

SECTION FIVE

WATER DELIVERY SYSTEMS

Tucson Water operates two types of water systems: a potable system and a reclaimed (non-potable) system. These are physically separate and distinct systems which convey water from supply sources through a pressurized hydraulic system to customers situated at different elevations. Tucson Water's systems consist of a complex network of pipes, wells, pumps, reservoirs, valves, automated controls, and treatment facilities.

The existing water systems extend throughout a 330-mile area and served a population of about 720,000 people in 2006. The existing systems provide a baseline upon which future supply and demand needs are assessed.

EXISTING POTABLE SYSTEMS

Tucson Water's potable water distribution systems currently receive supply from more than 200 wells spread over five well fields with a collective pumping capacity of 196 MGD. Figure 5-1 shows the location of the five well fields within the Tucson basin and Avra Valley. The network of large diameter pipelines in Tucson Water's potable distribution system is shown on Figure 5-2. About 4,200 miles of pipelines (ranging from 2 to 96 inches in diameter) convey water from the various potable supply sources to more than 200,000 businesses and residences. The distribution system includes 50 fully enclosed reservoirs ranging in size from 15,000 gallons to 60 million gallons; the overall system has a total storage capacity of 273 million gallons. The system has 124 booster stations used to lift water to higher delivery elevations.

The ground water served by Tucson Water meets all applicable federal and state regulatory standards. Because the water delivered through the Tucson Water distribution system must be free of pathogens, Tucson Water introduces chlorine at various locations in the system to maintain a residual disinfectant in the water delivered to customers. Areas where ground-water contamination could pose a threat to potable supplies are being managed by controlling ground-water pumping or by pumping and treating to either augment the ground-water system or for direct potable use.

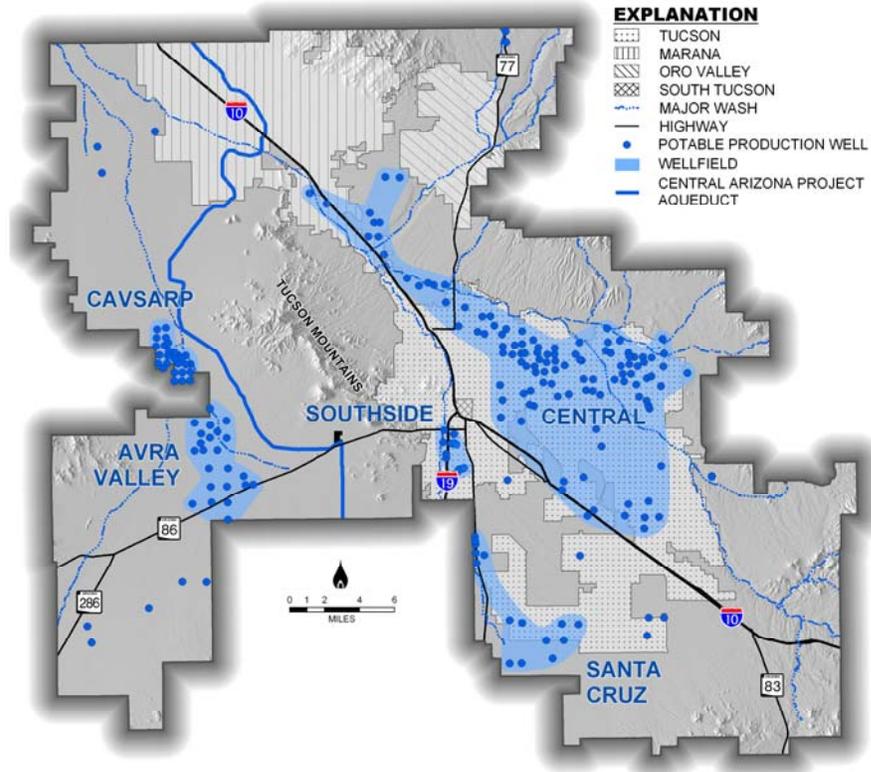


Figure 5-1: Tucson Water's Well Fields in 2006.

