation requirement. The director may adjust the irrigation water duty or conservation requirement based on clear and convincing evidence that extraordinary circumstances not in existence as of the date of notice make it unreasonable to require compliance with the irrigation water duty or conservation requirement. A.R.S. § 45-575(B).

In determining whether extraordinary circumstances make it unreasonable to comply with an irrigation water duty or conservation requirement, the director will consider, among other things, whether conditions that came into existence after the date of notice are significantly different from those conditions in effect at the date of notice. Examples of extraordinary circumstances may include the following situations: changes in water quality that necessitate altering water application rates for irrigation grandfathered rights or turf related facilities; changes in technology or economics that are significantly different from ADWR's projections or assumptions; and changes in federal, state, and local laws and regulations that prevent compliance with irrigation water duties or conservation requirements.

10.4 PLAN MODIFICATION PROCEDURES

At any time after the 4MP is adopted, the plan may be modified pursuant to the same public hearing and comment procedures required for adoption of the plan. A.R.S. § 45-572(A). The director may modify an irrigation water duty or conservation requirement established in the plan "only if the director determines that extraordinary circumstances, errors, or mistakes justify the modification." A.R.S. § 45-572(A).

Within 30 days of a modification of an irrigation water duty or conservation requirement, ADWR must give written notice of the modification to the person required to comply with the modified requirement. A.R.S. § 45-572(B). The person may request a variance from or an administrative review of the modified irrigation water duty or conservation requirement within 90 days of the date of the notice. A.R.S. § 45-572(B) and (C).

10.5 GROUNDWATER USE REPORTING REQUIREMENTS

The Groundwater Code (Code) contains a number of provisions that enable ADWR to acquire needed information on water use. This information is used to evaluate compliance with the Code and ADWR rules, permits, and management plans. The water use monitoring and reporting requirements, which are summarized below, are also designed to give water users the data needed to assess their progress in attaining conservation requirements. Over the last decade ADWR has shifted to a more interactive, web-based reporting format. Beginning in 2009, ADWR discontinued mailing hard copy Annual Water Withdrawal & Use Report forms to right holders. Instead, each year, right holders are sent a one-page letter in January, reminding them of the requirement to report by March 31st. In addition, holders of several types of water rights and authorities may now file their reports using ADWR's Online Annual Reporting Tool (eAR). During the fourth management period, ADWR intends to increase the number of water rights and authorities for which an annual report may be filed using the eAR tool.

ADWR has also devoted significant efforts towards increasing the availability of public records from the ADWR website, including well queries, pumpage queries, imaged records and interactive mapping tools. All of these are designed to not only answer public questions but allow water users access to their own information filed with ADWR to help them better manage their own water portfolio and comply with ADWR requirements.

10.5.1 Water Measurement

The Code requires persons withdrawing groundwater from nonexempt wells in Active Management Areas (AMAs) to measure those withdrawals using a water measuring device approved by the director. A.R.S. § 45-604. However, some small irrigation and non-irrigation users are exempt from the measuring device requirements. ADWR has adopted rules requiring the use of an approved device, or a combination of devices and methods, for measuring rates and volumes of groundwater withdrawals for the calculation of the total annual volume of groundwater withdrawn. A.A.C. R12-15-901, *et seq.* Persons subject to the measuring device requirements must maintain the accuracy of the device within specific standards.

10.5.2 Records and Annual Reports

The Code requires most persons who own or lease a right or permit to withdraw, receive, or use groundwater to file an Annual Water Withdrawal and Use Report with the director for each right or permit they hold. All persons required to file annual reports must maintain current and accurate records of water withdrawn, delivered, received, and used. A.R.S. § 45-632.

Persons withdrawing groundwater from exempt wells and most non-irrigation customers of cities, towns, private water companies, and irrigation districts are exempt from record keeping and reporting requirements. Persons receiving water pursuant to a grandfathered right or a groundwater withdrawal permit and persons assigned and noticed of individual user requirements must meet the record keeping and reporting requirements, although certain small right holders are exempted from those provisions.

10.6 MONITORING AND AUDIT PROCEDURES

ADWR has the authority to determine compliance with the Code, management plan, and rule requirements. This authority is described below.

10.6.1 Measuring Devices

ADWR monitors compliance with the measuring device requirements, through review of Annual Water Withdrawal and Use Reports, field investigations, and evaluations of energy use. Before field visits, ADWR generally contacts well owners to ask for their cooperation and presence during the inspection.

Standardized procedures and equipment are used to test the accuracy of measuring devices (A.A.C. R12-15-901, *et seq.*).

10.6.2 Irrigation Acreage and Water Use Monitoring

ADWR monitors irrigated acreage and irrigation water use in the PRAMA using annual reports, crop records, energy use records, aerial photography, and satellite-based remote sensing data. These procedures are also used to determine the accuracy of annual water use reports and to detect illegal irrigation. ADWR investigates any potential discrepancies or violations identified using these methods.

10.6.3 Annual Report Reviews and Audits

ADWR reviews all annual water withdrawal and use reports. This is ADWR's primary means for determining compliance with conservation requirements, measuring requirements, and groundwater use limitations.

ADWR conducts official audits of annual reports to check the accuracy of the reports and to verify suspected problems. An audit is a detailed review by ADWR staff of a person's water use records. Each person audited is requested to attend the audit. Audits ensure overall compliance with the Code and the management plan for the PRAMA.

10.6.4 Inspections

The Code allows ADWR to enter property where wells or other facilities that are used for the withdrawal, transportation or use of groundwater are located. This authority allows ADWR to inspect facilities and lands subject to Code provisions and obtain data or access to records relating to the withdrawal, use, or transportation of groundwater. A.R.S. § 45-633.

ADWR is generally required to give persons reasonable notice of inspections unless entry is sought solely to inspect a measuring device. Notice is not required in the rare cases in which there is reason to believe that notice would impede enforcement efforts.

10.7 COMPLIANCE APPROACH

ADWR has developed a compliance program approach that includes education, assistance, and flexibility.

10.7.1 Education and Assistance

ADWR informs water users of their conservation and reporting requirements as described in section 10.2 of this chapter. ADWR also educates water users by explaining how the requirements were derived and how the user can achieve those requirements. This is done through advisory committees, detailed program descriptions contained in reports and issue papers, public presentations, the publication of this management plan, and individual meetings with interested users.

Annual flexibility account balance information is available to all affected users allowing them to monitor their compliance status. Irrigation grandfathered right holders who have exceeded the debit limits of their flex accounts, or who are close to exceeding them, are notified of their status and given the opportunity to reduce water usage or purchase flex credits to avoid an enforcement action. However, irrigation grandfathered right holders regulated under the Historic Cropping Program may not purchase flex credits.

10.7.2 Determination of Compliance

The mandatory conservation programs in the 4MP are designed to achieve reductions in groundwater withdrawals and use. Consequently, the persons given notice of irrigation water duties and conservation requirements established in the plan are required to comply with those irrigation water duties and conservation requirements only in those years in which they withdraw, distribute, or receive groundwater.

The following two sections describe how ADWR determines compliance with conservation requirements when groundwater is used.

Maximum Annual Water Allotments and Gallons Per Capita per Day Requirements

The 4MP establishes maximum annual water allotments for irrigation grandfathered rights and turf-related facilities. Municipal providers regulated under the Total GPCD Program are required to comply with gallons per capita per day (GPCD) requirements. The requirements are similar to maximum annual water allotments in that they limit the amount of water that may be used during a year to a specified amount. A person's compliance with a maximum annual water allotment or GPCD requirement is generally determined by comparing the total amount of water used by the person during the year with the amount of water allowed by the allotment or GPCD requirement. However, the use of water in excess of the allotment or GPCD requirement during a year does not necessarily mean that the person is out of compliance for the year. To account for weather variations and other factors that may result in the use of more water in some years than others, ADWR determines compliance either through the operation of a flexibility account or through a three year averaging method, depending on the type of use.

Flexibility accounts are used to determine compliance for municipal providers subject to GPCD requirements and irrigation grandfathered rights. The total water use reported by the user for the year is compared with the amount of water the user was entitled to use during the year. Generally, if the total amount of water used during the year is less than the allotment for the year, the flexibility account is credited with the difference. If the water use exceeds the allotment, the flexibility account is debited with the difference. A user is out of compliance with its allotment or GPCD requirement in any year in which its flexibility account is debited with an amount of water that causes the account balance to exceed the maximum negative balance allowed for the use. The maximum positive account balances and the maximum negative account balances for each type of use can be found in chapters 4 and 5.

If an irrigation grandfathered right or municipal provider uses water during a year in an amount which causes its flexibility account to exceed its maximum negative account balance, a violation occurs, but only to the extent of the groundwater included in excess. ADWR determines the amount of groundwater in the excess by a process known as "stacking."

Under the stacking process, water from all sources used by a person during a year, with certain exceptions, is counted when comparing the person's water use to the maximum annual water allotment or GPCD requirement. However, groundwater is counted last. The process of counting groundwater last is called stacking because the groundwater is added to, or stacked on top of, the non-groundwater sources. Because groundwater use is counted last, the amount of any water used by a person in excess of its allotment or GPCD requirement will be comprised, at least partially, of groundwater. Groundwater withdrawn pursuant to an approved remedial action project under CERCLA or title 49 is counted as surface water when certain conditions are met.

Specific Conservation Measures

Municipal providers regulated under the NPCCP and irrigation grandfathered right holders regulated under the Agricultural Best Management Practices (BMP) Program are required to comply with specific conservation measures instead of GPCD requirements or maximum annual groundwater allotments. The following industrial users are required to comply with conservation measures specific to their type of use instead of maximum annual water allotments: sand and gravel facilities, large-scale power plants, large-scale cooling facilities, and new large landscape users. For these municipal providers and industrial users, compliance will be determined by ascertaining whether they implemented their specific conservation measures in the manner required by the management plan, rather than by comparing their water use to a volumetric allotment. They are out of compliance if they fail to implement the conservation measures in the required manner.

All industrial users, including those subject to maximum annual water allotments, are required to comply with the conservation measures established for All Industrial Users in section 6-1302 of Chapter 6. These conservation requirements include general requirements to avoid waste and make efforts to recycle water. They also include more specific requirements relating to low water use landscaping, landscaping and water features in publicly owned rights-of-way, and single pass heating and cooling. In addition to these requirements, section 6-1902 of Chapter 6 requires that all new large industrial users submit a water conservation plan to the director.

10.7.3 The Enforcement Process

When ADWR's monitoring program identifies a potential violation or when a third party complaint is received about the activities of another user, an investigation is conducted to obtain the facts.

An investigation may involve a field inspection by ADWR staff or an audit at ADWR's office after notice to the potential violator. ADWR may request that the individual produce relevant records for the inspection or audit. Based on the investigation, ADWR will determine whether there has been a violation, and if so, what course of action to take.

Where the violation is minor, and does not require corrective action, ADWR may bring the compliance action to a close with an advisory letter upon discontinuance of the violation. For more serious violations where there is reason to believe a person is violating or has violated a statute, permit, rule, or management plan provision, enforcement action will be taken by ADWR.

During the first and second management periods, ADWR took a nontraditional approach to enforcement. Given the recent enactment of the Code and adoption of the management plans, a high level of tolerance was employed. Fines were set at low levels and probationary provisions and advisory notices were widely used. In many instances, for unintentional violations of management plan requirements such as GPCD limits and maximum turf or irrigation grandfathered right allotments, ADWR deferred any monetary penalties. Instead, it allowed the violator to develop or expand conservation measures designed to help the violator reduce water use. ADWR felt that the long-term benefits of a properly designed and implemented conservation program, tightly structured and closely monitored, would exceed the benefits of a traditional monetary penalty program.

In each instance of a management plan violation, the violator was given the following options:

- Contest the enforcement action by requesting a hearing,
- Pay a predetermined monetary penalty, generally based on the amount of groundwater used in excess of the requirement, or
- Negotiate a mitigation program with ADWR designed to develop or expand conservation programs intended to assist the violator in achieving future compliance.

The results of this enforcement strategy have been mixed. Some mitigation programs developed under this approach have been successful in increasing water use efficiency, while others have been less effective. In most cases, significant and sometimes disproportionate amounts of time and resources have been invested by both the violators and ADWR.

The 4MP approach to enforcement will exercise flexibility on a more limited scale. The arguments of "newness and complexity" will be less compelling in this management period. Previous violations will be considered in determining the appropriate compliance approach. In addition, ADWR may consider new

compliance approaches during the management period for Code and management plan violations. One possible provision would employ a groundwater replenishment option. This may involve storage of renewable water designated as nonrecoverable, as defined by A.R.S. § 45-833.01, in a volume that would adequately compensate for the violation. A related approach may allow the purchase and extinguishment of long-term storage credits to offset a violation. The result of these approaches is a penalty that results in a positive water resource activity. If a water user anticipates a violation and informs ADWR of this expectation before receiving a notice of noncompliance, the director may consider this voluntary disclosure to be a mitigating factor in determining the appropriate enforcement action.

ADWR may consider a more aggressive level of compensation for certain violations as part of its forthcoming "enhanced aquifer management strategy."

Additional enforcement mechanisms are generally reserved for violators not amenable to the previously mentioned mechanisms. They include contested hearings, cease and desist orders, and civil penalties of up to $10,000 per day for violations directly related to illegal withdrawals, transportation, or use of groundwater. A.R.S. §§ 45-634 and 45-635.

Extremely serious cases may also be referred for criminal prosecution if persons knowingly violate or refuse to comply with the Code; or with a permit, rules, or order issued or adopted under the Code. A.R.S. § 45-636.

APPENDIX 10A
FOURTH MANAGEMENT PLAN REGULATORY APPROACH
PRAMA

ADWR's regulatory philosophy is based on its overall water management goals for the management plans: the conservation of groundwater through the efficient use of all water sources and the augmentation of water supplies to ensure a long-term, secure water supply. ADWR's regulatory programs are designed to be consistent with that regulatory philosophy.

The safe-yield goal and the overall mission statement of ADWR are guiding concepts in the agency's activities. An understanding of the basic framework of the regulatory programs requires knowledge of the components of the safe-yield goal and ADWR's compliance approach. The framework is described below.

The PRAMA Management Goal: Safe-yield

Safe-yield by January 1, 2025 is the management goal of the PRAMA. Safe-yield is defined by A.R.S. § 45-561 as:

"[A] groundwater management goal which attempts to achieve and thereafter maintain a long-term balance between the annual amount of groundwater withdrawn in an active management area and the annual amount of natural and artificial recharge in the active management area."

The statute specifies that safe-yield is *a long-term balance*. Thus, the hydrologic conditions in the PRAMA cannot simply be viewed in the short-term, but rather must be viewed over a longer period of time. Further, establishing a *balance* is more complicated than comparing the total amount of groundwater withdrawals for the PRAMA to the amount of recharge occurring in the area in a given year.

In analyzing whether an Active Management Area (AMA) is at a safe-yield condition, ADWR considers the following factors which impact groundwater levels and water in storage:

1. Groundwater pumpage: Annual pumpage volumes from the PRAMA's aquifers are considered in the safe-yield calculation. Withdrawals associated with irrigation grandfathered rights, non-irrigation grandfathered rights, groundwater withdrawal permits, and municipal providers are calculated as debits to the groundwater system. Note that the safe-yield calculation considers as a debit to the system the volume of municipal groundwater pumping that is allowed through the Assured Water Supply (AWS) Program for each Designation of Assured Water Supply (DAWS) and Certificate of Assured Water Supply (CAWS) issued prior to 2025. ADWR concluded in the development of the AWS Rules that a limited quantity of the groundwater in storage could be allocated as a portion of the allowable water supply for each applicant. This groundwater can be used at any time in the 100 year period by the entity to whom it was assigned and the entity or water provider is not required to replenish this volume; however, it does count as groundwater pumping in the calculation of safe-yield. It was expected that this allowance would be used soon after a provider is designated while other supplies were being developed, however, many providers have chosen to hold onto their groundwater allowance in anticipation of years when renewable supplies are short and additional groundwater will need to be withdrawn to meet demand.

2. Groundwater underflow: Groundwater underflow from the PRAMA is a naturally occurring outflow from the PRAMA's aquifers. It is a loss to groundwater in storage because it is no longer available for use in the PRAMA. For example, groundwater flows out of the PRAMA into the Big Chino groundwater subbasin.

While some may contend that these natural losses could be captured for use, and therefore should not be counted as a loss, the physical capture of groundwater leaving the PRAMA would be very difficult, if not impossible. Until the technology and infrastructure actually exist to locate and capture these outflows, they must be treated as a loss to the system.

3. Groundwater discharge to baseflow of surface water systems: Groundwater discharges to Del Rio Springs and the Agua Fria River are a loss to the groundwater system of the PRAMA. Even if these waters are captured by surface water right holders and used within the PRAMA, the groundwater that exits the system is a loss to the groundwater budget for the PRAMA.

4. Incidental and natural recharge in the PRAMA: Recharge is the process through which water is added back to groundwater aquifers and is thus treated as a gain to the system. Incidental recharge originates as groundwater or surface water which percolates down to the water table after it is used for human activity. In the PRAMA, the volume of incidental recharge is largely dependent on the quantity of municipal effluent discharged into stream channels, and the volume and efficiency of agricultural and landscape water use. Natural recharge is replenishment of an aquifer which occurs through infiltration, from precipitation and runoff.

5. Artificial recharge: Under the state's Underground Water Storage, Savings and Replenishment Program, A.R.S. §§ 45-801.01 *et seq.*, persons may undertake recharge projects to deliberately add water to an aquifer without the right to withdraw it in the future. However, artificial recharge is commonly used as a storage mechanism to accrue credits with the expectation of future recovery. Stored water for which credits have been issued cannot be counted as a contribution to safe-yield because it is already allocated to the water storer and is considered a non-groundwater supply when recovered for use. Therefore, this type of water has no net impact on the safe-yield volume; however, it does result in a temporary increase in groundwater in storage.

Not all water stored under the Underground Water Storage, Savings and Replenishment Program can be recovered. The volume of recharge which is allocated permanently to the aquifer, or "cut to the aquifer" that results from generation of certain types of recharge credits does benefit the aquifer and is a component of the safe-yield groundwater supply. In addition, any non-recoverable storage that is conducted in a given year can be included in the safe-yield volume for that year. Recharge credits that are generated and then subsequently extinguished prior to use are also a component of the safe-yield supply.

The volume of groundwater that can be withdrawn while maintaining a safe-yield condition in the PRAMA is not a fixed amount; it will change due to annual variations in incidental, natural, and artificial recharge, as well as other factors listed above. The groundwater system is in a state of "overdraft" as long as groundwater withdrawals exceed the sum of the naturally and incidentally recharged volumes plus the portion of the artificially recharged volume that will not be withdrawn later as storage credits.

Because water level changes are direct indicators of changes in groundwater storage, they are the measured data which support the other factors of the safe-yield analysis. However, changes in water levels are expected to continue even after achievement of safe-yield, as stored credits are recovered and entities with DAWS and CAWS utilize their groundwater allowances. An AMA that is at safe-yield should not experience broad-ranging, significant, and continuing declines in average water levels after adjustments are made for the factors just described. Therefore, water levels are considered in making the safe-yield determination.

