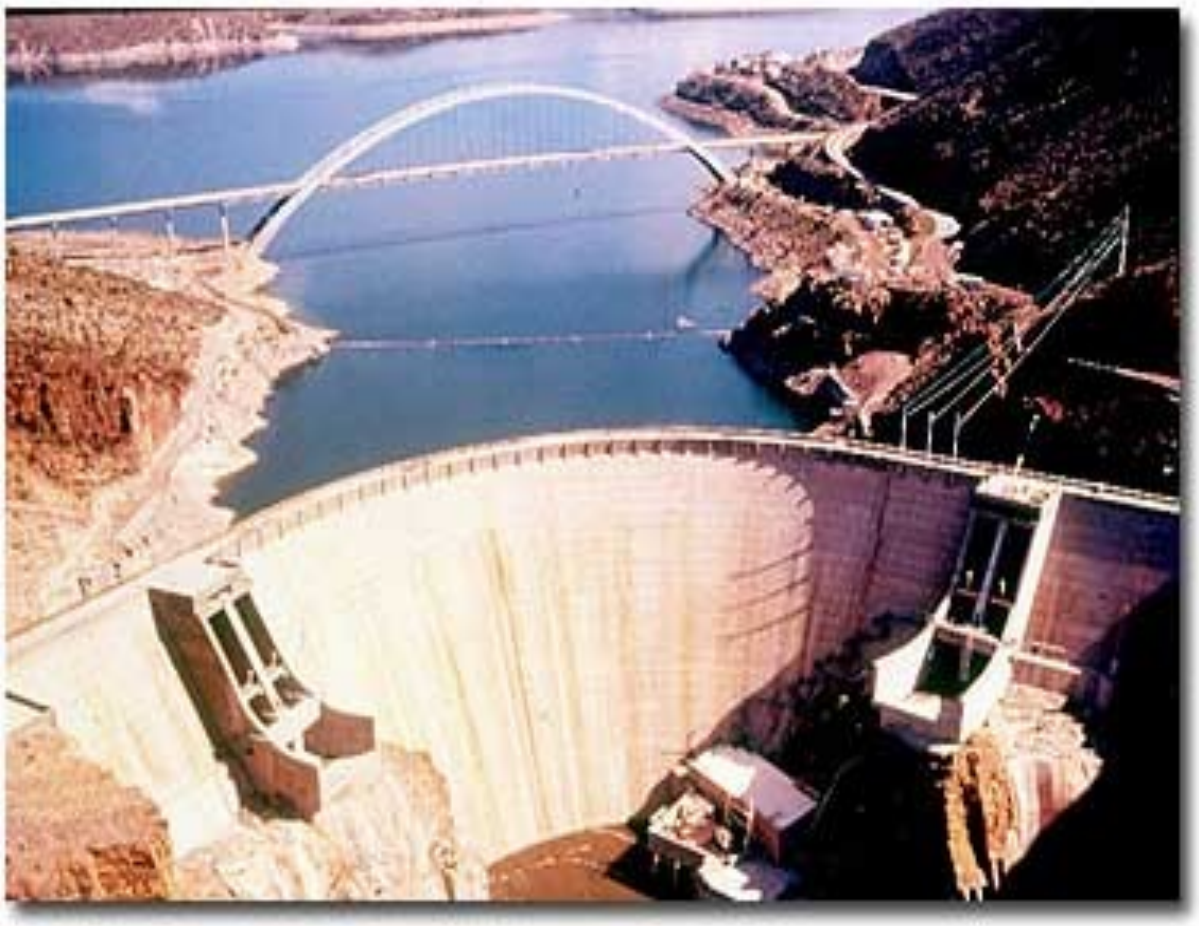

Tempe

City of Tempe
Water Service Area - Water Resources Plan

Tempe Public Works Department
Water Utilities Division
February 2012

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City of Tempe Public Works Department - Water Utilities
Water Resources Plan Update
February 2012

Executive Summary

The Tempe Water Resources Plan Update provides background information on the Tempe Public Works Department - Water Utilities Division and describes current water supplies and water demand for the Tempe Water Service Area, projected future water demands based on growth and redevelopment, and planning efforts for future water supply requirements.

Key elements of the water resources plan include these goals:

- Rely on renewable and sustainable water supplies and protect our access to those supplies
- Provide drinking water that meets or exceeds all federal and state water quality standards
- Provide the highest level of water and wastewater services at the lowest possible cost for customers in the Tempe water service area
- Develop and acquire new renewable water supplies
- Maintain safe yield levels of groundwater use
- Maximize the direct reuse of reclaimed water for non-potable water uses
- Utilize underground water storage programs to store surface water and reclaimed water supplies in groundwater aquifers for future recovery and use
- Increase groundwater / recovery well production capacity for system operational needs and for protection against prolonged drought cycles
- Maintain an effective water conservation program and implement new water conservation measures
- Establish water resources planning guidelines that consider the water rights status of lands slated for development and redevelopment projects

History of the Tempe Water Utilities Division

In this the year of the State of Arizona's celebration of its centennial, it is of note that the City of Tempe's municipal water system also dates back more than a century, established in 1902. In 1901, the Tempe Town Council voted to issue $30,000 in water works bonds to construct Tempe's first municipal water system. The bond issue was approved by the voters of Tempe by a margin of 102 to 17 in October, 1901. By the summer of 1902 construction on the town's water system was underway, and by December, 1902, residents were first able to tap into the new water system.

Tempe's first municipal well site (ca. 1902)

Tempe's first water system consisted of three 12" diameter wells, each about 150 feet deep. These wells were located east of Tempe's downtown area, at 7th Street and Willow Avenue (now College Avenue). The three wells were powered by a 30 HP electric motor that pumped water 249 feet up to a cement reservoir constructed atop the Tempe Butte. Water from the Tempe Butte reservoir was delivered by gravity flow through water mains to homes and businesses in town.

Several years ago, the City of Tempe Historical Museum and the Tempe Water Utilities Department commissioned a project to examine the history of water use in Tempe. The research examined the central importance of water throughout Tempe's history, with a new focus on the beginnings of Tempe's first municipal water and wastewater services, and the evolution of the City's water utilities over the past 100+ years. A publication on Tempe's water history resulted from this research:

- Mark E. Pry, Ph.D., **"Oasis in the Valley—The Story of Water in Tempe",** 2007, Tempe Historical Museum and Tempe Water Utilities Department.

For readers interested in more information on the history of water use in Tempe this publications can be obtained through the Tempe Historical Museum, 809 E. Southern Ave.; Tempe, AZ 85282, (480) 350-5100.

Tempe Water Resources & Water Utilities Division Facilities

The City of Tempe received its first Assured Water Supply (AWS) Designation from the Arizona Department of Water Resources (ADWR) on December 31, 1997 (AWS 97-007, Decision and Order No. 26-002043). The City of Tempe AWS Designation was modified and approved again by ADWR on September 29, 2010 (AWS No. 2010-013, Decision and Order No. 86-2043.0001). Tempe's AWS Designation certifies that Tempe has demonstrated the physical, legal and continuous availability of groundwater, surface water, Central Arizona Project/Colorado River water and effluent in an aggregate volume sufficient to meet water demands for a minimum of 100 years. Tempe is Designated as having an Assured Water Supply until 2025, at which time Tempe must update its projections and re-apply for the 100-Year AWS Designation.

The Tempe Water Utilities Division (WUD) provides water, wastewater, and environmental services to customers within the Tempe Water Service Area. The Tempe Water Service Area includes all lands incorporated within the City of Tempe as well as those within the Town of Guadalupe and several unincorporated county islands. The water service area covers about 42 square miles and is over 97% developed (*see Figure 1*). The City of Tempe is landlocked, bordered by the Cities of Chandler to the south, Mesa and Chandler to the east, Scottsdale to the north, and Phoenix to the west. As such, the boundaries of the Tempe water service area will not grow in the future; however, significant growth through redevelopment and increased density of development in the service area is occurring. This water resources plan update will examine redevelopment trends and areas with increased land use density, including high rise development.

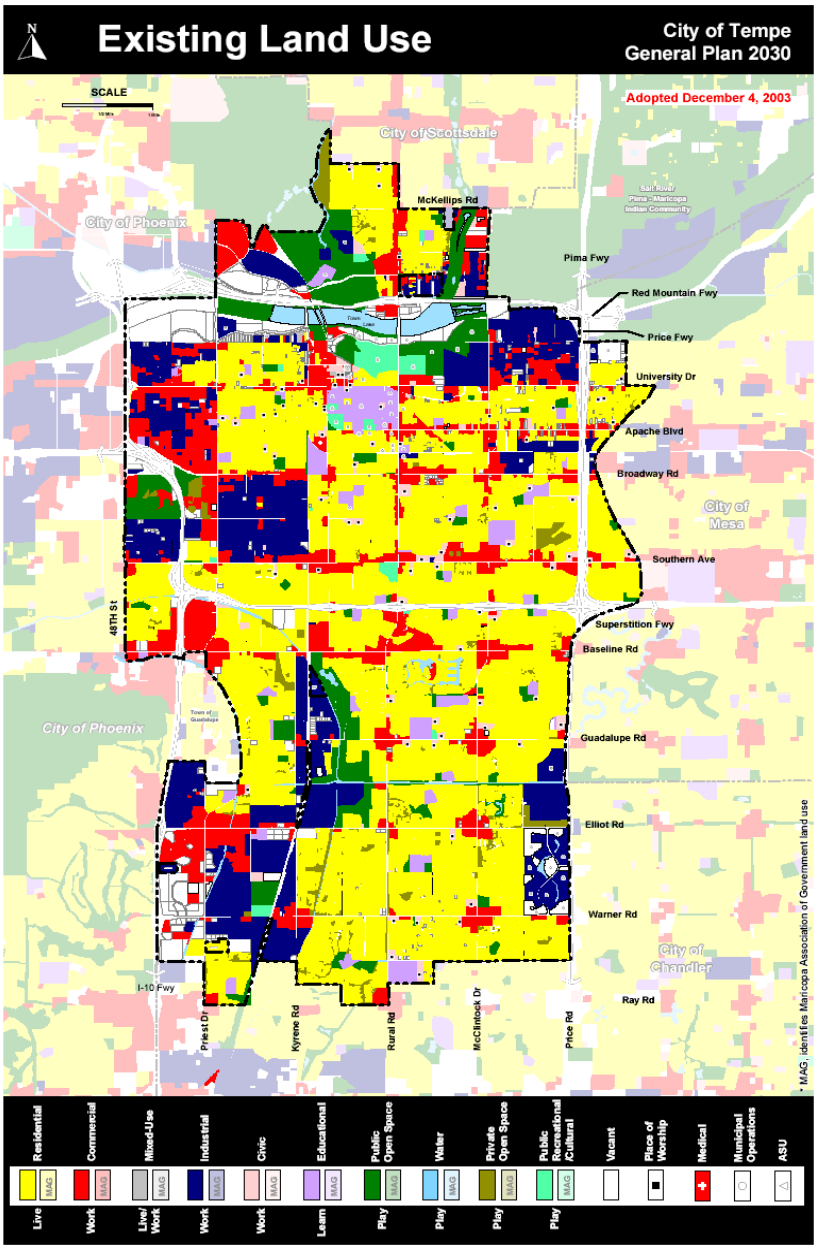


Figure 1

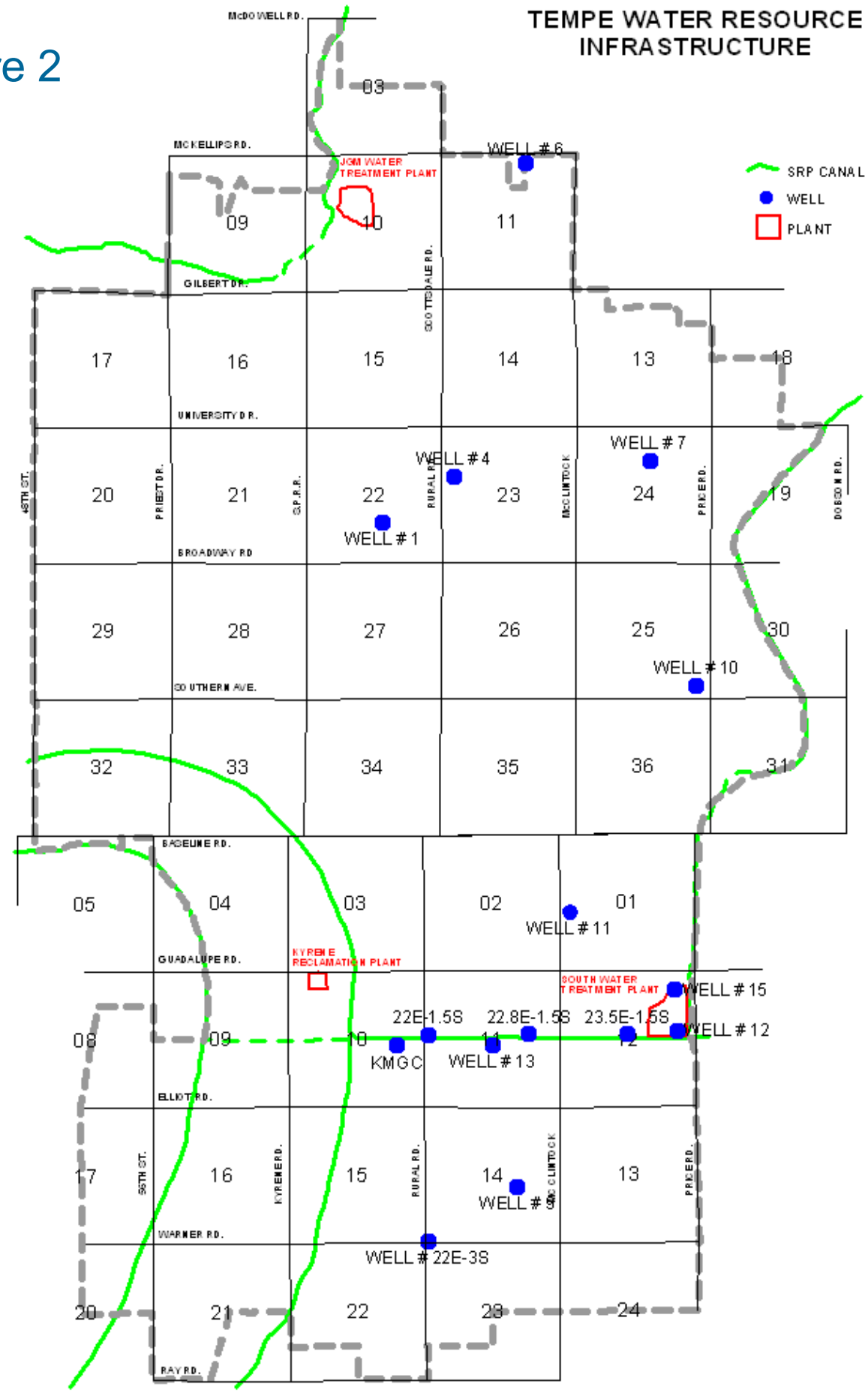
Drinking water delivered to Tempe residents and customers is produced at two municipally owned and operated water treatment plants, the Johnny G. Martinez Water Treatment Plant and the South Tempe Water Treatment Plant. Both plants are currently rated to treat 50 million gallons of water per day (MGD), for a total surface water system treatment capacity of 100 MGD. The Tempe WUD also operates ten groundwater wells that are used as a drinking water source and supplemental water supply for the municipal water system, and a number of other groundwater wells used for irrigation, water recovery, and water exchange purposes. Figure 2 shows the locations of these water production facilities in Tempe.

Tempe Johnny G. Martinez Water Treatment Plant

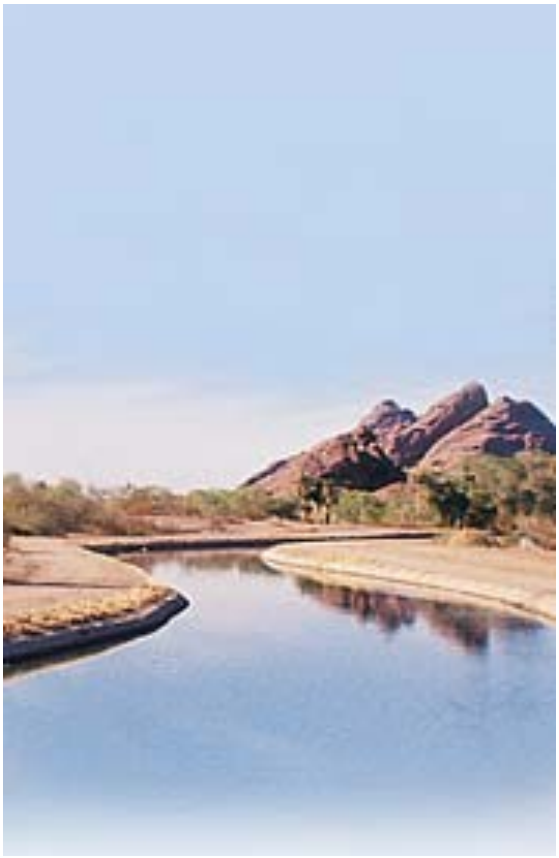
South Tempe Water Treatment Plant

Tempe Well # 9

Figure 2


TEMPE WATER RESOURCE INFRASTRUCTURE
SRP CANAL
WELL
PLANT
McDOWELL RD.
MCKELLIPS RD.
GILBERT DR.
UNIVERSITY DR.
BROADWAY RD
SOUTHERN AVE.
BASELINE RD.
GUADALUPE RD.
ELLIOT RD.
WARNER RD.
RAY RD.
SCOTTSDALE RD.
RURAL RD.
McCLINTOCK
PRICE RD.
DOBSON RD.
PRIEST DR.
S.P.R.R.
48TH ST.
55TH ST.
KYRENE RD.
JOM WATER TREATMENT PLANT
KYRENE RECLAMATION PLANT
SOUTH WATER TREATMENT PLANT
WELL # 1
WELL # 4
WELL # 6
WELL # 7
WELL # 10
WELL # 11
WELL # 12
WELL # 15
WELL # 13
WELL # 9
WELL # 22E-3S
KMGC
22E-1.5S
22.8E-1.5S
23.5E-1.5S

Water from Tempe's two water treatment plants and groundwater pumped from production wells (potable water) is delivered through the Tempe municipal water distribution system to customers throughout the water service area. Water delivered through the municipal system constitutes the majority of water used within the Tempe Water Service Area. Water supplies are also delivered directly from canals, wells, or water reclamation facilities for non-potable water uses such as residential flood irrigation, irrigation at parks, ball fields, golf courses, lakes, and industrial uses.