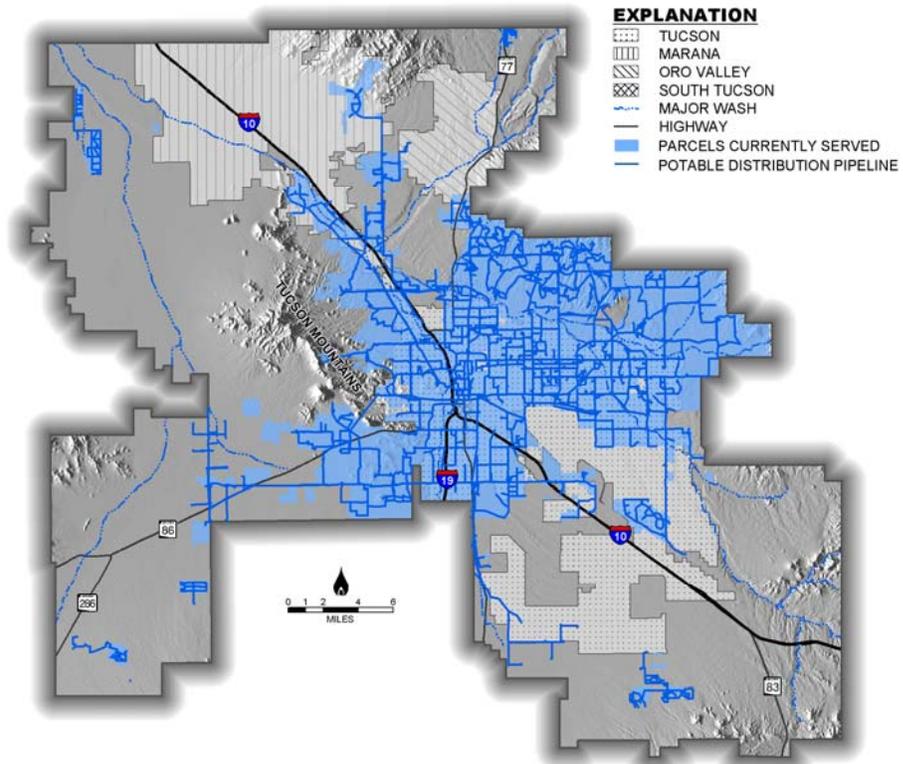


Figure 5-2: Tucson Water's Potable Distribution System in 2006.

EXISTING RECLAIMED WATER SYSTEM

Tucson Water has operated a reclaimed water system since 1984. The reclaimed system takes secondary effluent from Pima County's Roger Road Wastewater Treatment Plant, further treats it through filtration and chlorination, and delivers it for turf irrigation and other non-potable uses. The Utility delivered 14,168 acre-feet of reclaimed water through its reclaimed system in 2006. Of this total, 11,983 acre-feet of reclaimed water were utilized within the Tucson Water service area with the balance exported to Pima County and the Town of Oro Valley. Reclaimed usage in 2006 constituted about nine percent of total water demand for the Utility. The layout of the reclaimed water system is shown on Figure 5-3.

