

SECTION THREE

PROJECTED WATER DEMAND

The projections of aggregate water demand for the Obligated Area and the Potential Service Area provide supply targets that need to be met in the years to come. These projections depend in part on the size of the area (i.e. the number of people) to be served and on per capita water usage. To meet these demand targets, Tucson Water will ensure that sufficient water resources will be available when needed and that effective demand-management measures will be implemented.

PER CAPITA WATER USAGE RATES

In order to derive projected total water demand from population projections, average per capita water use of Tucson Water customers is determined. Such water usage is commonly measured in gallons per capita per day (GPCD).

The total GPCD water usage rate for Tucson Water's customer base has annually averaged about 177 GPCD for many years. The components of total GPCD include about 14 GPCD to meet reclaimed water demand and approximately 163 GPCD for all potable deliveries. Per capita potable water usage can be further broken down into total residential use at 110 GPCD, commercial and industrial water use at 35 GPCD, and water loss at 18 GPCD. Except for the past few years (which may be exceptional), the Utility's total GPCD has been relatively consistent for almost 25 years although the relative contributions of reclaimed and potable demand have changed over time. As longer-term per capita use trends change, water usage measures will similarly be revised.

PROJECTIONS OF TOTAL WATER DEMAND

Four projections of water demand were developed for this update to assess the potential impact of two variables over the 50-year planning period:

- Variable #1:** Reduce (or increase) the size of the potential area that will be directly served by Tucson Water; and
- Variable #2:** Invest (or not invest) in implementing additional, more aggressive demand-management measures to reduce potable GPCD.

The ultimate size of Tucson Water’s potential future service area and its impact on projected demand was evaluated by assessing the two differently-sized areas introduced in Section Two—the Utility’s Obligated Area and the larger Potential Service Area. The potential impact of additional demand-management on future water demand was assessed by assuming potable GPCD will remain constant by not investing in additional demand management measures (“without” condition) or it will gradually decrease ten percent from 163 to 147 by 2030 by making such investment (“with” condition). These two variables combine into four unique sets of assumptions each of which is represented in one of the demand scenarios shown in Figure 3-1.

Figure 3-1 indicates that *Scenarios A* and *B* focus on the smaller Obligated Area while *Scenarios C* and *D* are concerned with the larger Potential Service Area. Similarly, *Scenarios A* and *C* depict futures which assume investment in additional demand-management measures while *Scenarios B* and *D* represent futures without such investment.

	With Additional Demand Management	Without Additional Demand Management
Obligated Area	Scenario A	Scenario B
Potential Service Area	Scenario C	Scenario D

Figure 3-1: The Four Demand Scenarios and Associated Planning Assumptions.

The potential for achieving a ten percent reduction is based on analyses performed by Tucson Water’s Community Conservation Task Force (2006) and the Utility’s internal water-loss reduction program. The Task Force concluded that its recommended projects could reduce customers’ potable demand by about 7.5% over the proposed program’s implementation period. Further reductions will also be achieved through the Utility’s internal water-loss reduction program which seeks to improve system efficiencies. Taking into account both of these initiatives, a water-demand reduction of at least ten percent could be realized by 2030 and beyond. For such water-use improvements to occur, Tucson Water will need both community support and greater financial investment to develop and implement more aggressive demand-management programs.

For all scenarios, the projected annual demand for reclaimed water use was increased from the eight percent assumed in *Water Plan: 2000-2050* to at least nine percent over the planning period. This increase is due to recent changes in customer usage and anticipated increases in demand in the near and mid terms.

Results of Scenario Analysis

Scenario A projects water demand in the Obligated Area through 2050 and assumes potable GPCD will gradually decrease ten percent by 2030. Under this demand projection, Tucson

Water’s total water demand over the 50-year planning period would increase from 128,141 acre-feet in 2000 to about 180,000 acre-feet in 2030 and approximately 215,000 acre-feet by 2050. Of the four scenarios, *Scenario A* has the smallest increase in projected water demand as shown on Figure 3-2.

