WATER CONSERVATION PLANNING IN AUSTIN, TEXAS

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Abstract: Despite a long-standing, aggressive water conservation program, the City of Austin needed to develop additional conservation strategies to meet a City Council goal of reducing water use by 1 percent a year for ten years. This paper details the strategies discussed and ultimately recommended by staff and a Council-formed Water Conservation Task Force over a hectic 120-day period.

Austin’s Historical Water Use

Climate and Water Rights
Austin is located in central Texas and receives approximately 34 inches (812 mm) of rainfall each year (NOAA, 2006). The summer months of July and August are driest, often without rainfall for 3 to 4 weeks at a time. The extended dry periods increase overall water use in summer by almost 100 percent over winter use.

Austin’s current water supply comes from surface water, and the City has its own run-of-river water rights backed up by a firm water supply contract with the Lower Colorado River Authority (LCRA) for 401 million cubic meters (m^3) per year. These water rights are expected to meet demand through 2040; with an aggressive conservation and reclaimed water program, rights should be sufficient through 2050. Annual payments to the LCRA are triggered when consumption reaches 248 million m^3 per year, and are a strong motivator for conservation.

Historical Conservation Efforts
For most of the 1980s, demand management was seen as an emergency response to infrastructure inadequacies. Water conservation efforts in Austin have since evolved into proactive programs designed to reduce peak day demand and average per capita use, with the ultimate goal of delaying the construction of additional treatment capacity and extending the time before the City exceeds its water rights. The City now views efficiency as one of the strategies required to meet its long-term water needs.

Through a combination of programs targeting inefficient water use practices, Austin has slowed the rate of demand growth despite steady growth in the City over the past decade. While the population of the Austin service area has grown by 76 percent since 1984, total water pumpage increased only 61 percent during the same time period.

Water Conservation Task Force

Water Use Politics in Austin
In the spring of 2005 the City of Austin began working towards building a new water treatment plant. Initial water demand projections called for Phase 1 of the new plant to be
operational by 2011. Savings from the existing water conservation program were able to delay the need for phase 1 of the treatment plant by two years, until May 2013. However, citizens concerned about the environmental impact of the new water treatment plant seized upon water conservation as a way to delay building the plant even longer, if not cancel it outright.

In June of 2006, the Austin City Council set a goal of reducing peak day water consumption by 1 percent a year for 10 years. The initiative resulted in the formation of the Water Conservation Task Force in September of 2006. The Task Force was given only 120 days to examine and recommend cost-effective conservation measures to meet the 10 percent reduction goal and develop a policy document to present to Council.

Because plans for the treatment plant were announced just as a new water conservation initiative began its way through the approval process, it was difficult to prevent the Task Force’s efforts from being commingled, in the public’s eye, with the immediate need for a new water treatment plant. However, because the earliest effects of the Task Force’s conservation measures would not appear until 2008 in a best-case scenario, with the full impact not realized until 2017, conservation efforts would be unable to prevent the need for immediate construction of a new treatment plant. Effective conservation will help defer future expansions, and provides a necessary buffer for the plant’s tight construction schedule.

Task Force Procedure
Appointees to the Water Conservation Task Force included three members of the City Council (including Mayor Will Wynn) and representatives from the Environmental Board, Planning Commission, Resource Management Commission and Water and Wastewater Commission. Task Force meetings were scheduled two weeks apart, with a work session to explore each category of conservation measures (outdoor, indoor, City- and Utility-oriented) followed by a meeting to determine recommendations for that category. All task force meetings were open to the public and had time reserved for citizen communication.

During work sessions, Water Conservation staff presented a list of water-saving opportunities to the Task Force along with a list of possible strategies from the radical (prohibiting potable water for irrigation) to the more feasible (limiting potable water for irrigation during peak times). Task Force members asked questions and requested more information from staff on particular strategies, and discussed the impacts of strategies on the budget, customers and stakeholders. The following week, staff presented their recommendations to the Task Force, who then made alterations as necessary and passed initial recommendations. Following discussion of all strategies and additional stakeholder meetings, staff presented a summary recommendations package to the Task Force. The final recommendations formed the basis for the Policy Document to be presented to City Council for approval in the spring of 2007. Ordinances, rules revisions and policy changes will follow approval of the Policy Document.

