

Non-Potable Water

Conversion of Golf Courses and Parks To Alternate Water Sources

By Donna Pacetti, Denver Water, Denver, CO

Many communities are experiencing water supply shortages. Communities with rapidly growing populations located in arid climates or with partial water supply contamination might have a demand for water that exceeds supply.

As new water supplies become increasingly expensive and facilities difficult to build, water conservation programs become more favorable in meeting municipal water supply needs due to their ability to stimulate either water use reduction or maintain current water use levels. One remedy to this problem is developing a separate non-potable system for irrigating large open space areas.

The Denver Water Department loaned an employee to the Denver Parks and Recreation Department for three years to assist in the conversion of their golf courses and parks to non-potable water. The employee is the liaison between the two agencies, while providing technical guidance, training and advice to Denver Parks concerning conversion to non-potable water.

High and Dry

Denver is on the eastern slope — the dry side — of the Rocky Mountains. All of Denver's water comes from melting snow. Consequently, the winter snowpack in the mountains is the key to the water supply the following summer. Denver Water provides service to approximately one million people, with customers evenly distributed between the city of Denver and its suburbs.

Single-family homes are the largest consumers of water, with more than 50%. Business uses less than 20% and multi-family res-

idences consume 13%.

The city and county of Denver use 4.4% with Denver Parks taking 65% (2 billion gallons) of this amount for irrigation.

More than half of the 4,000 acres in the Denver Park System is irrigated turf (2,313 acres). Fifteen percent (352 acres) of the turf area is irrigated with non-potable water.

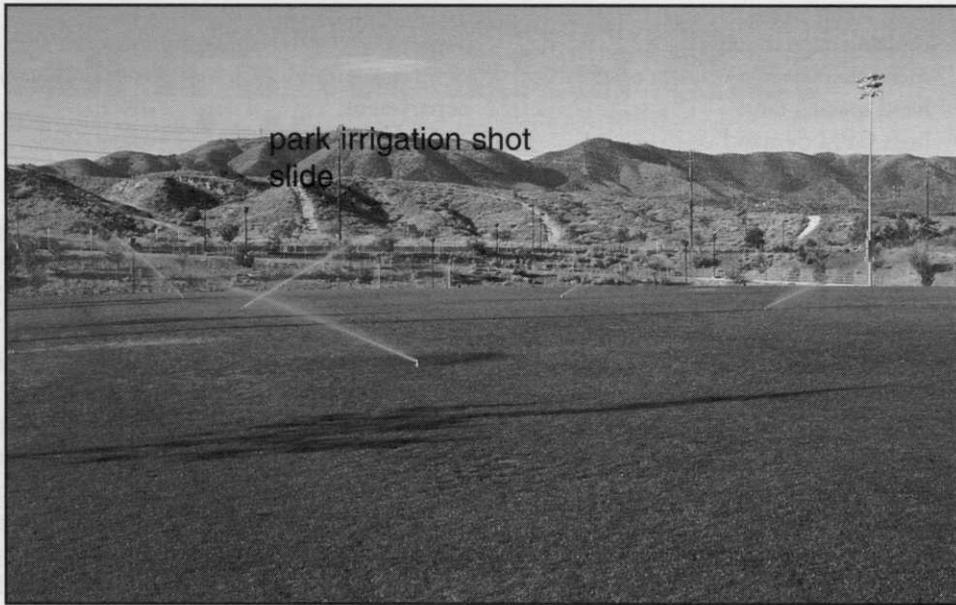
Denver Golf, a division of Denver Parks, owns and operates eight golf courses, constituting 2,300 acres. Of this total, 1,575 acres are irrigated with 1,157 using non-potable water.

Denver Parks has divided the city into nine maintenance districts. These districts maintain urban parkland only, and each district maintains about 500 acres.