Total Water Use Conservation Requirements and "Stacking"

With the wide array of water resources available in Arizona as an alternative to groundwater, including

surface water, reclaimed water and remediated groundwater, ADWR attempts to provide incentives that will promote use of these alternative supplies whenever and wherever possible. At the same time, it is recognized that groundwater is often a very accessible and inexpensive source of supply, whereas the alternative sources can be expensive and difficult to access. ADWR also recognizes that groundwater is our state's "emergency" supply, and it must be available for use whenever the other alternatives run short. Groundwater is particularly valuable as a long-term drought supply, to buffer the effect of changes in surface water availability. In order to maximize the supply of groundwater, and ensure sufficient supplies of water, all sources must be utilized efficiently.

For these reasons, ADWR believes that it is both impractical and unwise to consider groundwater use as the only measure of regulatory compliance. The level of groundwater use that is reasonable is relative to the amount of water used from other sources. To ensure that groundwater users make reasonable use of groundwater, and to encourage efficiency and flexibility in the use of alternative supplies, the regulatory strategy includes evaluation of the total water use of each water user and provider, and setting conservation requirements based upon that total water use. In keeping with ADWR's statutory obligations and limitations, however, the conservation requirements of the management plan only apply if groundwater is used. ADWR's regulatory program is, therefore, structured around the concept of "stacking" different types of water, by type, in a compliance hierarchy, with groundwater on top. If a total water use conservation requirement is exceeded by a user of groundwater, the amount of the violation of that requirement will be measured by the amount of groundwater used in excess of the regulatory requirement. This strategy will ensure that if groundwater is being used, it is being used as wisely and efficiently as economically possible. This system also provides the flexibility needed by most users of commingled supplies, allowing groundwater to be used as needed to supplement alternative sources.

Flexibility in the Components of the Regulatory Plan

ADWR recognizes that water use varies by year and locality. Therefore, ADWR has provided maximum flexibility when administering the regulatory provisions of the management plan. For example, most regulatory provisions include a basic program, with one or more alternative programs designed to meet special circumstances. The basic program is generally designed to place simple numerical limits on water use, leaving the means of achieving those limits wholly up to the water user or provider. The alternative programs tend to remove numerical limits in favor of specific conservation measures more applicable to the water user.

Another component of regulatory flexibility is the establishment of *flexibility accounts* for most allotment-based requirements. These accounts generally allow water users to borrow or bank water from one year to the next in order to overcome the variation in use caused by weather or other unforeseen circumstances. Flexibility accounts are mandated by statute for agricultural users, and ADWR has used this example to incorporate flexibility accounting into municipal programs as well.

Administrative Review and Variance of Conservation Requirements

Even with the general flexibility of the regulatory programs, the Code recognizes that certain individual conservation requirements may pose hardship in certain circumstances. To allow relief in these situations, the Code provides for an administrative review and variance process. The emphasis in this process is on the impact of a particular conservation requirement as it is applied to an individual water user. Administrative review and variance are fact-intensive inquiries which may result in some regulatory relief and are considered on a case-by-case basis.

Accounting for Water Use

Many water providers deliver a mix of water types. In order to determine compliance with conservation requirements, ADWR must adopt a set of policies for commingled systems. ADWR is continuing to develop policies for "volumetric" accounting.

Generally, a water provider delivering different types of water through a commingled system cannot determine which type of water a customer actually received. Therefore, the provider is generally required to account for all deliveries to its customers on a volumetric basis. This allows the provider to compute the percentage of each type of water delivered in a given year, and apply that same percentage to the water delivered to each customer, regardless of the type of water actually received by the customer. This volumetric accounting policy works well for most providers, because of its simplicity and certainty. Individual circumstances may warrant individual consideration, however, and ADWR is continually reviewing its policies on volumetric accounting to recognize necessary exceptions. Generally, ADWR does not recognize accounting which shows a concentration of deliveries of certain types of water to certain users if the delivery system is physically commingled.

Enforcement

An effective conservation plan requires effective enforcement. ADWR is given wide ranging enforcement authority in the statutes to ensure that all water users are contributing their share to the overall goal of groundwater conservation and augmentation of water supplies. While the statutes allow the imposition of substantial monetary penalties for violating either water use limitations or conservation requirements, ADWR is also given considerable discretion in how that enforcement program will be managed. Overall, ADWR's philosophy has been that the ability to correct management deficiencies and save groundwater is more important than collecting monetary penalties. Therefore, most of ADWR's regulatory efforts to date have involved voluntary *consent orders* where the water user in violation agrees to adopt conservation measures, guarantee future compliance, or otherwise mitigate the impact of the violation on the state's groundwater resources in exchange for a waiver or reduction of the civil penalties. This approach has worked well in the past, and has been particularly useful in making the transition from a state where groundwater use was essentially unregulated to a state where water regulation has become a fact of everyday life.

In the fourth management period, ADWR will continue its policy of reviewing each suspected violation on an individual basis. ADWR will also continue its policy of working with any water user in violation of the groundwater laws to make certain that all the surrounding circumstances are understood and to explore alternative means by which the problem might be solved. In some cases, however, violations are not matters of inadvertence or misunderstanding, but are repeat offenses or voluntary decisions based on economic considerations, lack of planning, or careless disregard for the resource. During the fourth management period, ADWR will strive to identify these latter types of violations and pursue stringent civil penalties. By so doing, ADWR intends to bring greater equity and fairness to the common goal of saving our groundwater supply. Alternative mechanisms to achieve compliance while encouraging achievement of local water management goals will also be explored.

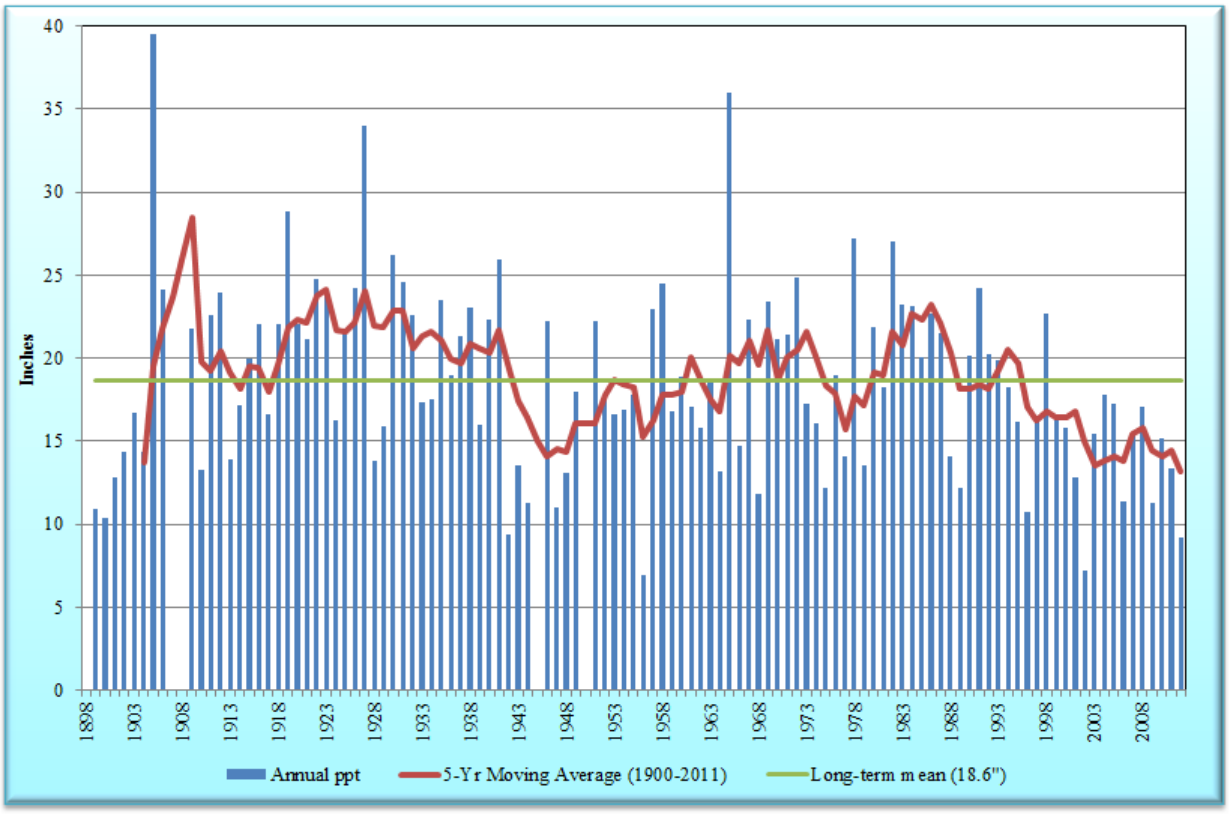
The foregoing synopsis of ADWR's regulatory approach is intended to assist the reader in understanding the reasons behind the mandatory conservation requirements in the 4MP regulatory chapters. This chapter explains many of the administrative policies and procedures contained within the management plan. Finally, it is ADWR's policy to offer assistance to anyone seeking to better understand or comply with the conservation requirements imposed by the management plans, or the requirements of the Groundwater Code. ADWR staff can provide valuable support on most water management issues.

CHAPTER ELEVEN:
BUDGETS

11.1 INTRODUCTION

The management goal of the Prescott Active Management Area (PRAMA) is to achieve and thereafter maintain a long-term balance between the annual amount of groundwater pumping and the annual amount of natural and artificial recharge in the Active Management Area (AMA) by 2025 (safe-yield). Net natural recharge and the other components in the calculation of safe-yield are described in the *Draft Version 2 Demand and Supply Assessment, Prescott Active Management Area* (Assessment) (ADWR, 2011)in part 3, "The Basic Budget Components." In all AMAs with a goal of safe-yield, maintaining safe-yield will be complicated as the vacillating weather conditions common in the southwest *(See Figure 11-1)* result in fluctuating net natural recharge to aquifers, primarily in the form of stream channel recharge. This is especially true in headwaters AMAs (Prescott and Santa Cruz) that rely on local, contemporary precipitation as the primary source of aquifer replenishment.

FIGURE 11-1
ANNUAL PRECIPITATION
PRESCOTT, ARZIONA
PRAMA



Like most of Arizona's groundwater basins, the PRAMA experiences years of low precipitation and occasional high rates of precipitation, resulting in flood flow. This vacillating pattern means that even after achieving safe-yield, there may be several consecutive years where the PRAMA experiences small volumes of overdraft that can be subsequently mitigated by one or more significant flood events (years of high net natural recharge) replenishing the aquifers. Climate change may result in drier conditions which in turn can cause long-term average annual net natural recharge declines. Reduction in precipitation not only results in less stream channel flow, but also less groundwater outflow; both being components of net natural recharge.

Without effective water management, these "feast or famine" conditions could endanger the long-term reliability of the water supply of the PRAMA. Therefore steps must be taken to mitigate these conditions in order to achieve and maintain safe-yield. Continued monitoring of pumping, the location of underground water storage and recovery of stored water, the effects of precipitation, and depth to water level measurements in AMA wells, coupled with comprehensive water management planning to anticipate and allow sufficient time to respond to changing conditions, are all imperative in achieving and ultimately managing the AMA's water management goal.

The Assessment (ADWR, 2011) included seven different water demand and supply projection scenarios and water budgets, each with slightly different assumptions. The Assessment utilized long-term averages of stream channel and mountain front recharge for the natural system components of the water budgets. Use of a long-term average for net natural recharge masks the annual variability of net natural recharge. Although safe-yield is a goal to be achieved based on a long-term average, it is important for PRAMA water users to understand that there may be many years of overdraft, which may result in localized water level declines, and the need to shift pumping to different locations. Further, there may be an occasional year of surplus, which, if captured and stored underground, could help mitigate years of shortage. Understanding the variability in the natural supply conditions that the PRAMA experiences will inform water management decisions and water management program development in the PRAMA.

As discussed and described in Chapter 3 of this plan, since the publication of the Assessment, Arizona Department of Water Resources (ADWR) Hydrology staff have further refined and adjusted the PRAMA hydrologic model. The natural recharge components were updated for the 4MP based on the current version of the PRAMA model (Nelson, 2013) from those used in the Assessment.

During the model update process ADWR Hydrologists identified the impacts of the seasonally and annually fluctuating net natural recharge characteristics in PRAMA. ADWR then developed statistically generated projections for net natural recharge to be used in the 4MP. These projections mimic the observed historical variability for purposes of planning and visually show what overdraft conditions the AMA might experience given variable supply conditions with increased demand. As in the Assessment, a "normal" and "dry" net natural recharge scenario was developed. However for comparative purposes this chapter includes only the "normal" net natural recharge projections. The "dry" conditions exacerbate difficulties in achieving and maintaining safe-yield. Charts and graphs in this chapter show the annually fluctuating net natural recharge conditions, to make clear that AMA water users cannot rely on receiving the long-term average net natural recharge volume every year. However, the 1985-2012 average net natural recharge volume also appears on charts and graphs in this chapter.

During the fourth management period ADWR may utilize scenario planning techniques to model and understand the implications of potential water management decisions. Scenario planning can inform decisions in situations that are highly complex and uncertain. When successful this planning technique is a learning process where stakeholders become informed about their situation and help each other build shared knowledge, achieve consensus, and develop adaptive management strategies. This process allows the development of a set of scenarios that potential solutions can be tested against to develop the best set of solutions regardless of future conditions (Aldrich, 2013). Examination and analysis of scenario planning results allows the community to understand which water management decisions have the greatest potential impact in securing long-term sustainable supplies and maintaining the economic viability of the PRAMA for as long as possible.

Unlike the Assessment, the historical period in this chapter is from 1985 through 2012. Three scenarios (described in detail below) are included in this chapter. The projected years are from 2013 through 2025 the year of the safe-yield goal, and extend to the year 2110. Future water demand and supply are affected by the requirements and implications of the Assured Water Supply (AWS) Program, as well as the Augmentation and Recharge Program (ARP) and need to be understood in the context of the 100-year

planning time frame addressed by the AWS Program. For purposes of these projections ADWR did not incorporate any limitations on the physical availability of groundwater pursuant to the AWS Rules in any of the scenarios included in this chapter. However, under current law, physical availability of groundwater could limit the approval of new subdivision demand.

Many of the decisions water users will make between now and 2025 will be made in the context of water management needs during the 100-year time frame of the AWS Rules. Statutory and rule changes, infrastructure improvements and expansions, as well as shifting approaches to water management present challenges, but are necessary for achievement of safe-yield in the PRAMA, and in other AMAs as well. Because of these variables, the projection period in this chapter has been extended from 2025 to 2110 to give insight into how demand and supply decisions may affect safe-yield beyond 2025.

Due to the timing of new population projection development by the Arizona Department of Administration (ADOA) and local Associations of Government, ADWR has not incorporated revised population projections from these jurisdictions into the scenarios in this chapter. Instead, ADWR re-projected population in PRAMA using statistical analyses and other planning assumptions based on recent population trends and the 2010 US Census data. Table 11-1 compares the statistically generated population projections to the population projections included in the Assessment, the Water Resource Development Commission (WRDC) and the updated ADOA population projections. Population projections generated by demographic agencies tend to mirror recent economic trends. When the economy is strong, the projections appear optimistic, following recent trends in in-migration as greater than historical numbers of people move into an area seeking new jobs. In less robust economic times, projections tend to be lower, mirroring a higher out-migration and/or lower in-migration. The most recent projections from ADOA are lower than those used in the Assessment, for the WRDC, and the ones used in this chapter. During the fourth management period the Assessment templates on the ADWR website will continue to be updated annually. A summary of the projection assumptions for the scenarios included in this chapter and a description of ADWR's general approach are included in the section below, and in Appendix 11-A. Projection budget templates and summary budgets can be found on ADWR's website: http://www.azwater.gov/azdwr/WaterManagement/AMAs/PrescottAMAFourthManagementPlan.htm.

TABLE 11-1
POPULATION PROJECTION COMPARISON
PRAMA

	2012	2014	2025	2040	2050
AMA Assessment					
Scenario One	145,108	152,973	197,720		
Scenario Two	145,809	154,482	206,152		
Scenario Three	151,011	161,782	221,020		
Updated ADOA					
Low	118,408	120,214	134,014	148,990	157,243
Mid	118,712	121,396	146,279	175,490	193,240
High	118,838	122,375	156,361	184,387	197,719
WRDC					
Low	132,310	138,980	167,902	183,451	186,743
Mid	134,698	143,161	184,019	222,283	240,429
High	138,137	149,177	207,214	285,005	329,213
Draft 4MP	119,790	126,454	169,186	214,478	241,406

NOTE: Data is total number of people in the PRAMA.

11.2 WATER BUDGET SCENARIOS

There are three scenarios included in this chapter. These scenarios are not intended to represent the future as they are not predictions. Nor do these scenarios represent all legal and institutional constraints or opportunities to reduce water demand or obtain additional water supplies. These scenarios are intended to illustrate the impact of demand and supply assumptions relative to PRAMA's goal of safe-yield. It is hoped they will encourage further conversations leading to additional planning efforts during the fourth management period resulting in water management decisions to achieve a more secure long-term water supply for the PRAMA. Demand and supply assumptions included in each scenario are described below.

11.2.1 Municipal Demand and Supply

In addition to using different population projections from those used in the Assessment, ADWR also used different water demand use rates in the 4MP. Most importantly, water supply assumptions were modified. All the scenarios included in this chapter assume: 1) Big Chino sub-basin groundwater is imported beginning in the year 2020 and ramps up over time, 2) the proportion of the AMA population on central sewer systems increases over time, 3) infrastructure improvements providing for the regional collection, storage, and recovery of reclaimed water are funded and constructed, and 4) recovery of as much reclaimed water as is physically feasible from within the area of impact of storage occurs. Some or none of these assumptions may come to pass. These assumptions are for illustrative and comparative purposes only and certainly other activities and circumstances may result in these assumptions being unachievable. For example, since the completion of the Assessment the City of Prescott, the Town of Prescott Valley and Salt River Project entered into an agreement to increase groundwater monitoring in the Big Chino sub-basin and prepare a groundwater flow model of the Big Chino. These activities may extend beyond the year 2020 rendering importation of Big Chino groundwater by the year 2020 untenable.

City of Prescott

All three City of Prescott scenarios make the following assumptions:

- The water service area population was re-projected by ADWR using the 1985 – 2012 water service area population and a linear trendline for 2013 – 2110. This results in a projected service area population of 53,309 people in the year 2020, and 134,522 people in 2110. In the City of Prescott's 2012 Annual Water Withdrawal and Use Report (annual report), the City projects a service area population of 59,140 people in the year 2020, with a demand of 9,122 acre-feet. ADWR has used its lower projection figures (53,309 people in the year 2020 and 134,522 people in the year 2110) for these scenarios.
- Prescott's direct use of reclaimed water is 2,240 acre-feet per year for 2013 – 2110. In Prescott's 2012 annual report, 1,474.32 acre-feet of reclaimed water was used for turf irrigation and another 82.29 acre-feet was used for other direct reclaimed re-use.
- Prescott annually stores and recovers 1,335 acre-feet of surface water per year.
- Big Chino importation begins in 2020, and ramps up to 4,365 acre-feet per year by the year 2044 and maintains that volume each year through 2110.
- For 2013 – 2024 Prescott uses up to 8,000 acre-feet of groundwater per year.
- For 2025 – 2110 Prescott uses zero groundwater; all pumpage is recovered water, either surface water or reclaimed water, equivalent to the remainder of Prescott's projected demand minus the assumed volume of direct use reclaimed water, recovered surface water, and Big Chino groundwater.