The SRP Cross-cut Canal delivers water to the Martinez WTP

Flume from canal to Martinez WTP

Water pumps at the Martinez WTP

Elevated water storage reservoir

Tempe Water Supplies

The City of Tempe relies on renewable surface water supplies, safe-yield groundwater supplies, effluent (reclaimed water), and surface water or reclaimed water that has been stored in groundwater aquifers. Renewable surface water sources make up more than 90% of Tempe's annual water supply in an average year. These water supply sources include:

Salt River Project

The Salt River Project (SRP) supplies Tempe surface water from six reservoirs on the Salt and Verde Rivers. The Salt/Verde River watershed covers an area over 13,000 square miles, from the headwaters of the Verde River in north central Arizona and the headwaters of the Salt River in the White Mountains of eastern Arizona, down to the desert in the Salt River Valley.

Established in 1903, the Salt River Valley Water Users Association (SRVWUA) is the private water association of the Salt River Project. The SRVWUA was formed by farmers, ranchers, and other landowners in the Salt River Valley who together pledged over 200,000 acres of their land as collateral to repay the loan for one of the first Federal Reclamation Projects in the western United States: construction of the Theodore Roosevelt Dam. Roosevelt Dam, at the confluence of the Salt River and Tonto Creek 60 miles northeast of the Salt River Valley, was completed in 1911.

The second component of the Salt River Project is the Salt River Project Agricultural Improvement and Power District, which oversees the power generation side of SRP. The Power District, established in 1937, is a political subdivision of the State with authority to issue bonds.

Today SRP serves water to a service area of over 248,000 acres in the Salt River Valley, delivering nearly 1,000,000 acre-feet of water per year to SRP shareholder lands. The SRP water service area is approximately 92% urbanized, with only about 8% of lands still used for agriculture. SRP delivers water supplies to the Cities of Avondale, Chandler, Gilbert, Glendale, Mesa, Peoria, Phoenix, Tempe and Scottsdale. These communities treat SRP water supplies at their city-owned water treatment plants for delivery to SRP shareholder lands within each city.

SRP water supplies available to Tempe are limited to use on SRP member lands in the Tempe Water Service Area. SRP also delivers surface water from the Salt and Verde Rivers appurtenant to Class A normal flow lands in Tempe. Class A lands have decreed water rights that pre-date construction of the SRP reservoir system.

These lands are entitled to receive “normal flow” surface water deliveries as determined by court decree (the 1910 Kent Decree). The amount of surface water available for use pursuant to the decree is based on the priority date of the Class A land and the amount of runoff measured on the Salt River and tributaries above the inflow to the SRP reservoir system.

SRP delivers groundwater from SRP wells pumped into canals when needed to supplement surface water supplies. SRP wells are also used to deliver groundwater directly to SRP shareholders and cities. SRP operates a network of over 240 groundwater wells across its water service area.

Approximately 80% of lands within the Tempe Water Service Area are eligible to receive either SRP stored water or decreed normal flow surface water supplies. Approximately 65% of lands within the Tempe Water Service Area have entitlements to both SRP stored water and normal flow surface water supplies. (*See Figure 3 – SRP member lands and Class A lands in Tempe.*)

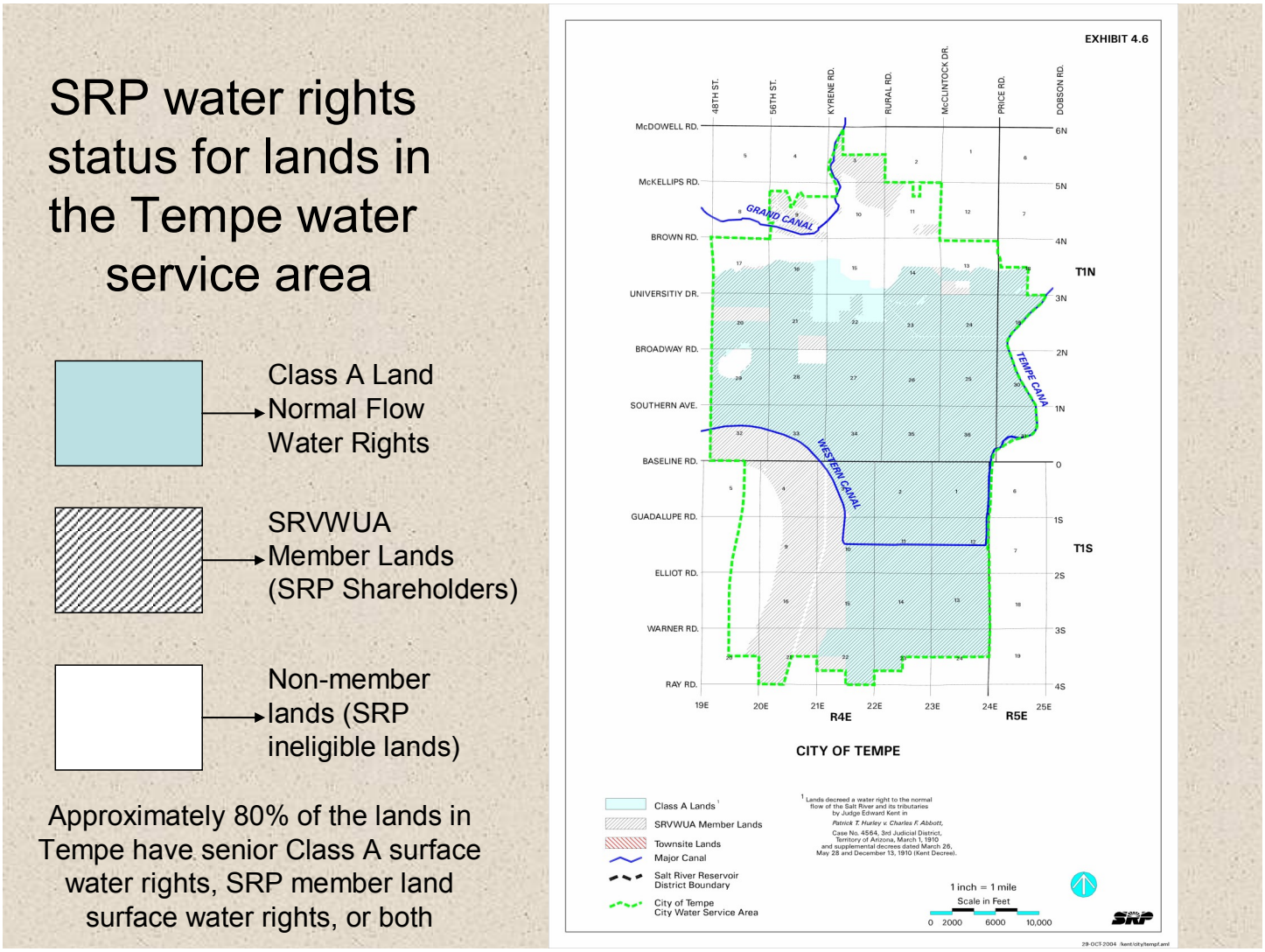
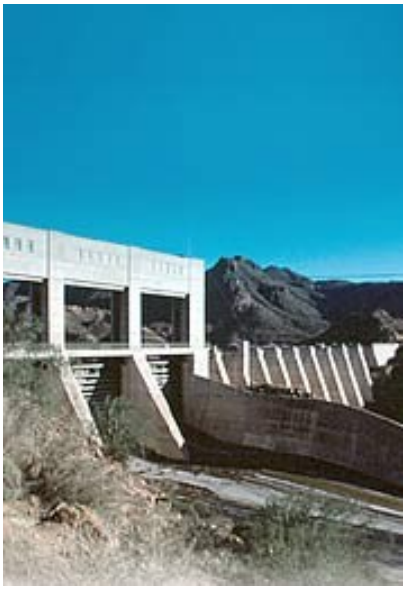


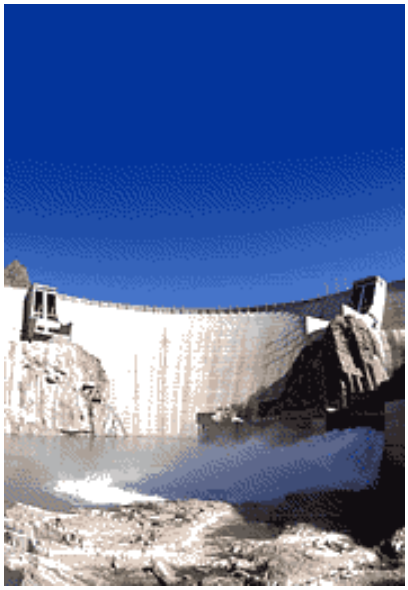
Figure 3

Salt River Project Dams

Horseshoe Dam

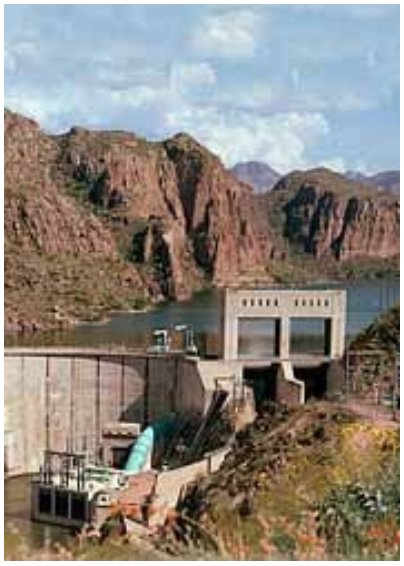


Bartlett Dam



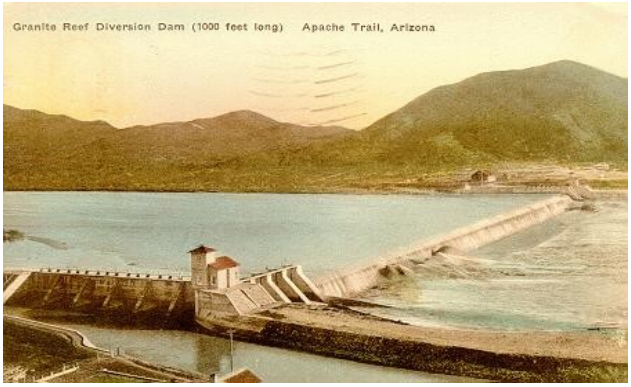
Roosevelt Dam

Horse Mesa Dam



Mormon Flat Dam

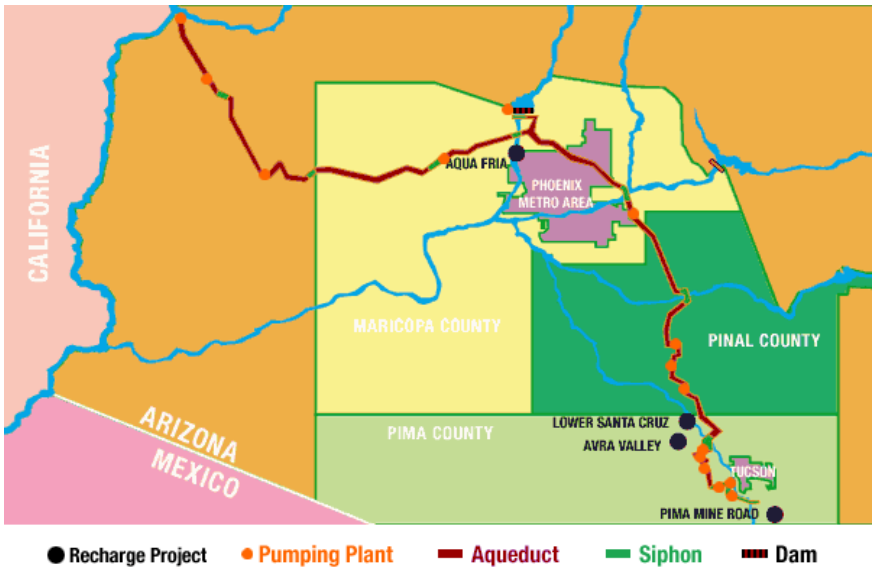
Stewart Mtn. Dam



Granite Reef Diversion Dam

Central Arizona Project

The Central Arizona Project (CAP) supplies Colorado River water to the City of Tempe and other municipalities, agricultural water users, industries, and Indian communities in Central Arizona. CAP pumps Colorado River water from Lake Havasu in western Arizona and delivers it to water users in Maricopa, Pinal and Pima Counties through the 336 mile CAP canal, terminating south of Tucson.



The seven Colorado River basin states entered into the Colorado River Compact in 1922. The Compact apportioned the use of Colorado River water among the upper and lower basin states, with the upper basin states of Colorado, Wyoming, Utah and New Mexico allocated 7.5 million acre-feet, and the lower basin states of Arizona, California and Nevada allocated 7.5 million acre-feet each year. Disputes over Arizona's share of the lower basin apportionment delayed the adoption of the Compact by the State of Arizona until 1944. Colorado River water allocations in the lower basin:

- *Arizona has an annual allocation of 2.8 million acre-feet*
- *California has an annual allocation of 4.4 million acre-feet*
- *Nevada has an annual allocation of 300,000 acre-feet*
- *(Mexico has an annual allocation of 1.5 million acre-feet pursuant to a 1944 treaty with the United States)*

The Colorado River Basin Project Act of 1968 authorized construction of the CAP system to bring a portion of Arizona's Colorado River allocation to central Arizona. In 1971, the Central Arizona Water Conservation District (CAWCD) was created to oversee construction, operation and management of the CAP system. CAWCD is a political subdivision of the State of Arizona, with 15 elected Board members. CAP delivers approximately 1.5 million acre-feet of Colorado River water to central Arizona each year. In Tempe, CAP water is used to meet water demands on lands not entitled to SRP water supplies, about 20% of all lands within the Tempe Water Service Area.

Modified Roosevelt Dam New Conservation Space (NCS)

Authorization of the Central Arizona Project included a regulatory storage component and upgrades to existing dams and infrastructure. One of the early sites proposed for a regulatory storage reservoir was the Orme Dam, proposed to be constructed at the confluence of the Salt and Verde Rivers. A Presidential review of water projects in 1977 recommended that Orme Dam and several other dams be eliminated and replaced by alternative dam locations. In 1981, the Secretary of the Interior identified a proposed alternative action, Plan 6. Plan 6 included construction of the New Waddell Dam on the Agua Fria River for regulatory storage of CAP water, the expansion of Roosevelt Dam, and a new dam on the Verde River, Cliff Dam. Cliff Dam was later deleted from the plan, but New Waddell Dam and Modified Roosevelt Dam were completed pursuant to Plan 6.

The City of Tempe funded and secured rights to 5% of the new water conservation capacity created when Roosevelt Dam was expanded in the mid-1990s, which provides Tempe 13,500 acre-feet of surface water storage capacity. Other cities that participated in the Plan 6 New Conservation Space (NCS) agreement include the Cities of Phoenix, Mesa, Scottsdale, Chandler and Glendale.

Roosevelt Dam NCS water can be used for any beneficial uses within the Plan 6 cities' water service areas. Tempe uses NCS water supplies to meet water demand on lands not entitled to SRP water supplies, similar to the use of CAP water supplies in Tempe.

Modified Roosevelt Dam

Groundwater

The Arizona State Legislature passed a comprehensive groundwater management bill in 1980, which was signed into law by then Governor Bruce Babbitt. The 1980 Groundwater Management Act was created to address the use of groundwater and groundwater overdraft in the most populous areas of the State. These areas are referred to as Active Management Areas (AMAs). There are five AMAs in Arizona: Phoenix, Tucson, Pinal, Prescott, and Santa Cruz. Groundwater users in AMAs are regulated, with limits on how much groundwater can be used in any year. The primary goal of the Phoenix AMA is to achieve safe-yield groundwater use by 2025, where groundwater withdrawal and use is balanced by natural and artificial groundwater recharge. The Arizona Department of Water Resources (ADWR) administers programs in each AMA that encourage the use of renewable water supplies and promote water conservation among all water users.

Tempe can withdraw a limited amount of safe-yield groundwater supplies from its wells each year. Water stored in groundwater aquifers through underground storage projects can also be recovered through city wells that are permitted as recovery wells. The use of groundwater from Tempe's municipal production wells over the last decade has ranged from less than 1% to about 11% of Tempe's total municipal water use in a normal year. During periods of prolonged drought, with reductions in available surface water supplies, Tempe's use of groundwater may be increased within allowable limits until watershed conditions improve. The ADWR Assured Water Supply Rules allow for drought exemption groundwater pumping only during periods when normal surface water supply allocations have been reduced due to drought conditions.

Tempe Well #12

SRP Well Site

Reclaimed Water

Wastewater collected throughout the Tempe water service area is treated at the regional 91st Avenue Wastewater Treatment Plant (WWTP) in Phoenix, or locally at the Kyrene Water Reclamation Facility. The City of Phoenix and its Sub-Regional Operating Group (SROG) partners Glendale, Mesa, Scottsdale and Tempe jointly own the 91st Avenue WWTP and transmission facilities. The plant is operated by the City of Phoenix for the partnership. Effluent, or reclaimed water, produced at the 91st Avenue WWTP is used for cooling water at the Palo Verde Nuclear Generating Station west of Phoenix, for irrigation uses by the Buckeye Irrigation Company, and for a riparian habitat project: the Tres Rios Constructed Wetlands Project. In the future, reclaimed water from this facility may be used for underground storage and credits at the Agua Fria Linear Groundwater Recharge Project.

91st Ave. Wastewater Treatment Plant

Reclaimed water produced locally at the Tempe Kyrene Water Reclamation Facility (KWRF) has been used to supply water for irrigation use at the Tempe Ken McDonald Golf Course, industrial water uses and cooling water at the SRP Kyrene Electric Generating Station, and for groundwater aquifer storage. In 2011 the Tempe Water Utilities Division recommended to the Tempe City Council that operations at the KWRF be temporarily discontinued due to declining wastewater flows in Tempe and the favorable economics of consolidating all of Tempe's wastewater treatment operations at the 91st Ave. WWTP. The temporary decommissioning of the KWRF is anticipated to save approximately $1,500,000 per year in operating costs and defer $2,200,000 in capital improvement project costs until wastewater flow conditions favor recommissioning the facility. The KWRF may be brought back on-line when average daily water demand in Tempe increases to a target level of 55 million gallons per day (MGD) and wastewater flows in Tempe increase to a target level of 23 MGD. Current average daily water demand in Tempe is approximately 46 MGD and current average daily wastewater flow in Tempe is approximately 18 MGD.

