Chemical and hydrologic investigation of the intermediate aquifer in Harper Lake Basin, San Bernardino County, California

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Abstract

Harper (Dry) Lake Basin is part of the Centro Sub-area of the of the Mojave Water Agency area in the central Mojave Desert region of California. This project is a groundwater study of part of the basin conducted in conjunction with Ninyo & Moore, a local geotechnical and environmental consulting firm, who was contracted to evaluate groundwater resources and water quality in the area. This area has been the site of ranches, farms and agriculture since early in the early 20th century. Chemical and hydrologic data were collected over a nine month period from six wells on the property to determine reliability for domestic use. These six wells were all drilled to a depth of ~220 feet into a confined aquifer within Quaternary alluvium. A perched aquifer, separated by a 50 ft low permeability clay aquitard, lies above the aforementioned aquifer, while the fractured Black Mountain Basalt aquifer acts as the deep aquifer. The focus of this study is the condition of the intermediate aquifer. Groundwater flow in the region based on water table heights is from southeast to northwest, parallel to regional faults and the Harper Lake shoreline.

Chemical analyses of water from shallow groundwater wells were also incorporated into this study. Major cations and anions as well as arsenic, nitrate, and other key element concentrations were monitored for inherent water quality. Piper diagrams and charts were then created for interpretation of those concentrations in relation to Environmental Protection Agency (EPA) and California Department of Public Health Standards. Average total dissolved solids (TDS) from the intermediate aquifer were quite variable but in general the water is brackish to highly brackish. Systematic spatial variation was also found in major anions in the intermediate aquifer trending from south to north. Average concentrations for arsenic, boron, and nitrate exceeded EPA standards for a number of wells during the months of observation; however hexavalent chromium, known to be present in the groundwater 10 miles to the southeast has not tested positive in any of the wells at this site. Water levels were measured to calculate direction of flow.