

APPENDIX C

ASSURED WATER SUPPLY IMPLEMENTATION

INTRODUCTION

ADWR's Assured Water Supply (AWS) Program is the prevailing regulatory paradigm for municipal water-resource management in Arizona's Active Management Areas. The program is designed to ensure that the water supplies that support developing Arizona communities are sustainable over the long term. In order to accomplish this, all new developments must demonstrate that their existing, committed, and reasonably foreseeable future water demands can be met using renewable water supplies over a 100-year period. Various water resources can be utilized to meet water demand but the ultimate goal is to reduce, and by 2025 eliminate, reliance on "mined" ground water. This forces a shift toward expanded utilization of renewable water supplies in order to meet the projected increase in water demand. The program also embodies a credit accounting system that tracks all water usage and applies to all three water supply sources currently available to the City of Tucson.

Prior to the advent of the AWS Program, water-resource and supply management consisted of distinct initiatives with objectives that were occasionally in conflict. These included ground-water resource development, demand management, effluent reuse, service area expansion, and resource planning. Under the AWS Program, these disparate initiatives are being managed with increasing coordination in order to achieve the ultimate goal of long-term sustainability.

The City of Tucson acquired its "Designation as Having an Assured Water Supply" (AWS designation) in 1998 for several reasons. Having an AWS designation is consistent with the community's goal of long-term sustainability. Ensuring that the community's water needs will be continually met into the future is an important reassurance to a growing population. This long-term commitment is essential to prospective business ventures that seek to locate in the Tucson area. In addition, while water providers are not required to obtain an AWS designation, those that do not are effectively prohibited from serving continued growth within their service areas. And perhaps most important, if Tucson Water did not provide an

Assured Water Supply for its expanding service area, growth would still occur in any area where a 100-year supply of ground-water is available. This could occur if developers obtained a Certificate of Assured Water Supply by joining the Central Arizona Groundwater Replenishment District (CAGRDR). As described later in this Appendix, the type of growth made possible by the CAGRDR is not founded upon the hydrological-based management principle of aquifer stewardship.

“PAPER WATER” VERSUS “WET WATER”

The world of paper water centers on the various rights and credit accounts that together provide Tucson Water with the authority to pump or use water. The world of wet water, on the other hand, is based on the availability and use of physical water.

Paper- and wet-water management strategies focus on different aspects of water-resource management and each has its own priorities and use. Tucson Water uses paper-water accounting to optimize its operational flexibility. However, the Utility also emphasizes wet-water management to ensure consistency with its long-range water-resource management goals. In the short term, it is possible for a water provider to primarily engage in paper-water accounting to avoid the large potential costs associated with wet-water management. In the long term, however, failing to address wet-water management could result in localized water level declines.

The distinction between paper and wet water can be illustrated by examining the accrual (crediting) and use (debiting) of paper-water recharge credits. Under Arizona law, a water provider can physically recharge a renewable water supply such as Colorado River water in one location and physically recover ground water at a different location within the same AMA. This approach maintains a balance of “paper” Colorado River water to offset the “wet” ground water pumped in the AMA. However, this paper-water accounting does not maintain a wet-water balance in the local area where the ground-water withdrawals occurred. Ground-water pumping that is not being hydrologically offset by recharge within the same area where the pumping occurred can result in significant water-level declines which in turn can increase the potential for land subsidence in that area. A resource-management approach which primarily depends on paper-water accounting may not be hydrologically sustainable in the longer term.

Tucson Water has sought to maintain a wet-water balance at both Colorado River water and effluent recharge projects in order to avoid the hydrologic impacts which can occur when there is a local wet-water imbalance. Over the long term, both the paper-water and wet-water worlds must be in balance for water supplies to be sustainable.

OBTAINING AN AWS DESIGNATION

To obtain an AWS designation, a community must demonstrate that a 100-year water supply is physically, legally, and continuously available. According to ADWR (2001), this supply must satisfy the following conditions:

- Adequate water quality.
- Use consistent with the AMA management goal.
- Use consistent with the AMA management plan.
- The community must have the financial capability to satisfy these conditions.