Tempe Kyrene Water Reclamation Facility

Underground Water Storage Credits (Long Term Storage Credits)

Tempe has water storage permits and/or underground storage facility permits for several groundwater recharge projects and groundwater savings programs that provide for underground storage in aquifers using Tempe's CAP water, NCS water, or reclaimed water supplies. The water that is stored establishes long-term aquifer "credits" that can be withdrawn at a later date through recovery wells, especially during times of drought. Tempe's projects include:

- Granite Reef Underground Storage Project (GRUSP)
- Tempe Ken McDonald Golf Course Groundwater Recharge Project
- Salt River Project Groundwater Savings Facility
- New Magma Irrigation & Drainage District (NMIDD) Groundwater Savings Facility

GRUSP Recharge Basins

Tempe's storage capacity at GRUSP is used for the storage of CAP water or NCS surface water in the East Salt River Valley groundwater sub-basin for long-term aquifer storage credits. Short-term monthly storage and recovery can also be done using SRP surface water supplies. The Tempe Ken McDonald Golf Course Recharge Project first used a dry well, or a vadose zone recharge well, to recharge the upper alluvial aquifer using reclaimed water from the Kyrene Water Reclamation Facility (KWRF). Tempe has initiated a project to increase storage capacity and upgrade recharge technology at this site by converting to an aquifer storage and recovery (ASR) injection well system. This project will initially recharge and store a portion of Tempe's CAP water and NCS water in the aquifer for credits, and eventually reclaimed water when the KWRF is back on-line.

Groundwater savings facility programs are considered "in lieu" recharge/storage projects. Tempe has partnered with SRP and NMIDD in programs to reduce groundwater pumping through the purchase and direct use of excess CAP water instead of using local groundwater supplies. The groundwater saved accrues as long-term storage credits to Tempe for future recovery and use.

Other underground storage programs the City of Tempe is currently pursuing include partnering with the SROG cities at the 91st Avenue WWTP on a recharge project in the west Salt River Valley: The Agua Fria Linear Recharge Project, that will recharge reclaimed water; and, leasing recharge capacity in the Superstition Mountains Recharge Project, an underground storage facility operated by the Central Arizona Project in the East Salt River Valley, to store CAP Colorado River water for Tempe in the East Salt River Valley Aquifer.

Tempe Assured Water Supply Designation & Current Water Use

The 2010 Assured Water Supply (AWS) Designation for the City of Tempe documents the current water demand for the Tempe Water Service Area and the projected water demand through 2025. The current and committed annual water demand for Tempe in the 2010 AWS Designation is 52,767 acre-feet (*based on 2008 annual water demands*). The total projected annual water demand for Tempe in 2025 was estimated at 73,685 acre-feet (*Total projected 2025 water demand = 2010 current and committed demand + additional projected demand through 2025*.) This projection includes potable water delivered from municipal water treatment plants and wells and non-potable water delivered directly from canals, wells or water reclamation facilities.

Total water use throughout the Tempe Water Service Area (*potable and non-potable water delivery*) in calendar year 2010 was 54,170 acre-feet.

In 2010 a total of 50,529 acre-feet of water was delivered through the Tempe municipal water distribution system (*see Figure 4*) . This includes SRP Salt and Verde River surface water supplies, CAP Colorado River surface water supplies, and groundwater supplies.

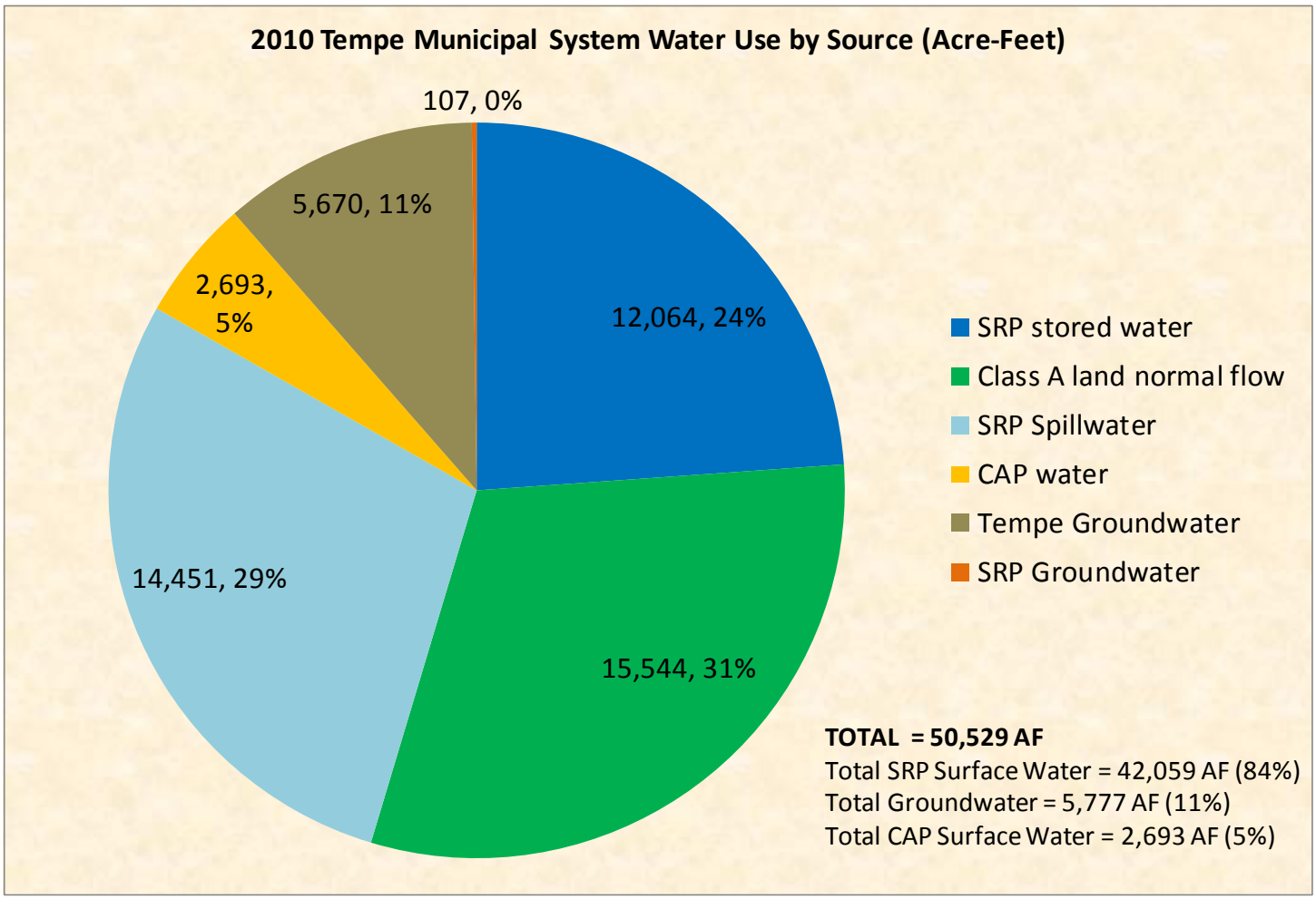


Figure 4

There are a number of sites within the Tempe water service area that take direct delivery of non-potable water from canals, wells, or water reclamation plants for irrigation uses or industrial uses. These sites include the Tempe Ken McDonald Golf Course, riparian habitat projects in Indian Bend Wash and Papago Park, 17 city parks/athletic fields, and the SRP Kyrene (K-7) Electric Generating Station. SRP also delivers water directly to SRP shareholders for irrigation use in Tempe.

3,641 acre-feet of non-potable water was delivered to these sites in 2010 using SRP water, CAP water, reclaimed water or groundwater/recovered storage credits from wells (*see Figure 5*).

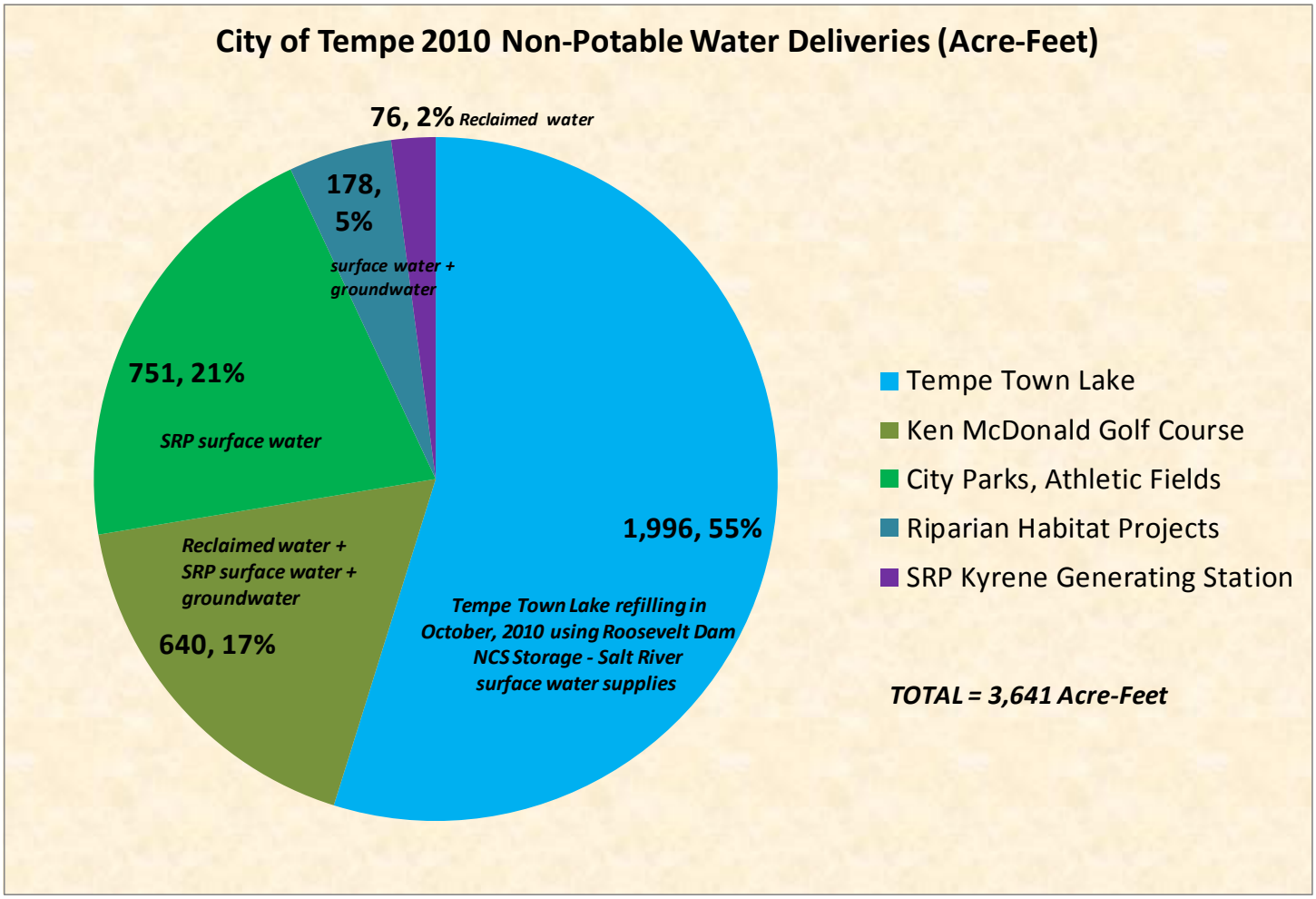


Figure 5

Municipal system water use in the Tempe water service area in 2010 (*Figure 4*) continues to demonstrate an overall trend of declining water demand and consumption over the past decade in Tempe (*see Figure 6*). Tempe has been able to identify a number of factors that have played a role in declining water demand in Tempe since 2000, including: Tempe's Water Conservation Program efforts, Tempe's landlocked and nearly built-out water service area, economic conditions, water efficiency measures undertaken by Tempe municipal departments, and increased awareness of regional drought conditions and water resources issues by Tempe's water customers.

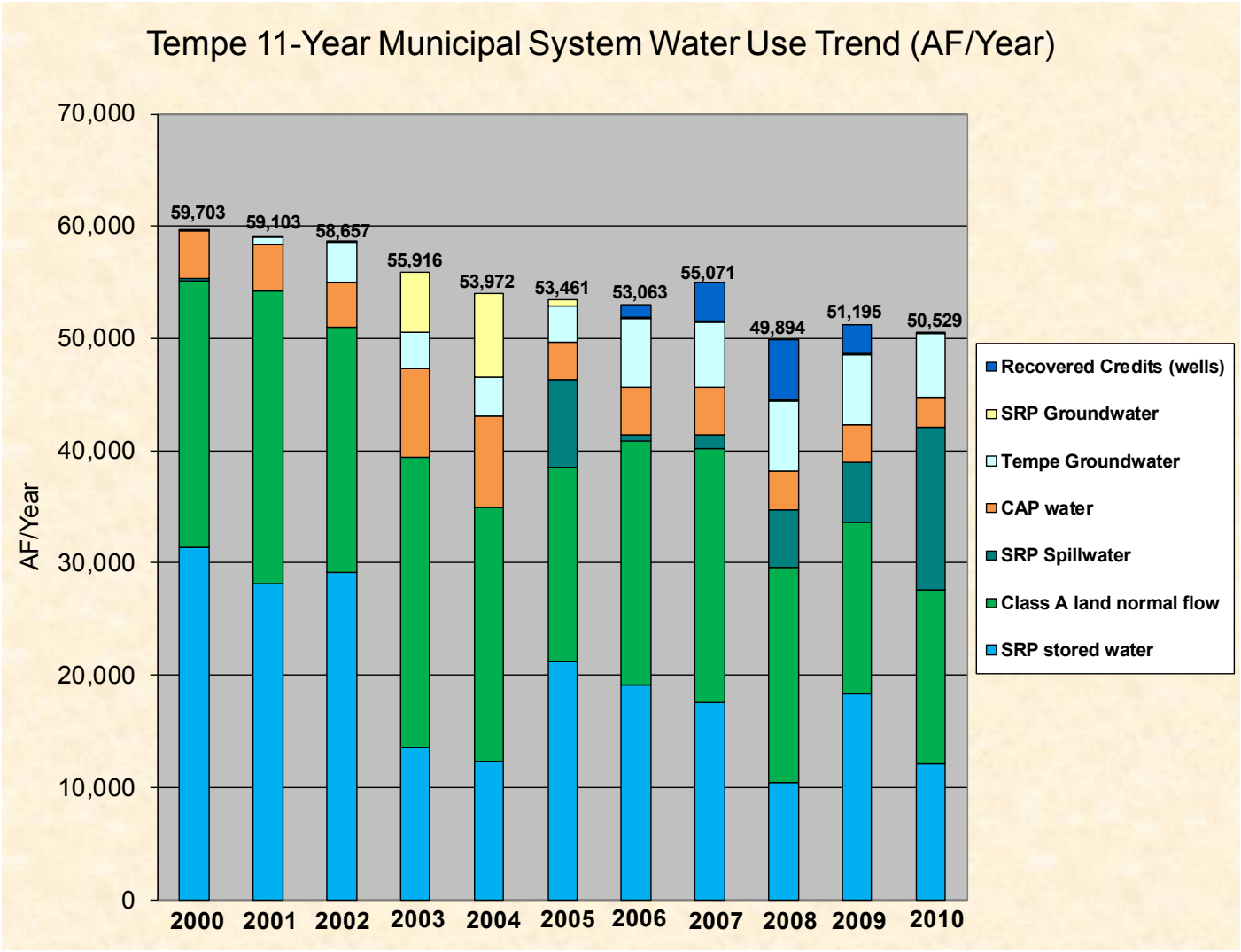


Figure 6

Tempe Assured Water Supply (AWS): Designated Water Supply Availability

The 2008 City of Tempe application for modification of Tempe's AWS Designation with the Arizona Department of Water Resources (ADWR) demonstrated the physical, legal and continuous availability of water supplies in an aggregate volume of 88,518 acre-feet per year for a minimum of 100 years. The City of Tempe received the AWS Designation from the Director of the Arizona Department of Water Resources in September, 2010, quantifying the following water supplies:

- Salt River Project (SRP stored water + Class A land normal flow) = 65,000 af/yr
- CAP (CAP M & I subcontract) = 4,315 af/yr
- Other CAP (CAP water through settlements and assignments) = 178 af/yr
- Modified Roosevelt Dam NCS = 4,200 af/yr
- Effluent (reclaimed water from Kyrene Reclamation Facility) = 7,798 af/yr
- Total Groundwater (GW allowance + incidental recharge allowance) = 6,071 af/yr
- Existing Long Term Storage Credits = 956 af/yr
- Total Tempe AWS (all sources) = **88,518 af/yr**

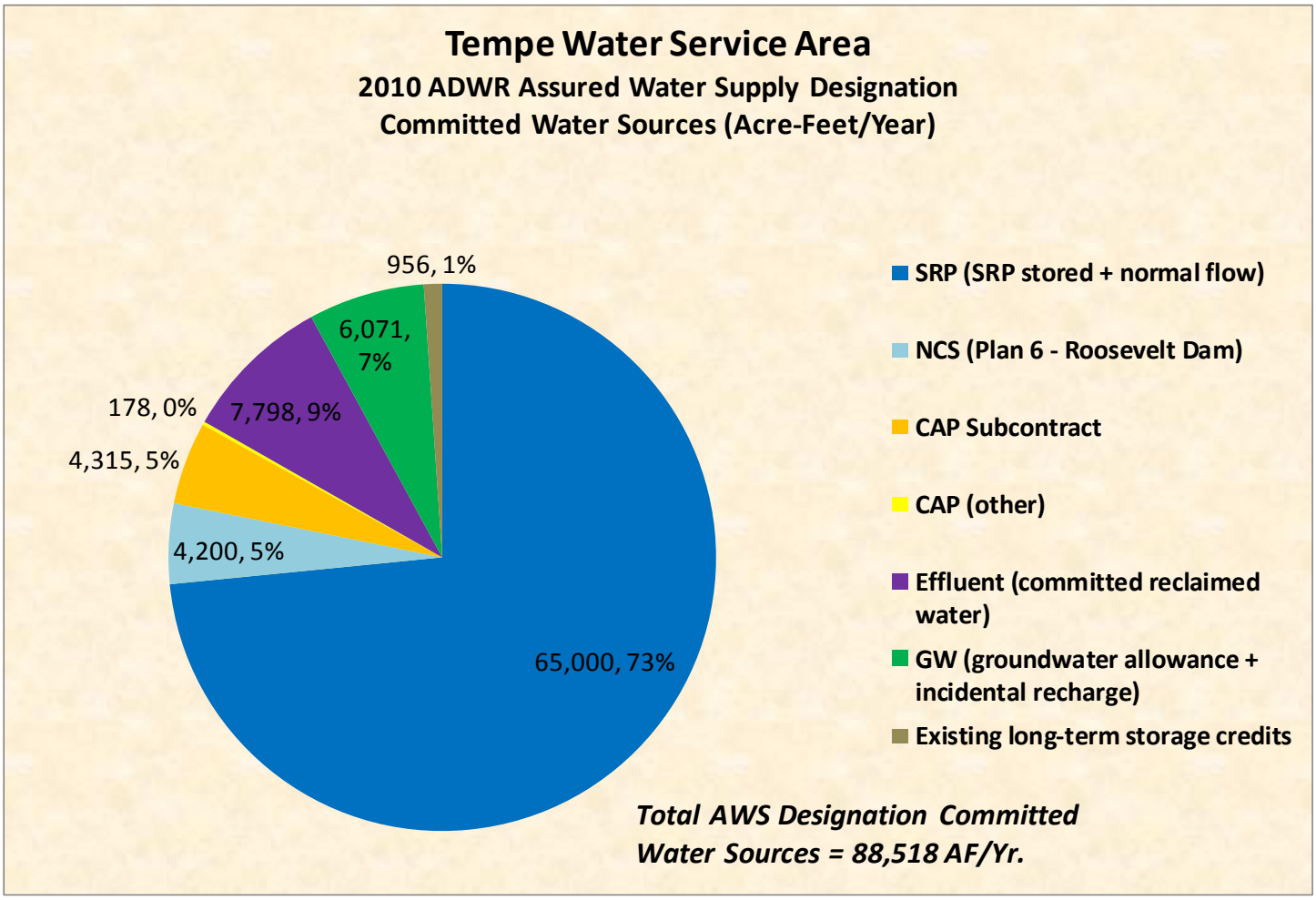


Figure 7

Total water demand in the Tempe Water Service Area for 2025 is projected to be approximately 73,685 acre-feet per year, as outlined in Tempe's 2008 AWS Designation application submitted to ADWR and documented in Tempe's 2010 AWS Designation Decision and Order from ADWR. The quantity of Tempe's total sources of water of water found to be physically, legally, and continuously available by ADWR's AWS Designation for Tempe through 2025 is 88,518 acre-feet per year (*see Figure 7*).

