

# Safford District Regional Hydrogeologic Studies

Safford, Arizona

## CLIENT

Freeport-McMoRan  
Safford, Inc. (Phelps Dodge  
Safford, Inc. prior to 2007)

## HIGHLIGHTS

- Long-term client
- Perform monitoring and modeling activities for mine permitting and environmental management
- Support groundwater exploration and development

Members of Clear Creek have been involved in several phases of hydrogeologic investigation and groundwater exploration at the Safford Mine since the mid-1990s. Clear Creek's two primary tasks are monitoring and modeling activities for mine permitting and environmental management, and groundwater exploration and development.

Clear Creek provides senior-level consulting services regarding the Monitor, Model, and Mitigate (3M) Program required by the Environmental Impact Statement (EIS) for the Safford District. 3M uses measurements of groundwater levels from numerous monitor wells combined with evaluation of computer modeling to determine the potential impact of pumping groundwater for mine operations on the Gila River. Mitigation actions taken (field following) regarding potential impacts could be modified based on observed changes in water levels, re-calibration of the computer model, and predictions of future surface water impacts.

Services provided during work phases for groundwater exploration and development have included: hydrogeologic data review, surface geophysical surveys (including CSAMT), groundwater exploration drilling, logging, and down-hole hydraulic testing, well siting, design, construction oversight, and single-well and multi-well aquifer testing. Clear Creek's experience at Safford included the drilling, testing, and/or installation of 77 exploration borings, test wells, and production wells. A total of eight production wells were installed and tested. Some of the testing was conducted for as long as six months using high-speed, small diameter oil field pumps with variable frequency drives operating at rates up to 4,000 gallons per minute. The total length of drilling was approximately 117,000 feet (22 miles). The work overseen by Clear Creek staff resulted in the establishment of an adequate water supply of good quality water for the Safford mine operations.

Clear Creek continues to support the Safford Mine through ongoing evaluation of the sustainability of the groundwater resource. Given its unique characteristics, the fractured rock aquifer developed at the mine requires frequent re-evaluation to all prediction of changes in groundwater flow from production wells. Clear Creek has also been instrumental in the evaluation of the Lower Basin Fill (LBF) aquifer that lies just south of the mine in basin fill sediments. Clear Creek has assisted with development of several groundwater models over the years that have been used to evaluate the sustainability of the groundwater resource from each aquifer and to assess the potential long-term impacts to flow in the Gila River five miles south of the mine. In addition, the San Carlos Apache Tribe has agreements with Freeport concerning water rights and has an ongoing concern regarding impacts from Safford Mine pumping on groundwater resources on reservation lands. The district groundwater model is used to evaluate these impacts as well.



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