

Executive Summary of Critical Issues

Topic – Subsidence

Last Update
July 17, 2007

CAP Position

The CAP canal continues to be adversely impacted by land subsidence as a result of groundwater pumping in the Paradise Valley Basin located in the northern portion of Scottsdale and Phoenix. Subsidence in the vicinity of Via Linda Road Bridge and near Scottsdale Road has threatened to restrict CAP's ability to deliver water to customers during the peak summer demand period. Subsidence also increases the risk of overtopping the canal due to the loss of freeboard (the area between the water surface and the top of the canal lining needed to safely operate the canal).

Although Arizona's Groundwater Code regulates groundwater pumping within the Phoenix AMA, the combination of local and regional groundwater withdrawals has created significant groundwater level declines resulting in subsidence impacts to the CAP aqueduct. Additionally, new municipal production wells are being constructed to serve the rapid growth in the northeast valley, potentially exacerbating the subsidence problem. CAP has implemented emergency repairs by raising the canal lining in the most critical areas to ensure continued uninterrupted water deliveries in the near-term while proceeding with a long-term subsidence study to more accurately define the location, rate and magnitude of subsidence and identify appropriate solutions. Scottsdale and Phoenix are cooperating with CAP on the subsidence study.

Summary of Issue

Freeboard loss was first detected in north Scottsdale near the Via Linda Road Bridge in June 1999. Approximately 1.4 feet of subsidence has occurred in this area raising the water level to within a few inches of the top of the canal lining. In response, CAP raised the canal lining three feet over a one-mile segment of affected area at a cost of \$350,000. An earth fissure was also found in this area but is currently not threatening the canal. A second and much larger subsidence area was later identified near the Scottsdale Airpark. This elongated subsidence area extends northwest into Phoenix and up to 1.2 feet of subsidence has occurred near the Scottsdale Road Bridge. The canal lining will be raised in this area at an estimated cost of \$820,000. Recently, a third subsidence area has been identified east of the Scottsdale Airpark in the Scottsdale WestWorld area.

In 2003, the CAP Water Planning Department initiated a multi-year subsidence investigation to determine the magnitude, rates, and possible causes of the subsidence. The cities of Scottsdale and Phoenix provided hydrologic data, including a computer model and future water use projections as their contribution to the study. Scottsdale also has reduced groundwater pumping and increased recharge in an effort to reduce the subsidence rate, partly in response to CAP's effort in raising their awareness to the problem.

In January 2005 staff presented preliminary findings of the CAP subsidence study at a Board Work Study session. Preliminary results of CAP's study indicate that subsidence is primarily due to compaction of extensive clay deposits in the groundwater basin as a result of pumping-induced water level declines. Historical and current groundwater withdrawals have caused partial dewatering of the clay deposits leading to the compaction observed today.

Since 2000, CAP management and staff have met with the cities on numerous occasions to discuss the subsidence problem and its impact to the CAP system. In response, Scottsdale has reduced groundwater pumping, which has recently reduced the rate of subsidence in some areas. However, it is not certain whether the reduced subsidence can be sustained over time. Preliminary long-term projections suggest continued subsidence along the portion of the canal that crosses the Paradise Valley Basin. Collection of field data including gravity surveys, satellite imagery, groundwater levels, aquifer tests and construction of two 1,000 foot deep monitoring wells was used to construct a subsidence model to allow CAP to more accurately project future subsidence so that appropriate cost-effective mitigation measures can be planned. Results from the subsidence model, developed through a joint funding agreement with the U.S. Geological Survey, suggest that subsidence will likely continue in the Paradise Valley Basin. However, mitigation through reduced groundwater pumping or targeted recharge may reduce the long-term impacts of subsidence in the area. Staff will prepare a long-term monitoring and mitigation plan for the Paradise Valley Basin in 2008. In addition, staff are preparing to re-evaluate the CAP system for vulnerability to subsidence.