

Contaminant Transport in a Brine-Affected Aquifer at a Uranium Mill Tailings Site near Moab, Utah, USA.

D.M. Peterson, J. R. Ford, J. Moran

S.M. Stoller Corporation, Grand Junction and Broomfield, Colorado, USA

Contamination in the form of dissolved uranium and ammonia occurs in an alluvial aquifer beneath and down-gradient of a 12-million ton tailings pile on the west side of the Colorado River near Moab, Utah. Transport conditions are unique in that flow in the aquifer is greatly affected by high salinity, with much of the local groundwater consisting of brine (total dissolved solids [TDS] concentration $\geq 35,000$ mg/L). Though some high salinity can be attributed to historical leaching of the tailings, the largest TDS concentrations are apparently caused by natural dissolution of deep evaporite sediments. In past years, occurrences of TDS concentrations of 100,000 mg/L in groundwater on both sides of the river and uranium concentrations approaching 0.05 mg/L on the river's east side have prompted some investigators to suggest that tailings-related contaminants are flowing below the river and impacting a nearby wetlands preserve. Using hydraulic and chemical data for groundwater on both sides of the Colorado River and a numerical model of density-dependent flow and transport, we demonstrate that such sub-river flow is very unlikely and that the occurrence of dissolved uranium in the vicinity of the wetlands can be attributed to natural phenomena, not tailings-derived contaminants.

Some of the evidence used to correlate high salinity and dissolved uranium on the east side of the river with natural processes includes ratios of measured chloride and bromide concentrations and the concentration ratios of the isotopes uranium-234 and uranium-238. These data, combined with the observed spatial distribution of salinity on both sides of the Colorado River, infer that contaminants emanating from the tailings pile remain confined to and discharge only along the west side of the river. Contamination will not impact the wetlands preserve unless groundwater pumping east of the river greatly increases.