For the City of Tucson, these requisite conditions were provided in its original AWS application filed with ADWR (Malcolm Pirnie, 1996). In its application, the City outlined its portfolio of available water supplies. In addition, the City enrolled in the CAGRDR in order to ensure acquisition of the AWS designation. Since its first issuance in 1998, the City's AWS designation has been modified and the current version became effective in 2002.

The Role of the Central Arizona Groundwater Replenishment District

The CAGRDR provides the opportunity for developers and water providers to obtain paper-water access to renewable resources without having to construct the infrastructure necessary to physically convey those resources to new developments. In effect, the developer or water provider need only install a local ground-water system to supply the wet-water needs of the development. The CAGRDR is not mandated to hydrologically balance local ground-water withdrawals with aquifer replenishment. Instead, the CAGRDR relies on paper-water accounting that allows ground-water pumping in one area of an AMA to be offset by the recharge of Colorado River water in another area of the same AMA. Growth which solely depends on the CAGRDR to obtain an AWS designation would result in a paper-water balance of ground water withdrawals with ground water replenishment. Utilizing the CAGRDR in this fashion is not consistent with Tucson Water's planning because reliance on paper-water accounting would circumvent the hydrologic-based principle of aquifer stewardship. This principle is the overall ground-water management goal of Tucson Water.

When the City of Tucson first applied for its AWS designation, the City was effectively prohibited by local initiative from delivering treated Colorado River water within its service area for potable use. In order to obtain issuance of its AWS designation in the time before alternative delivery mechanisms were completed, the City of Tucson entered into a membership agreement with the CAGRDR. This contract was structured to provide legal availability of the City's Colorado River water supplies with the intent that Tucson Water would eventually construct its own infrastructure. However, the City's contract with the CAGRDR allows for the long-term access to 12,500 acre-feet per year of replenishment water above and beyond the City of Tucson's own entitlement to Colorado River water. In other words, the City of Tucson can only rely on the CAGRDR to supply up to 12,500 acre-feet of water of additional water beyond the City's Central Arizona Project allocation to assist in demonstrating an assured water supply in the future.

The City of Tucson’s Assured Water Supply Portfolio

Under the modified AWS designation issued in 2002, the City of Tucson’s 100-year supply of water that meets all of the AWS criteria is 15,646,507 acre-feet. Divided over the 100-year time period, this equates to an annual supply of water of 156,465 acre-feet as shown in Table C-1. This current portfolio is based solely on the City’s physically available ground water and effluent supplies. The City of Tucson is indirectly credited with its Colorado River water supplies through its membership in the CAGRDR.

Current Assured Water Supply Designation Summary by Program Criteria (acre-feet)

	Physical Availability	Legal Availability	Continuous Availability	Water Quality	Financial Capability	Consistency with Plan (Conservation)	Consistency with Goal (Safe Yield)
Colorado River Water	0 ¹	CAP Contract	None	OK	OK	OK	0
Effluent	1,580,000 ²	Inter-Governmental Agreements	Reclaimed Plant and Sweetwater Recharge Facilities	OK	OK	OK	1,580,000
Ground Water	14,066,507 ³	Service Area, Type I, and Type II Rights	Groundwater system with 196 MGD capacity.	OK	OK	OK	17,476,488 ⁴
100-year Total	15,646,507 AF						19,056,488 AF
Annual Total	156,465 AF/yr						190,565 AF/yr

AF = acre-feet; AF/yr = acre-feet per year.

¹Physical Availability of Colorado River Water:

0 AF since, as of the City of Tucson's current designation, Colorado River water was not considered to be physically available.

²Physical Availability of Effluent:

650,000 AF based the annual capacity of the Sweetwater Recharge Facilities (6,500 AF/yr) times 100 years.

930,000 AF based the annual capacity of the Reclaimed Plant (9,300 AF/yr) times 100 years.

³Physical Availability of Ground Water:

12,066,507 acre-feet based on tank analysis for the Tucson basin.

