

# Inorganic, isotopic, and organic composition of high-chloride water from wells in a coastal southern California aquifer

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## Abstract

Chloride concentrations were as high as 230 mg/L in water from the surface discharge of long-screened production wells in Pleasant Valley, Calif., about 100 km NW of Los Angeles. Wells with the higher  $\text{Cl}^-$  concentrations were near faults that bound the valley. Depending on well construction, high- $\text{Cl}^-$  water from different sources may enter a well at different depths. For example,  $\text{Cl}^-$  concentration in the upper part of some wells completed in overlying aquifers influenced by irrigation return were as high as 220 mg/L, and  $\text{Cl}^-$  concentrations in water sampled within wells at depths greater than 450 m were as high as 500 mg/L. These high- $\text{Cl}^-$  waters mix within the well during pumping and produce the water sampled at the surface discharge. Changes in the major ion, minor ion, trace element, and  $\delta^{34}\text{S}$  and  $\delta^{13}\text{C}$  isotopic composition of water in wells with depth were consistent with changes resulting from  $\text{SO}_4$  reduction, precipitation of calcite, and cation exchange. The chemical and isotopic composition of high- $\text{Cl}^-$  water from deep wells trends towards the composition of oil-field production water from the study area. Chloride concentrations in oil-field production water present at depths 150 m beneath freshwater aquifers were 2200 mg/L, and  $\text{Cl}^-$  concentrations in underlying marine rock were as high as 4400 mg/L. High- $\text{Cl}^-$  concentrations in water from deeper parts of wells were associated with dissolved organic C composed primarily of hydrophobic neutral compounds believed to be similar to those associated with petroleum in underlying deposits. These compounds would not be apparent using traditional sampling techniques and would not be detected using analytical methods intended to measure contamination.