Available water supplies outlined in the City of Tempe 2010 AWS designation are about 20% greater than the projected water demand for 2025, and about 37% greater than current 2011 total Tempe Water Service Area water demand of approximately 55,000 acre-feet.

One of the objectives of the Tempe Water Resources Plan is to project future water demands across all water use sectors in the Tempe water service area. Future water demand estimates through 2030 are developed using projected land use categories from the Tempe General Plan 2030, with additional detail pertaining to water use projections for areas with a significant increase in density, such as high rise condo and mixed use developments in Tempe (*see Page 25, Table 1*).

Following the initial AWS Designation for Tempe in 1997 the Tempe WUD continued to develop new renewable water supplies, underground storage projects and reclaimed water reuse opportunities. These advances, now outlined in the 2010 AWS Designation for Tempe, represent a benchmark for measuring the City's success in managing our assured water supply portfolio while at the same time providing additional back-up water resources and water infrastructure for supplemental water supply and prolonged drought conditions.

In the 1997 AWS Designation Tempe had demonstrated a combination of assured water supply sources for use in the Tempe Water Service Area, which totaled 77,222 acre-feet per year. In the 2010 AWS Designation Tempe has demonstrated a combination of assured water supply sources for use in the Tempe Water Service Area that total 88,518 acre-feet per year, an increase of about 14% in water resources pledged to Tempe's Assured Water Supply Designation.

At the time of the 1997 AWS Designation, Tempe had stored 35,200 acre-feet of renewable water supplies in local aquifers for long-term storage credits at several underground water storage projects and groundwater savings programs in the East Salt River Valley groundwater basin. As documented in the 2010 AWS Designation, Tempe has now stored 95,600 acre-feet of renewable water supplies in local aquifers through these projects and is committed to increasing our underground storage program infrastructure to accomplish a higher rate of aquifer storage in the future.

Current and Ongoing Additions to Tempe Assured Water Supply Portfolio

In addition to Tempe's current recharge storage capacity at the Granite Reef Underground Storage Project, Tempe WUD currently has a project underway to construct and operate a new and upgraded groundwater underground water storage and recovery project at the Tempe Ken McDonald Golf Course in south Tempe. This project will use a series of aquifer storage and recovery (ASR) injection wells to store water recharge in the local groundwater aquifer. The ASR well system represents the best technology available to recharge the most favorable and productive segments of the alluvial groundwater aquifer. This underground storage project will utilize renewable surface water supplies in the near-term, and reclaimed water supplies from the KWRF in the long-term. These water resources will be stored in the aquifer in Tempe for long-term storage credits that can be withdrawn through municipal recovery wells throughout the Tempe Water Service Area at a later date, as future water supply and water demand conditions dictate.

Tempe is also examining participation in other underground water storage sites to increase our water storage options. Tempe plans to a secure water storage permit from ADWR and enter into an agreement with CAWCD to lease recharge capacity at the Superstition Mountain Recharge Project (SMRP) in the East Salt River Valley. The SMRP site was opened in 2011 near the CAP Canal and Queen Creek Wash to store CAP water in the East Salt River Valley Groundwater Basin. Tempe plans to utilize this recharge site, when capacity is available, to store CAP water in some years.

Another ongoing effort is exploring opportunities to fully utilize reclaimed water from the 91st Avenue WWTP with our SROG partners. One potential option is the construction of an underground water storage facility in the West Salt River Valley near the 91st Avenue WWTP that would store reclaimed water for long-term storage credits: The Agua Fria Linear Recharge Project, which would be located along lands adjacent to Agua Fria River.

A key component of Tempe's water resources strategy is to protect and enhance our water supplies through comprehensive water rights settlements with the United States, Indian communities, water agencies such as the Salt River Project and Central Arizona Project, other cities, irrigation and agricultural improvement districts and other water users in Arizona. Water rights settlement agreements and enabling legislation avoid costly and protracted legal battles over water supplies and provide greater certainty for all water users. Over the past two decades the City of Tempe and other water users have entered into comprehensive water rights settlement agreements with the Fort McDowell Indian Community, Salt River Pima-Maricopa Indian Community, San Carlos Apache Tribe, Gila River Indian Community, and the White Mountain Apache Tribe.

The City of Tempe and other Arizona water users are also parties to a comprehensive water rights settlement agreement, the Arizona Water Settlement Agreement (*and the Congressional Arizona Water Settlement Act of 2004*), that protects rights to water supplies from the Salt River Project and Central Arizona Project and makes certain CAP Colorado River water supplies available to facilitate future Indian community water rights settlements.

The United States, City of Tempe, SRP, CAP, and other Arizona water users entered into a comprehensive water rights settlement agreement with the White Mountain Apache Tribe (WMAT) in 2009. Included in the settlement agreement and the Congressional Act of 2009 were provisions to construct a dam on the North Fork of the White River, pipelines, water treatment plant and water delivery system for communities on the WMAT Indian Reservation in eastern Arizona. The WMAT was also provided with 25,000 acre-feet of CAP water as part of the settlement agreement and Congressional Act. The WMAT Tribal Council has voted to offer their CAP Colorado River water to other parties in the WMAT Settlement Agreement under the terms of a 100-year lease.

The Tempe City Council approved the White Mountain Apache Tribe Settlement Agreement in 2009. The City of Tempe and other cities within the SRP water service area also worked with SRP, CAP and the WMAT to negotiate the terms of a long-term 100-year lease of WMAT CAP water pursuant to the WMAT Settlement Agreement. The Tempe City Council also approved Tempe's 100-year lease term of WMAT CAP water in 2009. Tempe will lease 2,481 acre-feet of CAP water annually from the WMAT for a term of 100-years. The anticipated enforceability date of the WMAT Settlement Agreement is mid-2015, at which time Tempe will make the initial lease payment to the WMAT and begin to schedule delivery of this additional CAP Colorado River water resource for use in the Tempe Water Service Area.

Future Water Demand Projections for the Tempe Water Service Area

In a letter from the Arizona Department of Water Resources (ADWR) approving the Modification of Tempe's Assured Water Supply Designation on September 29, 2010, ADWR indicated that "*The City of Tempe's status as a designated water provider demonstrates that the City of Tempe is taking a long-term perspective in managing water resources. The City of Tempe's commitment to sound water management represents a major contribution to the State's water management goal of achieving safe-yield in the Phoenix Active Management Area.*".

The 2008 City of Tempe Application for Modification of a Designation of Assured Water Supply that was approved by ADWR in 2010, and the 2006 Tempe Water Service Area - Water Resources Plan, both described the planning tools used by the Tempe Water Utilities Division (WUD) to project future water demands and manage water supplies in our water service area. The Tempe WUD uses "Projected Land Use" categories from the Tempe General Plan 2030 to project future water demand by land use classification (*see Figure 8*). The Tempe City Council adopted the Tempe General Plan 2030 in December, 2003.

For water demand projections and planning purposes, an annual water duty has been established for each "Projected Land Use" classification in Tempe General Plan 2030. Water duties in acre-feet/acre/year were established for single-family residential, multi-family residential, mixed use, commercial, industrial and other land use categories in the Tempe Water Service Area. The water duties are based on recent water use data by sector and projections of the type and density of future development and redevelopment in Tempe.

Table 1 provides a breakdown of the total projected water demand at build-out or full development conditions in 2030 based on assignment of annual water duties to projected land use acreage from the Tempe General Plan 2030. The total projected water demand for the Tempe Water Service Area in 2030 is **75,937 acre-feet.**

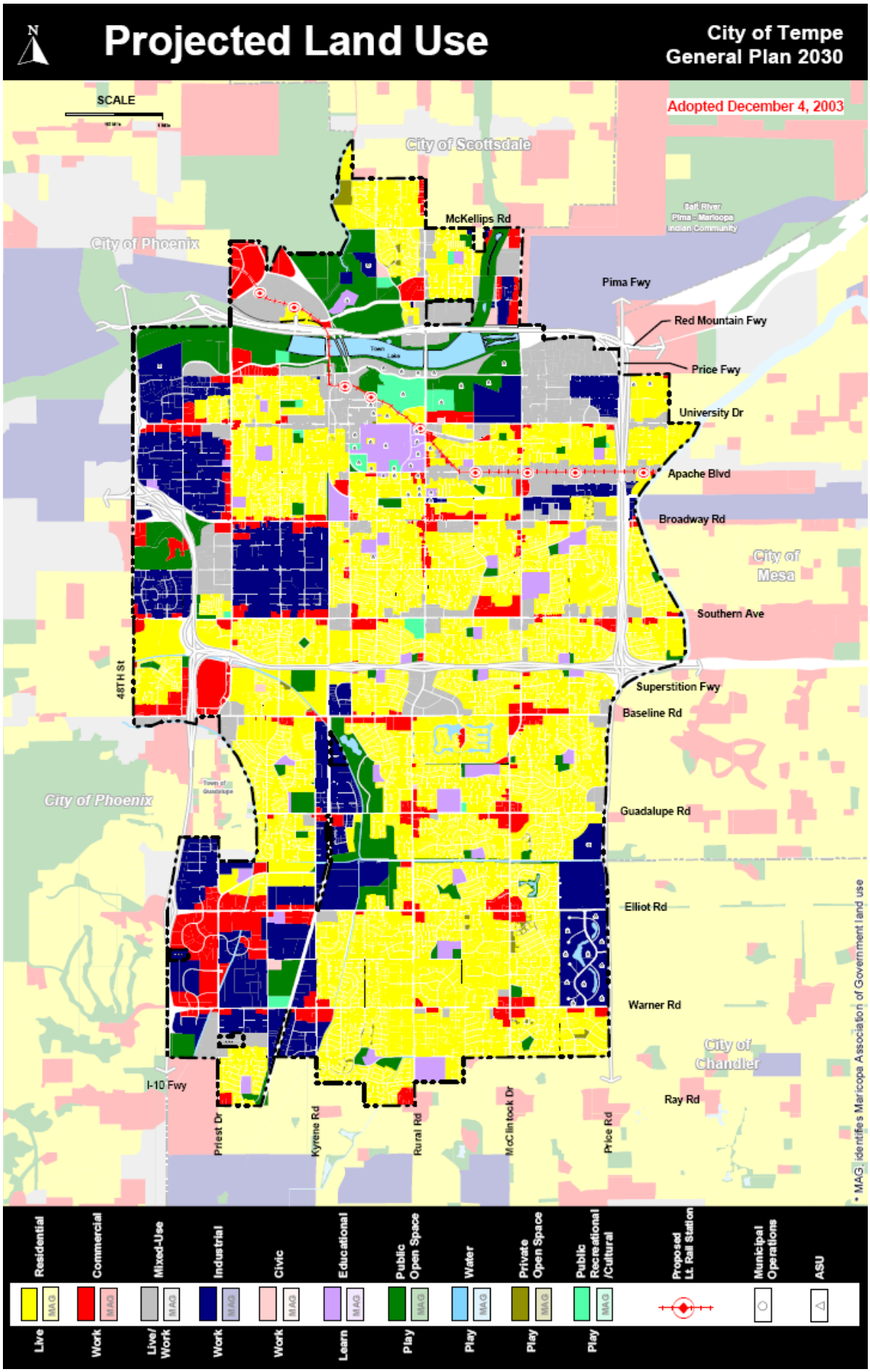

Projected Land Use
City of Tempe
General Plan 2030
SCALE
Adopted December 4, 2003
City of Scottsdale
McKellips Rd
Salt River
Pima - Maricopa
Indian Community
City of Phoenix
Pima Fwy
Red Mountain Fwy
Price Fwy
University Dr
Apache Blvd
Broadway Rd
City of
Mesa
Southern Ave
48TH St
Superstition Fwy
Baseline Rd
City of Phoenix
Guadalupe Rd
Elliot Rd
Warner Rd
City of
Chandler
I-10 Fwy
Ray Rd
Priest Dr
Kyrene Rd
Rural Rd
McClintock Dr
Price Rd
* MAG identifies Maricopa Association of Government land use
Residential
Commercial
Mixed-Use
Industrial
Civic
Educational
Public Open Space
Water
Private Open Space
Public Recreational /Cultural
Proposed Lt. Rail Station
Municipal Operations
ASU
MAG
Live
Work
Live/ Work
Work
Work
Learn
Play
Play
Play
Play

Figure 8

Land Category	Acreage	Demand Factor (af/ac/yr)	Demand (af/yr)	Demand (mgd)
Residential (SF)	7,689	2.75	21,145	18.9
Residential (MF) + Mixed Use (*highest density uses*)	3,896	5.0	19,480	17.4
Civic	49	2.25	110	0.1
Commercial +Industrial	5,351	3.0	16,053	14.3
Education	683	3.5	2,391	2.1
Open Space/Parks	1,943	4.5	8,744	7.8
Rights-of-Way	5,220	0.5	2,610	2.3
Recreational/ Cultural	195	3.5	683	0.6
Unassigned	378	3.5	1,323	1.2
County Islands	152	3.5	532	0.5
Guadalupe	512	2.45	1,254	1.1
Water (COT Lakes)	260	6.2	1,612	1.4
Total	**26,328**		**75,937**	**67.7**

Table 1 - Water Demand Projections for the Tempe Water Service Area at Full Development in 2030 (*utilizing Tempe GP 2030 Projected Land Uses*)

Water duties in Table 1 were developed by analyzing historical water use and water use trends for each land use category and projecting future water demands for some sectors by taking into account the potential for higher levels of development or redevelopment density. Mixed Use developments, for example, will have both residential and non-residential components, some with much greater density of development than exists on those lands today, so new water demand factors were developed for this projected land use category. Analysis of water consumption trends by residential land use category has also led to the development of separate water duty factors for single-family (SF) and multi-family (MF) residential sector acreage. A review of commercial and industrial water use trends in the Tempe water service area indicates a range of water demands that are very site-specific to the type of industrial or commercial land use and to changing economic conditions. The water duties for commercial and industrial land use acreage are combined, with a water duty that falls in the mid-range of water demand projections for these land use categories.

These future water demand projections assume that redevelopment activities and increased density of development in some portions of Tempe will continue through year 2030, as outlined in Tempe GP2030. Difficult to forecast economic factors play a significant role on the timing, type, and density of future development and redevelopment in the Tempe Water Service Area. The water demand projections for the Tempe Water Service presented here represent the potential future water demands at full development in the Tempe Water Service Area based on land use category, realizing that economic conditions will ultimately dictate the timing of development activity. Water demand projections for the Tempe water service area will be revised every few years to account for changing patterns in the density or rate of redevelopment activities. Water duties will also be adjusted when needed based on analysis of recent water consumption patterns across different land use sectors.

Taking into account these variables in the timing and density of new development and redevelopment in Tempe, water demand projections for the Tempe Water Service Area in 2030 indicate that total water demand on lands with SRP water supplies may be up to approximately 65,000 acre-feet per year, and total water demand for non-SRP portions of the water service area may be up to approximately 11,000 acre-feet per year (*see Figure 9*).

