

USGS Groundwater Study in the Elk Hills Oil Field Area Maps Aquifer Salinity Using Geophysical Logs

A U.S. Geological Survey (USGS) study in the Elk Hills Oil Field area uses geophysical logs to map groundwater salinity in the Tulare aquifer. The study "[Mapping aquifer salinity gradients and effects of oil field produced water disposal using geophysical logs: Elk Hills, Buena Vista and Coles Levee Oil Fields, San Joaquin Valley, California](#)" was published in *PLOS ONE*. The USGS is conducting this research under an agreement with the State Water Resources Control Board (State Water Board), in accordance with Senate Bill 4 (Pavley, statutes of 2013), which required the State Water Board to develop and implement a regional groundwater monitoring program. The objective of the scientific effort is to map salinity gradients in areas of oil and gas operations and adjacent groundwater resources; and identify risks of potential oil and gas fluid migration. Documentation of natural salinity gradients across large regions allows for both the identification of potentially useable groundwater and local anomalies in that gradient.

This study used data from existing oil field geophysical logs in Elk Hills and surrounding oil fields to map the gradual changes in natural salinity concentrations in the Tulare aquifer and mapped the deepest point in the aquifer where waters with less than 10,000 mg/L total dissolved solids exist as a 2-dimensional surface.

Anomalous salinity patterns in the Tulare aquifer were observed in the data from geophysical logs associated with existing wells located in a small area downgradient from the 18G waste produced water injection zone. These anomalies represent migration of more saline water and are clearly different from the natural gradient. The full extent of salinity migration cannot be determined from existing well logs and would require further investigation.

[Data associated with this report](#) are also available online.

Visit the State Water Board [Oil and Gas Regional Groundwater Monitoring Program](#) and [USGS California Oil, Gas, and Groundwater](#) websites for more information.