Non-Traditional Sources and Uses of Water-Reuse

Introduction

Due to projected increases in population and potable water demand, the evaluation of non-traditional sources and uses of water is an emerging strategy to conserve available supplies of potable water.

The amount of water on the earth is fixed–water is not a renewable resource but it is reusable. Water is constantly used and reused through the hydrologic cycle, withdrawn from aquifers and streams, and placed back into the hydrologic system. Raw water withdrawn from a point of diversion is treated before use to the standards appropriate for that use; water treated to drinking water standards that are related to public health is termed potable water. Wastewater that has been used for private, municipal, industrial or commercial purposes must be treated to standards related to aquatic life, safety and recreational contact before discharge; usually back into the aquatic system that it came from.

The vast majority of public water supply systems treat all water to potable quality. In most homes, businesses and commercial locations, only a small percentage of potable water is actually consumed as drinking water. The majority is used for cleaning, irrigation and recreation.

Lower quality water, such as water with higher solids or salt, can be used to supply demand for uses such as landscape irrigation, car washing, fire-fighting, cooling water reuse and toilet flushing, thus preserving higher quality water for drinking. High quality wastewater effluent may also be able to replace potable water in some commercial and industrial uses. If additional treatment is required, this is typically done on-site through distillation, reverse osmosis or other technology.

Artificial recharge is a method to store water for later use. When surface water supplies are available, such as during river high flows, or during stormwater runoff events, water may be captured and diverted into aquifer storage for possible later use. Treated wastewater may also be used for this purpose.

Types of Water Reuse

Across the country, wastewater is used for cooling water, agriculture, industrial scrubbers, and boiler feedwater among other uses. Currently in Kansas, the primary permitted reuse of treated wastewater is for irrigation, generally supporting irrigation of parks, golf courses and other recreational areas. As of 2012, there are 167 permitted facilities authorized to reuse treated wastewater. One hundred and thirty seven facilities (including one federal and 35 industrial facilities) are authorized to use wastewater effluent for irrigation of grass or agricultural land. One commercial and 24 municipal facilities are authorized to irrigate golf courses and other public use areas such as parks, ball fields and cemeteries. One facility is authorized to use effluent for cooling water for a bio-diesel plant, one for in-plant equipment wash down and one for an emergency discharge.

Irrigation accounts for about 86% of all reported water pumped or diverted in the state. Using wastewater or other non-traditional sources of water for irrigation of agricultural land could have a significant impact on fresh water use.

An opportunity for industrial water reuse exists in energy production Ethanol production, like many industrial and agricultural practices, involves a consumptive use of water. A 50 MGY ethanol plant uses about 200 MGY of water (or about 550,000 gallons per day), primarily due to evaporation during cooling and wastewater discharge. As new facilities are sited and current facilities are improved, they can be designed for water reuse. Reuse of treated wastewater and reuse of biofuel process water could replace the use of fresh water to dome degree.

Oil and gas production water reuse could include hydraulic fracturing of reservoir rock and enhanced oil and gas recovery which uses between 2 and 4 million gallons per well.

Artificially recharging the Equus Beds aquifer, which underlies the City of Wichita well field, is being utilized to meet the region's current and future demands. Diverting water from the Little Arkansas River when flow in the river exceeds base flow, treating the water to drinking water standards, and artificially recharging the treated water into the Equus Beds aquifer through injection wells and recharge basins is an example of a successful non-traditional water use strategy. In 2007, over 350 million gallons were recharged into the aquifer through this project. An additional benefit is the artificial recharge creates a hydraulic barrier in the groundwater, thus blocking migration of saltwater plumes from the Burrton oil field into the aquifer region of the city well field. Additional potential locations for artificial recharge in the state could be identified.

Barriers and Limitations to Reuse and Use of Nontraditional Sources

Protection of human health is the primary concern when developing and implementing a water reuse program. KDHE identifies several standard management practices for reuse of treated domestic wastewater when it will be applied to public areas such as golf courses or parks. Typical protective practices include an increased degree of disinfection, application of the treated wastewater when public access is restricted and posted warnings against swimming in or drinking ponded wastewater. Use of wastewater for irrigation of crops produced for direct human consumption is not permitted by KDHE. Monitoring of the treated wastewater is required using EPA approved methods and KDHE certified laboratories if applicable.

Salt accumulation may be a factor when evaluating the potential for water reuse, especially on golf courses and in agricultural irrigation. Water softening and other activities can add substantial amounts of sodium chloride to the wastewater. Typical wastewater treatment processes in use today often do not remove or manage inorganic salts. Facilities choosing to irrigate with treated wastewater may need to alter plant species selections or use other methods to address total dissolved solids, sodium and salinity in effluent.

The use and disposal of pharmaceuticals and personal care products entering wastewater systems and surface water is an emerging concern for wastewater treatment. Wastewater treatment plants are designed to remove conventional pollutants such as suspended solids and biodegradable compounds, but they are not designed to remove low concentrations of synthetic pollutants, such as pharmaceutical compounds. Depending on the purpose and application of treated wastewater, the effect and mitigation of these contaminants needs to be considered.

Negative public perception may be the biggest barrier to reuse of wastewater. An early example of water reuse occurred in Chanute, Kansas, located adjacent to the Neosho River which serves as its drinking water supply source. When the Neosho River ceased flowing in 1956 treated wastewater was further treated to drinking water standards and used as a potable water supply. Although the water was safe to drink, aesthetic issues resulted in public concern about its quality. Treatment technologies have advanced a great deal in the past 55 years since this incident addressing aesthetic issues. Community involvement and public education are important components in developing large scale wastewater reuse projects in the state. In some states, public perception of utilizing reused water to augment potable water sources, even in an indirect manner, has prevented some projects from implementation.

Under the rules and regulations of the Kansas Water Appropriation Act, consumptive use cannot increase after a water right has been perfected.

Consideration of the potential impacts of water reuse to downstream users is needed to ensure water reuse activities do not negatively impact the regional water supply.

Water reuse and the associated change in the amount of water returned to the natural system may impact instream habitat and flow requirements of aquatic organisms. Consideration of the potential impacts to instream habitat and species viability is needed to ensure that water reuse measures do not negatively impact instream use.

Other limitations to the use of non-traditional sources are the uncertainty of water availability for reuse and the proximity to an area or facility for reuse.