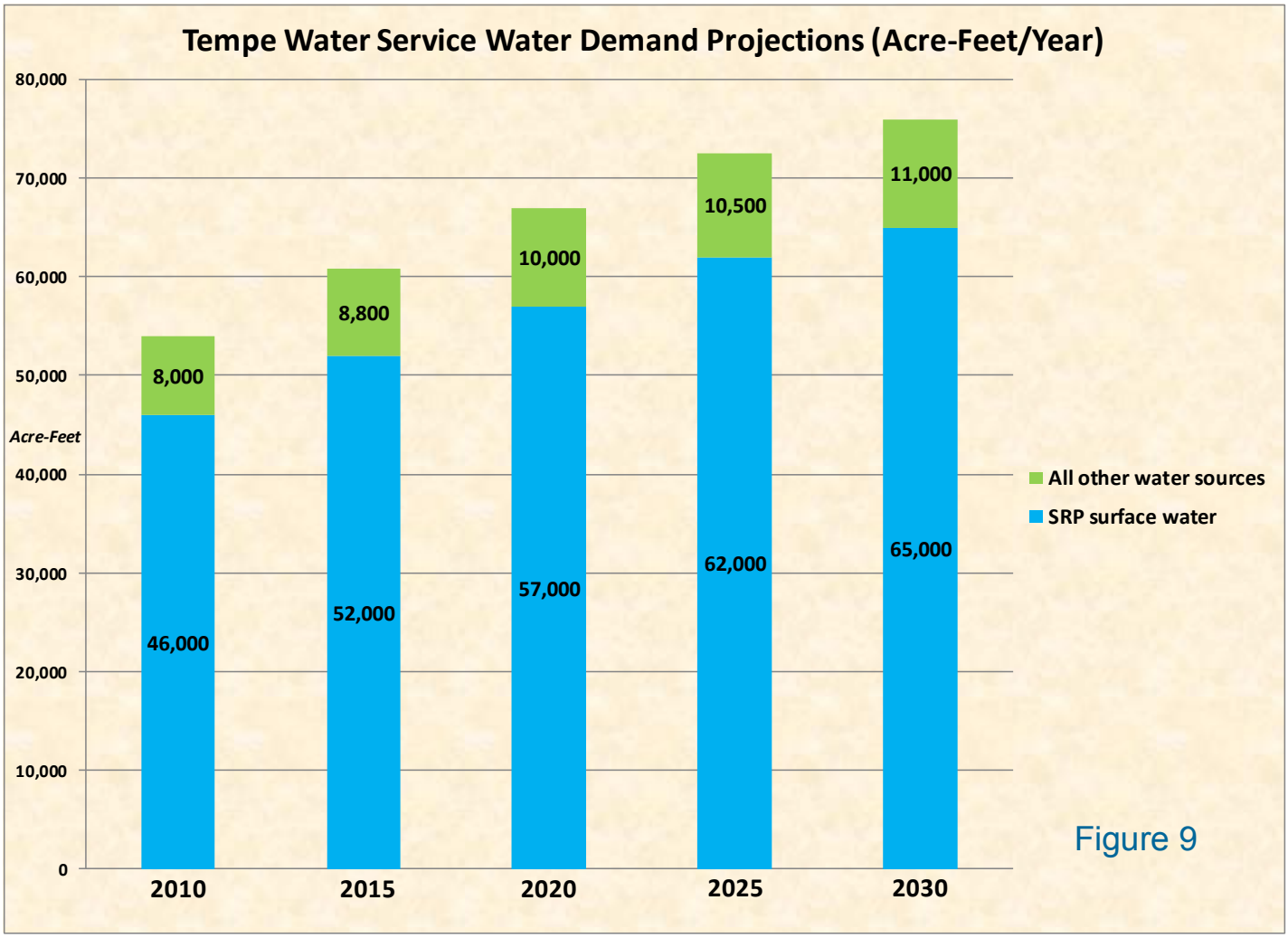


Figure 9

Tempe Water Utilities Division - Water Resources Planning Initiatives

The Tempe Water Utilities Division's water resources planning efforts focus on several key areas:

- Continued reliance on renewable surface water supplies, with emphasis on the protection and legal defense of these water supplies (*see Figure 10*).
- Preserving groundwater reserves for back-up water supply and/or supplemental drought supply.
- Provide safe and secure drinking water supplies to our customers at the lowest possible cost.
- Develop new renewable water supply sources, both surface water and reclaimed water.
- Store currently available excess water supplies in groundwater aquifers for future recovery and use, and develop additional groundwater recharge facility capacity.
- Increase production and recovery well capacity for backup water supply and drought protection.
- Establish development and redevelopment water resources policies that take into account the water rights status of lands to be developed in the Tempe water service area.
- Maintain an effective water conservation program and develop new conservation initiatives.

Reliance on renewable surface water supplies:

Tempe has a long history of reliance on renewable and sustainable surface water supplies. The Tempe WUD works cooperatively with water supply agencies such as the Salt River Project, the Central Arizona Project, the U.S. Bureau of Reclamation, and water regulatory agencies such as the Arizona Department of Water Resources, to protect Tempe's renewable water supply interests.

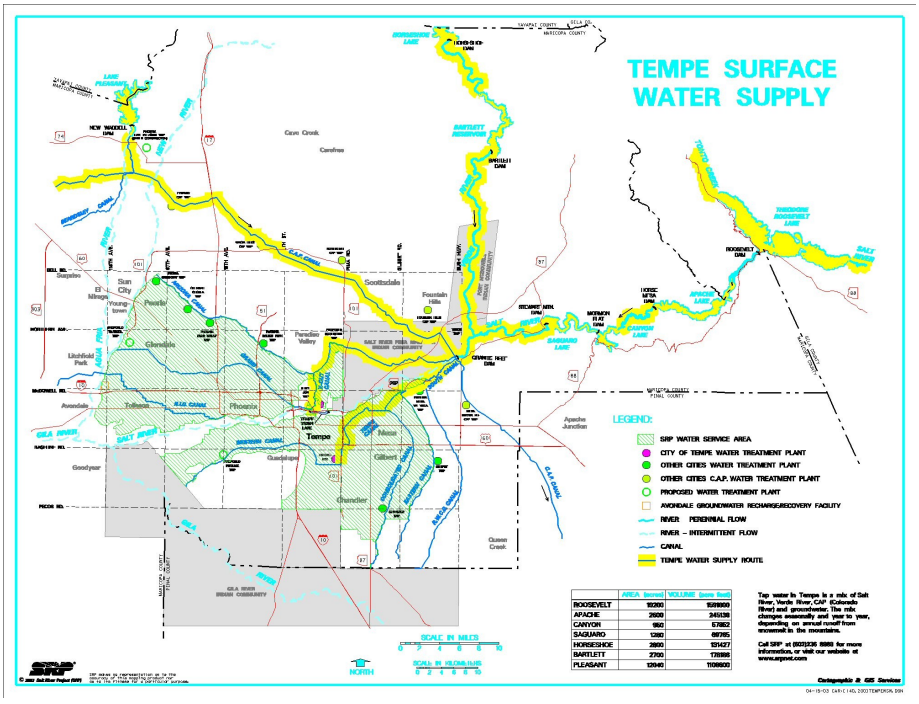


Figure 10

Implementation Strategies

- Protect the water rights to Salt and Verde River water supplies for all lands in the Tempe water service area, including water rights pursuant to decreed Class A normal flow lands, SRP shareholder member lands, and rights pursuant to Modified Roosevelt Dam NCS surface water supplies. Surface water supplies from the Salt and Verde Rivers delivered by the Salt River Project are the largest component of Tempe's assured water supply. The WUD will work with the Salt River Project to protect these rights from infringement by other parties with junior rights or users with no established rights to these surface water supplies. Be proactive in protecting Tempe's water resources through active participation in the Gila River General Stream Adjudication and ongoing water rights settlement negotiations with SRP, CAP, the United States, Indian Communities, Cities, and other water users.
- Continue to fully utilize Tempe's CAP M & I water subcontract allotment each year for non-member land water uses and groundwater recharge for long-term storage credits.
- Utilize excess CAP contract water for groundwater recharge and/or direct uses as available.
- Participate in Colorado River and CAP water users' stakeholder groups to protect Tempe's interests in Colorado River water supplies.
- Secure new CAP water or Colorado River water supplies for the Tempe water service area through reallocation or long-term lease for future non-member land water demands.
- Protect water resources and maintain critical habitat through participation in the National Environmental Policy Act (NEPA) and Environmental Impact Statement (EIS) procedures and habitat conservation plans (HCPs) at Roosevelt Lake and the Salt River watershed, Bartlett and Horseshoe Lakes and the Verde River watershed, and along the Lower Colorado River.
- Continue to participate in regional policy and water supply planning efforts through membership in the Arizona Municipal Water Users Association (AMWUA), the East Valley Water Forum, and other water users' stakeholder groups.

Preserve groundwater for operational back-up water use or supplemental drought supply

Tempe's early agricultural heritage and decades of water management partnerships and agreements with regional water supply agencies and the Federal government have provided today's Tempe residents and business owners with a strong and secure portfolio of renewable surface water supplies. Class A land normal flow surface water supplies with senior water rights, SRP surface water supplies in storage for SRP member lands, CAP contract Colorado River water supplies, and Roosevelt Dam New Conservation Storage (NCS) Salt River water supplies can provide for nearly all of Tempe's potable water supply needs each year. Tempe's surface water supply portfolio allows the Water Utilities Division to limit the use of groundwater resources for operational back-up water supply to meet water demands by supplementing one or both of Tempe's two surface water treatment plants, or for supplemental water supply during times of drought.

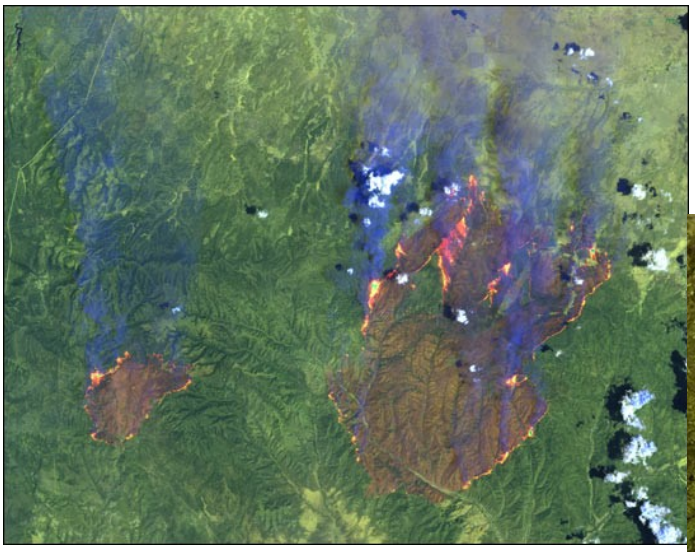
Under the terms of Tempe's Assured Water Supply Designation and Arizona's Assured Water Supply Rules Tempe is limited in the annual amount of groundwater it may withdraw to incidental recharge groundwater (aquifer return flow – safe-yield pumping), and a groundwater allowance account for the Tempe Water Service Area. Tempe will limit its annual use of groundwater to the volumes allowed under the Assured Water Supply Rules, and use aquifer storage and recovery of renewable water supplies when needed. Tempe's objective for its groundwater resources are to maintain safe-yield levels of groundwater withdrawals so that these supplies be reserved for operational/emergency back-up water supply and for supplemental water supply during times of drought.

Implementation Strategies

- Limit groundwater pumping and long-term storage credit recovery from wells to use for water quality blending, operational back-up or emergency water supply conditions, or as a supplemental supply during drought conditions.
- Track use of groundwater through the year through water accounting provisions and determine when the use of long-term storage credits is required.
- Develop annual groundwater use plans tied to SRP water allocations and SRP reservoir storage levels, current amount of NCS water in storage, and CAP water contracts. In years with a full 3.0 acre-feet/acre water allocation for SRP member lands, no shortage reductions in the CAP M & I water supply, and near normal deliveries of Class A land surface water there will be no need for groundwater use as a supplemental drought supply. When any one or a combination of surface water supplies are reduced due to drought conditions the annual groundwater use plan may be adjusted to provide for a temporary increase in groundwater use, within the limits of the drought groundwater exemption set by the ADWR Assured Water Supply Rules.

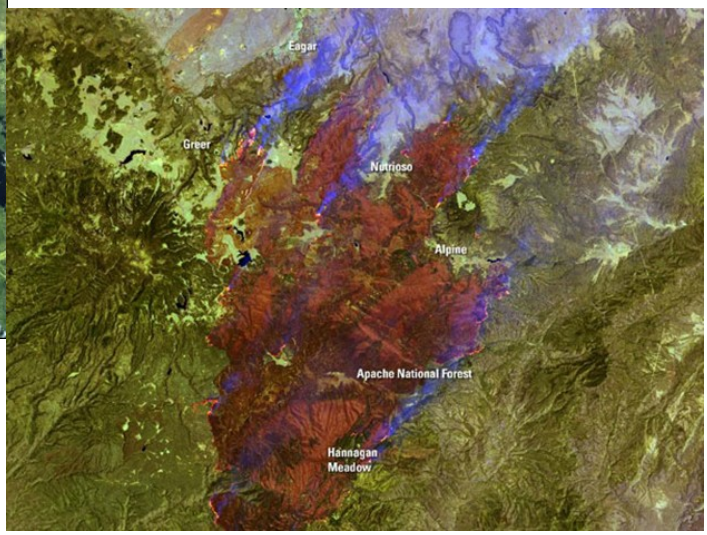
Implementation Strategies, (cont.)

- Increase recharge of renewable surface water or reclaimed water supplies for long-term aquifer storage credits to provide back-up or drought augmentation water supplies when needed.
- Implement water quality technology improvements in surface water treatment capability at Tempe's water treatment plants. In recent years surface water in the SRP canals that supply Tempe's water treatment plants has experienced incursions of high turbidity (sediment laden) water during the heavy watershed runoff of winter 2005, and again in 2010. High levels of total organic carbon (TOC) in source water require a higher level of treatment and may have secondary effects such as the formation of disinfection by-products in drinking water. High turbidity events occurred in 2005 and 2010 during heavy precipitation on the Salt and Verde River watersheds that followed several years of drought and large scale forest fires (*see Rodeo-Chediski Fire of 2002 and Willow Fire of 2004*). High TOC runoff events have occurred from 2005 through 2010, as the runoff from burned areas of the watershed combined with submerged vegetation at Roosevelt Lake resulting in high TOC levels in water released from SRP reservoirs. Groundwater wells in Tempe have been used as a blending supply to assist the surface water treatment process during these periods. Technology improvements installed at Tempe's two water treatment plants since 2005, such as enhanced coagulation, solids handling, and UV disinfection, have improved the water treatment capability to handle these challenges at each plant and reduced the need to use groundwater wells for blending purposes. These efforts have better prepared Tempe WUD's ability to deal with future challenging watershed conditions (*see Wallow Fire of 2011*).



Rodeo-Chediski Fire in the Salt River Watershed, June 2002

Wallow Fire in the Upper Salt River Watershed, June 2011



Provide safe and secure drinking water supplies to customers at the lowest possible cost

Drinking water can include contaminants such as microbes, radionuclides, inorganic and organic contaminants, and disinfection by-products. Under the Safe Drinking Water Act the U.S. Environmental Protection Agency (EPA) sets legal limits on the levels of certain contaminants which reflect both the level that protects human health and the level that water systems can achieve using the best available technology. Besides prescribing these legal limits EPA rules set water-testing schedules and methods that water systems must follow. The rules also list acceptable techniques for treating contaminated water. Currently, more than 90 contaminants are regulated.

Tempe has consistently met all drinking water standards since passage of the Safe Drinking Water Act in 1974. The Tempe Water Utilities Department constantly reviews upcoming regulations to ensure that current water quality meets all future drinking water standards.

Implementation Strategies

- Plan and manage water treatment processes to ensure drinking water is of the highest possible quality.
- Plan and manage water distribution practices to prevent the formation of contaminants within the City's water distribution system.
- Maintain a vigorous water quality sampling and analysis program to detect any current or potential future drinking water limit exceedances.
- Implement planned technology improvements in water treatment infrastructure at Tempe's two water treatment plants.
- Evaluate alternative or new technologies, as they become available, which may produce an even higher quality of drinking water.
- Evaluate and implement distribution system programs, such as increased monitoring and periodic system flushing, to ensure the highest possible level of protection from contaminants for all customers.
- Participate in national and regional partnerships such as the "Partnership for Safe Water", and "Tap Into Quality", where strategies for delivering high-quality drinking water are shared between water providers.
- Annually distribute the "Tempe Water Quality Report", a consumer confidence report which provides customers with summaries of drinking water quality delivered throughout each year. You can view a copy of the most recent Tempe consumer confidence report at: www.tempe.gov/waterquality/ccr.htm

The Tempe Water Utilities Division mission is to provide our water and wastewater customers the highest levels of utility service. The Tempe Water Utilities Division is operated consistent with efficient financial and business practices to keep our customers' water and wastewater rates among the lowest in Arizona.

Implementation Strategies

- Gradual phase-in of necessary water and wastewater rate adjustments to minimize impacts on our utility customers and to assure fair and equitable cost of service allocation across customer classifications.
- Develop and implement business models to operate Tempe's water and wastewater treatment facilities and infrastructure in the most efficient and cost effective means possible. In 2011 Tempe WUD completed a wastewater business strategy report to examine Tempe's most cost effective and practical wastewater treatment options over the next decade. Due to declining water demand and reduced wastewater flows in Tempe in recent years a business decision was made to temporarily de-commission the Tempe Kyrene Water Reclamation Facility for at least 3 - 5 years until water demands and wastewater flows in Tempe increase to target levels making it economically feasible to resume operation of the KWRF. During this time all Tempe wastewater flow treatment will be consolidated at the regional 91st Avenue Wastewater Treatment Plant in Phoenix using Tempe's current capacity in that facility. This consolidation of Tempe's wastewater treatment is anticipated to save approximately $1,500,000 annually in avoided operations cost at the Tempe KWRF and defer CIP costs.
- Design water and wastewater treatment expansions and technology enhancements at the most cost-effective facilities on a per-unit treatment cost basis. Planned expansions and upgrades at the J.G. Martinez and South Tempe Water Treatment Plants, and the 91st Ave. Wastewater Treatment Plant, can achieve the overall lowest per-unit treatment costs for Tempe, compared to expansions at other facilities or constructing new facilities.
- Work Force Flexibility: The Tempe Water Utilities Division has implemented cross training for our water and wastewater utility workers and a skill based pay system.
- Utilization of new technology at Water Utility Division facilities to reduce operating costs.
- Strict enforcement of Tempe's wastewater pretreatment ordinance.
- Relocation of WUD field crews to a central location, decreasing response times and vehicle mileage.
- Continue to offer more convenient and efficient payment options for our utility customers.

Develop new renewable water supply sources

The City of Tempe will have sufficient renewable surface water supplies to meet the projected future water demands on SRP member lands and Class A normal flow lands within the Tempe Water Service Area, approximately 80% of all lands within the water service area. For the 20% of the Tempe Water Service Area that is located on non-member land, additional renewable water supplies should be developed to firm up existing supplies and to assure a more dependable annual supply of sustainable water resources for these areas.

Reclaimed water will continue to be an important component of the City of Tempe's long-term renewable water resource portfolio. The City of Tempe's objective for its reclaimed water supply is to fully utilize this resource when and where it is available for a wide range of non-potable water uses. The use of reclaimed water conserves the use of surface water or groundwater supplies and can be used for water exchange purposes resulting in greater water use efficiency.

Implementation Strategies

- Secure new CAP water or Colorado River water supplies for the Tempe water service area through reallocation or long-term lease for future non-member land water demands. (*Tempe has secured a long-term 100-year lease of CAP Colorado River water from the White Mountain Apache Tribe through a comprehensive water rights settlement agreement. Tempe will lease 2,481 acre-feet of CAP water per year under the terms of this lease agreement, beginning as early as 2015. Tempe will also pursue additional CAP water through the reallocation process for a pool of CAP Non-Indian Agricultural water to be initiated by the Arizona Department of Water Resources sometime in the next several years.*)
- Continue to store CAP Colorado River water, Roosevelt Dam NCS Salt River water, and reclaimed water through aquifer recharge for long-term storage credits and future recovery. Develop additional groundwater recharge and underground storage facility capacity. (*See further discussion of Tempe groundwater recharge projects on Page 34.*)
- Provide reclaimed water from the KWRF for industrial use at the SRP Kyrene Generating Station, the Ken McDonald Golf Course for irrigation use, and other future re-use sites in exchange for surface water credits from SRP. (*Long-term strategy: The KWRF is currently decommissioned but reclaimed water deliveries to these re-use sites will resume when the KWRF is brought back on-line, potentially in 3 - 5 years.*)
- Work with the Sub-Regional Operating Group (SROG) partnership at the 91st Ave. Wastewater Treatment Plant to maximize the use of uncommitted reclaimed water from that facility through groundwater recharge projects, water reuse projects, or water exchanges.