2,000,000 acre-feet based on MODFLOW analysis for Avra Valley.

⁴Groundwater Consistency with AMA Management Goal (Safe Yield):

14,842,000 acre-feet based on City of Tucson's Central Arizona Project allocation* of 148,420 AF/yr times 100 years and use of the CAGRDR.

1,682,070 acre-feet of Allowable Ground-Water credits.

791,000 Incidental recharge over 100 years based on 4 percent of total annual demand.

161,418 acre-feet based on use of Remediated Ground Water (TARP) at 8,495.7 AF/yr from 2001 through 2019.

*At the time of designation (prior to the dissolution of the *Northwest Area Agreement*), the City of Tucson's Central Arizona Project allocation was 148,420 AF/yr.

Table C-1: Current Assured Water Supply Portfolio.

The current designation is limited by physical availability since Colorado River water was not physically accessible for supply at the time of application. This renewable source of supply was only made available to replenish ground-water withdrawals. Therefore, the designation is limited by the volume of ground water that the Utility was able to demonstrate as existing within its service area. The annual total of 156,465 acre-feet was sufficient to meet current and committed demands for several years; however, the Utility is currently approaching this limit and will soon have to update its water-resource portfolio in order to maintain its AWS designation.

MAINTAINING AN ASSURED WATER SUPPLY

ADWR reserves the right to periodically review and require modification of the AWS designation as conditions warrant. The designation can be revoked if the facts and

conclusions of law that originally led to its issuance are no longer valid. In addition, ADWR (2002, 2001) requires that Tucson Water annually submit the following information in order to demonstrate continuing compliance with the AWS Program:

- Estimated future demand of platted, undeveloped lots located in Tucson Water's service area (Committed Demand).
- Projected volume of water demand at build-out of customers with which Tucson Water has entered into a notice of intent to serve agreement in the calendar year (Committed Demand).
- A report regarding Tucson Water's compliance with water-quality requirements.
- Depth-to-static water level of all wells from which Tucson Water withdrew water during the calendar year.
- Any other information requested by the Director of ADWR to determine whether to continue Tucson's designated status.
- Current demands as reported in the Annual Ground Water Withdrawal and Use Report.

The most basic measure of Tucson Water's AWS compliance is the comparison of its approved AWS portfolio (156,465 acre-feet per year) to its current and committed demands that are submitted to ADWR each year. Current demands are based on the total water production for the current calendar year. The method of calculating committed demands involves estimating the future demand of recorded (platted) undeveloped lots in Tucson Water's service area (Tucson Water, 2003). In order to maintain its AWS designation, the Utility's must demonstrate that it has sufficient renewable water resources, continuously available over the next 100 years, to supply current and committed demands plus at least two years of additional projected growth.

In 2003, Tucson Water determined that its current and committed demands were approaching its currently approved 100-year AWS supply portfolio. Tucson Water submitted to ADWR a request to modify its AWS portfolio to include CAVSARP, a recharge and recovery facility which delivers Colorado River water to Tucson Water's potable system. Bringing CAVSARP on line makes a portion of Tucson's Central Arizona Project allocation physically available. It is anticipated that Tucson Water's AWS portfolio will be expanded and that this will extend the City of Tucson's AWS designation for up to ten additional years. Under this modification, the City of Tucson would retain its ability to utilize the CAGR to provide and replenish up to 12,500 acre-feet per year of Colorado River water to offset ground water pumping. This volume is in addition to the City's own Central Arizona Project allocation.

In order to maintain its AWS designation in future years, the City of Tucson must successfully acquire additional water supplies. There are several potential opportunities to expand the AWS portfolio including the acquisition of additional imported and local supplies.

Additional water supplies may be available outside the Tucson AMA for purchase and delivery to Tucson Water. A number of Phoenix-area cities have already entered into 100-year leases of Central Arizona Project water from Native American tribes as part of their respective water claims settlements. The cities of Phoenix, Scottsdale, Peoria, and Goodyear leased a total of 41,000 acre-feet per year of such water as part of the Gila River Indian Community water claims settlement. The Phoenix-area cities consummated additional 100-year leases with the Ft. McDowell, San Carlos and Salt River Pima Maricopa tribes as part of their respective water claims settlements. While the Tohono O'odham Nation was unwilling to enter into a long-term water lease as part of its water claims settlement with the City of Tucson and others, the settlement allows for long-term Central Arizona Project water leases and provides a right of first refusal to lessees located within the Tucson AMA.