Under *Scenario B*, water demand is projected for the Obligated Area but differs from *Scenario A* by conservatively assuming that potable GPCD would remain constant throughout the 50-year planning period. Under *Scenario B*, the Utility’s total water demand would increase from 128,141 acre-feet in 2000 to approximately 200,000 acre-feet in 2030 and about 235,000 acre-feet by 2050. *Scenario C* projects water demand for the larger Potential Service Area but assumes that potable GPCD will gradually decrease ten percent by 2030. Under this demand projection, Tucson Water’s total water demand through 2050 would be essentially the same as in *Scenario B*. Both *Scenarios B* and *C* would result in a relatively moderate increase in water demand as shown on Figure 3-2.

Scenario D, like *Scenario C*, also projects water demand in the larger Potential Service Area but assumes potable GPCD would remain constant through 2050. Under this projection, the Utility’s total water demand would increase from 128,141 acre-feet in 2000 to approximately 220,000 acre-feet in 2030 and about 255,000 acre-feet by 2050. This projection is consistent with the 50-year water demand projection in *Water Plan: 2000-2050*. *Scenario D* has the largest projected increase in water demand.

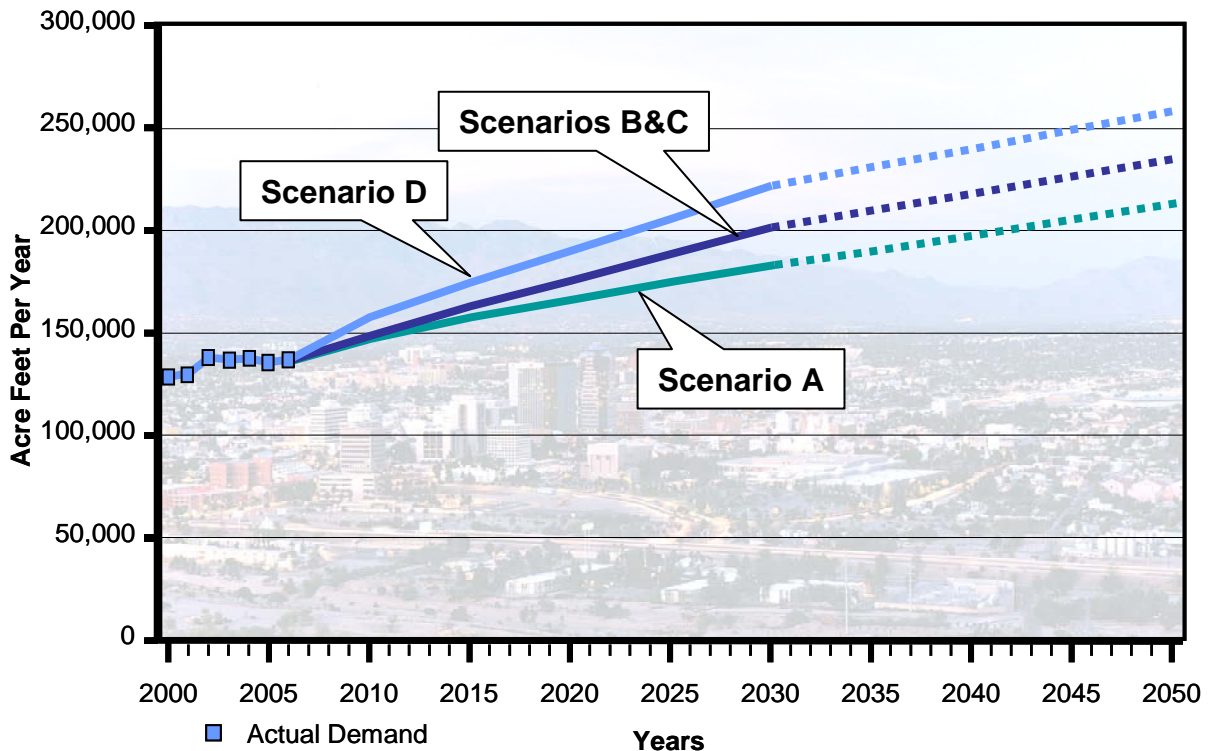


Figure 3-2: Projected Demand Scenarios: 2000-2050.

