SCIENCE & TECHNOLOGY (S&T)
PILOT PROJECT

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A pilot project is now up and running to study the effectiveness of treating Central Arizona Project (CAP) water with slow sand filtration and reverse osmosis, and how to beneficially use the concentrate generated by reverse osmosis, a membrane filtration technology. This study is a continuation of a previous study that found slow sand filtration could be an effective, low cost treatment option. The study is anticipated this study will continue to run until at least July 2008.

The study is funded by a Science and Technology grant from the U.S. Bureau of Reclamation (BOR). Metro Water District, along with the other Northwest water providers – Marana, Oro Valley, and Flowing Wells Irrigation District – wants to determine the best treatment for CAP water. Since the 1990s, the four water providers have been meticulously exploring the best approach to using their renewable water supplies and move away from dependence on groundwater.

"Our research has found that treating and delivering CAP water was the most efficient and effective way to use our renewable supply," said Mark Stratton, Metro's General Manager. "This study will provide important data as to the water quality results from these treatment options."

The University of Arizona (UofA) is actively participating in the study. Both the UofA and BOR are providing welcomed assistance because of their expertise, unbiased evaluation, and regional perspective in dealing with water quality and salinity issues. Also, Tucson Water is providing analytical testing. The study builds on a previous BOR grant completed in 2002 that proved slow sand filtration to be an effective treatment process at an estimated 25% less than the cost of other standard filtration treatments.

"With increasingly stringent regulations for water quality treatment, combined with the long-term impacts of increased salinity, this study will provide valuable information for water providers interested in an affordable, environmentally friendly treatment that produces high quality water," said Chris Hill, Metro's Deputy Manager and Site Coordinator for this study.

At the study site, water from the CAP canal is taken out and placed in slow sand filtration beds. The water is then pumped to a special research trailer and treated again through a reverse osmosis process. The treated water is measured for various water quality standards.

As a treatment by-product, reverse osmosis (RO) produces a brine concentrate. Since concentrate disposal represents half the cost of RO treatment, this pilot study investigates the irrigation of halophytes, plants that can grow with mixed salt and fresh (brackish) water. Therefore, in addition to water quality, this study is also investigating if halophyte irrigation is a cost-effective and implemental alternative for concentrate management.

Local water quality concerns with CAP water have meant that Metro Water and the other Northwest water providers have proceeded with caution in fully utilizing their allocations of CAP water. Other water providers in the Southwest, including Phoenix, Las

Vegas, southern California and El Paso, have also been faced in dealing with salinity, arsenic, and perchlorate challenges. The technology used in this study can be transferred to many cities and towns across the Southwest. Due to the simplicity of the operation of slow sand filtration, this technology can also be used by rural and Native American populations.

This study is simultaneously happening in conjunction with another cooperative study being conducting in Yuma. The main difference between the two studies is the investigation of using halophyte irrigation as a concentrate disposal option. Salt management through a combination of RO for treatment of Colorado River water and irrigation of salt tolerant crops for concentrate disposal will allow reuse of Colorado River water for consumptive uses such as agriculture and landscape irrigation.

"We are looking at something innovative," said Hill. "Early results are positive for a cost-effective combination for treatment and concentrate disposal. In the future, we will attempt to determine the feasibility of alternatives to slow sand filtration by investigating a variety of membrane treatment options such as micro and ultra filtration."

"Whatever treatment method of CAP water we decide upon, it will meet two foremost objectives - meeting all water quality standards and be cost effective," said Stratton. "This study, along with other technology, will help Metro deliver CAP water at the quality our customers have come to expect. While much more work is necessary before we treat and deliver CAP water, we know we cannot rely forever on our groundwater."

<u>Photo 1</u> – HDPE liner fabrication for the halophyte plots (40 mils) and the SSF filter cells (60 mils). Over 9,000 feet of liner were fabricated on site for use in the halophyte plots and slowsand filters.

Photo 2 - View of one of two plots that will be used to evaluate growing halophytes to manage concentrate produced during RO treatment. Each plot is lined with 40-mil HDPE geomembrane. The 6-foot diameter manholes will be used to monitor irrigation water applied to the plants.

Photo 3 - 40-mil HDPE liner installed for halophyte plot. Over 3,800 square feet of liner was used for each of the two plots.

Photo 4 – The lined plots were divided up into sections to monitor water uptake using a variety of plant species.

<u>Photo 5</u> - View looking north of the lined and backfilled halophyte plots. Salt tolerant plants will be planted on top of the soil.

<u>Photo 6</u> – Replacement slow sand filter being installed. As shown, one sand filter is concrete. Another sand filter, not shown, is semi-burried with liner and framing.

<u>Photo 7</u> – The finished product- lined plots awaiting irrigation piping and planting.