The City of Tucson may also have opportunity to purchase a significant quantity of Colorado River water from Arizona agricultural districts which have high-priority entitlements to more than a million acre-feet of Colorado River water. The United States previously purchased a quantity of this Arizona agricultural water entitlement as part of its water claims settlement with the Ak Chin Native American Community. This water was in turn leased to the community of Anthem located north of Phoenix.

The CAGR (2004) completed a survey of long-term water supplies potentially available for purchase or lease within the State. The resulting report concluded that if 20 percent of the Native American Colorado River water and 20 percent of the water currently in agricultural use along the Colorado River could be purchased or leased, the quantity available would be over 450,000 acre-feet per year. In addition, up to 145,000 acre-feet of ground water per year might be available from basins in western Arizona such as Butler Valley.

If additional imported supplies can be acquired, they would need to be brought to the City of Tucson. The Central Arizona Project aqueduct has the capacity to deliver 1.8 million acre-feet of water from the Colorado River and western Arizona. Since the Central Arizona Project is entitled to a total of 1.5 million acre-feet per year of Colorado River water, the aqueduct has 300,000 acre-feet of excess annual capacity. About 100,000 acre-feet of this capacity has been tentatively set aside for delivery of ground water and surface water purchased by Phoenix, Scottsdale and Mesa. Another 100,000 acre feet of capacity has been set aside for the CAGR. This leaves 100,000 acre-feet of uncommitted capacity that might be made available to deliver additional imported supplies to the City of Tucson.

Local supplies that might be acquired include additional legal authority to pump ground water and the lease or purchase of additional effluent entitlements. The AWS Program does not currently recognize annually renewable ground water that is derived from natural recharge. Without this recognition, Tucson Water's allowable ground-water credits will continue to be debited each year by the amount of ground water pumped even though additional physical ground water may be present. Tucson Water views renewable ground water as a potentially viable, hydrologically sustainable water resource that should be incorporated into ADWR's program. This would require legislative action and/or a regulatory-driven process that would quantify the volume of ground water that could be annually available for sustainable ground-water pumping. Tucson Water should pursue such

a change in order to establish that in future years, a hydrologically sustainable amount of ground water will not only be physically accessible but also legally available as a source of supply. *Water Plan: 2000-2050*, however, is based on current law and does not assume that there will be changes in law that will recognize renewable ground water.

Finally, Tucson Water has entitlement to a large volume of municipal effluent and the Utility may be able to increase its entitlement in the future. This could include agreements to lease or purchase the Secretary of the Interior's effluent entitlement as well as other effluent entitlements. This would result in greater utilization of the only locally generated renewable supply that grows with the community.

WATER CREDIT ACCOUNTING AND REPORTING

Renewable water supplies that are directly used are considered to be compliant with the AWS Program. Such efforts reduce ground water pumpage and contribute to the overall goal of achieving safe yield. Under the AWS Program, all ground-water withdrawals are debited from several potential sources of water credits. This program places a finite cap on the amount of ground water that can be pumped by Tucson Water without incurring a replenishment obligation. Under current regulations, once this volume is exhausted, all ground water that is subsequently withdrawn must be replenished with a renewable supply. Because future dependency on mined ground water is not consistent with the AWS Program, Tucson Water will become increasingly reliant on Colorado River water and municipal effluent to meet water demand. As a result, local ground water will no longer be the predominant water source for municipal supply.

Tucson Water initiated its AWS accounting process in 2001. The Utility must submit to ADWR an annual report that documents its ability to meet near-term projected growth and the debiting of each year's ground-water pumpage against its AWS credits. Each source of credits is described below, and information regarding requirements and/or limitations is summarized.