Implementation Strategies, (cont.)

- Explore other partnerships for wastewater treatment and reclaimed water reuse.
- Investigate the potential for mutually beneficial water exchanges with other water users.

Store currently available excess water supplies in groundwater aquifers for future recovery and use, and develop additional groundwater recharge facility capacity.

The Tempe Water Utilities Department will continue efforts to increase Tempe's stored aquifer water supplies for the future through the establishment of a large bank of long-term storage credits. Tempe will plan to continue using CAP M & I contract water, CAP excess contract water, Roosevelt Dam NCS water, and reclaimed water supplies to recharge our local aquifers. These long-term storage credits will be stored for future recovery to meet projected future non-member land water demand and for use during drought periods when surface water supplies are reduced.

The Tempe Water Utilities Department will pursue new opportunities to increase its direct groundwater recharge facility capacity, both at the Tempe Ken McDonald Golf Course Groundwater Recharge Project and by securing additional firm or leased capacity at other existing groundwater recharge facilities or new recharge facilities.

Implementation Strategies

- Continue programs to store CAP Colorado River water and Roosevelt Dam NCS Salt River water supplies in aquifers through direct recharge projects like the Granite Reef Underground Storage Project (GRUSP) and the Tempe Ken McDonald Golf Course Recharge Project, or through in-lieu recharge projects such as Salt River Project Groundwater Savings Facility.
- Complete construction on Phase 1 of the Tempe Ken McDonald Golf Course Recharge Project by installing and equipping the first of three aquifer storage and recovery (ASR) recharge wells in 2012. Complete two additional ASR recharge wells at this site by 2014/2015. Initial sources of water to be recharged/stored for long-term credits at this project will be CAP Colorado River water and Roosevelt Dam NCS Salt River water supplies. Long-term plans include recharging a portion of Tempe's reclaimed water supply to the aquifer for storage credits after the Kyrene Water Reclamation Facility is brought back into service, potentially in 3 - 5 years.
- Pursue an agreement with CAP and a water storage permit from ADWR to lease additional storage capacity at the CAP Superstition Mountain Recharge Project site in the East Salt River Valley, and explore other opportunities to lease or to secure firm recharge capacity at other existing recharge facilities or new recharge facilities.

Increase Recovery Well Capacity for Back-up Water Supply and Drought Protection

Tempe's municipal water system is better served with a greater level of water production facility redundancy between surface water treatment plants and wells. Increasing Tempe's recovery well production capacity provides a higher level of operational redundancy and back-up water supply reliability during droughts, emergencies, or surface water conditions that require the use of wells as a supplemental supply. Tempe WUD has added three new production/recovery wells to the system in recent years, two major groundwater delivery pipelines, and has rehabilitated and upgraded five existing production/recovery wells and associated infrastructure within our water distribution network.

Implementation Strategies

- Continue to implement new groundwater production/recovery well projects outlined in the current Tempe WUD Capital Improvement Project (CIP) Program. The current CIP budget includes funding for one new Tempe production/recovery well and the addition of three existing SRP production/recovery wells to the Tempe system by 2014/2015. This includes the drilling and equipping of one new municipal production well at a site to be determined, and establishing direct connections and upgrades to three existing SRP wells along the Western Canal that will be linked to an existing pipeline into the South Tempe Water Treatment Plant.
- Implement production performance and/or water quality rehabilitation projects at several older municipal production/recovery wells. Tempe WUD now has an ongoing CIP Program to rehabilitate and upgrade existing wells in our water service area. One to two production/recovery wells will be scheduled for repairs and upgrades each year.
- Investigate opportunities to drill and equip new production/recovery wells as an alternative industrial water supply for select large industrial water customers, for either existing or potential future industrial water users in the Tempe Water Service Area.
- Examine alternatives to wellhead treatment for COT Well #6. Tempe WUD completed a pipeline project in 2010 to connect COT Well #6 to the J.G. Martinez Water Treatment Plant for blending of this groundwater resource through the surface water treatment process. COT Well #6 has historically been impacted by low levels of volatile organic compounds (VOCs) present in the aquifer in far northern Tempe. COT Well #6 is currently treated by blending with surface water supplies through the water treatment plant process. Additional water treatment infrastructure at the Martinez Water Treatment Plant will allow for groundwater from this well to be treated and used independently of the surface water treatment process.
- Increase total municipal production/recovery well capacity in the Tempe Water Service Area from the current level of 28 MGD up to 45 MGD by 2016/2017.

Establish Development and Redevelopment Policies that take into Account the Water Rights Status of Lands to be Developed in the Tempe Water Service Area

The Tempe Water Utilities Division will work with Other Divisions of the Tempe Public Works Department and other Tempe Departments to encourage and inform industries and commercial enterprises considering locating their businesses to Tempe that we will provide them with top rated water and wastewater utility services, with one of the most secure water supply portfolios of any community in the southwestern United States .

One of the planning tools recommended by the Water Utilities Division in working with the development community to locate new businesses and industries in Tempe is taking into account the water rights status of lands where the development will occur. Larger, more water-intensive industry for example, is best served by locating on lands holding the most diverse and senior water rights portfolio. In the Tempe Water Service Area these areas include SRP member lands and lands that have Class A land decreed water rights, approximately 80% of all lands within the water service area. (*See Figure 3 on Page 10 for more detail*.)

Another planning tool for future development of industrial uses in Tempe will be the opportunity to work up front with new industries in examining new technologies in water use efficiency and water recycling, or examining the potential for alternative water supplies in the future, such as reclaimed water or on-site recovery wells.

City of Tempe Water Conservation Programs

The Tempe Water Conservation Office of the Water Utilities Division was established to provide assistance to Tempe residents and water customers in water use savings and efficiency, and to comply with State water conservation requirements of the Arizona Department of Water Resources (ADWR). The Tempe Water Conservation Office is staffed by two full time professional water conservation experts. The Water Conservation Program offers a variety of educational opportunities, publications, and financial incentives to adopt efficient water use practices at homes and businesses in Tempe. Overall water use in Tempe has declined during the past decade (*see Figure 6*), due in part to the successful programs offered by the Tempe Water Conservation Office, which include:

- *Residential sector water conservation programs*
- *Xeriscape landscape conversion rebates*
- *Xeriscape Demonstration Garden*
- *Low flow toilet rebates, including multi-family sector rebate program*
- *Commercial/Industrial sector water conservation programs*
- *Commercial/Industrial sector water conservation grants*
- *School educational programs and grants*
- *Low water use landscape ordinance and water wasting prevention ordinance*
- *Xeriscape design and irrigation system workshops and classes*
- *"Smartscape" training program for landscape professionals*
- *Regional "Water Use it Wisely" Program*
- *Tiered water rate structure to encourage water conservation and water use efficiency*
- *Tempe Water Conservation Website: www.tempe.gov/conservation/*
- *Coming soon: the "Eisendrath House Center for Water Conservation" in north Tempe*

The City of Tempe's water conservation programs are administered under the ADWR Non-Per Capita Conservation Program (NPCCP). This program focuses conservation efforts across all water use sectors to achieve water use awareness and efficiency in Tempe. The Tempe NPCCP consists of "best management practices" and reasonable conservation measures (RCMs) agreed upon by Tempe and ADWR to meet the water conservation goals of ADWR's 3rd Management Plan for the Phoenix Active Management Area. Program elements include 2 residential interior RCMs, 5 residential exterior RCMs, 2 non-residential interior RCMs, 2 non-residential exterior RCMs, and water conservation education components. The City of Tempe will administer its water conservation programs under the ADWR NPCCP throughout the Phoenix AMA 3rd Management Plan period (through at least 2012), and will transition to the Modified NPCCP under the Phoenix AMA 4th Management Plan when adopted.

- **Residential Low Flow Plumbing Rebate Program**

This RCM encourages Tempe homeowners to replace older, existing high water use toilets with more efficient models consistent with the Arizona Water Efficient Plumbing Act. Rebates are granted for 50% of the purchase price of these toilets, up to $75.00 per toilet. The Program is advertised in different venues to insure all residents can participate. Applicants are required to submit an application form and the original receipt of purchase for these low flow devices to meet eligibility requirements. After initially being offered to only single-family residential properties, this program was later expanded to include multi-family residences within the Tempe water service area. The Tempe Water Conservation Office realized the potential to expand this program to target water savings at many of the older multi-family apartment and condo properties in Tempe that were not able to take advantage of the original toilet rebate program for single family properties. The multi-family toilet rebate program also offers a 50% rebate for each installation of a low flow toilet, up to $75.00 for each toilet. The maximum rebate for any one multi-family property retrofit project is $5,000.00.

- **City Ordinance Prohibiting the Installation of Plumbing Fixtures in New and Existing Residential Housing that does not meet Water Saving Performance Standards**

City of Tempe ordinance # 98.23 outlines the maximum flow rates of plumbing fixtures that are allowed for installation in new residential homes and existing homes that have requested permits for additions or alterations. This ordinance also requires evaporative cooling systems and decorative fountains be equipped with water recycling or reuse systems. Implementation of this ordinance includes an inspection and enforcement program to ensure compliance.

- **Maintain a Water Distribution System Water Audit Program**

One component of this RCM provides for at least 10% of Tempe's water distribution system to be investigated for leaks each year. High-tech ultrasonic devices are utilized to inspect all water distribution pipelines, valves, and hydrants for leaks in designated areas of the water service area each year. In recent years up to 20% of the water distribution system has been monitored for leaks each year using this technology. Another component of this RCM is administration of Tempe's ten-year water meter replacement program. This program replaces or repairs malfunctioning or leaking meters identified by WUD personnel or residents and records a database for those meters. Other components of this RCM include accuracy of meters at production wells, and tracking monthly water deliveries, water production and water consumption to help identify possible losses in the system.

Implementation Strategies, (cont.)

- **Provide Landscape Watering Advice to Residents to Save Water**

Information is made available to any water customer requesting landscape-watering advice. This information includes:

⇒ Publications, flyers, brochures, and watering schedule cards that illustrate the value of using irrigation scheduling designed to reduce water lost to evaporation.

⇒ Information on the proper setting and adjustment of irrigation timers.

⇒ Information on plant evapotranspiration (ET) and how this information can be applied to save water through proper timing and duration of irrigation.

⇒ Regular schedule of Tempe Water Conservation Office drip irrigation system design and installation workshops, and low water use plant workshops for residents and water customers.

⇒ Tempe Women's Club Park Xeriscape Demonstration Garden.

- **Model Home Ordinance in New Residential Developments**

City of Tempe ordinance #808.9803 requires new model homes in residential subdivisions to meet water efficiency standards. This is accomplished by limiting the amount of water intensive landscaping allowed on model homes to no greater than 20% of the landscaped area. The ordinance for model homes limits the use of water intensive landscape to where it is functionally useful, for example, play areas or close to the home for energy efficiency. The ordinance also requires installation of efficient irrigation systems and plans for plants installed in desert landscaping to be on the State's low water use plant list.

- **Low Water Use Landscape Rebate Program for New and Existing Residential Customers**

This landscape rebate program offers residents a one-time rebate of $250 to convert a whole front or back yard of grass to low water use desert landscaping (xeriscape), $500 if both a front and back yard are converted to a xeriscape design. To qualify for the landscape conversion rebate a before-and-after series of photos must be submitted along with the rebate application form and receipts. In conjunction with this rebate program the Tempe Water Conservation Office also offer the following services:

⇒ Publications, brochures and information on xeriscaping and low water use plants.

⇒ The Tempe Water Conservation Office offers xeriscape workshops to educate residents on appropriate design and installation techniques for installing low water use desert landscapes.

⇒ The City of Tempe Water Conservation Office will issue rebate applications upon request. Call (480) 350-2668 to request a landscape rebate application form, or get the rebate form on-line at: www.tempe.gov/conservation/LandscapeRebate/program.htm.

Examples of xeriscape landscape conversions at Tempe residences 2 years after participation in the Tempe low water use landscape rebate program

- **Enforcement of Water Efficient Plumbing Fixtures in New Non-Residential Facilities**

City of Tempe ordinance #98.23 is a low flow plumbing ordinance for the non-residential sector relating primarily to fixtures that would be installed in a non-residential setting. Typically, toilet fixtures and sinks are different than those installed in residential properties. Metered faucets and other new conservation devices are becoming commonplace in these settings. This ordinance ensures these fixtures adhere to the standards set forth within the original parameters of the ordinance. The ordinance also covers restrictions on decorative fountains and evaporative coolers.

- **Distribution of Conservation Information to New Non-Residential Customers and Submittal of Water Use Plans and Report**

This RCM requires new non-residential facilities with a potential to use 10 acre-feet or more of water each year to file a water use report. This report details conservation strategies and technology that will be incorporated into their new facilities. These customers must demonstrate they are using the latest technology in process related water use and if a cooling tower will be part of their design. Landscape and domestic water use is also examined. This is also useful from a water demand management perspective, to determine total quantity of water that could be used by the new non-residential facility. The water conservation report is outlined in City of Tempe ordinance # 92.27.

- **Non-Residential Landscape Ordinance**

City of Tempe ordinance #808.9803 limits the amount of water intensive landscape that can be installed in new non-residential developments. The term water intensive is defined as: “Land with a permanent water application system that is planted with plants that are not on the State’s low water use list”. The ordinance limits the amount of water intensive landscape installed to no more than 20% of the landscape area in excess of 10,000 square feet.

- **Industrial Rebate Grant Program**

This Grant Program offers a funding opportunity to non-residential water customers in our service area that can save a minimum of 15% of their total water usage. Areas of water savings can be from process changes, cooling tower reductions, landscape watering savings, or a combination of these efforts. Participating industries or commercial water users have to demonstrate the potential for water use reduction in the grant application and funding is contingent upon the achieved results. Industrial Grants are available for up to 50% of the cost of the project, with a maximum grant of $20,000. Grant funding has also been made available to select multi-family residential properties that have undertaken extensive removal of turf and replacement with low water use landscapes.

In business planning, the cost of installing water saving technology improvements for certain industries and commercial operations may not be offset with a reasonable rate of return on their investments through water use savings. Water is relatively inexpensive for many businesses compared to other operating expenses, and to show that installation of water saving devices will pay for themselves within several years may be hard to accomplish. This grant program is designed to help close the installation cost gap so participating companies can realize a reasonable payback time frame on their investments while assisting the City of Tempe's water conservation goals.

- **Public Information and Education Campaign**

This may be the single most important aspect of our water conservation strategy. Continual water conservation education is the best way to encourage water use efficiency and sustainable changes in water use practices by our customers. This RCM highlights all of the other RCM's in the dissemination of information to the public. Current program components include:

⇒ Tempe Women's Club Xeriscape Demonstration Garden – To show residents the look and feel of desert landscaping and what could be achieved in their own yards.

⇒ Xeriscape Workshops – To demonstrate the proper planning, design, installation, maintenance and watering techniques of desert landscaping.

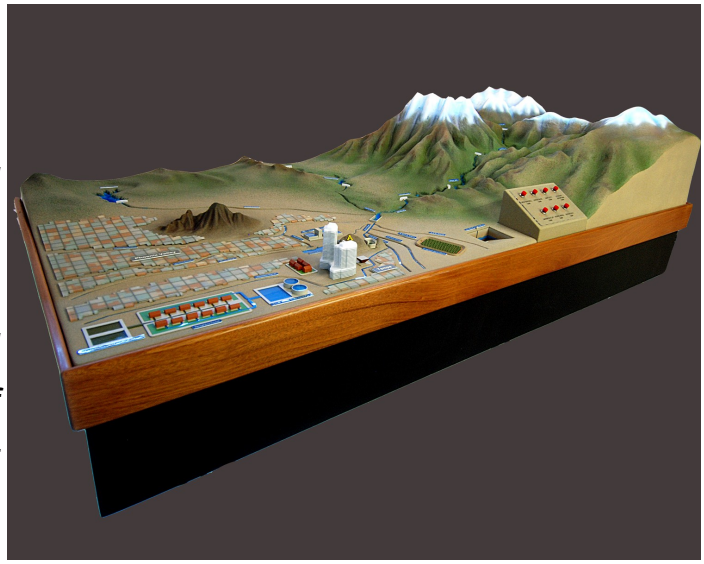
⇒ Drip Irrigation and Scheduling Workshops – To demonstrate the proper design, installation, care and scheduling of water efficient irrigation systems.

⇒ "Smartscape" training classes for landscape professionals.

⇒ Primary school education – Provide our Public Schools with a variety of educational programs to teach our youngest residents the value of conserving our natural resources.

⇒ <u>Tempe water supply and watershed model:</u>

The Tempe Water Conservation Office has developed a working display model of the watersheds, reservoirs, water delivery and water treatment systems that bring water to Tempe. This interactive model will be used for educational programs at schools and other events to highlight the sources of Tempe's water supplies and the path that brings water to our City.



- ⇒ Distribution of brochures and literature outlining the most up to date conservation information.
- ⇒ Participation in the Statewide Media Campaign "Water Use it Wisely" – This sends a consistent message to our residents at a much lower cost than Tempe could provide on its own.
- ⇒ Marketing water conservation ideas and strategies in a variety of methods through newsprint, direct mailings, water bill inserts, newsletters, and handouts.
- ⇒ Distribution of plumbing retrofit kits to older homes. Kits include faucet aerators for the kitchen and bathrooms, toilet displacement devices, and low-flow showerheads.
- ⇒ School Garden Grants Program – Offering grant monies to public schools to introduce gardening, proper watering techniques and low water use plant material to students.
- ⇒ Continued participation in the Arizona Municipal Water Users Association (AMWUA) Conservation Committee, a regional conservation program comprised of ten neighboring communities working together toward a common goal – Water Use Efficiency.

- **Enforce the water-wasting ordinance**

City of Tempe ordinance # 91.46 is a water-wasting ordinance that prohibits water from leaving a customer's property and going to an easement, alley, sidewalk or right-of-way. This ordinance is intended to prevent water waste from broken irrigation systems or unattended uses of water, such as leaving a hose running. The ordinance is enforceable with fines after a second written warning, however, it is intended primarily as an outreach effort to notify property owners that a complaint has been filed and to work with them to prevent the ongoing waste of water .

