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## Groundwater redox conditions and conductivity in a contaminant plume from geoelectrical investigations

V. Naudet<sup>1</sup>, A. Revil<sup>1</sup>, E. Rizzo<sup>1</sup>, J.-Y. Bottero<sup>2</sup>, and P. Bégassat<sup>3</sup>

<sup>1</sup>CNRS-CEREGE, Dept. of Hydrogeophysics and Porous Media, Aix-en-Provence, France

<sup>2</sup>CNRS-CEREGE, Dept. of Interfacial Chemistry, Aix-en-Provence, France

<sup>3</sup>ADEME, 2, Square La Fayette BP 406, Angers, France

E-mail for corresponding author: revil@cerge.fr

**Abstract.** Accurate mapping of the electrical conductivity and of the redox potential of the groundwater is important in delineating the shape of a contaminant plume. A map of redox potential in an aquifer is indicative of biodegradation of organic matter and of concentrations of redox-active components; a map of electrical conductivity provides information on the mineralisation of the groundwater. Both maps can be used to optimise the position of pumping wells for remediation. The self-potential method (SP) and electrical resistivity tomography (ERT) have been applied to the contaminant plume associated with the Entressen landfill in south-east France. The self-potential depends on groundwater flow (electrokinetic contribution) and redox conditions ("electro-redox" contribution). Using the variation of the piezometric head in the aquifer, the electrokinetic contribution is removed from the SP signals. A good linear correlation ( $R^2=0.85$ ) is obtained between the residual SP data and the redox potential values measured in monitoring wells. This relationship is used to draw a redox potential map of the overall contaminated site. The electrical conductivity of the subsoil is obtained from 3D-ERT analysis. A good linear correlation ( $R^2=0.91$ ) is observed between the electrical conductivity of the aquifer determined from the 3D-ERT image and the conductivity of the groundwater measured in boreholes. This indicates that the formation factor is nearly homogeneous in the shallow aquifer at the scale of the ERT. From this correlation, a map of the pore water conductivity of the aquifer is obtained.

**Keywords:** self-potential, redox potential, electrical resistivity tomography, fluid conductivity, contaminant plume

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