

Should Reclaimed Water Systems be Self-Supporting?

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Abstract

Reclaimed water rates are a reflection of community goals and values; therefore, the process and rationale for setting the rates is unique to each community. Many factors go into the decision of whether or not reclaimed water rates should cover all of the costs of operating the system. These factors include: 1) the role reclaimed water plays in the long-range water supply plans of the community, 2) the alternatives the community has for the disposal of treated wastewater, 3) the benefits a reclaimed system confers on the potable system, and 4) the community's policies for the use of reclaimed water.

This presentation discusses how the above factors have contributed to the City of Tucson's decision to subsidize the reclaimed water rates. It also discusses how these factors can be used to assist communities in developing a reclaimed water rate structure that reflects their unique situation.

Introduction

Because Tucson Water has been operating a community reclaimed water system for 23 years, we are often asked about our reclaimed water rate structure. While we have developed a rate structure that is politically and publicly acceptable in Tucson, our approach is not necessarily the best one for other water providers. Many factors go into the decision of whether or not reclaimed water rates should cover all of the costs of operating the system. These factors include: 1) the role reclaimed water plays in the long-range water supply plans of the community, 2) the alternatives the community has for the disposal of treated wastewater, 3) the benefits a reclaimed system confers on the potable system, and 4) the community's policies for the use of reclaimed water.

The Role of Reclaimed Water in the Long-range Water Supply Plan

The City of Tucson is located in the northern semi-arid reaches of the Sonoran Desert in eastern Pima County, Arizona and receives only about 11 (0.28 meters) inches of rain a year. Very few surface waterways contain perennial flow and most of these are effluent-dominated streams located downstream from municipal wastewater treatment plants. Until the early 1990s, the Tucson community relied almost exclusively on pumped groundwater to meet water demand. Due to rapid growth in population and associated water demand following World War II, the groundwater system transitioned from an approximate state of equilibrium to one of accelerating depletion. Rapidly declining water levels in the metropolitan and surrounding areas have resulted in land subsidence, increased pumping costs, and the gradual loss of native riparian habitat.

The Tucson area is growing rapidly, at a rate of 2.5 to 3 percent annually. The metropolitan area has a population of about one million people. Potable water supplies are groundwater and Colorado River water from the Central Arizona Project that has been recharged and recovered. Non-potable water is provided through the reclaimed water system.

Tucson's reclaimed water system is unique in several ways. Rather than a means to dispose of treated wastewater, it is an important and growing water supply for this desert community. Wastewater is the only supply the community has that will continue to grow as the population increases. Therefore, reclaimed water plays an increasingly important role in the water supply picture. As part of its long-range water supply plan, the City has committed to the increasing the use of effluent. This commitment anticipates that effluent for non-potable reuse will be eight (8) percent of the total water demand through the year 2050.

Alternatives for Disposal of Wastewater

The City owns and operates a municipal water utility, Tucson Water, which provides potable and reclaimed water service in the Tucson metropolitan area. Tucson Water serves potable water to over 710,000 people, about 75 percent of the metropolitan population. In 2006 (July 1–June 30), the utility delivered approximately 114,000 acre-feet of potable water and 14,000 acre-feet of reclaimed water. In the Tucson region, the combined annual municipal, agricultural, and mining groundwater pumpage is nearly three and a half times greater than the rate of replenishment of the aquifer.

Pima County owns and operates the regional wastewater collection system and treatment facilities. An intergovernmental agreement between the City and the County provides the City with the right to use about half of the 68,000 acre-feet of secondary effluent produced at the two regional treatment plants. Today, some of this secondary effluent is used in the reclaimed system and the remainder is used to irrigate a city-owned golf or is discharged into the Santa Cruz River, where it recharges the aquifer.

How Does the Reclaimed System Benefit the Potable Water System?

Tucson's Reclaimed Water System

Since the first customer (a golf course located at the end of a 10-mile pipeline) received reclaimed water in 1984, more than 100 more miles of pipe have been added to the system. Today, the reclaimed water system has more than 144 miles of pipeline and 17 million gallons of surface storage. The average day delivery is 11 million gallons and the summer peak day is approximately 28 million gallons. Unlike the potable water system that has a peak day of 1.65 times the average day, the reclaimed system's peak day is 2.3 times the average day. The high peaking factor on the reclaimed system reflects the usage patterns of the irrigation customers; high usage during the hot months, low usage during the cool months. This pattern is also seen, to a lesser extent, on the potable system.