Public Involvement
During every phase of the project, information was made publicly available on the City’s website and through live television and web broadcasts. Representatives of various City departments were called on for input, as were industry and community stakeholders. The Task Force recommendations ultimately included measures affecting stakeholders with diverse interests, including the Austin Apartment Association, the Austin Board of Realtors, the Irrigation Association and the Austin Homebuilders’ Association.
Exploration of Water Conservation Strategies

Existing Conservation Programs
Strong water conservation programs have been a hallmark of Austin Water Utility since the early 1980s. Fixture replacement incentives, conservation-oriented water rates, irrigation and rainwater harvesting programs, a water waste ordinance and a number of educational and outreach efforts have been implemented in an effort to reduce peak day water use and build a foundation for future conservation.

Through 2005, these programs have saved an estimated 12.7 million gallons per day (MGD) (peak), or nearly 5 percent of utility-wide capacity for a 16 million m$^3$ per year reduction. In terms of energy and air quality effects, existing water conservation efforts have saved approximately 12.7 GWh per year and removed the equivalent of 2,500 cars from the roads.

Potential Indoor Conservation Strategies

Mandatory Toilet Replacement
In 1991, Austin’s plumbing code was changed to require a maximum flush volume of 6.0 liters per flush (lpf) for toilets sold within the City. State and national standards followed in 1992, and incentive programs for toilet replacement were begun in 1993. Since that time, roughly 94,000 toilets have been retrofitted, but an estimated 228,500 inefficient toilets remain in the Utility’s service area. To target this market, the Task Force considered several options from making voluntary replacement more attractive to requiring fixture replacement.

Staff recommended requiring all single family properties’ plumbing fixtures to flush at current plumbing code volumes on transfer of title, and that multifamily and commercial properties built before 1992 be required to bring fixtures up to code by December 31, 2014. The Task Force chose instead to follow the suggestion of the Austin Board of Realtors and require that single family properties be retrofitted by December 31, 2009, enforceable upon notification of the transfer of title. The Task Force also felt that 2014 was too late a date for multifamily and commercial properties, and set a retrofit deadline of December 31, 2011.

Require Submeters for Water Billing
Although Austin’s Water and Wastewater Criteria Manual was changed in 2003 to require that multifamily and mixed use properties be plumbed for the installation of submeters, the City does not currently require that submeters be used to bill tenants. When customers are billed directly for the water they use, they reduce their use by 15 percent. Tenants who pay for their water use through allocated bills or homeowners associations do not reduce their water use (Mayer et al., 2004). Roughly half of Austin’s multifamily properties use allocated billing.

The Task Force recommended that multifamily and mixed use properties built after 2003 be required to bill tenants for individual water use by January 1, 2009. Discussions with the Austin Apartment Association led to an extension of the deadline until 2016 for Tax Credit properties built between 2003 and 2008, and a commitment to develop a City of Austin equipment specification for submeter installations.

Plumbing Code Revisions
The Task Force recommended that several changes be made to the plumbing code to prohibit garbage grinders in restaurants and liquid ring surgical/dental vacuum pumps, require
conductivity controllers on steam boilers, and set water use limits on urinals (1.9 lpf) and commercial dishwashers (3.4 liters/rack or 680 liters/hour). Staff recommendations not approved by the Task Force included requiring high-efficiency toilets, showerheads and faucet aerators in new construction.

Cooling Tower Efficiency Requirements
It is believed poor operation of cooling towers contributes to increased peak day water use. The Task Force recommendations require that new cooling towers have makeup and blowdown meters, conductivity controllers, overflow alarms, drift eliminators, and a minimum of five cycles of concentration, and that existing towers install this equipment by December 31, 2010. Additionally, new large commercial properties will be required to reuse A/C condensate, and rebates will continue to encourage the reuse of reject water for irrigation.

Car Wash Efficiency Standards
The Task Force passed recommendations to set per-vehicle water use limits for conveyor washes (151 liters), in-bay washes (208 liters) and large vehicle washes (284 liters). Hand-held wands would be limited to 11 liters per minute or less. While car washes represent a missed opportunity for onsite water reuse, no requirements for reuse were recommended, and a staff recommendation to require charity car washes to take place at existing establishments (rather than in parking lots) was not passed by the Task Force.

Commercial Clothes Washer Standards
Standards exist for residential clothes washers (single-load, soft mount machines), but there are no state or federal efficiency standards for hard-mount clothes washers and multi-load soft-mount machines. The Task Force voted to recommend a maximum water factor (measured as gallons used per cycle per cubic foot of capacity) of 8.0 for new commercial washers, and to require existing coin-operated equipment to comply by 2011.

