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Hydrostratigraphic characterization of glaciofluvial deposits underlying an infiltration basin

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About 80 % of the European population lives in urban areas, and this percentage is in continuous increase (Biasioli *et al*., 2006). Thus urban soils are exposed to diverse contaminations of anthropogenic origin (heavy metals, hydrocarbons), largely transported by storm water. A large part of urban areas are located on quaternary sediments. For example, the urban area of Lyon, as most of the others of the Rhone river basin in France, is located on gravel deposits, of which notably glaciofluvial deposits.

Glaciofluvial sediments have a high mean hydraulic conductivity, and are privileged materials for storm water infiltration. They are also exposed to urban contaminants. Their natural heterogeneities can generate preferential flow paths, leading to a deep soils and water resources contamination. These heterogeneities represent major obstacles in prediction of contamination, due to the fact that this one requires a reliable knowledge of the spatial hydrofacies distribution controlling flow and contaminant transport. Conventional characterization methods (borehole, pumping tests) are not adapted to the characterization of these sand and gravel deposits and single geophysical methods often provide insufficient information to reveal decimetric structures on the lithofacies scale.

In order to define a distribution model of glaciofluvial lithofacies, we used an approach relying on the use of ground-penetrating radar (GPR) for the detection of architectural elements, coupled with a genetic interpretation of the radar stratigraphy. Every lithofacies was then associated to one hydrofacies, using a bibliographical database of hy-

drodynamic characteristics of glaciofluvial lithofacies (Klingbeil *et al.*, 1999; Heinz and Aigner, 2003). This method was tested on a storm water infiltration basin located east of Lyon in France. The basin covers an area of 1 ha, and the water table is 13 m deep. GPR investigations were carried out on two grids with lines oriented north-south (N-S) and west-east (W-E). The first area is 15m W-E x 6m N-S with line spacings of 1.5 m EW and 1 m NS and the second one is 15m N-S x 8m W-E with line spacings of 1 m in each direction. The GPR profiles were calibrated (depth, reflector type) using a sedimentological description of foot walls from an excavation.

The analysis of radar profiles allowed delimiting the architectural elements consisting mainly of cross-bedded trough fills. Within these structural elements, four glaciofluvial lithofacies, characterized on foot walls, were used to set up a lithofacies distribution model. These lithofacies were related to corresponding hydrofacies using the bibliographical database. The hydrofacies spatial distribution model will be used to estimate groundwater flow within the glaciofluvial deposits.

Keywords :

glaciofluvial deposits, heterogeneous flow, ground-penetrating radar (GPR), architectural elements, lithofacies, hydrofacies

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