- **Work with city staff to develop a comprehensive water conservation plan for city parks and turf-related facilities**

Examine options for additional water efficiency and savings at city parks and turf facilities through system upgrades and new technology. An recent example is a CIP program to install a replacement and upgrade of the irrigation system at Kiwanis Park, one of Tempe's largest parks.

- **Tiered water rate structure to encourage water conservation and water use efficiency**

The Tempe City Council has established a tiered water rate schedule for single-family residential properties to encourage water conservation savings and the efficient use of water. The water rate schedule, effective November 1, 2011, sets progressively higher water consumption rate charges for each increasing block of water used at single-family residential properties. The current water rate schedule is outlined in Table 2 on Page 44.

The following fee structure was established by the Tempe City Council for the consumption rates for water service effective November 1, 2011:

Table 2—Tempe Water Rate Schedule

Single-Family Residential Water Consumption Rates

CONSUMPTION	INSIDE TEMPE AND GUADALUPE (PER 1,000 GALLONS)	OUTSIDE TEMPE AND GUADALUPE (PER 1,000 GALLONS)
First 8,000 gallons	$ 1.70	$ 2.21
Next 7,000 gallons	2.13	2.77
Next 10,000 gallons	2.66	3.46
Over 25,000 gallons	3.33	4.33

Non Single-Family Residential Water Consumption Rates

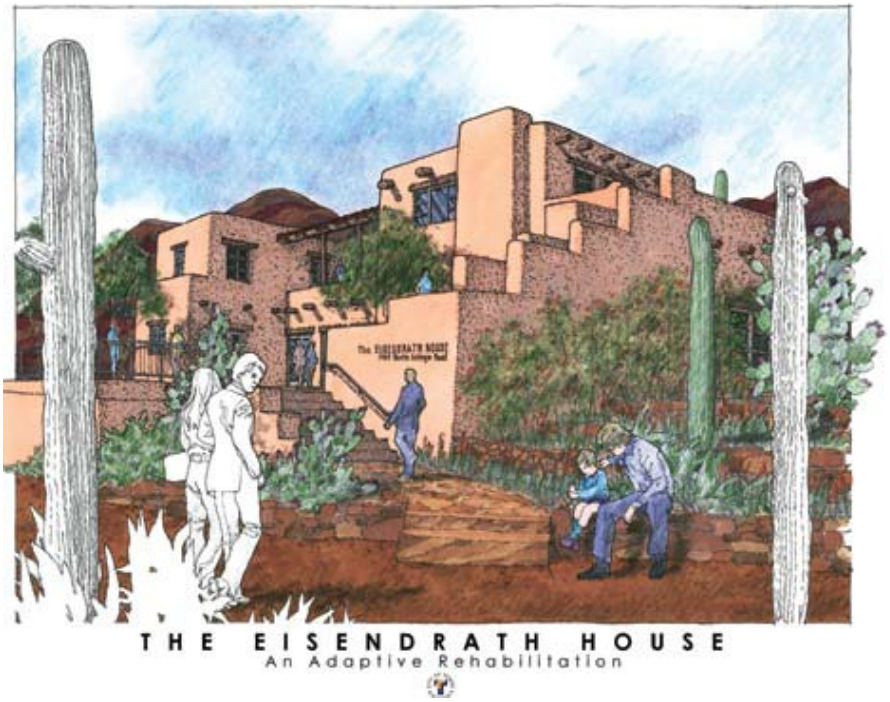
CUSTOMER CLASSIFICATION	INSIDE TEMPE AND GUADALUPE (PER 1,000 GALLONS)	OUTSIDE TEMPE AND GUADALUPE (PER 1,000 GALLONS)
Multifamily	$ 1.84	$ 2.39
Commercial	2.09	2.72
Construction	2.34	3.04
Industrial	1.87	2.43
Landscaping	2.34	3.04

Long Range Goals for Tempe Water Conservation Program

- ⇒ Work with non-residential water customers to identify cost-effective technologies to help save water and provide information on Tempe's Industrial Water Conservation Grant Program.
- ⇒ Explore the feasibility of a landscape irrigation efficiency ordinance that would create standards for drip irrigation systems.
- ⇒ Expand Tempe's Public School water conservation education efforts and create additional hands-on learning opportunities for students. The new interactive watershed and water supply model for Tempe will be utilized for water educational information and display at Tempe Public Schools. The Tempe Water Conservation Office's School Gardening Grant Program is another example of an ongoing effort to provide grant funding to Tempe Public Schools for the development of school gardens to help teach students plant care and nurturing, and demonstrate proper watering techniques .
- ⇒ Enhance the Tempe Women's Club Xeriscape Demonstration Garden in north Tempe that demonstrates the use of low water use desert trees and plants for the public to observe the diverse landscape potential possible with low water use plants.
- ⇒ Support the development of the Tempe Carl Hayden Campus for Sustainability in north Tempe, and assist in preserving, maintaining and enhancing the natural features and amenities of this portion of Tempe's Papago Park. The Carl Hayden Campus for Sustainability includes the Green Line riparian area, Arizona Historical Society Museum, O'Connor House and Center for Civic Discourse, Tempe Women's Club Park Xeriscape Demonstration Garden, LoPiano Mesquite Bosque, Loma del Rio Hohokam Ruin, Evelyn Hallman Park, and the historic Eisendrath House and Center for Water Conservation. Discover more information at: www.tempe.gov/conservation/images/Carl%20Hayden%20Campus.pdf
- ⇒ Attend more homeowners association meetings and look for creative and cost effective measures related to water use reduction.
- ⇒ Become more familiar with the whole range of multi-family developments in Tempe, examine additional ways to help them reduce their water consumption, and encourage multi-family residential sector toilet and low water use landscape conversions.
- ⇒ Examine undeveloped lands and lands slated for redevelopment in our service area and track development plans to help determine what their potential water uses might be. Use a proactive approach to maximize the water conservation savings potential for new developments.
- ⇒ Follow redevelopment trends in Tempe to target water conservation outreach to development areas with significant water conservation potential.
- ⇒ Transition from the current NPCCP plan under the 3rd Management Plan to the Modified NPCCP during the 4th Management Plan.

Long Range Goals for Tempe Water Conservation Program, cont.

⇒ Establish the Eisendrath Center for Water Conservation by 2014, to be located at the historic Eisendrath House in Papago Park within the Tempe Carl Hayden Campus for Sustainability.



The City of Tempe is restoring the property for use as a water conservation center. This will allow the house and property to serve the public as a reminder of the region's past and as a touchstone for its future as a sustainable, diverse community. A variety of interior and exterior spaces will provide opportunities for new and expanded programs in an unparalleled setting. The Eisendrath Center will include:

• A Tribute to Carl Hayden – This Tempe native, Maricopa County Sheriff, State Legislator, longest-serving U.S. Congressman and Senator will be honored by interactive exhibits on water conservation and recognized for his vital role in the Central Arizona Project.

• Rose Eisendrath Interpretive Center – The life of this strong woman, the career of architect and master builder Robert Evans and other aspects of the history and restoration of the home and site will be described through messages and displays throughout the home and property.

• City of Tempe's Water Conservation Program – City offices and staff will be located at the Eisendrath Center. Residents and visitors will be able to obtain information on water conservation and other sustainable practices.

• Additional Office and Program Space -- The restored Eisendrath House will offer classroom and meeting space in a unique setting convenient to Phoenix, Scottsdale and the East Valley, as well as Tempe and Arizona State University. Civic, educational and neighborhood organizations will be able to hold meetings, classes and other special events at the facility. A large room with ADA-accessible restrooms and a catering kitchen, as well as a smaller conference room, the east facing terrace and the semi-enclosed courtyard will accommodate a variety of functions.

Tempe Drought Plan Summary

Tempe Drought Plan Background

Arizona and the southwestern United States experienced a series of consecutive dry years in the late 1990's through about 2004. During this period of extended drought conditions in Arizona the Tempe Water Utilities Department prepared a report for the Tempe City Council in 2002 that outlined Tempe's drought planning and water management strategies (Tempe Drought Plan Stage 1 measures). In 2004 the Tempe Water Service Area Drought Plan was updated along with recommendations for implementing Stage 2 of the drought plan if necessary in the future. The Tempe City Council approved the measures outlined in the Tempe Drought Plan at a City Council Issue Review Session in September, 2004.

Stage 1 of the Tempe Drought Plan was implemented in 2003 and 2004 when the SRP Board of Directors reduced the water allocation for SRP member lands from 3.0 acre-feet per acre to 2.0 acre-feet per acre. The 2004 Tempe Drought Plan included additional proposed measures to be included in Stage 2 of the plan if the SRP water allocation was reduced to 1.5 acre-feet per acre in any year due to drought conditions, or if the CAP M & I subcontract water allocation was reduced by 50% or greater due to drought conditions, subject to approval by the Tempe City Council.

Overall water use in the Tempe water service area was reduced during implementation of the Stage 1 Drought Plan measures in 2003 and 2004, due in part to following the recommendations of the Tempe Drought Plan. Total water use for water delivered through the Tempe municipal water system was 58,657 acre-feet in 2002, dropping to 55,916 acre-feet in 2003, and 53,972 acre-feet in 2004. Since 2003, total water use in Tempe has continued to decline slightly or remain flat (*see Figure 6 on page 19 for more detail*). The Drought Plan measures included reductions in water use at city facilities, a reduction in SRP irrigation water deliveries to city parks and residential flood irrigation customers due to the SRP water allocation cut-back in 2003 and 2004, a voluntary program to encourage water customers to eliminate winter lawn over-seeding, and an increased public information campaign.

Drought conditions in Arizona eased somewhat in 2005 following a very wet winter/spring runoff season on the Salt and Verde River watersheds that refilled the SRP reservoir system. Watershed precipitation and runoff to the SRP reservoir system was variable during the next several years, followed by a wet year in 2010 that again refilled the SRP reservoir system. Drought conditions have returned to Arizona in 2011 and 2012 following two consecutive dry winter seasons.

Following approval of the Tempe Drought Plan measures in 2004 by the Tempe City Council several related water use reduction measures were implemented to enhance the water efficiency rebate programs offered by the Tempe Water Conservation Office. The Tempe Water Conservation Program had previously offered a one-time residential low water use landscape conversion rebate of $100 for homeowners that converted a whole front or back yard from grass to a low water use xeriscape design. In 2004, the landscape conversion rebate was increased to $250 for converting a front or back lawn from grass to a xersicape design, $500 if both a front and back yard are converted to low water use plants. The larger rebate payout and public information campaign increased the number of landscape conversion rebate applications by about 40% during the first year. To date, over 1,900 xeriscape conversion rebates have been processed for landscape conversions in the Tempe Water Service Area.

The second measure implemented in 2004 was to expand the low flow toilet rebate program to the multi-family residential sector. The Tempe Water Conservation Staff recognized the significant water conservation potential in promoting conversions to low water use toilets at many of the older apartment complexes in Tempe that were still equipped with older, high water use models. Multi-family properties were previously not eligible for this rebate under the toilet rebate program designed for older, single-family homes. Under the expanded rebate program, multi-family properties are eligible for a rebate of 50% of the cost of installing each low flow toilet, up to $75 per fixture. The maximum rebate for any multi-family residential complex is $5,000.

Water Supply Augmentation

The other primary component of the Tempe Drought Plan is water supply augmentation, to plan for alternative groundwater supplies and recovery of stored water from aquifers during times of prolonged surface water shortages due to drought conditions; and, provide the necessary water infrastructure to recover, deliver, treat, and distribute these water supplies.

Key elements of water supply augmentation

- ***Increase groundwater and recovery well production capacity for back-up water supply and supplemental drought supply. Increase Tempe's groundwater and recovery well production capacity from the current level of 28 MGD up to 45 MGD by 2016/2017, equal to the average daily water demand in the Tempe Water Service Area.***

Action Items

⇒ Increase groundwater and recovery well production capacity and infrastructure in Tempe through CIP programs to drill and equip new Tempe wells or connect to existing SRP wells in Tempe. *Three (3) new municipal production / recovery wells have been added to the Tempe municipal water system in recent years. Two (2) major groundwater delivery pipelines have also been constructed; the COT Well #13 / Western Canal pipeline and the COT Well #6 / Martinez Water Treatment Plant pipeline. The current CIP program for the Tempe Water Utilities Division provides funding to connect three existing SRP wells along the SRP Western Canal to the South Tempe Water Treatment Plant via the Western Canal pipeline by 2013, and add at one new Tempe municipal production well by 2016/17 at a location to be determined.*

⇒ Rehabilitation of older Tempe municipal wells to improve production, performance, reliability and water quality. *Five (5) Tempe wells have had significant rehabilitation or modification upgrades in the past several years. The Tempe Water Utilities Division has an ongoing CIP program to repair or rehabilitate one to two existing Tempe groundwater / recovery wells per year.*

- ***Request approval of a drought groundwater pumping exemption from the Arizona Department of Water Resources (ADWR) pursuant to the Arizona Assured Water Supply (AWS) Rules when surface water supplies have been reduced due to drought conditions.***

Action Items

⇒ With a reduction in the SRP stored surface water allocation in 2003 and 2004, Tempe was eligible for an AWS drought exemption for groundwater use in both years. Tempe requested approval from ADWR for a drought exemption of 8,622 acre-feet of municipal groundwater use in 2003, and 10,908 acre-feet of municipal groundwater use in 2004. The drought exemption groundwater volumes for those years were not deducted from Tempe's AWS groundwater allowance.

- ***Store surface water (CAP water or NCS water) or reclaimed water in groundwater aquifers for future recovery during surface water shortages due to drought conditions.***

Action Items:

⇒ Continue to bank and store surface water and reclaimed water supplies in groundwater aquifers for future recovery. *Currently Tempe has over 95,000 acre-feet of surface water and reclaimed water (predominantly CAP Colorado River surface water) in storage in our groundwater aquifers through direct or in-lieu recharge projects.*

Action Items, cont.:

⇒ Increase groundwater recharge capacity at the Tempe Ken McDonald Golf Course Groundwater Recharge Project by drilling and equipping three (3) new aquifer storage and recovery (ASR) recharge wells. *The Tempe Water Utilities Division has drilled the first of three ASR recharge wells at this site and will equip that recharge well in 2012 and begin recharge by 2013. Two additional ASR recharge wells will be drilled and equipped at this site by 2014/2105.*

Ken McDonald GC Groundwater Recharge Site

⇒ Investigate options to increase groundwater recharge capabilities at other underground storage sites by leasing or purchasing recharge capacity. *The Tempe Water Utilities Division is pursuing a water storage permit from ADWR and capacity lease agreement with CAP to lease recharge capacity at the Superstition Mountain Recharge Project in the East Salt River Valley*

⇒ Consider drought conditions and water allocation status as one determining factor for re-commissioning the Tempe Kyrene Water Reclamation Facility (KWRF). *The KWRF has been temporarily decommissioned due to declining wastewater flows in Tempe and the favorable economics of consolidating all of Tempe's wastewater treatment operations at the 91st Ave. WWTP. The Tempe Water Utilities Division will consider drought conditions and water allocation status along with target levels of water demand and wastewater flow in the Tempe water Service Area when making a decision about the timing of re-commissioning the KWRF to produce reclaimed water for re-use or aquifer storage.*

♦ ***Increase direct municipal use of available excess CAP Colorado River surface water or NCS Salt River surface water supplies to partially offset reductions in SRP stored water allocations due to drought.***

Action Items

⇒ Utilize Excess CAP contract water or Tempe Roosevelt Dam NCS water in storage as available. *Excess CAP water availability will decrease in the future as CAP water users utilize their full CAP water allocations, or during times of shortage on the Colorado River system. Tempe currently has over 10,000 acre-feet of surface water in storage in Tempe's Roosevelt Dam NCS space.*

Current Drought Status in Arizona and the Southwestern U.S.

Drought conditions prevailed across much of Arizona and the Upper Colorado River basin from the late 1990s through 2004. A wet winter/spring in 2005 eased drought conditions on the Salt and Verde River watersheds and re-filled the SRP reservoir system. Slightly over 1,000,000 acre-feet of water spilled over Granite Reef Dam between December, 2004, and April, 2005, most of it from already full reservoirs on the Verde River side of the SRP system. The New Conservation Storage (NCS) capacity at Roosevelt Dam partially filled for the first time in 2005, coming within 3 feet of the maximum water conservation pool elevation and accruing NCS water storage credits for the participating Plan 6 cities. During the period from the late 1990s to 2004, runoff from the Upper Colorado River basin into Lake Powell was mostly below average, with 2002 being a record low year delivering only 25% of normal runoff into Lake Powell.

From 2005 to 2009 precipitation and runoff on the Salt and Verde River watersheds was variable, with several near normal years and several below-average years. During this same period runoff from the Upper Colorado River basin into Lake Powell was also variable, with several below average years and several near normal years.

The winter/spring season of 2010 brought another wet year to the Salt and Verde River watersheds, again refilling the SRP reservoir system and completely refilling the NCS water storage capacity at Roosevelt Dam. Approximately 670,000 acre-feet of water spilled over Granite Reef Dam between January, 2010, and May, 20105, again mostly from already full reservoirs on the Verde River side of the SRP system. On the Upper Colorado River basin, the April - July runoff period for 2011 was the third wettest since construction of Glen Canyon Dam, about 163% of normal, increasing storage levels at both Lake Powell and Lake Mead .

Drought conditions interspersed with occasional wet years over the past decade demonstrate the annual variability of runoff on the Salt and Verde River watersheds and the Upper Colorado River basin. This climatic variability remarkably illustrates the water storage benefits provided by SRP reservoirs on the Salt and Verde River, and the reservoirs on the Colorado River system, to carry us through the dry cycles.

Drought conditions have returned to Arizona and much of the southwestern U.S. in 2011 and 2012. Watershed runoff from the Salt and Verde Rivers in 2011 was significantly below average, while 2012 is trending towards a second consecutive dry winter in Arizona. After an above-average runoff year on the Upper Colorado River watershed in 2011, snowpack on the Upper Colorado River basin in 2012 is below average.

Figure 11 is the current U.S Drought Monitor from the U.S. National Oceanic and Atmospheric Association (NOAA), showing much of the State of Arizona in some stage of drought condition.