Variations in scenarios A, B, and C for the City of Prescott are as follows:

Prescott Scenario A:

- Demand is projected at 150 gallons per capita per day (GPCD) through 2110. Prescott's GPCD in 2012, including its reclaimed water use, was 160 GPCD. Not including reclaimed water use, Prescott's GPCD in 2012 was 122 GPCD. In 2012 Prescott used reclaimed water and reclaimed water recovered within the area of impact of storage primarily for golf course irrigation.

Prescott Scenario B:

- Prescott adopts a "WaterSense" ordinance in 2015. The adoption of these lower-flow rate fixtures for new homes changes the indoor water use rate for new homes to 39 GPCD.

The Prescott Scenario B assumptions result in an overall (residential, non-residential, and lost and unaccounted for water, including all sources of supply) GPCD rate in the Prescott service area of 141 GPCD by 2110.

Prescott Scenario C:

- Prescott adopts a "WaterSense" ordinance in 2015, which changes the new residential interior model to 39 GPCD.
- Prescott adopts a landscape ordinance for new development resulting in a reduction of the exterior gallons per housing unit per day (GPHUD) from 75 down to 50 GPHUD for single family homes and from 58 down to 20 GPHUD for multi-family homes.

The Prescott Scenario C assumptions result in an overall (including residential, non-residential, and lost and unaccounted for water, including all sources of supply) GPCD rate in the Prescott service area of 130 GPCD by 2110. Note that Prescott's 2012 residential GPCD rate, which includes interior and exterior demand, was 79 GPCD. Assuming 2.3 persons per household and the revised exterior model for single family homes, a new single family home based on these assumptions would use 61 GPCD.

- Beginning in the year 2050, Prescott accesses and stores another 3,200 acre-feet of surface water from its other surface water claims.

The volume of Prescott's annual surface water recovery is related to the volume of water that annually flows into Watson and Willow Lakes, certain legal agreements between the Salt River Project and the Chino Valley Irrigation District (CVID) which Prescott inherited, and Prescott's water management strategy. In dry years with low net natural recharge there may be insufficient surface water to store and recover. In addition to legal constraints which restrict the periods of time that Prescott can store surface water, maintaining water in the lakes for recreational purposes is a priority for the City of Prescott, which can limit the volume of water that could be stored and recovered. Prescott also has the ability to use surface water from Goldwater Lake, the Hassayampa River, and Del Rio Springs pursuant to surface water claims they have filed. Using these surface water supplies would require additional infrastructure and also have legal and physical constraints that complicate their use.

Prescott's current water management policy assumes 8,000 acre-feet per year of groundwater pumping, and Prescott's Designation of Assured Water Supply (DAWS) includes 9,466 acre-feet per year of groundwater pumping. However these volumes of groundwater are greater than the 1985-2012 average annual net natural recharge for the PRAMA of 4,391 acre-feet. For all three scenarios, Prescott is assumed to use groundwater to meet the remainder of its demand up to 8,000 acre-feet for the years 2013

through 2024. However with the population and demand assumptions in these scenarios, Prescott never needs to withdraw as much as 8,000 acre-feet of groundwater in any year through the year 2024. For the years 2025 through 2110, it is assumed that Prescott uses no groundwater and the remainder of Prescott's demand minus direct use reclaimed water, recovered surface water, and Big Chino groundwater is met with recovered reclaimed water, primarily withdrawn from within the location of impact of storage. These assumptions are based on the idea that after 2025 Prescott could recover stored water and avoid pumping any water that is not offset with storage. ADWR's hydrologic model indicates that an optimal location for regional underground storage is along a linear stretch of Granite Creek from approximately the location of Watson and Willow lakes and extending for several miles northward to the Chino Valley area (Nelson, 2013).

Town of Prescott Valley
All three Prescott Valley scenarios assume the following:

- The service area population projection for the year 2110 is 238,760 people. The service area population was re-projected by ADWR assuming 4.1 percent growth from 2013 – 2025, 2.2 percent growth from 2026 – 2035, and 1.25 percent growth from 2036 – 2110.
- Projected demand will be based on 118 GPCD. Prescott Valley's 2012 GPCD rate, including reclaimed water was 111 GPCD. Prescott Valley's residential GPCD rate in 2012 was 70 GPCD.
- Prescott Valley begins using Big Chino groundwater in the year 2020 and ramps up to 3,703 acre-feet in the year 2045. From 2045 through 2110, Prescott Valley will continue to use 3,703 acre-feet of Big Chino groundwater each year.
- For 2013 – 2024 Prescott Valley uses up to 6,000 acre-feet per year of groundwater.
- For 2025 – 2110 the remainder of Prescott Valley's demand each year after subtracting the volume of imported Big Chino groundwater is recovered reclaimed water, primarily recovered from within the area of impact of storage either at Prescott Valley's existing recharge projects or at an assumed new regional recharge facility located along Granite Creek.

Prescott Valley has prepared water demand projections as part of an internal planning process assuming approximately 6,000 acre-feet per year of groundwater pumping; however, this volume of groundwater is greater than the 1985-2012 average annual net natural recharge in the PRAMA of 4,391 acre-feet. (*See 4MP Historical Assessment Summary Budget at http://www.azwater.gov/azdwr/WaterManagement/AMAs/PrescottAMAFourthManagementPlan.htm.)* In addition to its existing reclaimed water underground storage projects, storage and recovery of additional reclaimed water along Granite Creek by Prescott Valley will require the construction of additional infrastructure to transport reclaimed water to Granite Creek for underground storage, or some other location experiencing water level declines, the construction of recovery wells in the area of impact of storage along Granite Creek, or some other area that prior storing water was experiencing water level declines, and infrastructure to transport the recovered water back to the Prescott Valley service area for distribution. These assumptions are based on the idea that after 2025 Prescott Valley could recover stored water and avoid pumping any water that is not offset with storage of renewable supplies.

Small Municipal Providers
All scenarios for small municipal providers assume the following:

- Small municipal provider population as a whole, including the Town of Chino Valley, was re-projected using the 1985 – 2012 population and a linear trendline for 2013 – 2110. Currently the Town of Chino Valley is a small municipal provider. At some point in the future, Chino Valley (and potentially other small providers) will begin using more than 250 acre-feet per year of water, and transition to large municipal providers. However, for these scenarios Chino Valley and others remain in the category of small municipal providers.

The small municipal provider population across the entire AMA is 42,390 people by the year 2110.

- Because Chino Valley owns and operates a wastewater treatment plant, Chino Valley was included in the calculations of projected reclaimed water available for storage, in all three scenarios. Therefore, it was necessary to project population for the Chino Valley water service area separately from the projected population of all small providers. The increase in population within the Chino Valley Town CDP for each projection year was added to the Chino Valley 2012 service area population. This assumes that any new population within the Chino Valley CDP is connected to Chino Valley's sewer system rather than individual septic systems. New growth within the Chino Valley service area was assumed to use 150 GPCD, consistent with Chino Valley's current use rate per capita.
- Small provider demand was projected assuming 90 GPCD.
- For the years 2013 through 2024 small providers are assumed to use 100 percent groundwater. However, in 2025 through 2110, it is assumed that regional reclaimed water storage and recovery will be implemented to offset or replenish small provider demand.

Variations included in scenarios B and C for small providers are as follows:

- Town of Chino Valley begins using Big Chino groundwater in 2020 and ramps up to 3,483 acre-feet in the year 2045 and maintains that volume of Big Chino groundwater thereafter.

- A regional wastewater collection system is in place beginning in the year 2020, to collect wastewater from all new small providers and the exempt well population added in 2020 and thereafter. This increases the supply of reclaimed water that can be stored and recovered.

Exempt Well Population
All scenarios for exempt well population have the following assumptions:

- The exempt well population for the year 2110 is projected to be approximately 30,000 people. ADWR believes this to be a conservative population projection because it assumes efforts to encourage new development on centralized distribution systems will result in a decline in the annual rate of increase of exempt wells in PRAMA.

- Exempt well population can only be calculated for the 2000 and 2010 US Census years. In the Assessment, exempt well population was estimated for 1985 through 1999 assuming exempt well population increased five percent per year. This assumption tracks closely with the average rate of increase in new exempt wells each year since 1985. Using the estimated exempt well population for 1985 – 1999, and the 2000 and 2010 US Census calculated exempt well population figures for the PRAMA interpolated for the years 2001 through 2009, ADWR utilized the trendline function in Microsoft Excel to project the exempt well population from 2011-2110. Several trendlines were considered. ADWR selected the Power trendline. The linear trendline results in a year 2110 exempt well population projection of about 67,000 people. The log trendline results in a year 2110 exempt well population projection of about 25,000 people. (In the 4MP historical budget template, for the years 2011 and 2012 the 4.3 percent growth rate (the 1985 – 2006 average growth rate for large municipal water providers in the PRAMA) that was used in the Assessment was applied to estimate exempt well population.)

- Demand for exempt well population was projected using 90 GPCD. The exempt well population is assumed to use 100 percent groundwater for the years 2013 through 2024. For 2025 through 2110, it is assumed that a regional reclaimed water storage and recovery project will have been constructed and will replenish small provider and exempt well groundwater pumping. This will allow the offsetting of exempt well pumping for several decades into the future.

Scenarios B and C for the exempt well population include the following additional assumptions:

- A regional wastewater collection system is in place beginning in the year 2020, to collect wastewater from all new small provider and exempt well population added in 2020 and thereafter, thus increasing the supply of reclaimed water that can be stored.

Projected Reclaimed Water Supply, Underground Storage and Recovery
All three scenarios project the volume of reclaimed water available for storage based on an assumption that the entire service area populations of both the City of Prescott and the Town of Prescott Valley are connected to the sewer system. For the Town of Chino Valley all population growth within the US Census Designated Place (CDP) for Chino Valley in the future is assumed to be connected to the sewer system. The CDP is much larger than the current Town of Chino Valley water service area.

The projected volume of reclaimed water generated was based on the following assumptions for each entity:

- For Prescott, 54 percent of the total water deliveries will be reclaimed water.

- For Prescott Valley, reclaimed water will constitute 58 percent of deliveries from 2013 - 2023 and 64 percent of deliveries from 2024-2110.

- For Chino Valley, 60 percent of deliveries will be reclaimed water.

Scenarios B and C assume that a regional wastewater collection system is in place beginning in the year 2020, to collect wastewater from all other new small provider and exempt well population added in after 2019, thus increasing the supply of reclaimed water available for storage to replenish small provider and exempt well groundwater demand.

For all three scenarios, the total volume of reclaimed water stored each year is equal to the total volume estimated to be generated by all entities, minus Prescott's direct delivery of 2,240 acre-feet per year, minus evaporative losses. It was assumed that all reclaimed water would be stored via a constructed USF facility, and that there would be no cut to the aquifer imposed. Under these assumptions, depending on the demand and other supply assumptions, by the year 2024 there would be between 77,000 and 85,000 acre-feet of reclaimed water long-term storage credits in the PRAMA.

In all three scenarios, beginning in the year 2025, only 3,000 acre-feet of groundwater is assumed to be pumped by the municipal sector (including large and small municipal water providers and exempt well demand). The next sources assumed to be used are direct-use reclaimed water, Big Chino groundwater, and recovered surface water. The remainder of the PRAMA's municipal demand (including exempt well demand in the municipal category of PRAMA demand) will be delivered through recovery of annual or long-term storage credits of reclaimed water.

As noted above, it is assumed in these scenarios that the PRAMA municipalities will cooperatively develop and construct an underground storage facility along Granite Creek and infrastructure to direct reclaimed water to a stretch of the Creek, recovery wells located along Granite Creek, and infrastructure to transport the recovered reclaimed water back to each contributing entity.

11.2.2 Industrial Demand and Supply

The Assessment Baseline Scenario One demand was incorporated into all three scenarios included in this chapter for the industrial sector (consisting of Type 1 and Type 2 Non-Irrigation Grandfathered Groundwater Rights and Permits). This assumption holds industrial groundwater demand, which

comprises the majority of the demand, at about 1,500 acre-feet per year through 2110. There is currently roughly 8,000 acre-feet of industrial pumping authority in the PRAMA, but actual annual industrial use within the PRAMA over the historical period 1985 – 2012 was approximately 1,000 acre-feet. This assumes that industrial demand will continue in the PRAMA, but the majority of future industrial demand will be served by a municipal water provider pursuant to their service area rights rather than through a Type 1 or Type 2 Grandfathered Right (GFR), or a permit.

11.2.3 Agricultural Demand and Supply

The Baseline Scenario One demand from the Assessment was also incorporated into all agricultural sector scenarios in this chapter. This demand was based on the agricultural sector water use in PRAMA continuing to decline to only about 30 acre-feet of groundwater use by 2025, with the CVID recovering about 750 acre-feet per year of reclaimed water to meet agricultural demand. CVID's recovery of reclaimed water is pursuant to CVID's agreement with the City of Prescott and is limited to a maximum total of 33,000 acre-feet of recovered reclaimed long-term storage credits. Under these assumptions, Prescott fulfills its 33,000 acre-foot obligation to the CVID in the year 2037. After that, it is assumed the remaining agricultural users return to groundwater, and the agricultural groundwater pumping is volume remains constant at about 800 acre-feet per year from 2038 through the year 2110.

11.3 PROJECTED NATURAL SUPPLY

Water supply in the PRAMA has been projected by ADWR using a statistical approach based on development of the PRAMA hydrologic model and its recent updates (Nelson, 2013). During the model update, ADWR Hydrology staff gained new understanding of the PRAMA's natural water supply variability not evaluated in the Assessment. The projected natural supplies included in this chapter are not intended to be supply forecasts for each projection year, but rather are intended to mimic the historical annual variability in net natural recharge in order to inform any water management issues that may arise from increased demand coupled with supply variability over time *(See Figure 11-2)*.

Historical data reveals the pattern referred to earlier in this chapter; namely periods of little precipitation and streamflow with occasional flood events that replenish the aquifer. This variability, which may be impacted further by climate change, is the reason using a long-term annual average for net natural recharge can be a deceptive metric in PRAMA. Such an assumption gives the false impression that the natural supply is consistently available.

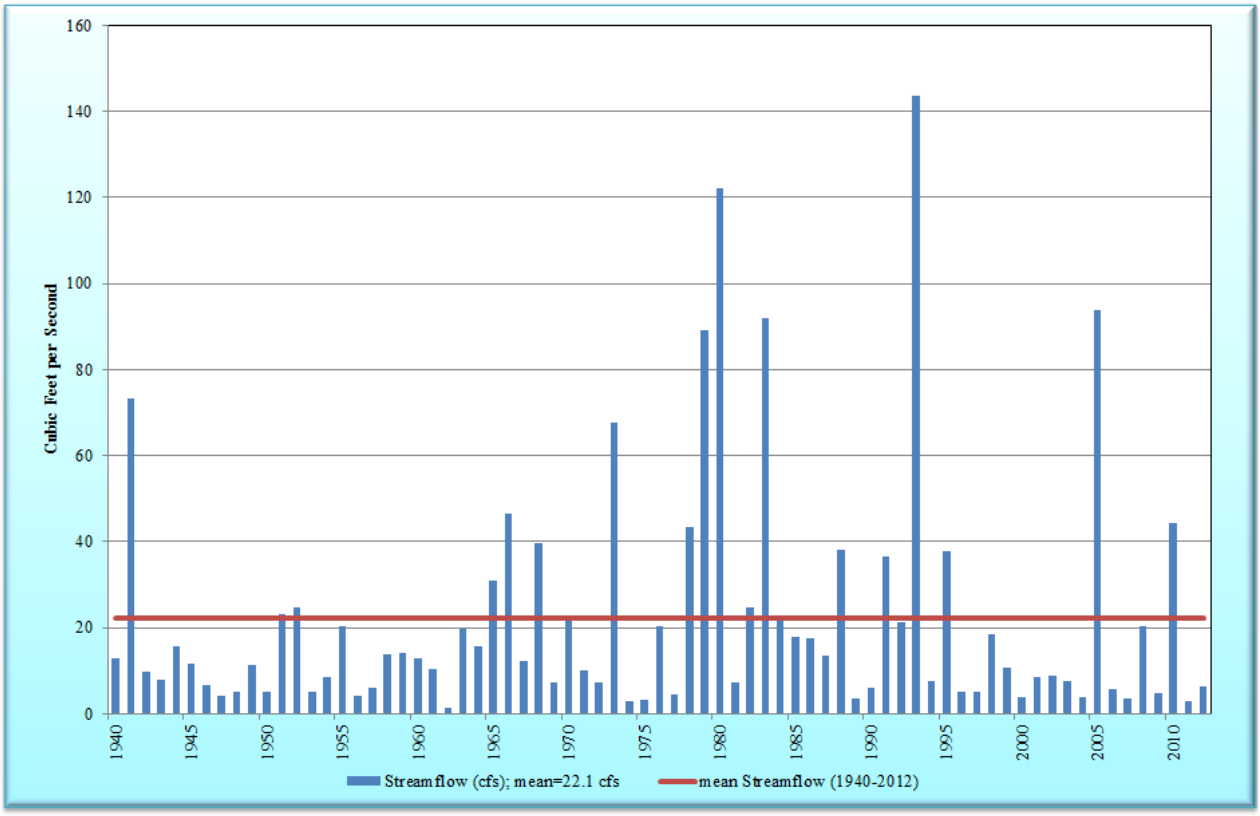
In Chapter 2 of this plan, refer to Figures 2-7E, 2-7I and 2-7Q, in addition to the hydrographs shown here in Appendix 11-B, Figures 11-B1 and 11-B2 to see examples of water level variations over time. Water level data collected from local wells provides additional information on the frequency, magnitude, and variability of natural recharge. Streamflow data shows that significant streamflow events occurred at higher frequencies between the mid-1970s and the mid-1990s, compared to the period from the 1940s through the mid-1960s and recent decades. Data reveals water rises in wells in response to streamflow patterns, and declines in the absence of recharge, especially in wells with direct hydraulic contact with major streams and tributaries.

Net natural recharge is the sum of stream channel recharge, mountain front recharge and groundwater underflow and discharge. Human activities such as agricultural irrigation also result in recharge in the PRAMA. Historical volumes for annualized streamflow which results in stream channel recharge shown in Figure 11-2 are based on the outputs from the updated PRAMA hydrologic model. The individual components of net natural recharge, plus agricultural incidental recharge, are shown in Figure 11-3. The 1985 through 2012 average annual net natural recharge is also shown in Figure 11-3.

For 2013 through 2110 the statistically generated simulation of fluctuating net natural recharge for 2013 – 2025 was repeated each year. Again, this is not intended to forecast net natural recharge, but to provide a

variability surrogate to compare against the AMA projected water demand to determine the potential impacts on supply availability and provide insight into appropriate directions for water management planning.