Allowable Ground Water

Under the AWS Program, designated water providers are granted a volume of allowable ground water to provide credits for a finite amount of ground-water withdrawals without incurring a replenishment obligation. This volume was considered a phase-in allowance to assist water providers in shifting from reliance on mined ground water to renewable supplies. The City of Tucson was credited with 1,682,070 acre-feet of allowable ground water credits at the start of the AWS Program. This allowance was based on 15 years of ground-water pumpage at the 1994 water usage rate of 112,138 acre-feet.

Allowable ground water can also be credited over time. An annual incidental recharge credit is accrued based on 4 percent of the total potable and reclaimed water produced in the previous calendar year. In addition, 314,000 acre-feet of ground-water credits have been granted by the State in exchange for Tucson Water's extinguishment of a Type II water right associated with the Santa Cruz Well Field. These "unassigned credits" have not yet been

added to Tucson Water's AWS portfolio, but they can be added as allowable ground water in the future. Finally, by 2025, the City of Tucson will have access to two million acre-feet of additional ground water credits as a result of A.R.S. 45-463 F. These credits were assigned to the City of Tucson in recognition of its efforts to purchase and retire Avra Valley farmlands in the 1970s to preserve the ground-water resource.

Remedial Ground Water

The City of Tucson has an additional source of ground-water credits that will not be debited from allowable ground water. This resource is associated with Tucson Airport Remediation Project, a ground-water remediation project where contaminated water is pumped from a defined aquifer zone within urban Tucson and treated to potable standards. The treated water is subsequently discharged into Tucson Water's potable distribution system under agreement with the EPA. A total of 161,418.3 acre-feet of Tucson Airport Remediation Project credits exist based on the projected use of approximately 8,495.7 acre-feet per year from 2001 through 2019.

Annual Storage

Under the AWS Program, renewable water supplies that are not used directly can be used to accrue storage credits and recovered within the same calendar year, a process called annual storage and recovery. This type of renewable resource use complies with the goal of attaining safe yield as ground-water withdrawals are offset by the storage of renewable supplies. Renewable water supplies can either physically recharge the ground-water system or be utilized in lieu of ground water at approved locations. In either circumstance, a recharge credit is granted for the volume of renewable resource that is recharged or used in lieu of ground water. These credits can either be recovered from wells located at the point of recharge or from more distant wells. Tucson Water has access to significant volumes of Colorado River water and effluent to generate such credits. Under annual storage, water providers are allowed to pump, without paying any fees to ADWR, a volume of water equal to that which was stored within the same calendar year.

Long-Term Storage

Long-term storage credits are accrued when renewable water supplies are recharged to the aquifer for recovery in a subsequent year. The accounting for long-term storage differs slightly from annual storage. For Colorado River water, only 95 percent of the water that is placed into long-term storage is made available for recovery. In addition, a fee payable to ADWR is required for the recovery of any effluent or Colorado River water long-term storage credits.

THE FUTURE OF ASSURED WATER SUPPLY

The City's AWS designation must be renewed at intervals of ten years or less and is currently under re-negotiation with ADWR. At each renewal, the City must update the projected water demand and water availability data to reassess its future compliance with the AWS Program.

As the City acquires additional water supplies or puts currently available source waters to use, the City will include these water supplies to expand its AWS portfolio.

The AWS Program does not currently recognize annually renewable ground water that is derived from natural recharge. No mechanism to obtain credit for annually renewable ground water is included in ADWR's AWS Program. Without such a mechanism, Tucson Water's allowable ground-water credits will continue to be debited at an excessive rate each year. Tucson Water views renewable ground water as a water resource that should be formally incorporated into ADWR's program. This would require legislative action and/or a regulatory-driven process that would quantify the volume of ground water that could be annually available for sustainable ground-water pumping. Tucson Water has an interest in pursuing such a change in order to ensure that in future years, ground water will not only be physically accessible but also legally available as a source of supply. However, *Water Plan: 2000-2050* is based on current law and does not assume that state law will be changed to establish the use of renewable ground water.