Reclaimed water is produced in two ways: at a filtration plant and through recharge and recovery. The filtration plant further treats secondary effluent from one of the County's wastewater plants and is permitted to produce up to 10 MGD.

Reclaimed water is also produced at two recharge and recovery facilities: the Sweetwater Recharge and Recovery Facility located south of the filtration plant and the Santa Cruz River. The Sweetwater facility consists of eight constructed basins which are used to recharge secondary effluent. It is operated under an aquifer protection permit that allows 6,500 acre-feet of treated wastewater to be recharged and recovered annually. A constructed wetlands is also part of the Sweetwater facility. The wetlands were designed to treat the backwash water from the filters and are used as a public environmental amenity.

The Santa Cruz River facility is a "managed in-channel" project. Secondary effluent produced at the County's wastewater treatment plants is discharged into the river and "stored water credits" earned.

These credits are then used to recover effluent from wells which pipe water into the reclaimed system. The recovered water is a very good quality, less than one NTU turbidity with nitrogen levels below the 10mg/L drinking water standard. This low nitrogen level is significant because the secondary effluent produced by the County is not denitrified and is typically in the 28mg/L range. Recovered water from the recharge facilities is blended with water produced at the filtration plant to produce water that meets Tucson's Reuse Permit requirements. The amount of recovered water blended with the filtered water varies daily based on total system demand and the quality of the filtered water. On an annual basis, the blend is about 50 percent filtered water and 50 percent recovered water.

Tucson's Reclaimed Water Customer Characteristics

In 2006 (July 1–June 30), the utility delivered approximately 14,000 acre-feet of reclaimed water to over 900 customers. Fifty eight percent of this water was delivered to fourteen golf courses. Another 17 percent was delivered to parks. The remainder was delivered to schools (8 percent), other water providers (8 percent) and other (single family, agriculture, commercial, multi-family, and street landscape (9 percent).

Although reclaimed water deliveries have increased by nearly 50 percent since 1995, the percentage of deliveries in each customer category has remained relatively constant except in the single-family group, which has had the highest increase. This can be attributed to increased public awareness of the availability of reclaimed water and a model environmental community that includes reclaimed water service to each home.

The Role of Reclaimed Water in Tucson Water's Conservation Program

Reclaimed water is important to Tucson's conservation program from the resource perspective by replacing potable water use, where appropriate, with a non-potable source that will increase in the volume available over the years. Reclaimed water is also plays an important role in assisting Tucson Water meet the conservation targets established by the state Department of Water Resources. Tucson has a conservation target of 164 gallons per capital per day (GPCD) of water use in its service area.

Although exempt from this calculation, reclaimed water plays an important part in it. In 2006, reclaimed water use accounted for 15 GPDC that would otherwise have been potable water use.

Policies Governing the Use of Reclaimed Water

Requirements to Use Reclaimed Water

Since the late 1970's, the Tucson community has placed a high value on water conservation. The City has a policy that all new golf courses and turf facilities over 10 acres use reclaimed water. Pima County also has a policy requiring reclaimed water use for new golf courses.

Although the City has considered the adoption of regulations requiring other new and existing uses to use/convert to reclaimed water, this has not happened. Each time the matter has been considered, it was decided that it was best to allow the market (reclaimed water rates) and community values to determine the use of reclaimed water at facilities other than golf courses.

Customer Off-site Responsibilities

As with potable water, it is the customers' responsibility to pay for the extension of reclaimed mains to their property. Because of the expense, few customers, except those required to use reclaimed water find it in their economic interest to extend a reclaimed water main.

Customer On-site Responsibilities

Customers are responsible for getting their sites ready for reclaimed water. This often requires expensive irrigation system work as well as the installation and annual testing of a backflow prevention assembly on all Tucson Water potable services on the site.

Availability of Loans

Tucson Water has a loan program with two school districts to assist them with the on-site expenses of getting their school grounds ready to use reclaimed water. Under the program, Tucson water provides up front funds for on-site improvements such as irrigation systems. The loan is repaid over a five-year period.

Ranking of Factors

The table below shows how Tucson Water ranks the various factors related to the appropriateness of subsidizing reclaimed water rates.