Other Potential Opportunities
Staff considered potential water savings from promoting or providing incentives for water-efficient homes, but did not pursue a recommendation since the U.S. Environmental Protection Agency is currently developing specifications under the WaterSense program. Additionally, several technologies to deliver hot water without wasting cold water were evaluated, but no recommendation was made to require “hot water on-demand” systems. Finally, while staff believes it is likely that automatic flush sensors lead to unnecessary flushing and increased water use, the information available was insufficient to make a recommendation.

Potential Outdoor Conservation Strategies
Outdoor water use is what drives peak day use for the City of Austin – irrigation accounts for more than 50 percent of Austin’s peak day use and approximately 35 percent of year-round water use. Improperly installed and maintained automatic irrigation systems increase outdoor water use, and many homeowners display a lack of knowledge or willingness to properly schedule irrigation systems. With the availability of unlimited potable water for outdoor use, many commercial customers water too frequently during the summer, and more than 10 percent of irrigation water is wasted due to too-high pressure, misaligned heads, and irrigation during the hottest part of the day. Many area homes have inadequate soil depth and incorporate grasses and plants that are inappropriate for the Texas climate.
Enhanced Water Use Management Regulations
The City of Austin currently has a Water Use Management ordinance that prohibits water waste year-round and includes three stages of seasonal water restrictions. Stage 1 Restrictions, in effect from May 1st through September 30th of each year, prohibit commercial properties from watering during the day and encourage a voluntary watering schedule for all customers. Stage 2 restrictions are triggered by elevated consumption and include mandatory watering days and limits on non-essential outdoor water use. The stringent Stage 3 restrictions are designed for emergency situations, and have never been enacted in Austin. The current ordinance does not restrict properties from over-watering, or contain year-round restrictions on watering during daylight hours when more water is lost to evaporation and wind. Additionally, staff limitations have prevented the ordinance from being fully enforced.

Enhanced regulations developed through the Task Force process will require all customers to follow an address-based, twice-weekly watering schedule during the summer, and prohibit daytime watering with automatic irrigation systems. The Task Force considered but did not approve staff recommendations to require timers on hose-end sprinklers and prohibit the overseeding of established grass except when used explicitly for erosion control.

Irrigation Standards & Permits
Although Texas is one of the few states to license irrigators, there is still a lack of oversight in irrigation system design and installation. Austin Water Utility irrigation staff has observed water loss of 20 to 50 percent from inefficient system design.

In addition to requirements under the City’s existing commercial irrigation system permitting process, the Task Force recommended that newly-installed commercial systems be designed for zero runoff, have a master valve, and have a minimum distribution uniformity of 0.6. Sprinkler arcs must not pass across a paved area, water may not be sprayed on any median or island less than six feet wide, and pop-up heads must be set at least six inches from impervious surfaces. Turfgrasses in the landscape must meet dormancy requirements, and installers must develop an as-built design plan and water budget prior to final City inspection.

The Task Force recommended similar measures for new residential irrigation systems, and included requirements for hydrozoning and pressure regulation. While staff recommended requiring a design plan and permit prior to installation, the requirement was dropped after discussions with the Irrigation Association and the Austin Homebuilder Association. The groups will instead continue to work with staff on developing documentation requirements. Submeters that have automatic readouts will be required one year after the other requirements become effective, and a rebate for their installation will be available until they are required.

The Task Force considered requiring weather-based controllers on all new systems, but determined the technology was not yet proven suitable for residential systems. They will be required for commercial systems.

Residential Landscape Development
Many Austin landscapes include non-native plants and grasses that are ill-adapted to Austin’s climate. Even where native plants are present, homeowners are often unfamiliar with plant water requirements. Additionally, native soil depth in Austin is often insufficient to support the types of landscape aesthetics homeowners desire, resulting in excessive irrigation.
After discussions with developers and realtors, an initial recommendation mandating 8” of soil depth was modified to require the addition of compost-rich soil to a total depth of 6” in new developments. New turfgrass installations must meet dormancy requirements to survive drought periods, as demonstrated in a recent turfgrass study by Texas A&M University and the Texas Turfgrass Producers (Chalmers, et al. 2006).

The Task Force further recommended requiring homebuilders to offer a WaterWise landscape option to prospective home buyers. The WaterWise landscape option would contain only drought-tolerant plants with less than 50 percent of the landscape area covered by turfgrass.

**Routine Irrigation System Analyses**

The Water Conservation Program currently offers free irrigation system analyses for commercial and multifamily customers, and for residential customers using more than 95 m³ per month. Licensed irrigators on staff examine the system for needed repairs and adjustments, and create a more efficient seasonal schedule for the homeowner. A rebate program is available to offset the cost of needed repairs and upgrades. These irrigation audits can result in water savings of 15 percent or more.