FIGURE 11-2
AVERAGE ANNUALIZED STREAMFLOW
AGUA FRIA RIVER NEAR MAYER, ARZIONA
PRAMA

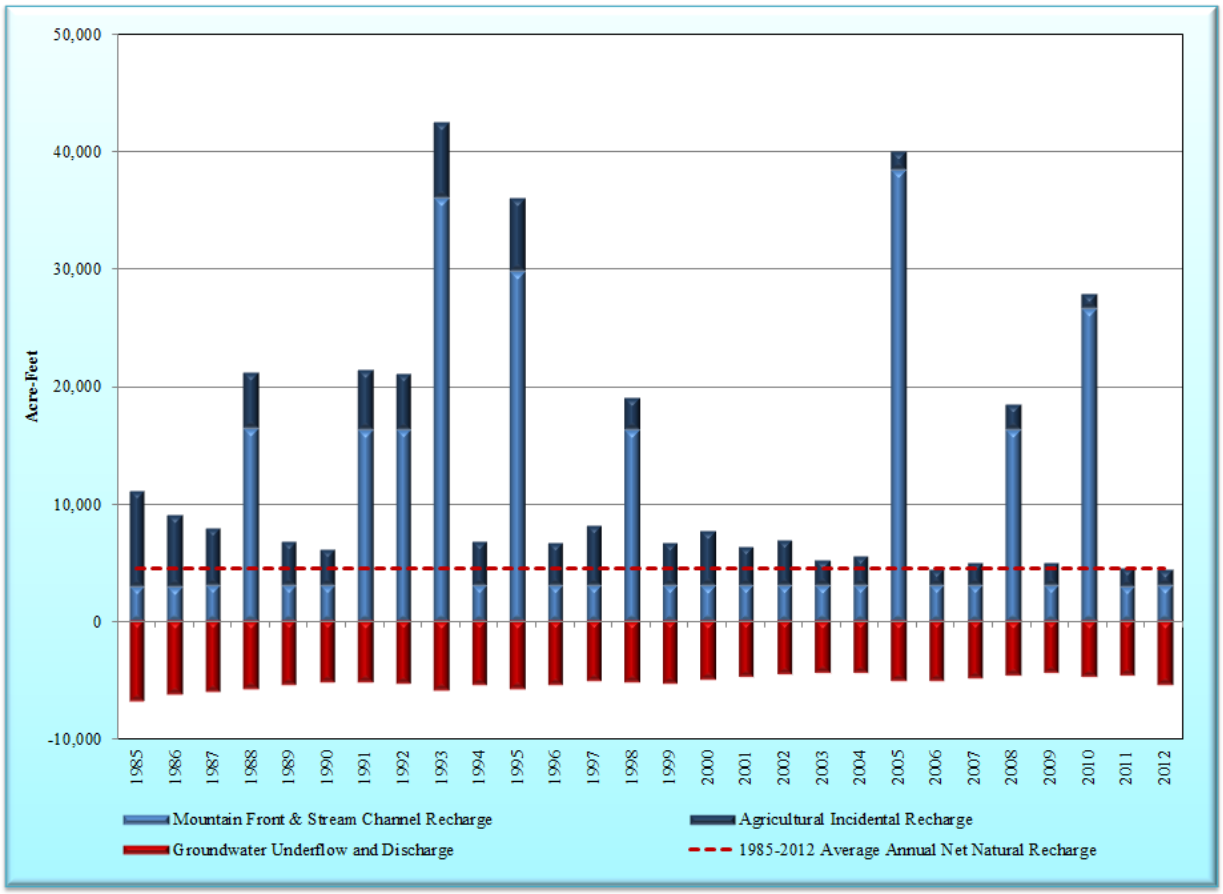


For water management purposes, it is important to consider the extended positive impact of occasional flood events, which replenish the aquifer beneath and in proximity to the stream channel, resulting in water level rises in wells. After a significant flood event, the benefits to the aquifer may endure for more than one year.

In Figure 11-3, there are years when the groundwater underflow and discharge was greater than the mountain front and stream channel recharge. This is because the agricultural incidental recharge made up a large component of the groundwater underflow and discharge after infiltrating into the aquifer. Agricultural incidental recharge is not a component of *natural* recharge, but it is shown in Figure 11-3 to illustrate how groundwater underflow and discharge can be greater than mountain front and stream channel recharge. In these years, the outflow of water beneath the land surface is primarily agricultural incidental recharge because there was insufficient natural inflow to result in the outflows observed.

Storage capacity availability at Granite Creek will need to be monitored closely if significant volumes are stored. During periods of low precipitation more storage capacity may be available than immediately after a flood event. When the aquifer is full, pumping can occur in the replenished areas until water levels begin to decline, at which point artificial recharge could increase. Some mechanism to capture and retain reclaimed water destined for underground storage may need to be designed and constructed to allow for temporary storage until aquifer storage capacity becomes available.

FIGURE 11-3
MODELED ANNUAL NET NATURAL RECHARGE
PRAMA



There has historically been a seasonal pattern to water level increases and declines in certain areas of the PRAMA. Artificial recharge in areas experiencing seasonal declines, and the ability to seasonally shift pumping to locations where water tables are stable or rising, would take better advantage of seasonal replenishment opportunities. Historically, the groundwater withdrawn by municipal providers in the PRAMA has been concentrated in the Chino Valley and Prescott Valley areas. Under this approach, some of the groundwater withdrawals in those areas might be seasonally shifted closer to Granite Creek, or other suitable locations for underground storage and recovery, to avoid stored water leaving the AMA.

11.4 RESULTS OF WATER BUDGET ANALYSIS

The overdraft values shown in the water balance charts in this chapter represent PRAMA-wide annual balances. For the historical period, these are estimates are based on ADWR's hydrologic model as well as reported and estimated water demands for the PRAMA. These figures do not reflect seasonal fluctuations in precipitation and stream channel recharge. Managing seasonal fluctuations in precipitation and stream channel recharge may require 1) shifting pumping centers, 2) more artificial recharge, and 3) more recovery within the area of impact where water is stored.

Figures 11-4A through 11-4C illustrate the historical and projected overdraft or surplus in the PRAMA, under the assumptions for the 1985 – 2012 (historical period) and the 2013 – 2110 (projected period). Of note is the persistent overdraft in both the historical period and the early part of the projected period until 2025. With the water management approaches incorporated into the assumptions above, minimal

overdraft occurs between flood events (at or below 5,000 acre-feet per year). The local communities work to fund construction of infrastructure to channel periodic flood flow to Granite Creek, or other suitable areas for underground storage, to be stored. In addition, stored reclaimed water is recovered to offset pumping as long as reclaimed annual and long-term storage credits persist. When long-term reclaimed storage credits are exhausted, the PRAMA once again begins overdrafting the aquifer.

In Figures 11-4A through 11-4C overdraft is shown with red bars. Surplus years are shown in teal colored bars in Figures 11-4A through 11-4C. These charts illustrate the following:

- As shown in Table 3-2 in Chapter 3, and in Figure 11-4A through 11-4C in the Historical Period portion of the chart (1985 through 2012), there were few years where the water supply, based on net natural recharge into the PRAMA, exceeded the volume of pumping (surplus years).

- The years 2013 through 2024 incorporate the assumptions used in the Assessment ("Assessment Projection" period), and do not move the PRAMA closer to safe-yield.

- After 2024, the assumptions described in this chapter are depicted in Figures 11-4A through 11-4C. Post 2024, each figure shows a period of safe-yield ("Safe-Yield" Period, the length of which depends on the scenario), where the PRAMA is able to achieve a long-term average of safe-yield with a small volume of annual overdraft in most years that is cancelled out by the periodic flood recharge events.

- In all three scenarios, the Safe-Yield Period comes to an end, after which overdraft resumes. In order to mitigate resuming an overdraft situation, additional supply augmentation (besides the importation of Big Chino groundwater) will be needed.

Although the projected scenarios include years of surplus which mimic the historical pattern of overdraft with occasional years of surplus, once the reclaimed water long-term storage credits are exhausted, the surplus years are not able to offset the overdraft that occurs in between surpluses and the PRAMA once again begins a trend of persistent overdraft as observed in the historical period. Because the water table is greatly affected by localized recharge and withdrawal, achieving safe-yield PRAMA-wide does not ensure that all local areas of the AMA will attain a balance of supply and demand. There may be localized areas within the AMA with persistent groundwater declines, wells going dry, increased pumping costs, and water quality changes. Conversely, the physical benefits of recharge may be confined to areas where recharge basins and stream channels are located. Addressing the impacts of local water level declines and recovery in localized areas of the AMA must be addressed during the fourth management period. A more comprehensive approach to water management is needed to ensure that all areas of the AMA receive the benefits of stable water levels.

FIGURE 11-4A
PROJECTED WATER BUDGET: BASE SCENARIO
PRAMA

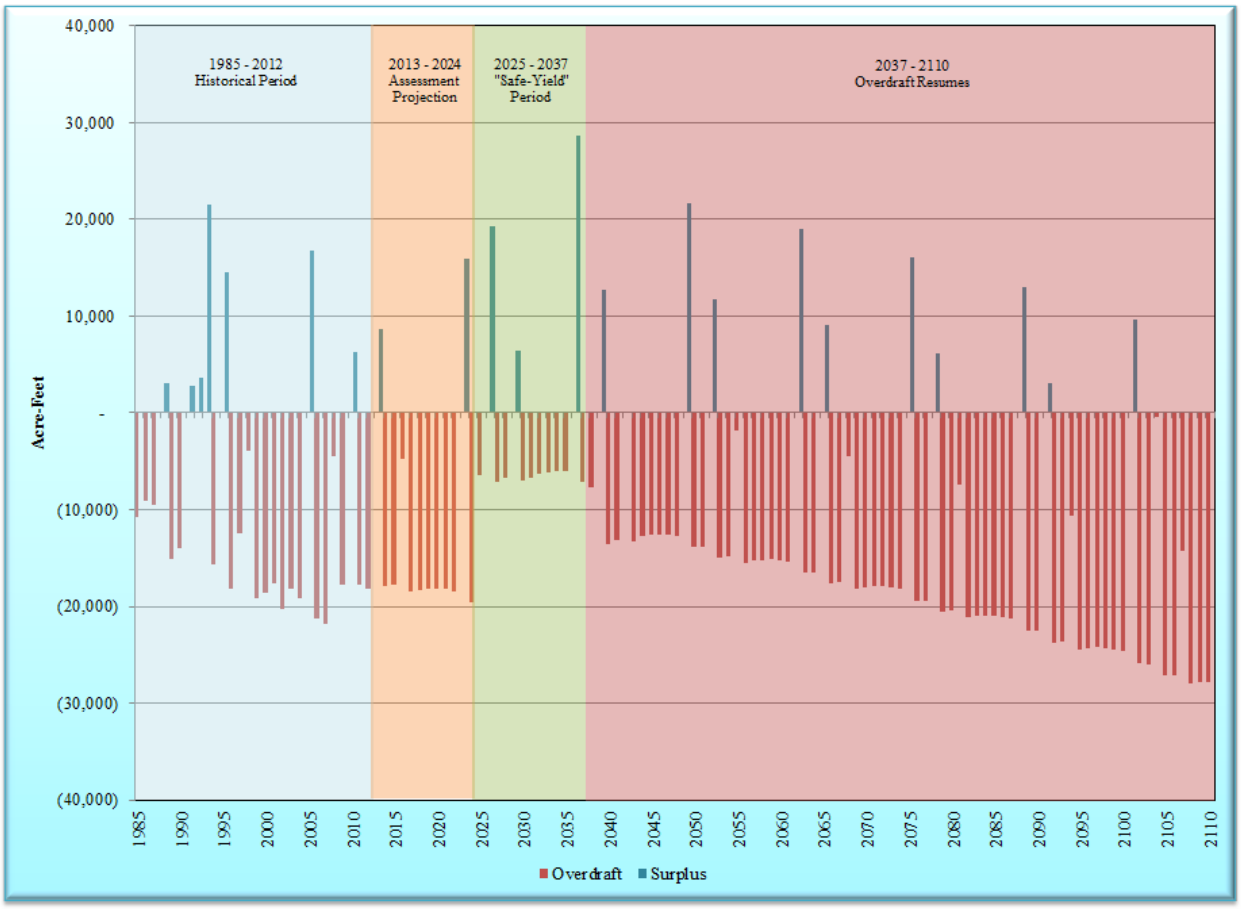


FIGURE 11-4B
PROJECTED WATER BUDGET: WATERSENSE, CHINO VALLEY BIG CHINO PRAMA

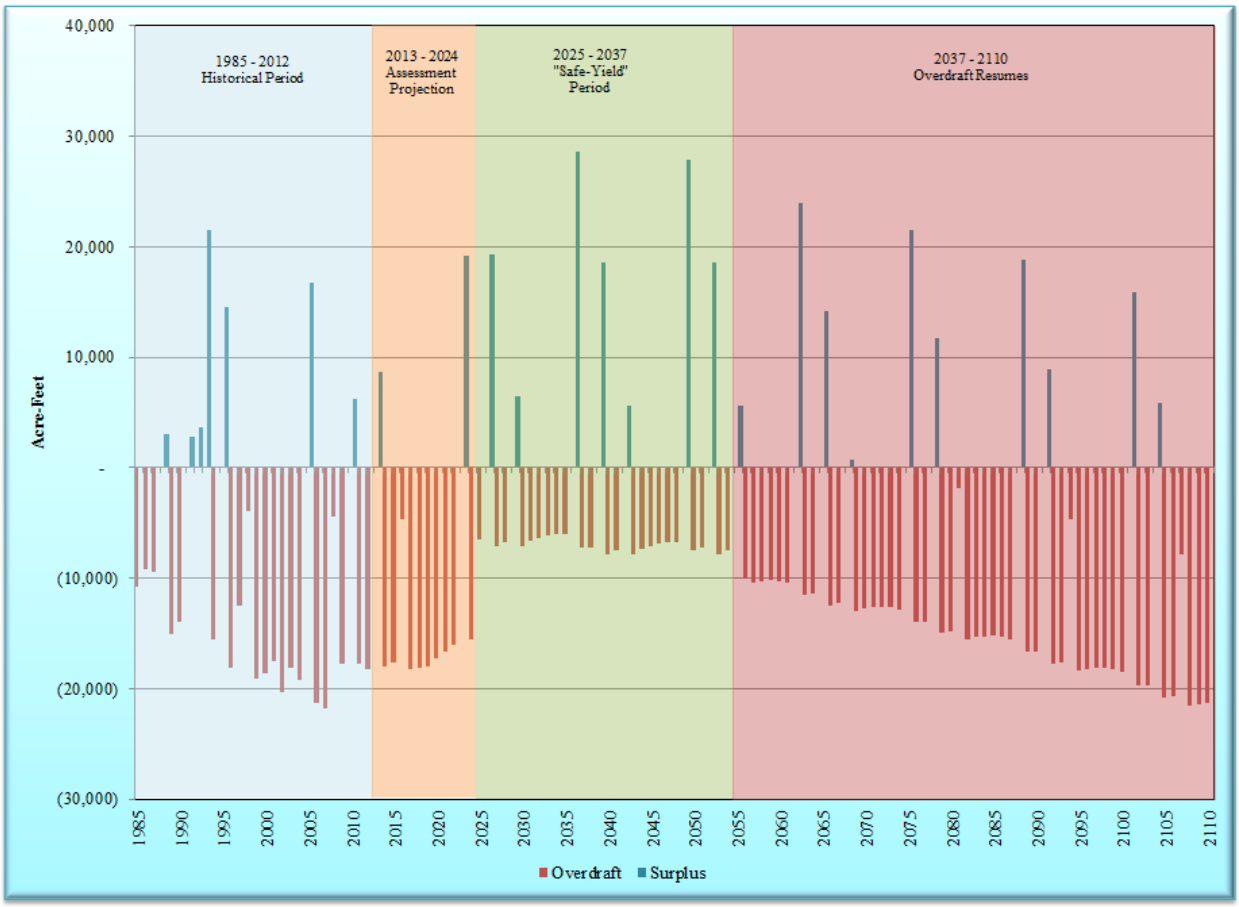
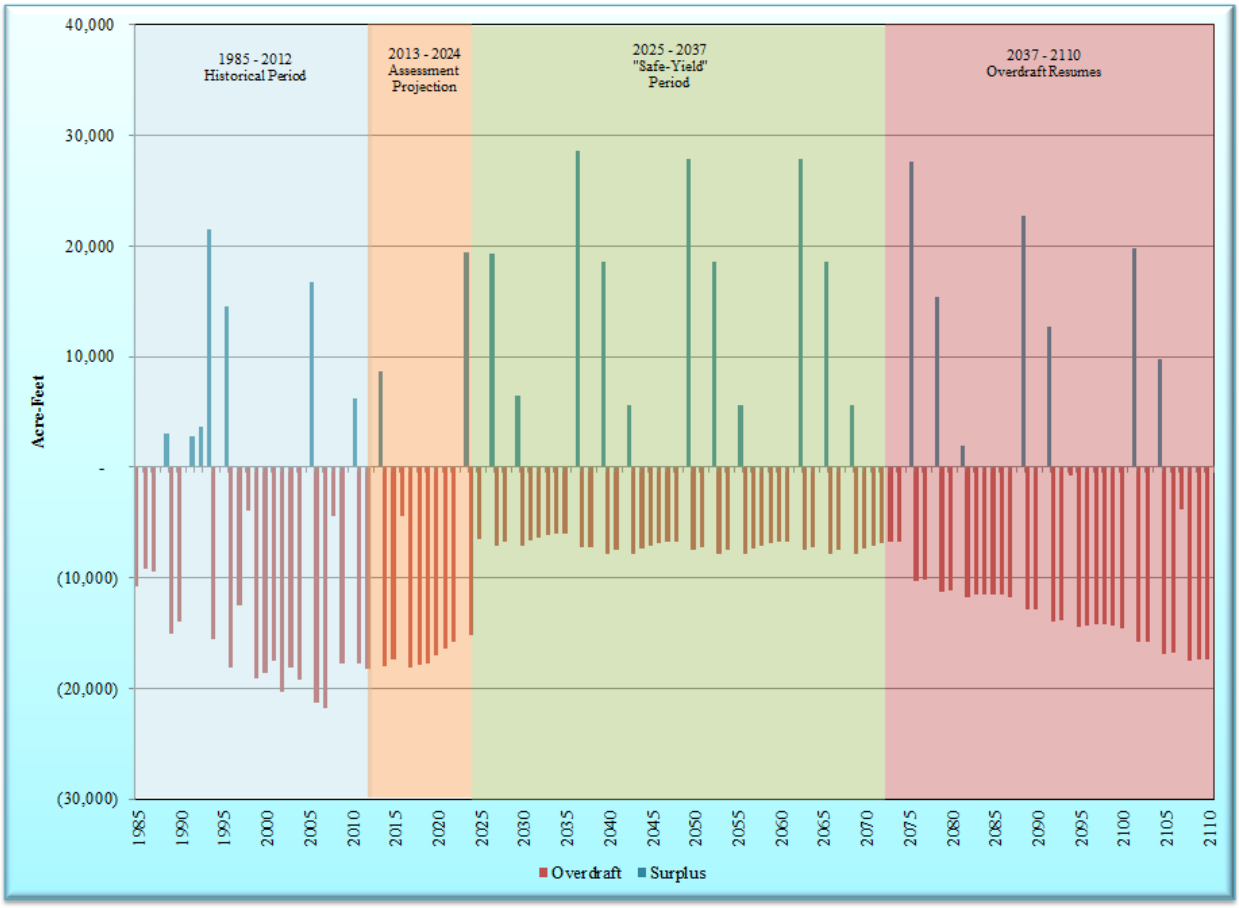


FIGURE 11-4C
PROJECTED WATER BUDGET: WATERSENSE, CHINO VALLEY BIG CHINO, ADDITIONAL SURFACE WATER CITY OF PRESCOTT
PRAMA



With the use of the additional supplies and reduced demand assumptions included in scenarios B and C, the period for which minimal overdraft can be maintained is extended. In Scenario A, the PRAMA is projected to remain in safe yield until the year 2037. In Scenario B this period is extended to the year 2054, and in Scenario C, this minimal annual overdraft, which can be offset with a significant flood event, can be maintained for growth projected until the year 2072. Thus, the water budget scenarios illustrate the range of possible overdraft in the PRAMA from 2013 through 2110, given the statistically generated, annually variable net natural recharge components and the demand and supply assumptions described above.