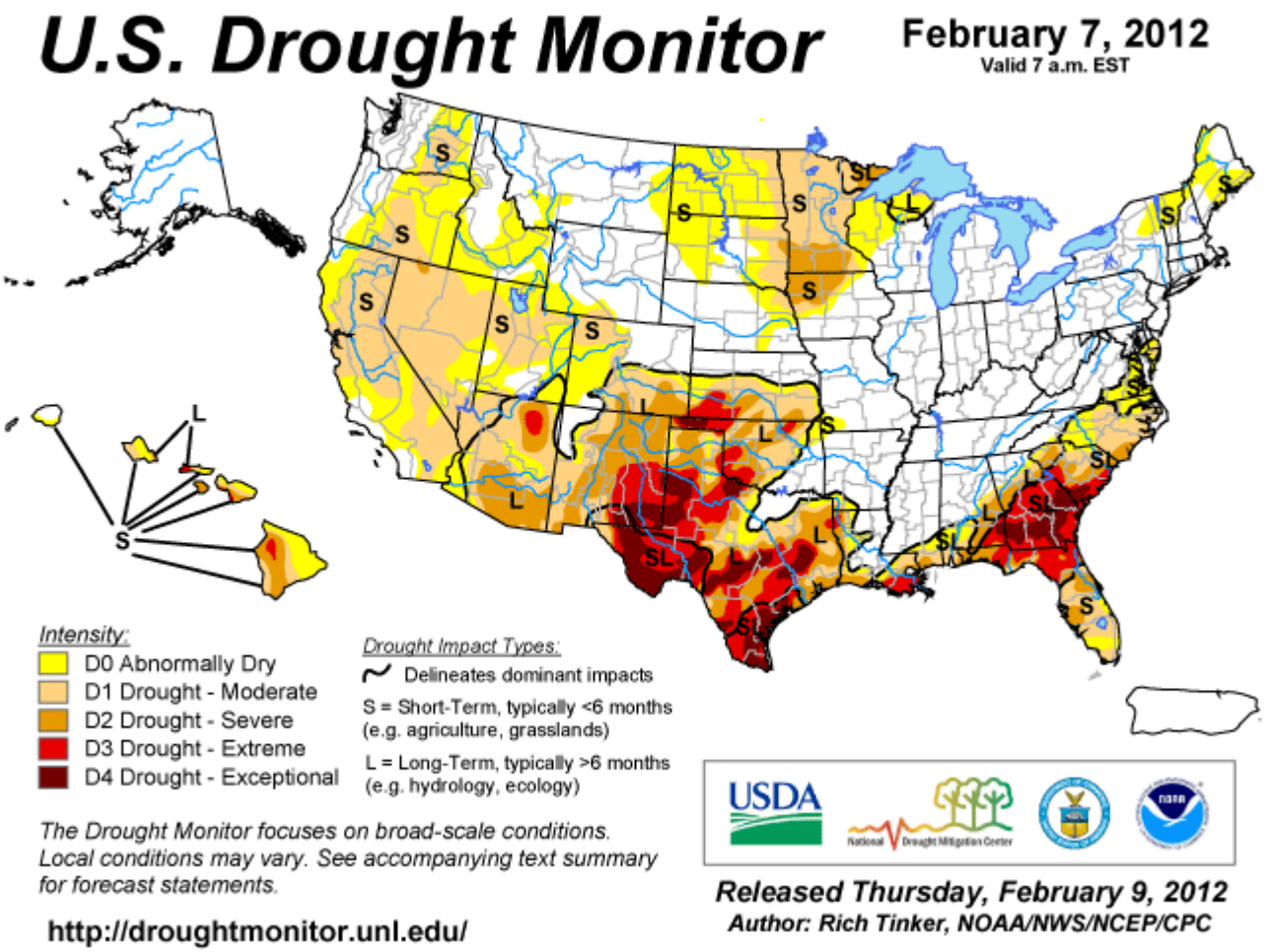


Figure 11

Figure 12 is the U.S. NOAA Drought Outlook through April, 2012, which forecasts drought conditions to persist or further develop across much of Arizona and the Upper Colorado River basin.

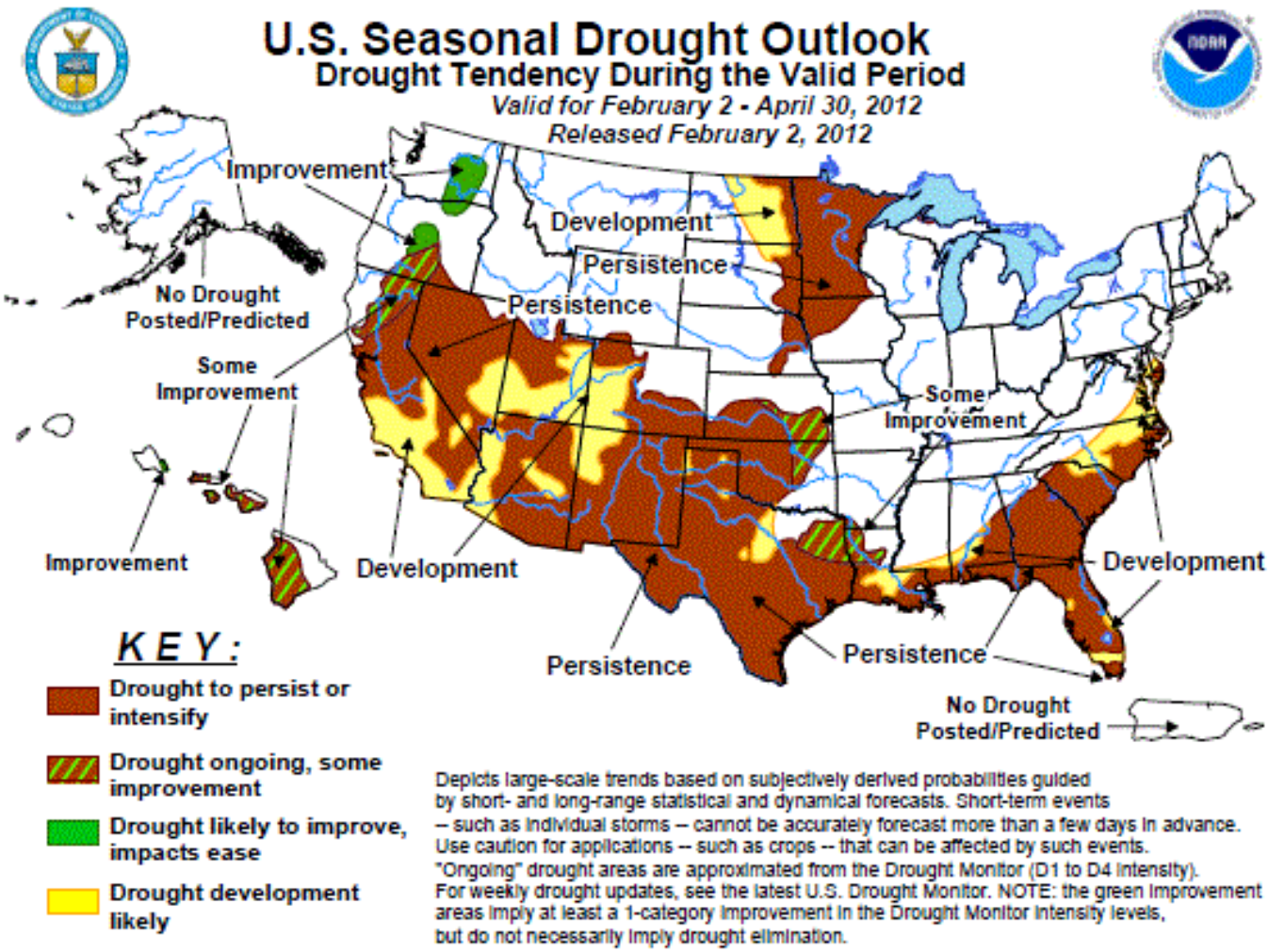


Figure 12

Figure 13 is a 3-month precipitation probability outlook from the U.S. NOAA that predicts below average precipitation this season across much of Arizona and the Upper Colorado River basin.

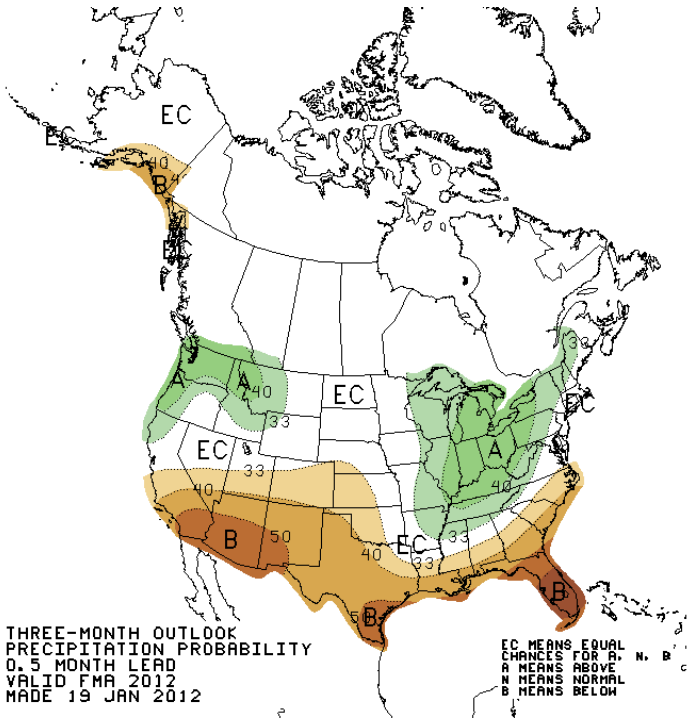


Figure 13

Below average precipitation across the southwestern U.S. for winter 2012 is forecast due to a second consecutive year of weak to moderate La Nina conditions in the Pacific Ocean (*see Figure 14*). La Nina is a term used to describe cooler than average water conditions in equatorial regions of the Pacific Ocean that may result in a shift in ocean circulation patterns and the storm track/intensity of Pacific storms leading to drier and warmer winter weather across the southwest (*see Figure 15*). La Nina conditions in 2011 resulted in below average winter precipitation across most of Arizona.

The counterpart to La Nina conditions in the Pacific is known as El Nino, a warming of water in the equatorial Pacific that may result in a shift in the storm track and intensity of winter storms producing above average winter precipitation in the southwestern U.S. El Nino conditions in 2010 resulted in above average precipitation and runoff on the Salt And Verde River watershed that year.

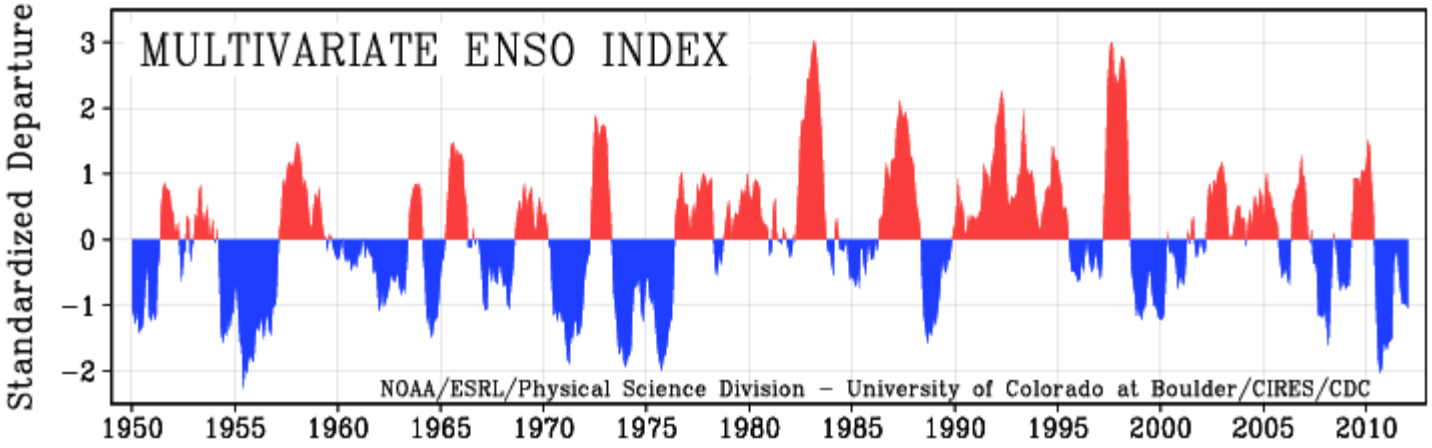


Figure 14 - El Nino Southern Oscillation Index (El Nino Years in Red, La Nina Years in Blue)

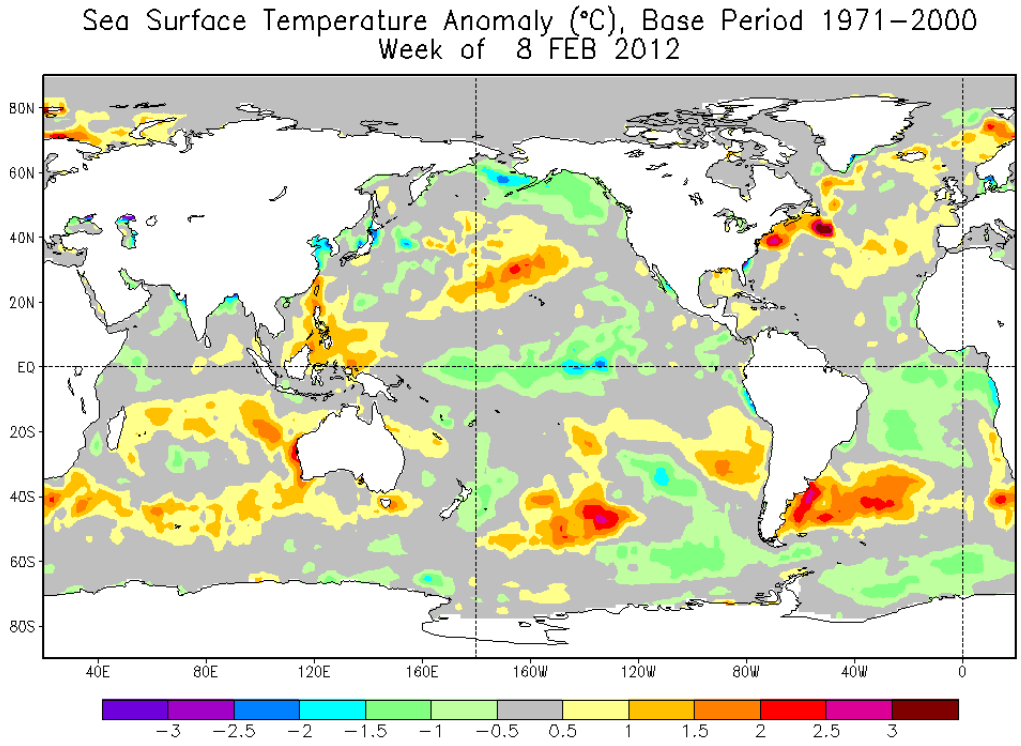


Figure 15

Tempe Drought Plan Conclusions

Many climate experts and water managers in the southwestern U.S. recognize that drought patterns in the west are cyclical, and even during extended dry periods there are likely to be wet years with above average precipitation. There is consensus among climate experts that Arizona and portions of the southwestern U.S. entered into what may be a long-term 20 - 30 year drought cycle beginning in the late 1990s. There were several wet years that provided some relief from drought conditions in Arizona between 2005 - 2010, with a return to regional drought conditions prevalent in 2011 and 2012.

Recent tree ring studies and historical reconstruction of stream flow and climate data sponsored by SRP have concluded that 20 to 30 year drought cycles in the western U.S. have occurred with some regularity over the centuries (*see Figure 16*). These studies have also shown that drought cycles tend to occur in both the Salt/Verde River watershed and the Colorado River watershed during the same time periods. These findings are counter to previous theories that when the Salt River watershed was experiencing drought conditions the Colorado River would not be in drought.

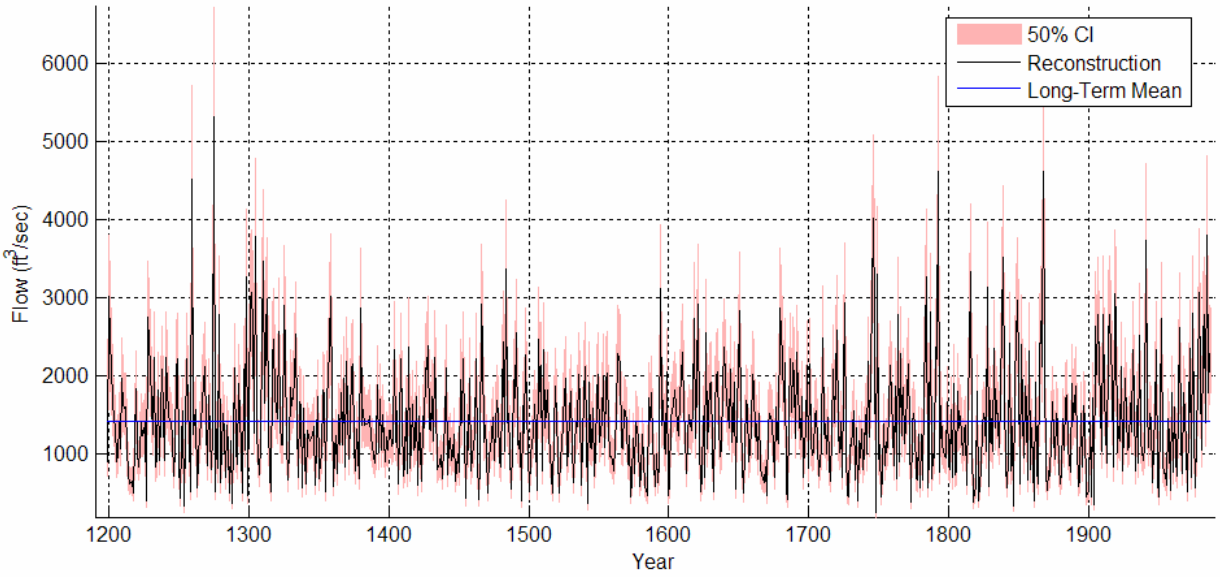


Figure 16 - Reconstructed Flow of Salt+Verde+Tonto Rivers, Arizona, based on tree ring data, from *" A Tree-Ring Based Assessment of Synchronous Extreme Streamflow Episodes in the Upper Colorado & Salt-Verde-Tonto River Basins, University of Arizona Laboratory of Tree Ring Research and the Salt River Project, 2005*

If long-term drought persists, Tempe's drought planning measures will guide us through periods of surface water shortages. Thus far, through a long-term drought cycle that started in the late 1990s, Tempe has only had to implement Stage 1 drought measures in 2003 and 2004, due to sound reservoir management by SRP, CAP and the U.S. Bureau of Reclamation, and the availability of groundwater and stored water reserves in aquifers. Combined with our water use reduction measures under Stage 1 and Stage 2 of the drought plan Tempe is well prepared to deal with prolonged drought conditions should they persist.

A copy of the 2004 Tempe Drought Plan can be obtained by calling the Tempe Water Utilities Division—Water Resources Office at (480) 350-2608.