Ten-Acre Rule

To promote conservation of potable water related to irrigation Denver Water adopted an operating rule in 1993 that outlines the installation guidelines to follow for irrigated sites larger than 10 acres. The rule states:

"An application for any potable water tap for irrigation of open spaces larger than 10 acres in total area will be reviewed by the department to 1) encourage efficiency of irrigation in large, open spaces and 2) to utilize alternatives to the treated water system where they are feasible. Such water service shall be provided only by non-potable or raw water if such alternative service can be made available by the department, is competitive with the cost of added water supply, is financially practical and is an efficient use of water. Potable water may be provided for irrigation of such property



Denver set up a program to require evaluation of non-potable water instead of treated water for irrigation in public parks and golf courses.

only after completion of the review and upon finding by the board that the proposed design of landscape and irrigation is calculated to use water efficiently in view of the uses intended."

Denver Water and Denver Parks are working closely to satisfy these requirements for new projects. Some existing parkland and golf courses are good candidates to convert to non-potable. The current process that the two agencies are following is listed below:

Plan review - The plan review process, starts several years prior to actually viewing a set of plans. Denver Water and Denver Parks conduct several meetings a year to keep each agency informed of either new parks that are in the concept design phase or new non-potable sources that are being developed.

Requirements for new sites - The basic information that is required when considering a new site for non-potable water includes:

- dimensions in square feet of areas to be irrigated;
- total square feet of each type of planting area, for example, turf, shrub beds, natural

areas, etc.;

- maximum GPMs required (to determine peak pumping demand);
- water budget for the site that includes total planned yearly irrigation needs; and
- desired point of connection.

Retrofit Site Characteristics

The characteristics for good and bad candidates for alternate source irrigation are:

Good

- large area, especially square areas
- single source of water sufficient
- minimal pump lift needed
- head spacing small
- constant low GPM
- low GPM/acre
- automated irrigation control
- existing storage
- power source
- as-builts and operation records

Bad

- small area
- long and narrow

- multiple taps required
- multiple pumps for lifting needed
- head spacing large
- high GPM demand
- manual system
- no storage

Other important characteristics outlined by the board include the proximity of the raw water source, the rate of availability of the raw water, the quality of the water, existing abandoned facilities at the site and surface water storage and drainage.

If a site is determined to be a candidate for a non-potable source, then a hydraulic study is conducted of the existing system. The water meter is monitored in order to determine the feasibility of converting the system to non-potable. The flows are monitored during the peak irrigation season in July and August in an attempt

to obtain the most critical flow rate through the irrigation system. A data logger is used to monitor the flow every ten minutes with maximum hour flow rates calculated using these readings.

Denver Water promotes alternative water sources to supply irrigation demands by identifying parks and golf courses that are candidates for conversion to non-potable water.

Planning Phase

Denver Water's planning division will investigate possible alternatives to supply irrigation demands with non-potable. The objective will be to identify parks that are good candidates for conversion to non-potable by minimizing capital and operational and maintenance costs. Initial investigation of a potential non-potable project will include an assessment of the water supply availability, initial cost estimate and a water quality assessment.

Water Supply Assessment - A water supply assessment will be conducted to evaluate the reliability of the raw water source and to determine legal and administrative requirements. This assessment will be conducted by Denver Water's planning

department (water rights, groundwater and general planning), with input from the legal department.

Initial Cost Estimate - Design, construction, operations and maintenance, and legal/administrative costs will be estimated for the project. This estimate will be prepared by planning with input from engineering. This estimate will determine the feasibility of proceeding with the project.

Water Quality Assessment - The quality of non-potable irrigation water sources will be tested as to its intended use as irrigation water. Water Resources will coordinate this assessment. The Quality Lab, with input from Water Resources, will develop a water quality sampling program.

If a project is determined to be feasible, the planning department prepares a draft report that addresses such factors as demands, alternatives, probable costs, timing constraints and any other factors of consequence. A project attorney will be assigned to oversee legal aspects of the project, such as water rights applications and other agreements. Where non-potable water irrigation is to replace existing treated water taps, a determination will be made concerning abandonment or maintenance of existing treated water tap for backup purposes.

Design and Construction

The engineering division receives input on the project from Water Control and Conservation. The project engineer coordinates the review process and design approvals from each of the interested divisions. The project engineer continues to coordinate the project from this point to completion. Once the system is operational and all the monitoring is complete, the project engineer trains the parks department on the operational aspects of the system.

Donna Pacetti is water conservation specialist for Denver Water, Denver, CO.