**Tucson Water's Ranking of Factors
Relating to Subsidization of Reclaimed Water Rates**

	High	Medium	Low
1. Community acceptance of use of reclaimed water	X		
2. Reclaimed water as water supply	X		
3. Need to dispose of effluent			X
4. Role in meeting regulatory requirements	X		
5. Ability to delay potable system capital expenditures	X		
6. Requirement to use reclaimed water			X
7. Customer off-site expenses	X		
8. Customer on-site expenses	X		
9. Availability of Loans			X

Tucson's support for the use of reclaimed water (Factor 1) and the important role effluent plays in the community's long-range water supply (Factor 2) set the stage for public acceptance of a subsidy for the reclaimed water system. While Tucson has the ability to dispose of treated effluent to a river, the long-term need to use effluent as a water supply outweighs the need for disposal (Factor 3). Reclaimed water plays an important role in the utility's ability to meet State conservation targets (Factor 4).

Tucson requires only new golf courses and turf facilities over 10 acres to use reclaimed water and relies on the savings customers can accrue from the lower reclaimed rates to provide the incentive for conversions (Factor 6). Under City of Tucson policies, the customer is usually responsible for extending the reclaimed main to the site and making all required on-site improvements (Factors 7 & 8). The City has agreements with two school districts to provide loans for on-site improvements; however, there are no city-sponsored programs to provide financial support to other customers for the conversion to reclaimed water (Factor 9).

When all of these factors are considered together, it is evident that reclaimed water/effluent use is very important to Tucson. It is also apparent that Tucson Water has few requirements for reclaimed water use and places a substantial financial burden for its use on the customer. This importance and financial burden on the customer is recognized through the subsidization of the reclaimed water rates.

Reclaimed Water Rate Setting Process

Every year Tucson Water initiates a rate setting process that culminates in Mayor and Council adoption of potable and reclaimed water rates. This process includes a series of steps including a cost of service analysis for potable and reclaimed water. The "cost of service" estimates the Utility's actual cost to provide water service to each customer class. The approach to allocate revenue requirements to classes based on cost of service is endorsed by the American Water Works Association (AWWA) and adopted by the Mayor and Council in its water financial policies.

The cost of service analysis is considered to be the baseline for determining the amount of revenues to be recovered from Tucson Water's various customer classes. In establishing revenue targets for each customer class, cost of service results often are adjusted to meet other water objectives, such as the factors discussed above.

Since Tucson Water began delivering reclaimed water in 1984, it has been the Mayor and Council's policy that reclaimed would cost less than potable water. This was originally done as an incentive for Tucson Water customers with uses suitable for reclaimed water to convert. Initially, it was determined that recovery of approximately 80 per cent of the cost of service for reclaimed water through the reclaimed rates would meet the goal of keeping the reclaimed rates below the potable water rates. And would also ensure that the reclaimed system paid a fair share of its expenses. The remaining 20 per cent of the reclaimed system costs are included in the potable water rates. The rate payers accept this allocation of reclaimed costs because were there not a reclaimed water system, there would have to be additional expenditures on the potable side to acquire, treat, and deliver water for non-potable purposes. In the past several rate cycles, reclaimed water rates have recovered between 73 and 85 of the cost of service, with the remaining paid by the potable water customers through their water rates.

For current potable rates, the effect of the subsidy is estimated at approximately \$.05 per Ccf. The average residential customer uses 12 Ccf/month and would therefore pay \$0.60 per month in support of the reclaimed system.

Conclusion

The decision of whether to subsidize reclaimed water rates depends on many factors and is as individual as each community. The City of Tucson has, since 1984, subsidized its reclaimed system through the potable water rates. Reclaimed water is important to the Tucson region from both a resource and regulatory perspective. The reclaimed water system benefits not only its customers, but the entire community.

The use of reclaimed water by large turf facilities, like golf courses, reduces the summer peak demand on the potable system and as a result delays the need for acquisition of additional potable supplies and expansion of the potable treatment and distribution systems.

One way that Tucson recognizes this importance and encourages people to use reclaimed water is by pricing it lower than the potable rates. The lower cost of reclaimed water has been an important incentive for people to use/convert to reclaimed water. Almost all large volume reclaimed water customers that convert from Tucson Water's potable system realize a savings. For example, under the fiscal year 2007 rates an 18-hole golf course could save \$150,000 - \$200,000 per year by converting to reclaimed water. A high school could save \$18,000 annually by converting.

Tucson Water is operated on an enterprise basis which means that all of the costs of producing both potable and reclaimed water must be recovered either through rates or other income sources. In order to keep the reclaimed rates low enough to be an incentive for conversion, the potable water rate reflects potable costs as well as a small portion of the reclaimed water system costs. Potable water customers and elected officials recognize the importance of the reclaimed water and are willing to provide this subsidy to the system.

In determining whether a reclaimed water system should be self-supporting, each community must evaluate its unique goals and circumstances to find the formula that works for them.