



Land Subsidence Monitoring Program, Chino Basin Watermaster

Background

The Chino Basin Watermaster (CBWM) is a consensus based organization that facilitates the development and utilization of the Chino Basin. The CBWM's mission is to manage the Chino Basin in the most beneficial manner and equitably administer and enforce the provisions of the Chino Basin Adjudication. The Chino Basin, a large, adjudicated groundwater basin, located in southern California, is a large alluvial groundwater basin with storage in excess of six million acre-feet. The Chino Basin is located in San Bernardino, Riverside, and Los Angeles Counties. The basin has a long history of groundwater development dating back to the early 1900s.

As a result, piezometric heads declined during the past century – in some areas by more than 200 feet. Declines of this magnitude typically cause irreversible aquifer-system

compaction, which in turn results in subsidence at the ground surface. Land subsidence is the lowering of the land-surface elevation from changes that take place underground.

Ground Fissuring

An area underlying Chino, California has experienced ground fissuring as early as 1973, but an accelerated occurrence of ground fissuring ensued during the early 1990s, which has damaged existing infrastructure

and poses concerns for new development.

A common cause of ground fissuring within alluvial basins is due to the removal of subsurface fluids resulting in compaction of poorly-consolidated aquifer materials and land subsidence. Chino Basin Watermaster (CBWM), the basin manager, has recognized that land subsidence and ground fissuring should be minimized to the extent possible, through groundwater management practices. At the same time, CBWM is implementing basin-wide storage



Piezometers and Extensometers

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and recovery programs that include temporary short-term overdraft and the possibility of causing substantial head declines in the areas of historic subsidence and fissuring. The CBWM implemented a technical investigation to characterize the extent, rate, and mechanisms of subsidence and fissuring in the Chino Basin.

Monitoring Program Design

Wildermuth Environmental Inc. (WEI) designed and implemented a monitoring program to collect the information necessary to

understand the extent, rate, and mechanisms of subsidence and fissuring in Chino.

The program consisted of three main elements that include conventional surveying of benchmark monuments, analysis of remote sensing

imagery, and monitoring of the aquifer-system with piezometers and extensometers.

The benchmark surveys and the remote sensing analyses measured the deformation of the land surface. The aquifer-system monitoring measured the hydraulic and mechanical changes within the aquifer-system that caused the land surface deformation. The data collected and analyzed as part of this effort is currently being utilized to develop

effective management tools (e.g. computer models that simulate groundwater flow and land subsidence) and, ultimately, a long-term management plan that will minimize or completely abate ground fissuring and subsidence in Chino.



Piezometers and Extensometers



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