Review of Figure 3-2 indicates that future water demand is highly sensitive to the size of the area to be served and per capita water usage rate. *Scenario A* represents future water supply

needs within the smaller Obligated Area and assumes that more aggressive demand-management strategies would be successfully implemented with the support of the community. Conversely, *Scenario D* represents a demand future which assumes that the larger Potential Service Area would be served solely by Tucson Water and that additional demand-management programs would not be implemented above and beyond those already in place. Of the four scenarios, *Scenario A* would offer the Utility the greatest resource planning flexibility while *Scenario D* would offer the least. The water-resource planning ramifications of the four scenarios are discussed in Section Six.

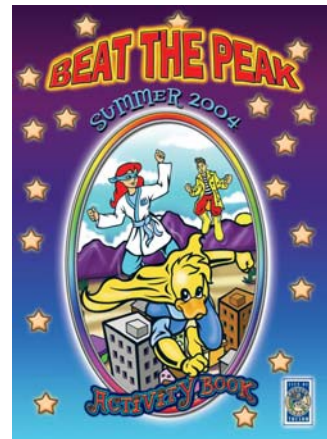
MANAGING DEMAND

Managing current and projected water demand is a critical component of any integrated water-resource and system plan. The extent to which future water demand can be further reduced could have a significant bearing on the water resources and system improvements that will be needed over time. Water conservation, improving the Utility's distribution system efficiency, and drought preparedness are the three demand-management programs discussed in this update.

Water Conservation

Conservation programming has been a critical component of Tucson Water's planning process for several decades. During this time, many programs have been implemented encouraging greater water-use efficiency, and they have collectively been instrumental in maintaining a low per capita potable water usage rate. This low rate has largely been maintained through extensive educational outreach efforts and ordinance-based requirements which have resonated with and contributed to the community's conservation ethic. The Utility will continue to evaluate existing programs and develop additional ones based on their effectiveness, reliability, and cost to implement.

When developing more aggressive conservation measures, proposed initiatives need to be evaluated by assessing their demonstrated effectiveness as seen in other communities and by determining their potential applicability in Tucson given the unique characteristics of the local community. If these measures are appropriate, they could yield quantifiable decreases in the community's potable GPCD and a corresponding decrease in the projected growth of water demand in future years as shown by *Scenarios A* and *C*.



Conservation Initiatives Currently Underway

Tucson Water has been moving forward with several on-going programmatic activities to further widen the reach of its conservation program. These activities include the following:

- Develop a voluntary Incentive Program for commercial water customers;

- Implement the Enhanced Water Waste Enforcement Program;
- Demonstrate community leadership by providing technical support to City General Services who will coordinate the implementation of water audits for departments within the City;
- Review the conservation measures developed by other jurisdictions;
- Complete the Irrigation Design Standards by finalizing performance targets and developing procedures to implement those standards; and
- Investigate options to reduce water waste associated with hot water distribution systems in the residential sector.

Community Conservation Task Force

In addition to developing the above measures, Tucson Water also established the *Community Conservation Task Force* in 2005 to ensure that new conservation strategies selected for implementation would be both effective and broadly supported by the community (Community Conservation Task Force, 2006). In order to achieve the latter, the members of the Task Force Committee represented a wide range of community stakeholders.

The Task Force Committee recommended 22 conservation measures that offer the greatest potential water savings and all were given the same implementation priority. The measures targeted five programmatic areas:

- Rebates and Incentives
- Ordinances Requiring Retrofits on Resale
- New Construction Ordinances
- Demonstration Programs
- Other

These measures targeted single-family residential, multi-family residential, and the commercial/industrial water-use sectors; the recommended measures are listed in Appendix A of this update. The Task Force Committee recognized that its final recommendations more heavily emphasized the multi-family residential sector over the others noting that Tucson Water's past conservation efforts and its block-rate pricing structure primarily targeted single-family residential users.

