Geophysical Research Abstracts, Vol. 9, 01512, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-01512
© European Geosciences Union 2007

Integrated methods in urban groundwater management - quantitative information fusion including geostatistical analysis of aquifer heterogeneity and groundwater modeling

J. Epting (1), P. Huggenberger (1), C. Regli (2), N. Spoljaric (1) and R. Kirchhofer (1)

(1) Department of Environmental Sciences, Applied and Environmental Geology, University of Basel, Switzerland, (2) GEOTEST AG, Davos, Switzerland

(jannis.epting@unibas.ch / +41-61-2673446)

Open space in urban areas is very rare and new infrastructure is increasingly constructed in the subsurface. Subsurface constructions may affect urban groundwater systems temporarily during construction as well as permanently after completion. This can result in considerable changes to regional hydrogeological regimes and groundwater quality. Generally, expected changes of hydrogeological regimes are regarded as limited to their vicinity, neglecting possible effects at the regional scale. Additionally, further stresses on the system, like nearby groundwater use and possible interactions with contaminated areas, are often not sufficiently taken into account.

To manage and protect urban groundwater adequately, a holistic perspective is necessary. This includes an evaluation of aquifer properties and an inventory of all impacts to the system (e.g. groundwater withdrawal and recharge, interactions with contaminated sites, construction of buildings and roads). Previously, decisions concerning impacts on urban hydrogeological regimes were typically taken at the level of the individual project. However, it is the sum of all impacts, and their interaction in time and space, that have to be considered.

Numerical methods greatly facilitate the consideration of the multitude of impacts in a complex environment. They allow evaluating and comparing constructional alternatives and groundwater management strategies as well as ensuring an adequate protection of groundwater resources.

In support of this approach methods were developed that allow to adequately quantifying the consequences of cumulative effects arising from the numerous decisions affecting the hydrogeological regime and groundwater quality. Additionally, profiles and development goals for specific urban groundwater areas are determined.

This study illustrates the integration of geostatistical methods into groundwater modeling during an ongoing tunnel highway construction in the city of Basel, Switzerland. Here urban groundwater resources are intensively used by industry and in the past, parts of this area was contaminated by industrial waste. The described approach includes the fusion of quantitative information, and results in the setup of a groundwater management system comprising (1) extensive groundwater monitoring; (2) development of a data base application, facilitating lithofacies-based interpretation of borehole data; (3) geostatistical analysis of the aquifer heterogeneity; (4) high resolution regional and local groundwater flow models and (5) a groundwater transport model.