

Monitoring with Lysimeters to Assess Regulatory Compliance with Recycled Water Recharge, Inland Empire Utilities Agency

Background

The Inland Empire Utilities Agency (IEUA), originally named the Chino Basin Municipal Water District, was formed to supply supplemental water to this region. Since its formation, the Agency has expanded its areas of responsibility from a supplemental water supplier to a regional wastewater treatment agency with domestic and industrial disposal systems and energy recovery/production facilities. In addition, the Agency has become a recycled water purveyor, biosolids/fertilizer treatment provider and continues as a leader in water supply salt management, for the purpose of protecting the regions vital groundwater supplies.

Rapid urban growth in Southern California leaves the region’s water agencies no choice but to elevate the supply of safe and reliable water as the top priority issue facing the region. The Southern California Association of Governments (SCAG) reports that Southern California’s population increased by more than – 12

percent from 1990 to 2000 – an influx of almost two million people. The population of Riverside and San Bernardino Counties – collectively known as the “Inland Empire” – grew by an astonishing 26 percent! The IEUA, the Chino Basin Watermaster (CBWM), the Chino Basin Water Conservation District (CBWCD), and the San Bernardino County Flood District (SBCFD) are working together to expand and improve 19 recharge basins to enhance the agencies’ ability to capture and recharge stormwater, recycled water, and imported water. These sources of water supply will be recharged into the Chino groundwater basin and will ensure the stakeholders that the region is drought-proofed to the greatest extent possible.

With the efforts of the IEUA, the recharge basin enhancement and expanded recycled

water projects will produce 95,000 acre-feet of new water annually, enough to meet the needs of 300,000 new residents. Recharging recycled water into a potable groundwater basin, required that the current Basin Plan had to be first reviewed, evaluated, and ultimately amended. Secondly, the groundwater quality objectives for the basin had to be raised through a rigorous methodology that was consistent with state law.

The Santa Ana Water Quality Control Plan (Basin Plan) that was in force when the project was being considered was last modified in 1995. The Basin Plan is adopted and administered by the Regional Water Quality Control Board, Santa Ana Region (Regional Board). The Basin Plan is the basis for the Regional Board’s regulatory programs



Lysimeters used to monitor compliance



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and establishes water quality standards for all groundwater and surface waters of the region.

The Porter-Cologne Water Quality Control Act (Division 7 of the California Water Code), and the Federal Clean Water Act both mandate periodic review of these basin plans. Section 13240 of the Water Code requires, "Each regional board shall formulate and adopt water quality control plans for all areas within the region. Such plans shall be periodically reviewed and may be revised."

The Nitrogen/TDS Task Force (Task Force) was formed in 1995-96 to conduct studies regarding the TDS and nitrate-nitrogen objectives and other components of the N/TDS management plan due to the concern of watershed stakeholders that were questioning the validity of the Basin Plan. The Santa Ana Watershed Project Authority coordinated the task force, which is comprised of 22 water supply and wastewater agencies throughout the region. Regional Board staff members were active participants in this effort. Findings

and recommendations based on the Task Force studies were presented to the Regional Board at numerous public workshops during the course of the studies. The Task Force recommendations for changes to the TDS and nitrate-nitrogen water quality objectives for groundwater within the region are based on consideration of factors specified in Water Code Section 13241 and the state's antidegradation policy (SWRCB Resolution No. 68-16). The economic implications of all recommended changes to the N/TDS management plan were also considered.

In certain groundwater basins in the watershed, the TDS and nitrate objectives were raised to allow the recharge of recycled water. IEUA had to demonstrate to the regional board that raising the objectives would be consistent with the maximum benefit to Californians, would not unreasonably affect present and anticipated beneficial use of such water, and would not result in water quality less than that prescribed in the basin plan amendments.

These amendments will ensure the reasonable protection of the beneficial uses of surface and groundwaters within the region and are consistent with the state's antidegradation policy (SWRCB Resolution No. 68-16). On 8 September 2004, the State Water Resources Control Board approved the basin plan amendment, which was subsequently approved by the Office of Administrative Law and US Environmental Protection Agency.

Lysimeters Monitor Compliance

Two California state regulatory agencies – the Regional Board, and the State Department of Health Services (DHS) – provide oversight of the Chino Basin Recycled Water Groundwater Recharge Program. The DHS



Lysimeter installation in Turner Basin



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has been developing draft regulations for the recharge of recycled water. Early versions of these proposed regulations required the project proponent to drill and install monitoring wells in the recharge “mound” beneath the recharge basin to demonstrate - reduction of total organic carbon and total nitrogen to concentrations specified in the permit. A groundwater mound is the local rise of the water table above its natural level resulting from a localized source, such as a recharge basin.

WEI installed lysimeters in the bottom of the recharge basins to ensure that samples

collected are truly representative of the recharged water. WEI recommended that the DHS consider permitting the use of lysimeters to monitor compliance with the recharge permit. A lysimeter consists of a porous cup and reservoir installed in unsaturated soil that collects undiluted samples of recharge water prior to reaching the regional groundwater table.

WEI installed these lysimeters directly in the bottom of the recharge basins to ensure that samples collected while the recharge basin is being operated are truly representative of the recharged water. The lysimeter also has two tubes that run up

the casing to the lysimeter head assembly. Conduits route the tubes to lysimeter head assemblies that were constructed on the top of the recharge levee.

Lysimeter sample collection procedures are

straightforward. Upon installation below ground level, a vacuum is applied to the lysimeter through the tubing leading from the lysimeter to the ground surface. The negative air pressure created inside the lysimeter draws pore water into the lysimeter through the porous, stainless steel section of the lysimeter. The pore water is brought to the surface by applying positive pressure to the lysimeter through a second tube. At the surface, the pore water is collected in a collection bottle.

TOC concentrations decreased by 70 percent to 80 percent from the recycled water at the surface to the 25-ft deep lysimeter following soil-aquifer treatment (SAT) processes.

After months of biweekly sampling, IEUA and the CBWM found a consistent 70 to 80 percent reduction in TOC concentrations from the recycled water at the surface to the deepest (25 feet) lysimeter due to processes related to SAT. Total nitrogen concentrations from IEUA's advanced treatment plants are extremely low and already meet permit requirements, thus lysimeter compliance demonstration is not necessary.



Lysimeters installation at Turner Recharge Basin