

Managing Land Subsidence and Ground Fissuring within an Alluvial Groundwater Basin Being Used as a Storage and Recovery Reservoir

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The Chino Basin, located in southern California, is a large alluvial groundwater basin with storage in excess of six million acre-feet. 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. In a portion of Chino Basin, land subsidence has been accompanied by ground fissuring, which damaged existing infrastructure and poses concerns for new development.

Chino Basin Watermaster, 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, Watermaster is implementing basin-wide storage 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.

Watermaster has implemented a technical investigation to characterize the extent, rate, and mechanisms of subsidence and fissuring in Chino Basin. The investigation employs ground-level surveying of benchmarks and remote-sensing analyses to monitor ground surface deformation, and borehole extensometers and piezometric monitoring to establish the relationships between groundwater production, piezometric levels, and aquifer-system deformation. These data are being used to create numerical groundwater flow and subsidence models that will then be used to design long-term management strategy. Future plans must address the subsidence and fissuring phenomena while accommodating basin-wide storage and recovery programs.

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