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Procedures for Quantifying the Salinity of Groundwater Using Well Logs

In many parts of the world, including the Southwest, desalinization of brackish and saline groundwater is now a viable source of potable water. These projects require an accurate determination of salinity in order to quantify available fresh, brackish, and saline water resources. In determining the water quality of an aquifer there is certainly nothing equal to a laboratory analysis of the water, but water analyses are usually not available for brackish to moderately saline waters.

In the absence of a water analysis, water quality can be calculated from well logs, which are much more abundant and more easily accessible than water analyses. In hydrocarbon-producing areas such as Texas and New Mexico, tens of thousands of logs are available for aquifers that only have a few water analyses. Thus logs are a valuable resource for groundwater studies.

Determining water quality from well logs has long been a subject of interest to log analysts. However, most of the research has been conducted by the petroleum industry and has centered on very saline and brine waters. Only a few papers have addressed techniques for quantifying the salinity of less saline waters. Techniques designed for very saline waters do not work for less saline waters due to the effects of surface conductance and divalent ions in the less saline waters.

In 1987 the Texas Water Development Board funded a six-year study of openhole logging techniques for characterizing groundwater resources. This paper summarizes some of the findings of the study. Techniques for calculating total dissolved solids (TDS) from logs for aquifers with waters less than 50,000 ppm TDS are reviewed.

Hughbert Collier's professional experience as a geologist and petrophysicist includes 20 years of consulting, research, technical support for litigation, and teaching throughout the United States. He has authored a dozen papers, including a textbook, **Borehole Geophysical Techniques for Determining the Water Quality and Reservoir Parameters of Fresh and Saline Water Aquifers in Texas**, Texas Water Development Board Report 343 (two volumes). After receiving B.S. and M.A.T. degrees in geology from Mississippi State University, he completed a Ph.D. in geosciences from the University of Texas at Dallas. His firm, Collier Consulting, Inc., conducts hydrogeological investigations throughout the United States.