Water Conservation staff have observed significant over-watering at large commercial and multifamily properties, where irrigation system inefficiencies often go unchecked and are not repaired. Irrigation maintenance contracts often do not provide for an overall analysis with projected water use amounts, so property owners and managers are without a good frame of reference for recognizing when water use is too high. The Task Force therefore recommended that commercial, multifamily and municipal properties larger than one acre with automatic irrigation systems be required to submit an irrigation analysis to Austin Water Utility once every three years according to a staggered schedule.

The Task Force recommendations require an irrigation system analysis by a licensed irrigator once every three years for residential properties that exceed 132 m³ per month at least once in each of two consecutive calendar years while under the same ownership.

**Other Potential Opportunities**

Wet ponds can require millions of gallons of potable water to survive the summer months. The Task Force considered recommendations to limit the use of potable water in ornamental ponds, wet ponds and green roofs, but no recommendation was made. The Task Force also chose to make no recommendation regarding alternative water sources, asking for further staff review of the capture and reuse of stormwater for irrigation purposes.

**Potential City and Utility Conservation Strategies**

**Reducing Water Loss**

Austin Water Utility recently created a Water Accountability Committee to minimize water loss within the Utility’s distribution system. While these efforts were discussed through the Task Force process, staff recommendations for a large meter testing and repair contract and a small meter exchange program were not approved. The Task Force did recommend continued funding for a Leak Detection Contract approved in late 2006 that locates subsurface leaks, particularly in older areas of the City with cast-iron piping.

**CIP funding for reclaimed water projects**
The Task Force voted to recommend the approval of funding for several reclaimed water projects that will result in a reclaimed water capacity of 23,500 m³; potential customers include the University of Texas, Austin-Bergstrom International Airport and the Texas School for the Deaf. The Task Force also recommended requiring new commercial and municipal customers with access to reclaimed water to use it for irrigation, cooling and other non-potable uses.

Utility Water Rates
The Utility’s current water rate structure does not provide adequate conservation price signals for high use customers. The Task Force recommended that the utility implement a fifth rate tier for high-volume residential customers. It further recommended a cost of service study be conducted to evaluate strategies that will reduce demand by 19,000 m³. The study will determine where to set the fifth rate tier and consider irrigation rates, water budgets, mandatory irrigation meters, and conservation rate structures for wholesale customers. The Task Force also recommended adding water use graphs to customer bills and a program to alert customers when consumption increases dramatically.

Wholesale Customers
A number of Austin Water Utility’s wholesale customers have a considerably higher per capita water use than the City’s direct customers. The Task Force recommended steps to make sure conservation measures are effectively implemented by wholesalers where required by contract, and requiring conservation measures in new and renewed contracts.

Increase Water Efficiency in City Facilities
Citizens look to the City to lead by example in conserving water, and there are multiple opportunities for City facilities to take advantage of available conservation techniques. Since the City has committed to a minimum silver-level Leadership in Energy and Environmental Design (LEED) certification for all new facilities, the Task Force recommended that water conservation elements be required as part of that process. It is also recommended that the City complete water efficiency recommendations from a performance contract currently in progress, and install weather-based controllers under Parks Department management on 39 athletic fields.

Reduce Excessive Water Use Due to High Pressure
High pressure leads to higher water use and faster deterioration of appliances and fixtures. The Task Force recommended changing the plumbing code to require pressure reducing valves (PRVs) on new residential properties with pressure above 4.48 bars and supported a $100 rebate for installing PRVs on existing properties with pressure over 5.52 bars.

Outreach Programs
Currently, the Water Conservation program uses a number of different outlets to reach customers, including inserts in customer utility bills, media advertising, an electronic newsletter, a website and elementary education programs. However, despite extensive marketing efforts, many citizens are unaware of the City’s water conservation programs. The Task Force recommended a more comprehensive campaign that would help “brand” water conservation programs through a uniform appearance and tone. The Task Force authorized a recommendation for a $725,000 media campaign, primarily aimed at informing customers of new restrictions generated through the Task Force process and promoting existing incentive programs.
Conclusions
Austin City Council is expected to vote on the recommendations later this spring, but the Task Force has already created a package of improvements that will further emphasize conservation. Together, the recommendations amount to peak-day water savings of nearly 125,000 m$^3$ at an average cost of roughly $0.30 per liter. Compared to the cost of new water treatment plant construction at more than $0.90 per liter, the Task Force recommendations represent a significant cost savings for the City of Austin.

References


Table 1. Projected costs and savings from conservation strategies

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<th>Conservation Strategy</th>
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