Historical and projected supplies through 2025 are shown in Figure 11-5. This chart shows groundwater use declining until 2012, and then the groundwater projected to be used from the Assessment is shown from 2013 through 2024. In 2025 there is a sharp drop in groundwater use based on the assumptions described in this chapter where there is an increase in annual and long-term credit recovery of stored reclaimed water. The average net natural recharge (from the 4MP Historical Assessment Summary Budget (*http://www.azwater.gov/azdwr/WaterManagement/AMAs/PrescottAMAFourthManagementPlan.htm.*) for the years 1985 to 2012 is shown as a red line on Figure 11-5. The groundwater demand from 1985 through 2024 is well above this historical average net natural recharge. Based on the assumptions for

2025, however, groundwater demand in 2025 is very close to the long-term average net natural recharge figure (the red line in Figure 11-5).

FIGURE 11-5
HISTORICAL AND PROJECTED SUPPLIES, BASE SCENARIO, 2025 – 2110
1985 – 2025
PRAMA

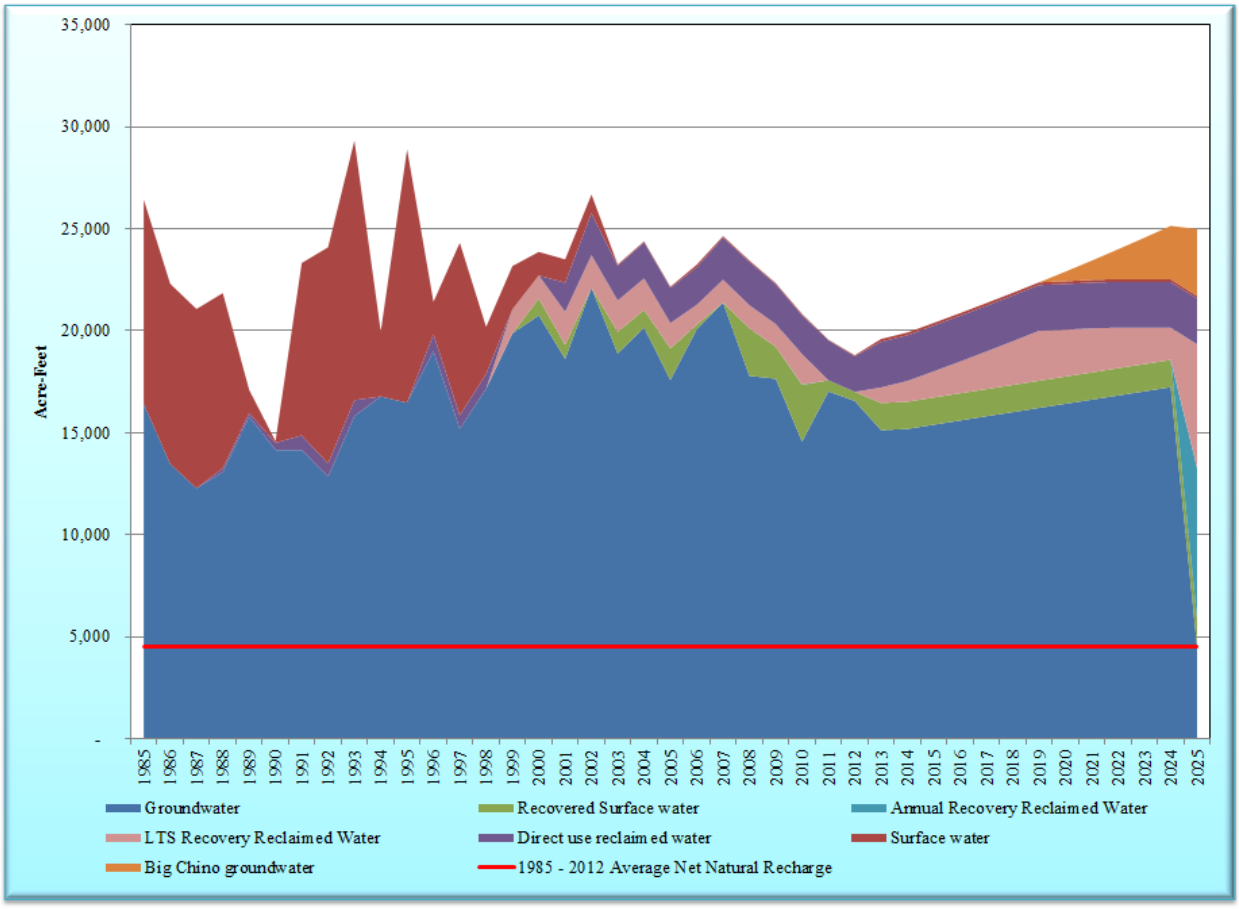
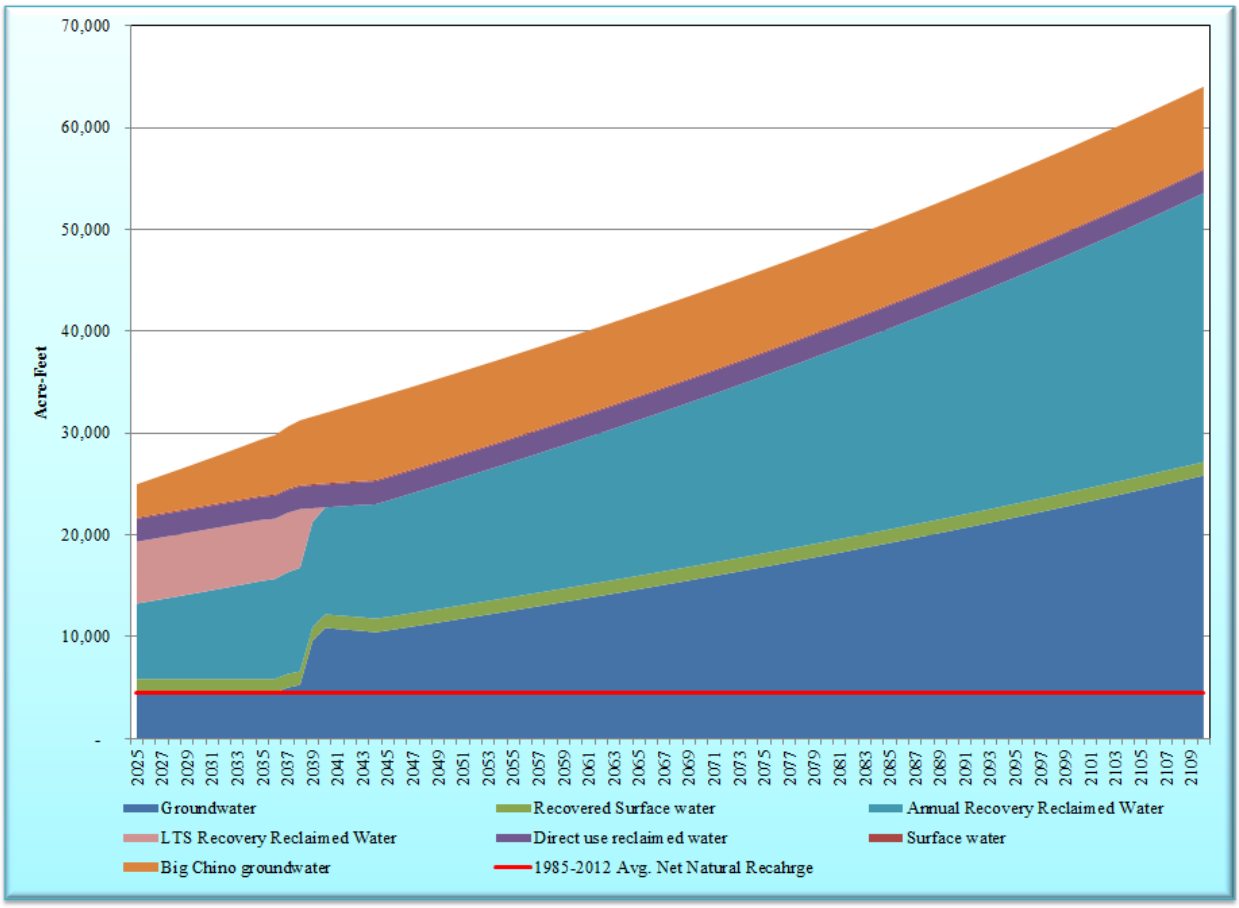


Figure 11-6A shows the projected supplies to meet demand from 2025 through 2110 for Scenario A, the Base Scenario, the assumptions for which are described in the preceding sections. This chart shows that a volume of groundwater demand comparable to the volume of long-term net natural recharge can be maintained based on the assumptions in Scenario A until about 2037. After 2037 long-term storage credits for reclaimed water are exhausted, and the sum of the assumptions for the volume of available Big Chino groundwater, direct-use reclaimed water, annual reclaimed recovery and recovered surface water are insufficient to meet the projected demand in the PRAMA. As the only remaining water supply, groundwater pumping must increase after 2037 to meet the remainder of the PRAMA water demand. Thus, the groundwater wedge in Figure 11-6A rises above the volume of net natural recharge, and overdraft resumes and is projected to continue to increase through 2110.

FIGURE 11-6A
HISTORICAL AND PROJECTED SUPPLIES, BASE SCENARIO
PRAMA



Figures 11-6B and 11-6C show the distribution of projected supplies to meet demand from 2025 through 2110 for Scenarios B and C respectively.

FIGURE 11-6B
HISTORICAL AND PROJECTED SUPPLIES, WATERSENSE, CHINO VALLEY BIG CHINO PRAMA

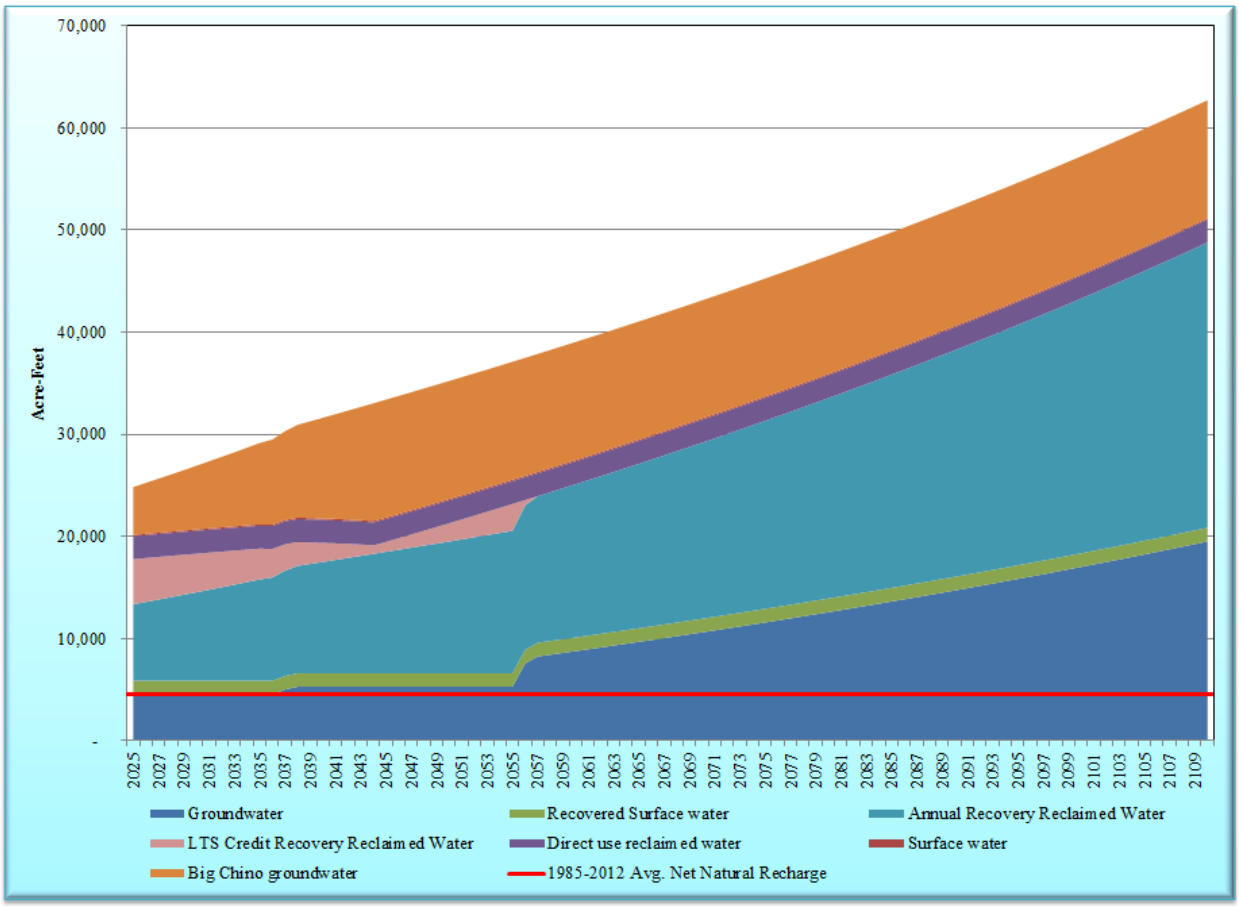
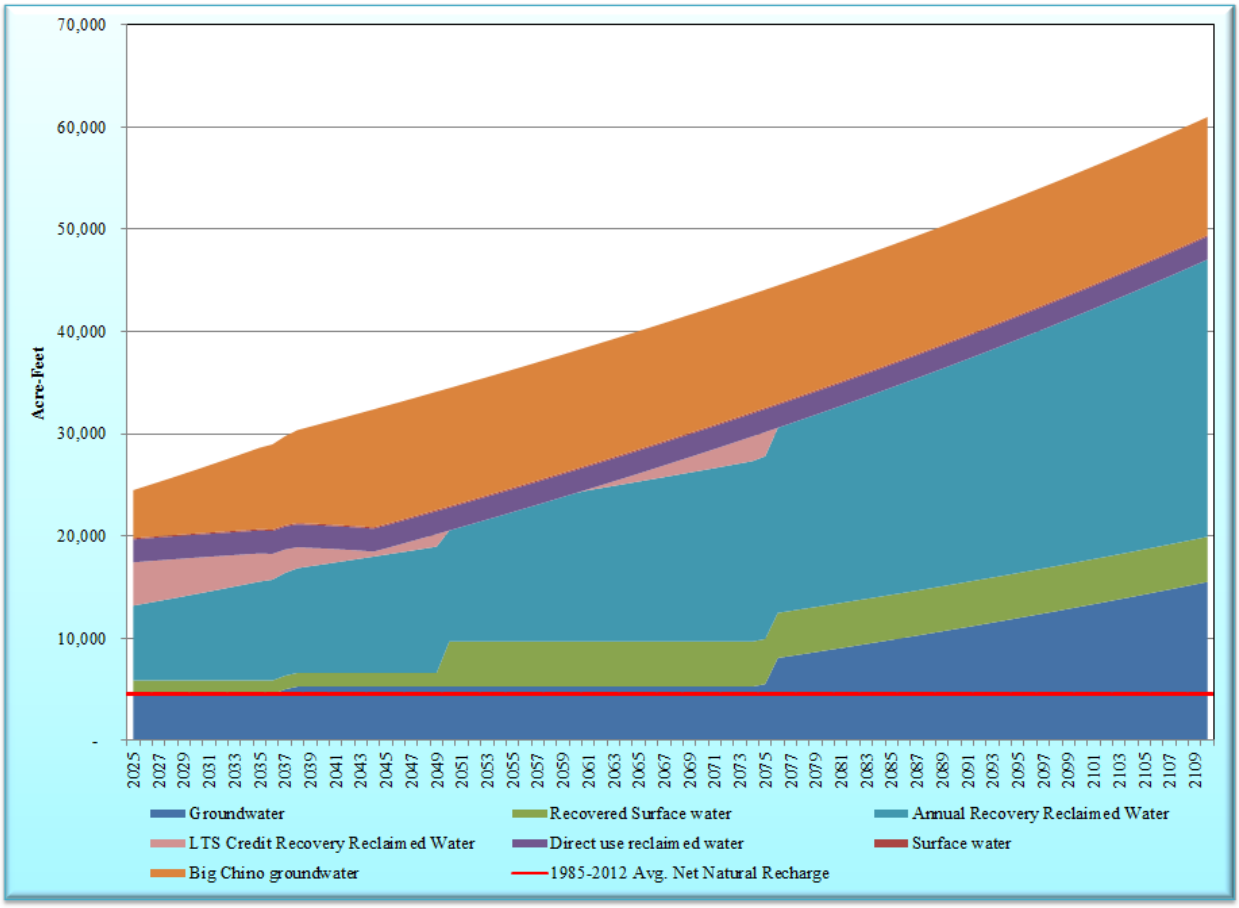


FIGURE 11-6C
HISTORICAL AND PROJECTED SUPPLIES, WATERSENSE, CHINO VALLEY BIG CHINO, NEW EXTERIOR MODELS, ADDITIONAL SURFACE WATER CITY OF PRESCOTT
2025 – 2110
PRAMA



11.4.1 Determining Factors

Only a portion of the water management factors affecting the PRAMA's ability to achieve safe-yield are under ADWR's authority. These include conservation requirements, DAWS, permitting recharge facilities, well permitting, and incentives for use of renewable supply. Other water management factors not under ADWR's authority are difficult to predict, including economic factors, local initiatives and ordinances, and individual attitudes and habits. The outcome of these variables could either impede or enhance the PRAMA's ability to reach safe-yield.

Economic and growth factors are impacted by water pricing. Water rates are controlled by water providers and the Arizona Corporation Commission. Pricing can have a direct effect on water use. Energy costs affect water pricing to some extent as well. Water rates paid by customers in the PRAMA fall in line with those paid in other AMAs. For example, City of Tucson (Tucson Water) customers pay about $15 per 5,000 gallons. In contrast some private water companies in the Phoenix AMA who invested in constructing and operating their own water treatment plants to treat and deliver CAP water have rates of more than $50 per 5,000 gallons.

