

# A semi-analytical solution for transient streaming potentials associated with confined aquifer pumping tests

## Details

**Meeting** [2008 Fall Meeting](#)

**Section** [Hydrology](#)

**Session** [Hydrogeophysics: Methods, Models, and Applications IV Posters](#)

**Identifier** H51G-0918

**Authors** [Malama, B\\*](#), [Boise State University, 1910 University Drive CGISS/Department of Geoscience, Boise, ID 83725, United States](#) [Revil, A](#), [Colorado School of Mines, Department of Geophysics, Golden, CO 80401, United States](#) [Kuhlman, K L](#), [Sandia National Lab Carlsbad ORG-6712, 4100 National Parks Hwy, Carlsbad, NM 88220, United States](#)

**Index Terms** [Hydrogeophysics \[1835\]](#) [Modeling \[1847\]](#)

## Abstract

We present a semi-analytical solution for the transient streaming potential response of a confined aquifer to pumping at a constant rate through a fully-penetrating line sink. Confined aquifer flow is assumed to occur without fluid leakage from the confining units and is thus described by the solution of Theis (1935). The confining units, which are typically more electrically conductive than the aquifer, are treated as non-insulating in the development of the solution. A three-layer conceptual model is used to develop the solution for the transient streaming potential response of the aquifer and the confining units. The solution is fitted to field measurements of streaming potentials associated with a confined aquifer test performed at a site located near Montalto Uffugo, in the region of Calabria in Southern Italy. Estimates of hydraulic conductivity compare well to estimates obtained using only hydraulic head data. Estimates of aquifer specific storage and of the electrical conductivities of the confining units are also obtained. Our work indicates that, where observation wells are unavailable to provide more direct estimates of aquifer hydraulic conductivity and specific storage, self-potential data, collected at land surface, may be used to provide preliminary estimates of these hydraulic parameters quickly and cheaply.

**Cite as:** Author(s) (2008), Title, *Eos Trans. AGU*, 89(53), Fall Meet. Suppl., Abstract H51G-0918