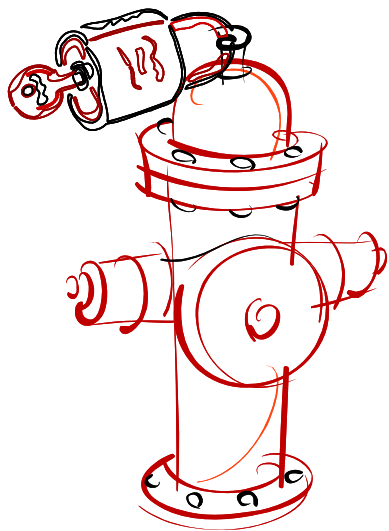
The recommended projects may potentially reduce demand by up to 7.5% over the life of the proposed program (Community Conservation Task Force, 2006). Consistent with the Task

Force Committee's recommendations, projected water demand associated with *Scenarios A* and *C* assume that such demand-management efforts would be successful in producing significant potable GPCD reductions. Further study is currently being performed by Tucson Water to assess the potential rate impacts associated with implementing the recommended measures.

Conservation is a vitally important demand-management tool. Effective conservation allows the community to maximize the use of the water it has available by optimizing efficiencies. Like any demand-management strategy, an aggressively managed conservation program can have a significant impact on when critical decisions must be made and when water-resources and system-planning projects need to be implemented to meet Utility goals.

Improving Water System Efficiency

A comprehensive Water Loss Control Program was initiated in October 2006 to better track and reduce the amount of "lost and unaccounted for" water in Tucson Water's potable system. This program integrates on-going programs and has initiated new ones to identify, control, and track system water losses. This information is used to increase water-use efficiency, reduce water losses to comply with regulations, and recover lost revenue. In essence, the Water Loss Control Program is the Utility's "internal" water conservation and product control program.



The overall purpose of the Water Loss Control Program is to control and track lost water by calculating the Utility's water balance; establishing goals, metrics, and milestones; and assessing the Utility's water-use efficiency performance. The total annual potable deliveries considered lost were 11.2, 11.9, and 12.5 percent in years 2004, 2005, and 2006, respectively.

The Water Loss Control Program will accomplish several specific objectives:

- Reduce water loss to seven percent of total annual potable deliveries within the next five years and to four percent in the longer term;
- Ensure to the degree possible that all water delivered through the potable system is accounted for;
- Increase billing accuracy;
- Comply with the conservation requirements in ADWR's Third Management Plan; and

- Establish the Infrastructure Leak Index to measure how efficiently the Utility manages and controls leaks on an annual basis.

To achieve these objectives, the specific projects managed under the Water Loss Control Program must involve all of the administrative divisions within the Utility. Tucson Water has taken steps which have reduced the potential for additional water losses in the potable system. The Water Loss Control Program integrates the Source Water Flow Meter Replacement Program, the Production Well Maintenance Program, and the Meter Replacement Program. The latter is particularly noteworthy since in the last three years, Tucson Water has replaced over 31,000 aged customer meters. Such meters tend to under-report the volume of water that passes through them which in turn results in a loss in revenue. In addition, the Utility's Water Loss Control Program has already initiated activities with the following objectives:

- Capture all non-revenue water losses in the potable system by developing a centralized water-tracking database;
- Quantify discharge volumes from pipeline breaks, leaks, and planned or unplanned distribution system releases by using standardized water discharge estimating and measurement procedures;
- Recover lost water revenue from stuck water meters by implementing a back-billing process;
- Implement the Large Reclaimed Meter Inspection and Replacement Program;
- Implement the Potable Meter Inspection and Replacement Program;
- Calculate and record water loss by updating well purging procedures; and
- Ensure production well meter accuracy by implementing a meter testing, calibration, and replacement program.

Plans are also in place to initiate a water system audit process to conduct an overall system water balance. The results will identify and prioritize sub-areas within the system where additional water control measures and Utility resources need to be focused. In addition, the main replacement program will focus on areas demonstrating the greatest need by considering historical outages, pipeline materials and age, and locations where mains will be relocated by road projects.

Decreases in the amount of water that is lost will help offset increasing total water demand. Tucson Water will provide the City of Tucson Mayor & Council with annual updates on the continuing development and findings of the Water Loss Control Program.

