

Migration of nickel in a sandy aquifer downgradient from a liquid waste disposal site : organic complexation versus sulfide precipitation

ALAIN C.M. BOURG^{1*}, GEOFFREY M. WILLIAMS²,
MICHELLE P. BANNON³ AND CATHERINE CROUZET⁴

¹EA4592 Georessources and Environment, Geosciences Dept,
Univ. of Pau, BP 1155, 64013 Pau Cedex, France
(*correspondence: alain.bourg@univ-pau.fr)

²British Geological Survey, Keyworth, Nottingham NG12
5GG, UK

³Applied Environmental Research Centre, The Mill, Cromford,
Derbyshire, UK

⁴BRGM, BP 6009, 45060 Orléans Cedex 2, France

The behavior of heavy metals in aquifers downgradient from polluted sites is of major concern. We investigated a nickel plume originating from infiltration ponds near Birmingham (UK).

Multi-level samplers installed along a 300-m long transect enabled the collection of depth-specific groundwater samples. Two surveys 8 years apart were available on this site. Chloride and conductivity enabled us to locate the polluted plume, indicating a migration rate of ca. 30 m/year.

Amongst the many parameters analyzed, we identified dissolved organic carbon (DOC), dissolved inorganic carbon and dissolved sulfide as being relevant to the nickel transport. Chloride was used as a tracer of mixing of contaminated water and pristine water to identify the Ni solubility controlling processes.

During the 8-year interval, dissolved Ni and DOC (originally up to 100 $\mu\text{mol/L}$ and 100 mmol/L , respectively) decreased simultaneously by a factor of ca. 2. The Ni plume is limited in extension by zones rich in dissolved sulfide (up to 20 $\mu\text{mol/L}$).

The solubility and therefore transport of Ni away from the infiltration ponds is closely related to the presence of DOC. As DOC is consumed by microbiological processes, Ni is removed from solution by precipitation as sulfide.