Customers of the City of Prescott and Town of Prescott Valley pay between $15 and $25 for the first 5,000 gallons of water that they use. Both large municipal providers have increasing block water rates, where customers with the highest water use pay increasingly higher rates for blocks of water above the

first 5,000 gallons they use. Increasing block water rates are designed to encourage conservation by increasing the unit cost of water with increasing use.

Economic conditions can have positive or negative effects on water demand. Population growth can result in higher water demand for support industries and increased municipal demand.

In a November 2009 city election, Prescott voters passed Proposition 401 which requires a public vote on all city projects that cost more than $40 million. In 2011, the City of Prescott estimated the costs of the Big Chino importation project to be approximately $170 million. An estimated $36 million was spent as of the year 2011 on the Big Chino importation project for land acquisition, engineering and design, hydrologic studies, and other costs. To construct the pipeline and bring water into the PRAMA, an additional $133 million is estimated to be needed. (City of Prescott, 2011) Construction of the Big Chino pipeline will require a public vote to implement. Other augmentation strategies are likely to be in excess of the cost of Big Chino, and Proposition 401, would also require a vote to implement.

In addition to importing groundwater from the Big Chino basin, some members of the community have supported rainwater harvesting as a method of augmenting the water supply in the PRAMA. Rainwater harvesting refers to engineered systems to enhance the capture, and storage of, rainwater. This can be accomplished at a small scale at a single residence, or at a larger scale for residential subdivisions, commercial developments, industrial sites, parking lots, roads and highways. Proponents of this water management strategy have suggested that the operators of water harvesting systems be able to obtain underground storage credits for harvested rainwater through ADWR's Underground Storage and Recovery Program. Should this concept prove to be viable, directing underground storage credits to specific users will require significant monitoring of localized storm events, accounting and administration. Additionally, there are concerns from some existing water rights holders that inhibiting flows that otherwise would have entered the surface water system may reduce their water availability. To address these and other related issues, the Arizona legislature passed House Bill 2363 in 2012 establishing a Joint Legislative Study Committee on Macro-Harvested water to evaluate the issues arising from the collection and recovery of large-scale harvested water. The work of this Committee will be important in determining whether or not these projects can result in significantly enhancing water supplies beyond what is currently available for future uses. To date, it has not met. Pilot projects are currently being developed to analyze the feasibility and potential of this water management alternative in the Upper San Pedro Basin in Cochise County.

11.5 CONCLUSIONS

The water budget scenarios discussed in this chapter are not intended to suggest limitations on individual water users or sectors, but are included here to assess the status of the AMA and illustrate the need for additional water management planning, infrastructure construction, and augmentation to achieve its management goal. ADWR's understanding of the hydrology of the PRAMA has improved since the adoption of the 3MP. This increased understanding, coupled with rapid growth experienced during the third management period, and growth projections under several different scenarios, indicates that the PRAMA must increase use of renewable water supplies and continue the commitment to import water. Both of these approaches involve the construction of new infrastructure. Based on the projections included in this chapter, the PRAMA can achieve safe-yield by 2025, but the period of time for which the AMA can maintain safe-yield will depend on the nature of the growth and the choices made related to conservation, importation, infrastructure construction and water management strategies. Many of the assumptions included in the scenarios illustrated in this chapter will require unprecedented regional and cross-jurisdictional cooperation from today and continuing thereafter.

APPENDIX 11-A
4MP SCENARIO ASSUMPTION SUMMARY
PRAMA

	Population	Demand	Supply
City of Prescott	Re-projected service area population from 1985-2012 using a linear trendline from 2013-2110. Results in 2110 service area population of 134,522 people.	For Scenario A = 150 GPCD; For Scenario B and C assumed Prescott adopts a "WaterSense" ordinance in 2015, this changes the new interior use model from 57 GPCD down to 39 GPCD. For Scenario C also assume Prescott adopts a landscape ordinance for new development resulting in a reduction in the exterior GPHUD from 75 to 50 for single family homes and from 58 down to 20 GPHUD for multi-family homes, similar to actual rates observed in the Town of Prescott Valley. This results in an overall GPCD in the Prescott service area of 141 GPCD by 2110 for Scenario B, and an overall GPCD in the Prescott service area of 130 GPCD by 2110 for Scenario C.	All three scenarios assume Prescott direct use of reclaimed water is 2,240 acre-feet for 2013-2110. Scenarios A and B assume Prescott annually stores and recovers 1,335 acre-feet of surface water per year. Scenario C assumes that Prescott accesses and stores, beginning in the year 2050, another 3,200 acre-feet of surface water from its other surface water claims. All scenarios assume that Prescott begins using Big Chino groundwater in 2020 and ramps up to 4,365 acre-feet by the year 2044 and maintains that volume of Big Chino groundwater importation through 2110. For all three scenarios, for 2013 through 2024, Prescott is assumed to use groundwater to meet the remainder of the demand, up to 8,000 acre-feet. With these demand assumptions and population projection assumptions, Prescott never reaches 8,000 acre-feet of groundwater through 2024. For 2025 through 2110, it is assumed that Prescott uses no groundwater, and the remainder of Prescott's demand minus direct use reclaimed water and recovered surface water and Big Chino groundwater is met with recovered reclaimed water.
Town of Prescott Valley	Re-projected service area population assuming 4.1% growth rate from 2013-2025; a 2.2% growth rate from 2026-2035; and a 1.25% growth rate from 2036-2110. Results in 2110 service area population of 238,760 people.	For Scenarios A, B and C: 118 GPCD	For all three scenarios, for 2013 through 2024, it is assumed the Prescott Valley uses groundwater up to 6,161 acre-feet per year. It is also assumed that Prescott Valley begins importing Big Chino groundwater in 2020 and ramps up to 3,703 acre-feet by 2045 and maintains that volume of Big Chino groundwater importation thereafter. Any additional demand in each year above 6,161 acre-feet is met with recovered reclaimed water. For the year 2025 through 2110, it is assumed the Prescott Valley uses no groundwater, but supplies all its demand with recovered reclaimed water and Big Chino groundwater.
Small Providers	Including the Town of Chino Valley, small provider population was re-projected using the 1985-2012 historical data and a linear trendline for 2013-2110. This results in a small provider population of 42,390 people in 2110.	For Scenarios A, B and C: 90 GPCD	In all three scenarios, for 2013 through 2024 small providers are assumed to use 100% groundwater. However, in 2025 through 2110, it is assumed that regional reclaimed water storage and recovery will be implemented to offset or replenish small provider demand such that between small providers and exempt well population, only 3,000 acre-feet of municipal groundwater is withdrawn per year. The remainder of the demand is met with recovered reclaimed water. In scenarios B and C it is assumed that the Town of Chino Valley begins importing Big Chino groundwater in 2020 and ramps up to 3,483 acre-feet in the year 2045 and maintains that volume of imported Big Chino groundwater thereafter. Also in scenarios B and C, it is assumed that a regional wastewater collection system is in place beginning in the year 2020, to collect wastewater from all new small provider and exempt well population added in 2020 and thereafter, thus

	Population	Demand	Supply
			increasing the supply of reclaimed water that can be stored and recovered.
Exempt wells	Exempt well population is known only for the 2000 and 2010 US Census years. In the Assessment, exempt well population was estimated for 1985-1999 using a 5% growth rate (back-calculating from the 2000 US Census figure). For 2011 and 2012 the 4.3% growth rate that was used in the Assessment was used to estimate exempt well population. Using these figures, a trendline was developed using the estimated exempt well population for 1985-2012 to project the population from 2013-2110. This results in an exempt well population of about 30,000 people in 2110 using the "power" trendline. This projection is low. It is assumed that steps are taken to restrict the number of new exempt wells in PRAMA as a water management strategy for the fourth management period and continuing thereafter	For Scenarios A, B and C: 90 GPCD	In all three scenarios, exempt wells are assumed to use 100% groundwater for the years 2013 through 2024. For 2025 through 2110, it is assumed that a regional reclaimed water storage and recovery projected will have been constructed and will operationally have the capability to limit the sum of small provider and exempt well groundwater pumping to 3,000 acre-feet per year. The remainder of exempt well demand will be offset with recovered reclaimed water. In scenarios B and C is assumed that a regional wastewater collection system is in place beginning in the year 2020, to collect wastewater from all new small provider and exempt well population added in 2020 and thereafter, thus increasing the supply of reclaimed water that can be stored and recovered.

	Population	Demand	Supply
Industrial		From Baseline Scenario One in the Assessment: 1,640 acre-feet per year for 2013-2110. This assumed that industrial demand will somehow be limited in the PRAMA, to allow the achievement and maintenance of safe-yield for as long as possible. This does not mean that there won't be any commercial uses or industry in PRAMA. These types of uses can occur and be served by a municipal water provider pursuant to their service area rights. What it does mean is that GFR and permit pumping would need to be limited under the assumptions in these scenarios in order to allow for safe-yield.	Industrial demand is assumed to be met primarily with groundwater, with a very small volume each year as direct diversion of surface water. This assumption was held constant in all three scenarios.
Agricultural		From Baseline Scenario One in the Assessment: reduces to 783 acre-feet in 2014 and maintains thereafter.	It is assumed that the Prescott continues to transfer reclaimed water long-term storage credits to the CVID until a total of 33,000 acre-feet of credits have been transferred and recovered by CVID to meet agricultural demand. At an assumed rate of 750 acre-feet of recovered reclaimed water LTS credits per year, the 33,000 acre-feet is exhausted in the year 2037. At that point, the agricultural sector returns to using groundwater and maintains that use through 2110. This assumption was used in all three scenarios

APPENDIX 11-B
SELECTED HYDROGRAPHS
PRAMA

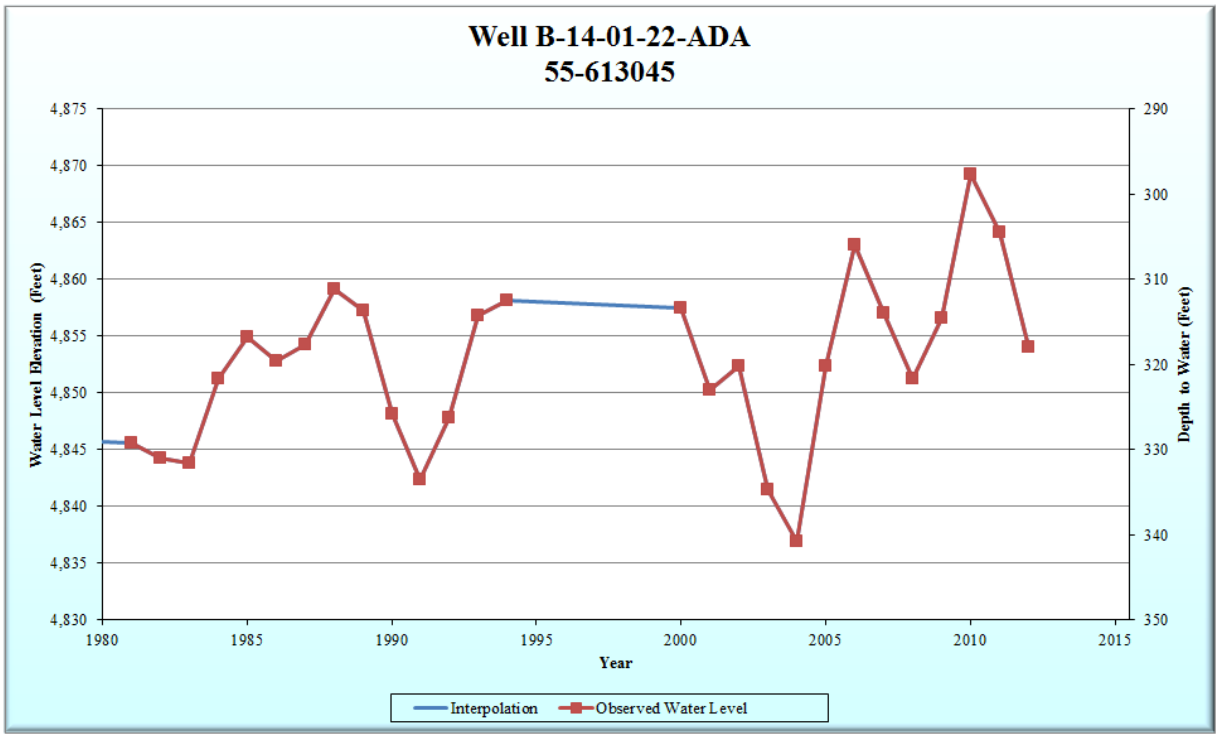


Figure 11-B1. Groundwater Level Data UAF Sub-basin adjacent to Lynx Creek, (B-14-01)22ada (1971-2013).

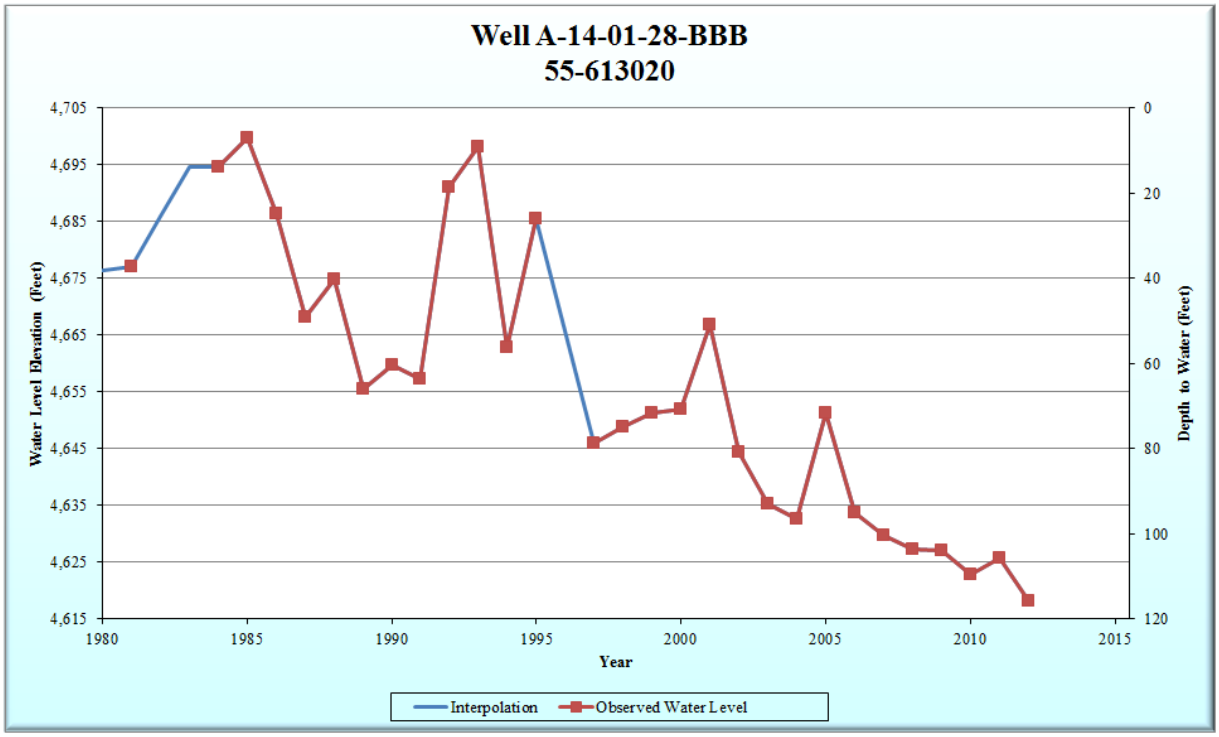


Figure 11-B2. Groundwater Level Data in the UAF Sub-basin adjacent to Lynx Creek, (A-14-01)28bbb (1956-2013). Groundwater level data shows the impacts of significant and frequent recharge in the 1980's and 1990's.

Bibliography

ADWR. (2011). *Water Demand and Supply Assessment 1985 - 2025, Prescott Active Management Area*.

Aldrich, S. (2013, October 1). *Scenario Planning: Building Resilience for an Uncertain Future*. Phoenix, AZ.

City of Prescott. (2011, July 27). Water Resources and Utilities Enterprises, 2011 General Plan Committee. City of Prescott.

Nelson, K. (2013). *Hydrogeology and Simulation of Groundwater Flow, Prescott Active Management Area, Yavapai County, Arizona (Report No. 25).* ADWR.

CHAPTER TWELVE: WATER MANAGEMENT STRATEGY

12.1 INTRODUCTION

The Fourth Management Plan (4MP) programs were developed within current statutory guidelines. However, as described in Chapters 8 and 10, full implementation and complete compliance with the conservation requirements outlined in Chapters 4, 5, and 6 are unlikely to reverse the groundwater overdraft currently experienced in the basin and result in the achievement of the Prescott Active Management Area (PRAMA) goal to achieve safe-yield by the year 2025. The PRAMA communities are facing water management challenges due to the lack of sufficient and multiple renewable supplies. They lack access to Central Arizona Project (CAP) supplies and locally available surface water supplies within the PRAMA are hydrologically or legally limited.

12.2 WATER MANAGEMENT ISSUES

Although current statutes and rules require new growth in the PRAMA to be consistent with the goal of safe-yield, many existing uses are not subject to this requirement. In addition, land subdivided prior to the adoption of the Groundwater Code (Code) is not required to be developed in a manner consistent with the PRAMA goal. Therefore, groundwater overdraft in the PRAMA may continue and could increase above current rates. Some individuals have recommended that ADWR impose greater restrictions on groundwater pumping in the PRAMA. However, the Arizona Department of Water Resources (ADWR) does not have statutory authority to do so. Imposing additional conservation measures and increasing and carefully managing underground water storage and recovery can be accomplished by local authorities and individual water users through local ordinances and self-regulation.

As previously stated, non-groundwater water supplies in the PRAMA are limited. With full allocation of PRAMA groundwater supplies, new growth becomes dependent on acquiring and utilizing renewable or augmented supplies. The PRAMA surface water supply is inconsistently available, depending on weather and climatic conditions, and is subject to the rights of downstream senior appropriators and prior agreements based on surface water claims and the pending Gila River General Stream Adjudication. The reclaimed water supply is derived from water delivered for municipal uses and collected into centralized wastewater systems and infrastructure. Thus, its availability is a function of the availability of other water supplies, interior water demand, and the proportion of the population on sewer systems. The feasibility of importing water supplies continues to be examined by PRAMA municipalities and other interested parties but, to date, these supplies are not available to PRAMA water users.

The Safe-Yield Subcommittee of the PRAMA Groundwater Users Advisory Council identified numerous impediments to achieving safe-yield in its 2006 “Final Report on Safe-yield Impediments, Opportunities, and Strategic Directive.” These included the issues described below, as well as other issues. This study also identified next steps and potential solutions. In April 2013, the Central Yavapai Highlands Water Resources Management Study (US Bureau of Reclamation, 2013), referred to as CYHWRMS, identified several options to augment water supplies in the PRAMA and other areas in the Central Yavapai Highlands. Many of the ideas for next steps and solutions described in CYHWRMS are included in this chapter.

The following section describes in detail the major water management issues facing the PRAMA during the fourth management period and beyond.

12.2.1 Allowable Pumping

Under existing law, several categories of water users, both existing and potential new users, may withdraw groundwater without replenishing, or replacing, that volume of water back into the aquifer. These uses contribute to overdraft and, under current regulations, may increase and continue in perpetuity.