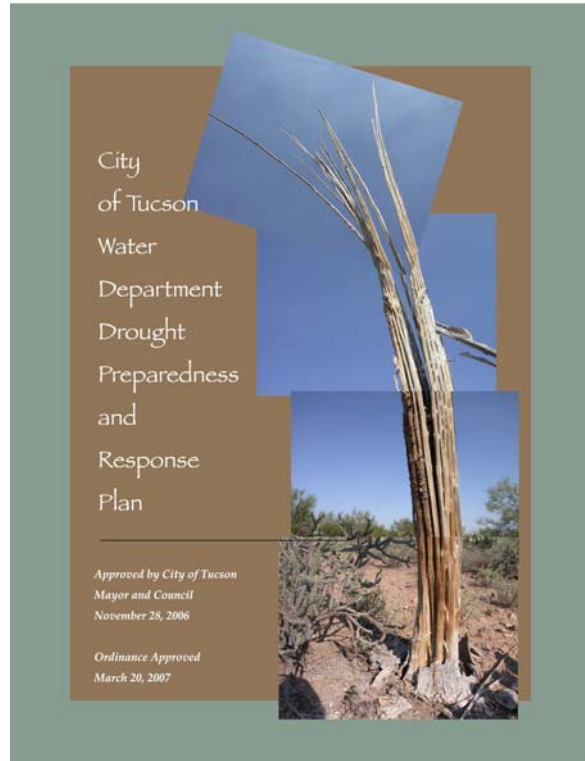
Drought Preparedness and Management

Drought preparedness and management are inextricably linked with water-resources planning. The impacts associated with drought are caused not only by dryer than normal weather patterns but also by the water demands the community places on its available supplies. The effects of drought can be worsened by managing available water resources inefficiently or through inadequate resource and/or system planning. Conversely, effective drought planning can serve as a “buffer” which can minimize the severity of drought impacts when they occur (Arizona Department of Water Resources, 2007). The *City of Tucson Water Department Drought Preparedness and Response Plan* (Drought Plan) was developed to conform with recently enacted state law and to further reinforce the Utility’s existing drought management and water resource/system buffers already in place.

In response to recommendations developed by the Governor’s Drought Task Force (2004), drought-related legislation became state law in 2005 and required all Arizona water systems to submit a drought preparedness and response plan to the State by January 1, 2007. The City of Tucson Mayor & Council approved the Drought Plan in November 2006 and subsequently amended the Tucson Code in March 2007 by adopting an ordinance which enforces the drought response stages and response measures embodied in the Drought Plan.

The City’s Drought Plan addresses the inherent uncertainties associated with drought events such as their potential duration and severity. It was developed with the understanding that drought impacts can potentially occur more locally or regionally. For instance, drought can be only local involving the Santa Cruz River Watershed and nearby basins, or it can be more regional encompassing all or part of the Colorado River Watershed thus impacting water users in several states. It is now common knowledge that drought can occur both locally and regionally at the same time.

Tucson Water’s Drought Plan consists of four drought response stages ranging from the mild to the most stringent. These stages and the associated response measures account for the unique attributes of the Utility’s water system which is configured and operated to maximize reliability in both its available resources and supply infrastructure. Tucson Water’s system is less vulnerable to the effects of local or regional drought because the Utility has diversified its water-resources portfolio. This means that the Utility is not fully reliant on either surface water or ground water for potable supply. In addition, Tucson Water also operates a large



reclaimed water system which meets a significant portion of the Utility's total water demand. This system also serves as a drought buffer since it reduces the magnitude of peak demand on the potable system thereby minimizing the potential impact of local or regional drought. The Utility's conjunctive use of ground water and Colorado River water for potable supply and its utilization of reclaimed water to meet non-potable demand collectively provide Tucson Water and its customers greater supply resiliency in both wet and dry years.

For more detailed information on the stages, drought indicators, and response actions, the *City of Tucson Water Department Drought Preparedness and Response Plan* can be viewed on the City of Tucson Water Department's web site at <http://www.ci.tucson.az.us/water>. Answers to frequently asked questions regarding the City's Drought Plan and a summary of the staged response actions are provided in Appendix B.