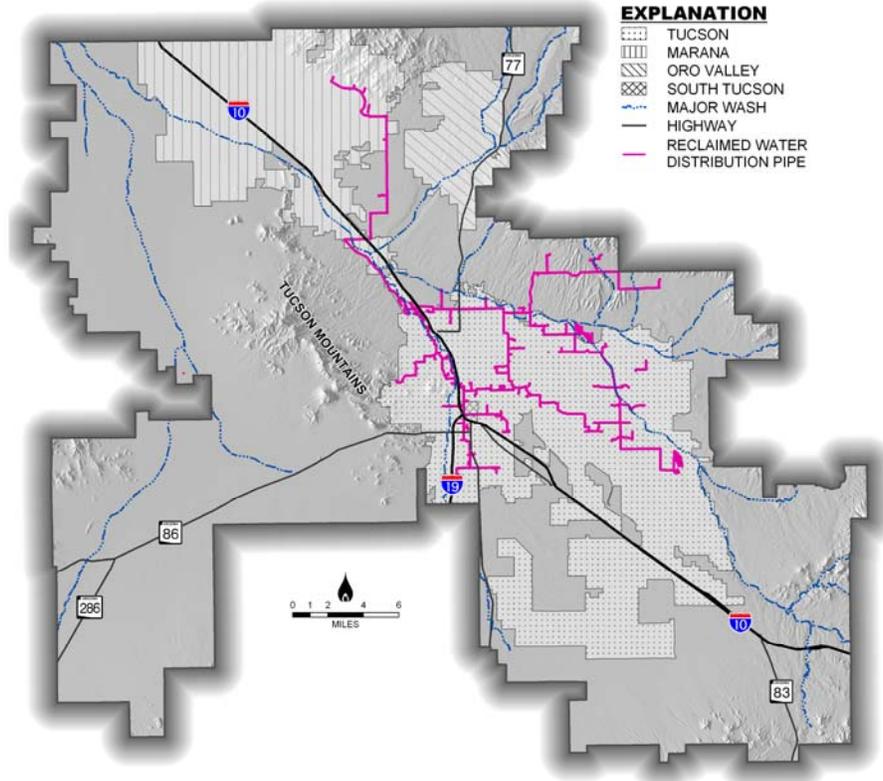


Figure 5-3: Tucson Water's Reclaimed Distribution Pipeline System in 2006.

The Utility's Reclaimed Water Treatment Plant is permitted to treat up to 10 MGD. The Sweetwater Recharge Facilities are permitted to annually recharge and recover up to 6,500 acre-feet of reclaimed water to meet seasonal peak demand requirements. The Utility plans to expand its annual recharge and recovery capacity at the Sweetwater Recharge Facilities up to 13,000 acre-feet by optimizing the operation of existing infrastructure and by constructing additional recharge and recovery facilities. The recovered effluent is blended with filtered water from the Reclaimed Water Treatment Plant, disinfected with chlorine, and boosted to customers through the reclaimed water distribution system. The total delivery capacity of blended water from the Reclaimed Water Treatment Plant and the Sweetwater Recharge Facilities is currently 27 MGD with plans to expand it to 33 MGD in 2009. In addition, the reclaimed water system receives about 2.5 MGD from the Randolph Park Water Reclamation Facility and up to 2.5 MGD from the Santa Cruz River Managed Underground Storage Facility.

IDENTIFYING POTABLE AND RECLAIMED SYSTEM NEEDS

Existing and future water system needs are identified and evaluated using computer models to simulate water flow velocities and pressures in the potable and reclaimed distribution systems. These computer representations of the two systems are called hydraulic models. The results of modeling assessments are portrayed schematically and are used to assess future potable and reclaimed system improvements.

Future Potable System Needs

Future potable water system needs are determined by applying a GPCD water use factor to population projections within Tucson Water's projected service area. As described in Sections Two and Three, population projections are distributed spatially to locate future delivery system needs. A hydraulic model is used to size the projected pipelines and to ensure there is adequate water supply, storage, and pressure to meet projected demands in future years. This necessitates adding infill capacity to the existing infrastructure.

In fiscal year 2006, Tucson Water spent approximately \$14 million on electric power (over 100 Gigawatt-hours) and natural gas (nearly 6 million therms). Eighty-five percent of the electricity and 100 percent of the natural gas was used to power potable system facilities. Meeting the operational and regulatory requirements of the water distribution systems will increasingly require more energy in the future. As the demand for energy has increased over time, alternative energy sources have become increasingly viable because of technological advances, changes in regulations, voluntary programs, and incentives. At the same time, opportunities to develop geographically-distributed energy production facilities are being considered due to security and reliability concerns.

Tucson Water recognizes the need to utilize sustainable energy for its facilities. Opportunities are being explored to partner with the City of Tucson's Energy Manager and local electric providers to expand the use of solar power, evaluate the utility of low-head hydroelectric projects, and assess the potential of other sustainable energy technologies at potable facilities.

Future Reclaimed Water System Needs

In this Update, it is assumed that at least nine percent of the projected total water demand will be met with reclaimed water. At the present time, most reclaimed system customers are large turf facilities such as parks, golf courses, and schools. Capital improvement projects scheduled in the next decade will increase system capacity and water supplies; these projects will also improve operational efficiency to meet increasing future non-potable demand.

In fiscal year 2006, reclaimed water system facilities consumed approximately 15 Gigawatt-hours of power to meet operational and regulatory requirements. As with the potable water system, energy sustainability will also be pursued for reclaimed water facilities including installation of additional photovoltaic arrays on reclaimed reservoir roofs.