Agricultural Sector
Irrigation Grandfathered Groundwater Rights (IGFRs) allowing farmers to withdraw groundwater for agricultural purposes were granted at the time the Code was adopted. No new IGFRs may be created, but existing rights may be conveyed to new owners, converted to Type 1 Non-Irrigation Grandfathered Rights (GFRs), or extinguished for credits to support demonstration of Assured Water Supply (AWS) consistency with management goal. The trend through 2012 in the PRAMA shows that many IGFRs have been inactivated from agricultural use and extinguished. IGFRs that remain represent a perpetual authority to withdraw groundwater without a replenishment requirement, though this volume is relatively small in comparison to domestic, municipal and industrial water uses.

Industrial Sector
The future use of Type 1 and Type 2 GFRs depends on the potential for growth in non-irrigation groundwater use. Historically, industrial demand in the PRAMA has been fairly stable and largely associated with golf course use. However, there is about 8,000 acre-feet of industrial groundwater allotment that could be used and represents additional authority to pump groundwater. As with IGFRs, there is no requirement for Type 1 and Type 2 GFRs to replenish their groundwater use.

Additionally, the Code gives the director the authority to issue several types of groundwater withdrawal permits. Many of these are short term uses, for exploratory or de-watering purpose. A longer term permit is a General Industrial Use (GIU) permit. The Code allows GIUs to be issued for up to 50 years and which may be renewed. There is no requirement for any of the users of water pursuant to these permits to replenish their groundwater use.

There are many factors that impede the ability of industrial users to use renewable water supplies, including lack of proximity to renewable supplies, reliability of supply, cost, supply ownership, infrastructure, and water quality issues. Although there are no significant water quality problems associated with using reclaimed water on turf-related facilities in the PRAMA, use of this source by other Industrial users could, depending on the industrial process, require additional treatment to remove salts, organics, and other constituents.

Municipal Sector
The municipal sector is the dominant water use sector in the PRAMA. Municipal demand more than tripled between 1985 and 2010, increasing from about 4,000 to approximately 14,500 acre-feet by 2012. The degree to which municipal groundwater use must be replenished has evolved over time, as described below:

- Prior to the adoption of the statewide Water Adequacy Program in 1973, no determination or evaluation of the water supply for future development was required, and there was no requirement for new development to replenish the groundwater it would use.

- From 1973 until 1980, the Water Adequacy Program was in effect statewide, requiring developers to disclose the adequacy of the water supply to new home buyers. However, a determination that the water supply was inadequate did not prevent the development from moving forward. The Water Adequacy Program does not require groundwater to be replenished.

- In 1980, the Groundwater Code established the Active Management Areas (AMAs) and required a 100-year AWS for new subdivisions within those AMAs. Alternatively, a municipal water provider may choose to prove an AWS for their entire water service area. To prove an AWS, a developer or a municipal provider must demonstrate five criteria:

- the water supply for the new development is physically, legally and continuously available;
- the developer has the financial capability to construct any infrastructure necessary to provide water to the new development;
- the proposed water supply meets water quality standards;
- the water supply is consistent with the management plan of the Active Management Area (AMA); and
- the water supply is consistent with the management goal of the AMA.

To prove consistency with the safe-yield water management goal, groundwater use must be limited and replenished, or renewable supplies must be used in place of groundwater.

- In 1995 AWS Rules were adopted which further defined and explained how an AWS is proven. At that time, the PRAMA was considered to be at a state of safe-yield and the consistency with goal requirement was not required for AWS applicants in the PRAMA.

- In 1999, the director declared that the PRAMA was no longer in safe-yield (this period is referred to as post-declaration). Since then, new developments applying for an AWS have been required to meet all of the AWS criteria including consistency with the AMA goal. To do this, nearly all new development in the PRAMA has been using extinguishment credits, which are generated from the permanent extinguishment of grandfathered groundwater rights, and then pledged to the new subdivision.

Under the AWS Rules, ADWR must consider the water demand associated with pre-Code plats and previously issued determinations of AWS and Adequacy as "committed demand" when determining whether there is additional physical availability of groundwater in the AMA's aquifers for new applications for AWS. In the PRAMA there are currently many lots making up committed demand that are not required to meet consistency with the AMA goal. Of the estimated 4,000 – 5,000 acre-feet of potential demand associated with platted but not yet built lots in the PRAMA, only 550 acre-feet are associated with post-declaration (issued after 1999) subdivisions which have been required to meet the consistency with goal criterion. This means that much of the current growth potential in the PRAMA can result in additional groundwater overdraft with no further review of groundwater availability by ADWR and no requirement for replenishment. This presents a large challenge to the PRAMA safe-yield goal. For a more detailed discussion of committed demand, see Appendix 12-1.

Exempt Wells

Unlike the larger AMAs in central Arizona, exempt wells (wells that pump less than 35 gallons per minute) are a significant factor in achievement of the management goal in the PRAMA. As of 2012, the PRAMA population that is self-supplied by exempt domestic wells was greater than the population served by Small Municipal Providers. Although Small Providers are required to report their water use annually to ADWR and have limitations on water wasting and on lost and unaccounted for water, exempt well owners are exempt from all regulatory programs. ADWR lacks the authority to impose any conservation requirements on exempt well water use, and ADWR cannot require exempt well owners to meter and report water use data. For purposes of the Assessment and the 4MP, ADWR estimated that each person self-supplied via an exempt well would use 90 gallons per capita per day. This estimate is based on the 3MP single-family interior and exterior water use models for new development. Given the absence of reporting requirement and metering, ADWR has little data on exempt well uses, but preliminary examinations have revealed that there is wide variation in the annual water use among exempt well owners.

Groundwater Allowance

Post the 1999 declaration, the consistency with goal provision of the AWS Rules has been in effect in the PRAMA. However, pursuant to the AWS Rules, a certain volume of groundwater is allowed to be used and not replenished or offset. These groundwater allowances are designed to help municipal providers transition from groundwater to renewable supplies and to allow legal pumping of groundwater during periods when renewable supplies are unavailable.

When a Designation of Assured Water Supply (DAWS) or Certificate of Assured Water Supply (CAWS) is issued, a groundwater allowance account is established. ADWR may credit additional allowable groundwater to these accounts under certain conditions. The AWS Rules describe under what circumstances the groundwater allowance can increase. The amount of allowable groundwater granted to new applicants for DAWS and CAWS is reduced over time, reducing to zero groundwater allowance in 2025 in the PRAMA.

The AWS Rules also allow for adding credits to the groundwater allowance of a DAWS or CAWS through extinguishing grandfathered rights (IGFRs, Type 1 and Type 2 rights) within the same AMA. The methods of calculation of these extinguishment credits described in the AWS Rules and are different for each AMA. Groundwater use reported pursuant to the water provider's or subdivision's allowable groundwater volume is considered consistent with the management goal of the AMA and is not required to be replenished, but physically contributes to overdraft.

12.2.2 Underground Storage and Recovery

Not all recovered water is equal under the AWS Rules. When water is stored and recovered from the same area, the stored water recharges the aquifer in the same location as the wells are withdrawing it, and the stored water is adding physical availability to the wells that recover the water from within the area of impact of storage (AOI). Historically, the majority of the recovered water in the PRAMA has not been within the AOI. The result of this strategy is water level declines in the vicinity of the recovery wells.

The location of water storage is important for hydrologic reasons as well. Work done by Doug McMillan and presented to the Coconino Plateau Water Advisory Council in January 2013 (McMillan, 2013) indicates that the ideal locations for underground storage and recovery in the PRAMA are: (1) along Granite Creek, just north of Watson and Willow Lakes and continuing linearly for some distance north within the AMA, and (2) along the Agua Fria River near Prescott Valley. This is corroborated by ADWR's most recent calibration of the PRAMA groundwater model. Prescott Valley is already permitted to store a large volume of water near the Agua Fria, and this area has limited additional potential for storage beyond Prescott Valley's recharge permit volumes. However, there is significant hydrologic potential to store additional water along Granite Creek in addition to the projects already located in this area.

12.2.3 Conservation

Efficient use of all water supplies is prudent, especially in the arid southwest. While ADWR conservation programs encourage efficient use of all water supplies, conservation alone will not result in the achievement of safe-yield in the PRAMA. As described in Chapter 11 of this plan, modifying the interior and exterior models for new residential water demand resulted in less than 1,500 acre-feet of annual water savings by the year 2110 in Scenario B and about 3,000 acre-feet of annual water savings by the year 2110 in Scenario C. Annual demand increased by 73 percent (more than 40,000 acre-feet) over the year 2012 demand in all three scenarios. If the projected growth does not occur, the AMA can sustain safe-yield for longer, but for the PRAMA to grow, conservation, augmentation and multiple other water management strategies will be necessary to achieve and maintain safe-yield beyond 2025.

Municipal Gallons Per Capita Per Day Program and the Non-Per Capita Conservation Program
The Gallons Per Capita per Day (GPCD) conservation program is only available to large municipal water providers who hold a DAWS. Large providers without a DAWS must be regulated under the Non-Per Capita Conservation Program (NPCCP), which is a best management practices (BMP) program. Regulatory compliance in the NPCCP is based on the implementation of BMPs and reporting requirements, not on achievement of a specific reduction in water use. The Code requires that the NPCCP be designed to achieve water use *efficiency* in the service areas equivalent to the water use efficiency assumed in establishing the GPCD requirements. However, this does not necessarily mean that providers in the NPCCP will achieve the same GPCD *rate* as they would if regulated under the GPCD program. Customers within the service area of a NPCCP provider might be extremely efficient in their use of water; however, the provider's service area could be growing disproportionately between the residential and non-residential sectors. By adding more non-residential demand than residential, even if the new uses are extremely efficient, a provider's GPCD rate is likely to increase, as demand is added without adding commensurate population to keep the GPCD low.

The Code prescribes that the 4MP include, if feasible, additional conservation requirements for non-irrigation uses. The Municipal Conservation Program is included in the category of non-irrigation uses for the 4MP. In the PRAMA, the feasibility of additional conservation varies by water provider. Some providers have almost entirely new service areas, with new homes, low water using landscapes, and, low-flow plumbing fixtures compliant with the current national plumbing code. Consequently, the potential for further reductions in GPCD rates of these providers is low during the management period. Some providers may experience reductions in GPCD rates without implementing any additional conservation measures if the proportion of residential to non-residential demand shifts to be more residential. Reduction or lack of growth in commercial and industrial uses within a service area can result in lower GPCD rates without any increases in efficiency. Reductions in GPCD *rates* do not necessarily mean that a municipal water provider is increasing water use *efficiency*.

It should be noted that there are now available plumbing fixtures with flow rates lower than the national plumbing code. These products are labeled "WaterSense" *(see http://www.epa.gov/watersense/about_us/what_is_ws.html)*. WaterSense is a partnership program with the United States Environmental Protection Agency that seeks to protect the future of the nation's water supply. The City of Prescott is a WaterSense partner. As an example of local action, the City of Sierra Vista in Cochise County passed a water conservation ordinance in January of 2013 adopting the WaterSense program for future residential development. Sierra Vista was the first community in the nation in which all new homes will potentially be eligible for WaterSense certification. http://www.kvoa.com/news/sierra-vista-first-community-in-the-u-s-to-adopt-epa-watersense-standards/

12.2.4 Reclaimed Re-Use
The PRAMA has a long history of the use of reclaimed water for watering turf-related facility landscaping. However, ADWR regulatory authority and programs have not historically required the same standard of efficient water use for reclaimed water as it has for groundwater and other sources of supply. As an incentive, the Turf Program in the Industrial Sector allows for each acre-foot of reclaimed water used by a turf facility to be counted as 0.6 acre-foot of water when compliance with the turf facility's maximum annual water allotment is determined. This incentive was originally included in the management plans to encourage the replacement of groundwater with reclaimed water in the turf sector. Continuation of this incentive should be reviewed and possibly removed or reduced during this or future management plans.

Use of septic systems reduces the amount of wastewater that may be reclaimed and reused and septic system leachate cannot be directed to areas experiencing water level declines. In contrast, wastewater collected through a centralized sewer system may be treated and stored underground under an enhanced

aquifer management strategy. In Chapter 11 of this plan, the projected scenarios assume that all new growth in the PRAMA will be connected to a sewer system, whether served potable water via a central distribution system or exempt wells. This results in a significant volume of reclaimed water that will be available for storage and replenishment or recovery within the area of impact of storage.

There is currently no cut to the aquifer applied to the storage of reclaimed water at a constructed underground storage facility as there is for storage at a managed facility, or storage of CAP water in AMAs with access to CAP water (Phoenix, Pinal, and Tucson AMAs). This means that 100 percent of the water sent to underground storage, minus evaporative losses and other debits, is recoverable. The merits of the general benefit to the AMA of applying a cut to the aquifer vs. all effluent credits residing with individual storing parties requires further examination and debate in PRAMA.

12.2.5 Limits on Use of Surface Water Supplies

In 1998, the City of Prescott (City) and the Chino Valley Irrigation District (CVID) entered into an agreement whereby the City would make recovered reclaimed water available to CVID and, through a sever and transfer, obtain the surface water rights of the district. In years prior to the agreement, the CVID managed Watson and Willow Lakes to meet the needs of agricultural water users. The City has been recharging water from the lakes; however, this is complicated and restricted by a court ordered stipulation between CVID and SRP that precludes recharge from the lakes prior to April 1 or after November 30. In addition, City residents have expressed a desire to maintain a sufficient volume of water in the lakes for recreation. These recharge restrictions and recreational priorities limit the utility of this supply to support the City's DAWS. For more information see http://www.cityofprescott.net/_d/water_mgmt_policy.pdf and http://www.cityofprescott.net/_d/annual_report_bw_waterresources2.pdf.

The City of Prescott also has surface water rights for Banning Creek (Goldwater Lake), the Hassayampa River, and Del Rio Springs for more than 3,000 acre-feet per year. However the City does not have plans to use those rights to support its DAWS in the foreseeable future. This source could be used to replace groundwater pumping which would move the AMA closer to safe-yield. It should be noted that inclusion of these locally available supplies in a DAWS is not a prerequisite for their use. Shifting existing demand from groundwater to surface water supplies would serve to advance the PRAMA toward safe yield and/or reserve the groundwater for future use.

12.2.6 Timing, Cost and Impacts of Imported Supplies

Currently water users in the PRAMA have the authority to import groundwater from the Big Chino Sub-basin outside of the PRAMA. Although a pipeline is planned, there are several issues surrounding the importation of this supply, including potential costs and whether other water users could be affected. In addition, the timing of the construction of the pipeline may be an issue if new development is dependent on that supply to proceed.

12.2.7 Rainwater Harvesting

The idea of rainwater harvesting is supported by some local interests as a possible source of water supply for the PRAMA. Rainwater harvesting would require increased administration and monitoring by ADWR. In addition, it has not yet been shown that capture of rainwater can be conducted in a manner that renders downstream senior water right holders unharmed. Further examination of this issue is warranted and is under review at the legislature. Local pilot projects examining the feasibility of this alternative are planned. None have been constructed to date.

12.3 POSSIBLE SOLUTIONS

During the fourth management period, ADWR will continue to develop long-term water management solutions to the issues described in section 12.2. ADWR will work with the regulated community as well

as others within the PRAMA, to identify issues and develop and implement solutions to water management problems as well as craft a cohesive water management strategy for the entire PRAMA. Such a strategy is anticipated to include the following components:

- Construction of additional regional underground storage facilities along Granite Creek, with recovery wells located within the area of impact of storage.
- Adoption of a seasonal/annual pumping regime to withdraw water from wells when water levels have recovered, and shift pumping to other wells when water levels are declining.
- An increase in the proportion of the PRAMA population on central sewer, including exempt wells; an increase in the capacity and/or number of wastewater treatment plants to treat the additional wastewater; and an increase in the volume of reclaimed water stored. Develop strategically located facilities to recharge and recover these newly developed local supplies.
- Importation of groundwater from the Big Chino Sub-basin, or some other alternative supply
- Use of more water from Watson and Willow Lakes to meet M&I water demand and less for recreational purposes, and evaluation of surface water available from the southern portion of the AMA and Goldwater Lake.
- Pursuing an allocation of CAP water, or another source of supply, which may be able to be either imported or used as a water exchange vehicle, allowing more use from local, natural streams to which downstream users have senior rights/claims.
- Adoption of more stringent conservation requirements, such as an ordinance at the municipal or county level requiring WaterSense fixtures.

ADWR has developed additional water demand and supply scenarios extending beyond 2025 which show that the PRAMA can achieve safe-yield and maintain it for some years beyond 2025. Assumptions included in those scenarios are outlined in Chapter 11 of this plan.

In addition, possible solutions related to each issue section described in section 12.2 are discussed in further detail below.

12.3.1 Allowable pumping

Agricultural Solutions

Agricultural pumping is likely to decline to a small proportion of total AMA water demand. Until the year 2025, IGFRs can be extinguished to create credits to help meet the AWS criterion of consistency with the management goal. By the year 2025, it is possible that the agricultural demand sector will be relatively small, as will its contribution to overdraft.

ADWR will continue to provide technical and conservation planning assistance to the members of the agricultural sector in an effort to increase efficiencies and further reduce groundwater reliance. ADWR will continue to encourage and evaluate incentives for the increased use of reclaimed water by the agricultural sector. Additional infrastructure will be needed for agricultural users to utilize reclaimed water directly in the PRAMA.

To completely eliminate overdraft in the agricultural sector, agricultural users would need to rely on 100 percent renewable supplies (minus incidental recharge) or be required to replenish groundwater pumping. Further reductions in agricultural groundwater use and increased use of renewable water supplies, combined with enhanced on-farm irrigation water management practices would move the PRAMA closer to safe-yield.

Industrial Solutions
ADWR requires submittal of information on water demand, supply, and acreage information from all turf-related facilities in the PRAMA, and can work cooperatively with golf course superintendents to help courses improve their water use efficiency. ADWR can modify or eliminate the reclaimed use incentive in the turf program, resulting in more efficient use of this renewable supply.

To completely eliminate overdraft in the industrial sector, industrial users would need to rely on 100 percent renewable supplies (minus incidental recharge), or be required to replenish groundwater pumping. Alternatively, an incentive could be created for non-turf industrial facilities in the PRAMA to switch from using groundwater to use of reclaimed water, or to store and recover reclaimed water in the area of impact of where the water was stored. Golf courses represent one of the best opportunities in which reclaimed water or other renewable supplies could be directly used. Four of the six golf courses in the PRAMA currently use reclaimed water for turf-related watering needs.

The unused Type 1 and Type 2 GFRs in the PRAMA may never be fully utilized, and could be extinguished to generate credits for meeting the AWS consistency with goal criterion. Encouraging Industrial users to maximize use of reclaimed water, as well as improve water use efficiency, could help reduce Industrial users' dependency on GFR groundwater pumping.

General Industrial Use (GIU) groundwater withdrawal permits are a permit type that the director issues if certain requirements are met. One of these requirements states that "the management plan for the active management area can be adjusted to accommodate the intended general industrial use consistent with the achievement of the management goal for the active management area." A.R.S. 45-515(A)(5). ADWR has not historically considered that issuance of a GIU permit would require the management plan for any AMA to be adjusted. However, this provision could be further explored during the fourth management period.

