Providing Leadership to the Industry for Research, Permitting, and Implementation

Direct Potable Reuse is Augmenting Potable Water Supplies

Although our planet has significant amounts of water, only about 3 percent is in the form of fresh water (surface or groundwater) that is readily usable for human consumption. With an exploding global population and changing drought patterns, reclaiming wastewater can result in a significant new water supply.

The practice of water reuse has been implemented for hundreds of years all over the globe to irrigate crops, landscaping, and even for domestic water supply. In recent years, communities in the U.S. facing severe drought conditions and dwindling water supplies are looking to turn municipal wastewater into potable water using advanced technologies and fail-safe monitoring.

Wastewater reuse as a potable water supply has a long history in the United States due to wastewater discharges to surface waters that become the water supply for downstream communities. This common practice is termed “defacto” reuse. In defacto reuse, the stream acts as an environmental buffer between the point of discharge and the point of use.

Indirect potable reuse (IPR) is the next level of potable reuse. IPR is most commonly implemented through groundwater recharge projects using surface spreading (percolation) or direct injection into the groundwater. Here, the ground acts as the environmental buffer, provides a measure of treatment, and allows for water quality monitoring. A recent study by the National Research Council found that potable reuse through surface spreading or groundwater injection provides a greater level of public health protection than typical drinking water treatment of existing surface water supplies.

Direct potable reuse (DPR) involves high-level treatment and direct introduction of the purified water into the water supply, with no environmental buffer. Independent research, some of which is detailed here, has demonstrated that DPR can be implemented in a safe manner, consistent with public health standards.

Carollo Engineers has been at the forefront of IPR, with significant work in its research, planning, and permitting. Now, as part of the latest work in Texas, New Mexico, and California, Carollo is addressing the increased challenges of DPR. Several critical DPR projects have been implemented by Carollo.

Texas

In the U.S., DPR begins in Texas. Extreme drought conditions have forced cautious utilities across Texas to move quickly to DPR, beginning with the project known nationally as “Big Spring.” The Colorado River Municipal Water District began DPR in the Spring of 2013. The raw water production facility in Big Spring resembles the Orange County Water District’s groundwater replenishment system, with one key difference—no environmental buffer. The Texas Water Development Board recently retained experts at Carollo to provide a detailed and extended evaluation of the Big Spring DPR process, including an analysis of each treatment barrier and a determination of pathogen and pollutant removal. Carollo’s work will support broad acceptance of DPR in Texas through demonstrated treatment efficacy and cost-effective process monitoring.
New Mexico

Another key DPR project is in Cloudcroft, New Mexico. This small community has contracted with the National Water Research Institute (NWRI) to bring together a panel of experts to evaluate how to safely implement DPR in New Mexico (in general) and Cloudcroft (in particular). NWRI has been a steady hand for IPR projects throughout California, and this new national role will help Cloudcroft rapidly implement its project. NWRI has asked Carollo to be one of three key national DPR experts for this critical New Mexico project.

California

The California Legislature has declared that the California Department of Public Health must reach consensus on the feasibility of DPR in California by 2016. The key to such a determination is the completion of research demonstrating that potable reuse can be implemented in a safe and reliable manner. Carollo is the principle investigator or co-principle investigator on four leading-edge DPR research projects in the areas of risk mitigation, treatment technology, and monitoring.

• WaterReuse Research Foundation 11-10 – Application of Risk Reduction Principles for Direct Potable Reuse. This project, which included a team of risk reduction experts from nuclear, structural, and aerospace engineering—yes, NASA, this is rocket science—evaluated how to make DPR safe and reliable. Key conclusions included incorporating hazard analysis into design, developing better online monitoring, and replacing the environmental buffer with a form of engineered storage.

• WaterReuse Research Foundation 11-02 – Equivalency of Advanced Treatment Trains for Direct Potable Reuse. This project includes pilot testing of industry best available technology (BAT) and emerging lower-cost technologies for DPR. Products of the research include a report on the state-of-the-science for indirect potable reuse (IPR) and a detailed analysis setting the treatment standard for IPR and DPR.

• WaterReuse Research Foundation 12-06 – Guidelines for Engineered Storage for Direct Potable Reuse Systems. This key research identifies how to replace the environmental buffer with engineered storage, including a framework that allows for reduced engineered storage based upon improvements in online monitoring. A second equally-important component of this work is the first foray into public perception of DPR, including a professional animation describing potable reuse to the public, called “The Ways of Water.”

• Water Research Foundation Project 4536 – Blending Requirements for Water From Direct Potable Reuse Treatment Facilities. This critical DPR project investigates the water quality, public health, and corrosion impacts of mixing different qualities and amounts of reclaimed water with raw water supplies. The research includes analysis of pathogens, trace pollutants, and antibiotic resistance gene transfer.

Carollo’s potable reuse research is being effectively applied to our utility clients, including potable reuse pilot-testing, permitting, and facility planning/case studies for IPR and DPR. California clients working with Carollo on potable reuse include the Santa Clara Valley Water District, the West Basin Municipal Water District, the Los Angeles Bureau of Sanitation, the Encina Wastewater Authority and the cities of Ventura, Oxnard, San Diego, and Escondido.

Carollo has conducted pilot testing on the latest DPR technologies for the WaterReuse Research Foundation and several clients in California.