Municipal Solutions
The AWS Rules require new subdivision development to be consistent with achievement of the goal of safe-yield. For the municipal sector to eliminate its contribution to overdraft, nearly all current, committed and future demand in the PRAMA would need to offset its groundwater use and/or use renewable supplies. Careful management of stored and recovered reclaimed water could stretch the ability of the PRAMA to achieve and maintain safe-yield through projected growth in the year 2070. Use of imported groundwater from the Big Chino Sub-basin, increased reclaimed water storage and recovery, and increased use of surface water supplies, coupled with reduced demand, depending on net natural recharge conditions can help to reduce groundwater dependency. Water could also be stored and declared to be non-recoverable to offset the groundwater use associated with committed demand that to date has not been required to meet consistency with the management goal criterion of the AWS Rules. However, such an endeavor is not likely to be implemented on a voluntary basis and as such would likely require statutory changes.

Exempt Well Solutions
As outlined previously in this chapter, while unmetered, exempt well usage is estimated to have accounted for approximately 12 percent of municipal water use in the PRAMA in 2012. Previous attempts in the PRAMA to address the exempt well issue have been unsuccessful; however, obtaining additional data on uses of water via exempt wells would help frame the issue and determine its magnitude and spatial impacts. Statutory changes would be required in order to obtain annual water use information regarding exempt wells.

Groundwater Allowance Solutions
The formulas for calculation of water providers' groundwater allowance were not developed with strict adherence to the physical availability of groundwater in the AMAs. The AWS Rules do not specify when a designated provider's groundwater allowance may be used. Most water providers use their groundwater allowance sparingly, implementing a strategy of saving it for times of renewable supply shortage when they must increase their pumping to meet demand. Perhaps the most prudent strategy is to avoid use of the groundwater allowance altogether. Although use of the groundwater allowance is permitted under the AWS Rules and not regulated, this use has an impact on the aquifer.

12.3.2 Underground Storage and Recovery Solutions
The location of recharge should be encouraged in areas with the greatest potential for aquifer replenishment. A commitment by the PRAMA's water users to regional storage and recovery is needed to help address supply concerns.

Considering the location water is recovered is another important component of water management strategy in the PRAMA, as groundwater levels continue to decline due to groundwater demand exceeding the volume of water that naturally or artificially recharges the aquifer each year.

12.3.3 Conservation
In the PRAMA, conservation alone will not achieve safe-yield. However, efficient use of all water supplies is prudent and allows for more water management flexibility. Conserved water can be stored for future use, or used to extend economic growth into the future. Conservation includes low water use landscaping and low flow plumbing fixtures. EPA "WaterSense" programs and plumbing fixtures can be adopted for new subdivisions to increase water use efficiency. High exterior demand represents a use of water that cannot be recovered in sewer systems, and thus reduces the volume of reclaimed water that could be stored and recovered as a future supply, and should be avoided.

Conservation is different from curtailment. Conservation is a habitual and long-term commitment to using less water for various purposes than has historically been used for those purposes. Curtailment is a water management strategy usually employed during short-term droughts. Curtailment includes limiting landscape water use and other exterior uses of water, such as car washing. Curtailment measures can also include interior use rate changes, such as limiting the length of time and number of cycles that water is used for washing, laundry, and dish cleaning. Extreme conservation and curtailment, while achievable, affects quality of life for many people and may be difficult to maintain over the long-term. Therefore, conservation is perhaps best considered one of several water management approaches and tools, rather than the end-all solution.

12.3.4 Reclaimed Re-Use Solutions
Maximizing the availability and control the AMA water users have over reclaimed water can greatly enhance achieving and maintaining safe-yield. Approaches that may be considered include modifying or eliminating the reclaimed water incentive in the turf program, the municipal program or both; connecting more of the AMA's residents to central sewer systems to increase the supply of reclaimed water; and potentially, adopting a cut to the aquifer for reclaimed water stored at constructed Underground Storage Facilities (USFs).

12.3.5 Limits on Use of Surface Water Supplies Solutions
Policies related to the use of surface water from Watson and Willow Lakes could be re-evaluated to maximize the use of the available supply. Entering into a new agreement with SRP, or possibly a water exchange, could allow increased use of the water in the lakes by the City of Prescott. An additional 17,333 acre-feet of CAP allocation will become available for re-allocation to areas outside the three county CAP Service Area after the year 2020.

The City could explore use of their additional surface water supplies, and/or seek to modify or amend the agreement on the use and storage of water from Watson and Willow Lakes.

12.3.6 Timing, Cost, and Impacts of Imported Supplies Solutions

Regional cooperation and coordination is needed to pool all available resources to identify and pay for future imported water supplies. Identifying the supply and the cost of importation needs to be done well in advance. It can take many years, even decades, to realize the magnitude of a project needed to meet the needs of growing communities throughout Arizona. Partnerships with other communities, different water interests, and State and Federal entities can help with these efforts and can also help meet multiple water management objectives (e.g., water for people and water for the environment).

Identifying the potential impacts of utilizing an imported water supply is outside the scope of this management plan. However, the process of identifying potential impacts associated with supply importation and considering ways to address potential impacts is an important water management objective where appropriate.

12.3.7 Rainwater Harvesting Solutions

Before rainwater harvesting can be pursued as a water management solution in the PRAMA, the feasibility of this alternative must be demonstrated through successful completion of a pilot study is needed as well as a thorough evaluation of the potential legal ramifications and administrative and monitoring costs that would be associated with implementing a rainwater harvesting program.

12.4 SUMMARY

The water community of the PRAMA has shown interest in the development of a regional water management strategy, both in terms of supply and demand. Decisions regarding planned per-capita demand, sources of supply used, and locations and types of water supply infrastructure affect the degree to which supplies are available for additional growth or during times of drought. ADWR staff will continue to be available to provide explanation of statutory provisions and water management options to aid in the creation of the community's vision for the future, including geographic information, data analyses, and review of various water demand and supply scenarios using ADWR's hydrologic groundwater model. Continuing in the fourth management period, ADWR will work in tandem with PRAMA community representatives to develop additional monitoring and planning tools and to help manage water supplies and demands in order to ensure a viable economic future. Analysis and examination of local regulations and individual decisions by water users, as well as possible additional statutory authority, must be further explored during the fourth management period if the PRAMA is to make achieve and maintain its water management goal.

Achievement of the management goal in the PRAMA will require future growth to depend on imported water supplies or water stored and recovered within the area of impact to meet the increased demand. Maximizing the use of treated reclaimed water can defer the costs associated with importing a water supply from outside the PRAMA for a long period of time, and must continue and be expanded during the fourth management period. Maintaining and continuing to strive for a high water use efficiency (a low per-capita use rate) can also partially reduce the amount of any future imported water needed on an annual basis. However, the fluctuating nature of surface water availability must be taken into consideration in future water supply planning in the PRAMA. The volume of water that might need to be imported could increase during years where there is little or no local surface water available. Earlier focus on using more renewable supplies and less groundwater will increase the viability of AMA groundwater serving as a back-up supply in times of renewable supply shortage.

Ultimately, the challenge for water planners in the PRAMA will be to put available alternative water supplies to efficient beneficial use. Although some water users within the AMA are currently able to put alternative or imported water supplies to beneficial use, others lack either access or sufficient infrastructure to effectively use alternative supplies that are available from within the PRAMA, or imported groundwater from the adjacent Big Chino Sub-basin. In order to achieve and maintain safe-yield in the PRAMA, the various water users will need to work together to retrieve and distribute alternative water supplies.

12.5 CONCLUSION

In order for ADWR to close these "holes in the bucket," - uses of groundwater that can persist or increase without replenishing the aquifer - additional statutory authority and rule changes are required. However, ADWR is not the sole authority that could enact changes that could move the PRAMA to achieving safe-yield. Counties and cities, as well as individual choices, can help reduce groundwater reliance in the PRAMA. It is possible for the PRAMA to achieve safe-yield by 2025, and safe-yield can be maintained in PRAMA as far into the future as about 2070 (at projected growth rates), but it will require importation and use of groundwater from the Big Chino Sub-basin, or some other alternative supply; a diligent commitment to increasing the proportion of the population on central sewer; increasing the efficient use of all water supplies; and careful management of the storage and recovery of reclaimed water as well as direct or indirect use of locally available surface water.

Bibliography

McMillan, D. (2013, January 25). *Macro-Rainwater Harvesting Evaporation Interception*. Flagstaff, Arizona.

US Bureau of Reclamation. (2013, April 18). *Central Yavapai Highlands Water Resources Management Study, Phase III - Water Supply Alternatives*.

APPENDIX 12-1
MUNICIPAL GROWTH AND SAFE-YIELD
PRAMA

Water use by the Agricultural sector in the PRAMA continues to decline, and although it may reach a point of stabilization with a few farms remaining in production through the year 2025, the Agricultural sector no longer has a major impact on groundwater pumping within the PRAMA. The Industrial sector in PRAMA, while it has the potential and ability to grow, has not grown much during the historical period of 1985 through 2010. It also does not seem likely to increase much between today and 2025, and Industrial allotments, like those in the agricultural sector, are capped and do not increase. The Municipal sector, in contrast, can continue to grow and expand provided new subdivision growth can meet the requirements of the AWS Rules. Therefore, the Municipal sector is the key factor affecting water demand and supply in the PRAMA, and will continue to be so through 2025 and beyond.

Physical Availability of Water Supplies for AWS Purposes
The management plans are only one water management tool provided to ADWR in statute. In addition to the management plans, ADWR's implementation of the AWS Rules impacts future municipal demand where new subdivisions must prove that the water supply is physically available, among other criteria that must also be proven. At some point, depending on the new subdivision growth rate, all the available groundwater that can be allocated for AWS purposes within the PRAMA will be assigned, and any new subdivision demand will need to be based on physical availability of another source of supply, such as water stored and recovered within the area of impact of storage, surface water with appropriate back up supplies as needed, and/or imported water supplies.

The Assessment included a scenario where Big Chino groundwater is imported into the PRAMA beginning in the year 2020. To date, construction of the necessary infrastructure has not begun and additional issues must be resolved before this source of supply can be put to use. Another suggestion that has been made is to harvest water. SB1236 was adopted in April 2012 and includes provisions for a pilot water harvesting program. However, the bill did not include any provision for funding. In addition, HB2363 established a 29-member Joint Legislative Study Committee on Macro-Harvested Water to analyze and evaluate issues arising from the collection and recovery of large scale harvested water. To date, this committee has not yet met. Water harvesting is complicated by surface water law and the adjudication process and may be administratively burdensome to manage. The need remains to find, finance and bring to the tap an alternative water supply to allow long-term, secure continued growth in the PRAMA Municipal sector.

Consistency with the AMA Goal for PRAMA Groundwater Supply
For many years, local water users and ADWR estimated that the PRAMA was in a state of safe-yield. However, with additional data and the development of a detailed hydrologic model, it became apparent that this was not the situation. On January 12, 1999 the director of ADWR declared that the PRAMA was no longer in a state of safe-yield. Legislation adopted during the 1998 session established interim guidelines for applicants for AWS during the public process period required before the director could issue a Final Decision and Order regarding the PRAMA's safe-yield status. The interim guidelines expired on March 5, 1999. Since then, new development has been required to demonstrate consistency with the AWS Rule criteria for consistency with the safe-yield goal. Thus far, this has been accomplished primarily through the pledging of extinguishment credits, created when agricultural and non-agricultural grandfathered groundwater rights are extinguished and a groundwater credit is subsequently created for use by future development under the AWS Rules. Some developers and municipal water providers have also pledged long-term storage credits, associated with the artificial recharge of reclaimed water, to offset a portion of the groundwater pumping by new development. Further discussion of the impacts of the Declaration is contained in the 3MP for the PRAMA.

Non-groundwater supplies are consistent with the achievement of the PRAMA goal, but only a limited volume of additional groundwater pumping from within the PRAMA could be made consistent with the PRAMA goal using extinguishment credits because the maximum potential volume of extinguishment credits is finite based on the number of remaining GFRs and the number or years remaining between today and 2025, when extinguishment credits can no longer be issued in the PRAMA. A significant amount of extinguishment credits in the PRAMA have not been pledged to new subdivisions and could still be used for new AWS determinations provided the groundwater can be proven to be physically available at the proposed location of withdrawal.

There are hundreds of platted lots within the PRAMA that pre-date the AWS Rules. These lots, located in subdivisions approved prior to the date of Declaration, prior to the AWS Rules, prior to the Code and even prior to the Water Adequacy Program, are not required to be consistent with the PRAMA goal; nor were they required to prove physical availability of the groundwater supply at the time the subdivision plats were recorded. ADWR has no authority to retroactively require these lots to be consistent with the safe-yield goal. ADWR estimated that as of 2010, there were more than 11,500 pre-1973 vacant lots in the PRAMA. (Some of these are within the water service area of the City of Prescott, and are included in the City's DAWS. However, more than 8,000 of these vacant lots are not in the City's service area.) In addition to these, ADWR estimates that there are more than 4,100 additional vacant lots that were required to prove physical availability of groundwater but were not required to prove consistency with the AMA goal. After the Declaration, ADWR issued CAWS for 1,440 more lots, of which about half are yet to be built. Table 12A summarizes this information. Figure 12A shows the approximate location of these lots.

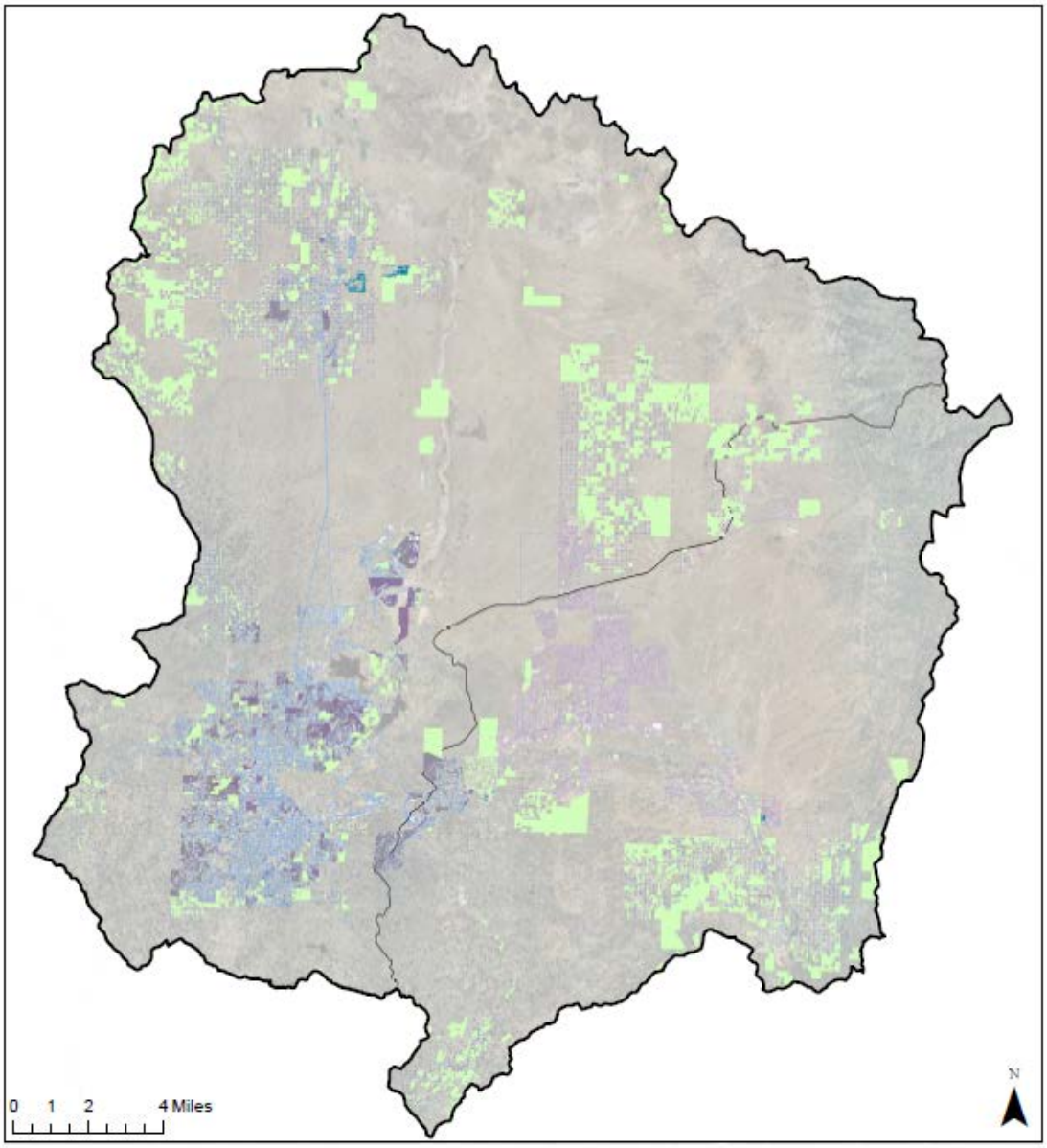
Table 12-1: PRAMA Historical Water Use Trend by Three Water Use Sectors

Category	ADWR Estimated Un-Built Lots	ADWR # of Lots Issued on CAWS	GW Allowance Granted[2]	Extinguishment Credits Pledged	Estimated Lots Built
Non-CAWS vacant parcels[1]	11,537	-	-	-	Not quantified
1973 to Declaration (1999) Subdivisions	4,133	15,089	-	-	10,956
Post-Declaration (1999) Subdivisions	642	1,440	3,832	23,011	798
Total	16,312	16,529	3,832	23,011	Not Quantified

[1] In 2010 the City of Prescott reported 3,398 platted but un-built lots within the City's water service area. These lots count as committed demand according to the AWS Rules. These lots are shown in the table above in the Non-CAWS vacant parcel row.
[2] The GW Allowance Granted does not include the City of Prescott's groundwater allowance associated with its DAWS.

At some point, the need for imported supplies in PRAMA will be necessary for new AWS determinations to be issued. The cost of importation and who will pay for it, the length of time for construction to be completed, and the rate of future growth will need to be addressed. Climate change is another uncertainty that may affect water supply in the PRAMA. Currently, surface water is a small component of the overall AMA water supply; however, its absence due to drought conditions or long-term climate change could significantly affect its user, the City of Prescott. The City would need to rely on its other sources such as groundwater, recovered reclaimed water, and direct use reclaimed water should surface water supply in the future be reduced. The City has a large volume of groundwater allowance granted under the AWS Rules and has proven more than 10,000 acre-feet per year of groundwater for 100 years to be physically available, so growth could continue in the City based on groundwater for some time into the future.

FIGURE 12-1
APPROXIMATE LOCATION OF UN-BUILT LOTS
PRESCOTT AMA



Prescott AMA

Legend

- Pre-1973 Approximate Location of Unbuilt Lots
- City of Prescott Approximate Location of Unbuilt Lots
- Post Declaration CAWS Approximate Location of Unbuilt Lots
- Post 1973 to Date of Declaration CAWS Approximate Location of Unbuilt Lots
- Appxroximate Location of Exempt Wells

Large Municipal Water Provider Water Lines

- City of Prescott
- Town of Prescott Valley