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author(s): **Stanko Ruzicic**
Faculty of Mining, Geology and Petroleum Engineering, Croatia,
stanko.ruzicic@rgn.hr

Goran Durn
Faculty of Mining, Geology and Petroleum Engineering, Croatia,
goran.durn@rgn.hr

Marta Mileusnic
Faculty of Mining, Geology and Petroleum Engineering, Croatia,
marta.mileusnic@rgn.hr

Michaela Hruskova
Faculty of Mining, Geology and Petroleum Engineering, Croatia,
michaela.hruskova@rgn.hr

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The object of this study is unsaturated zone of unconfined Quaternary aquifer (Fig.1), located below Zagreb, capital of Croatia. Unsaturated zone consists of Pleistocene aeolian sediments and alluvial and proluvial Holocene sediments. Hydromorphic soils of different hydromorphic regime prevail in the Sava River valley. Sediments along the Sava River form the recent fluvial terrace, while Molic Fluvisols, Calcaric Fluvisols, Eutric Cambisols on Holocene deposits, and Eutric and Calcic Gleysols (FAO 1990), are developed on the Holocene terrace Romić and Romić (2003).

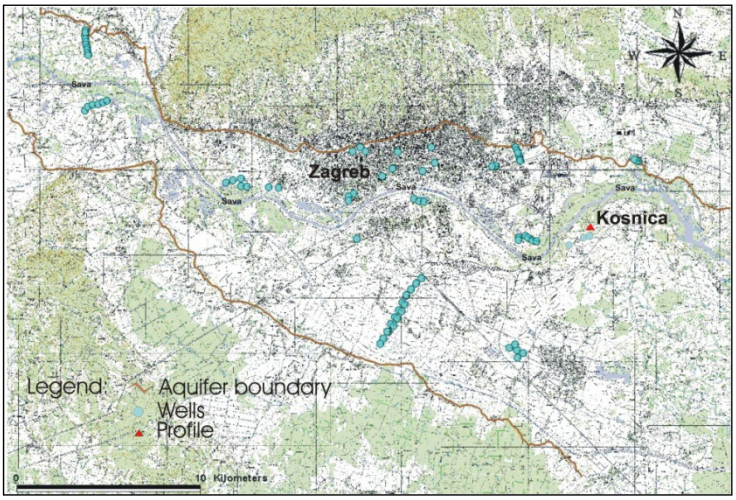

Figure 1. Simplified map of Zagreb aquifer boundaries and wells. Source: Croatian Water Resources Management.

Romić and Romić (2003) already showed that the distribution of trace elements in soils of investigated area is primarily controlled by: (a) geology, (b) industrial impact—traffic, heating plants, chemical industry and airports and (c) external factors—some trace elements are brought by the Sava River, which has been exposed to intensive pollution by mining, industries and towns in its upper course recently. A portion of trace elements is wind-blown from the industrial region of north Italy Antonić and Legović, (1999). The goal of this study is detail sedimentological and pedological description of complete vertical profile through unsaturated zone and 1D modeling of water flow and solute transport.

Investigated profile is located in (45˚76' N; 16˚08' E) second zone of sanitary protection of the water abstraction site Kosnica (Fig. 1), about eight hundred meters from Sava river. This profile consists of two parts (Fig. 2).

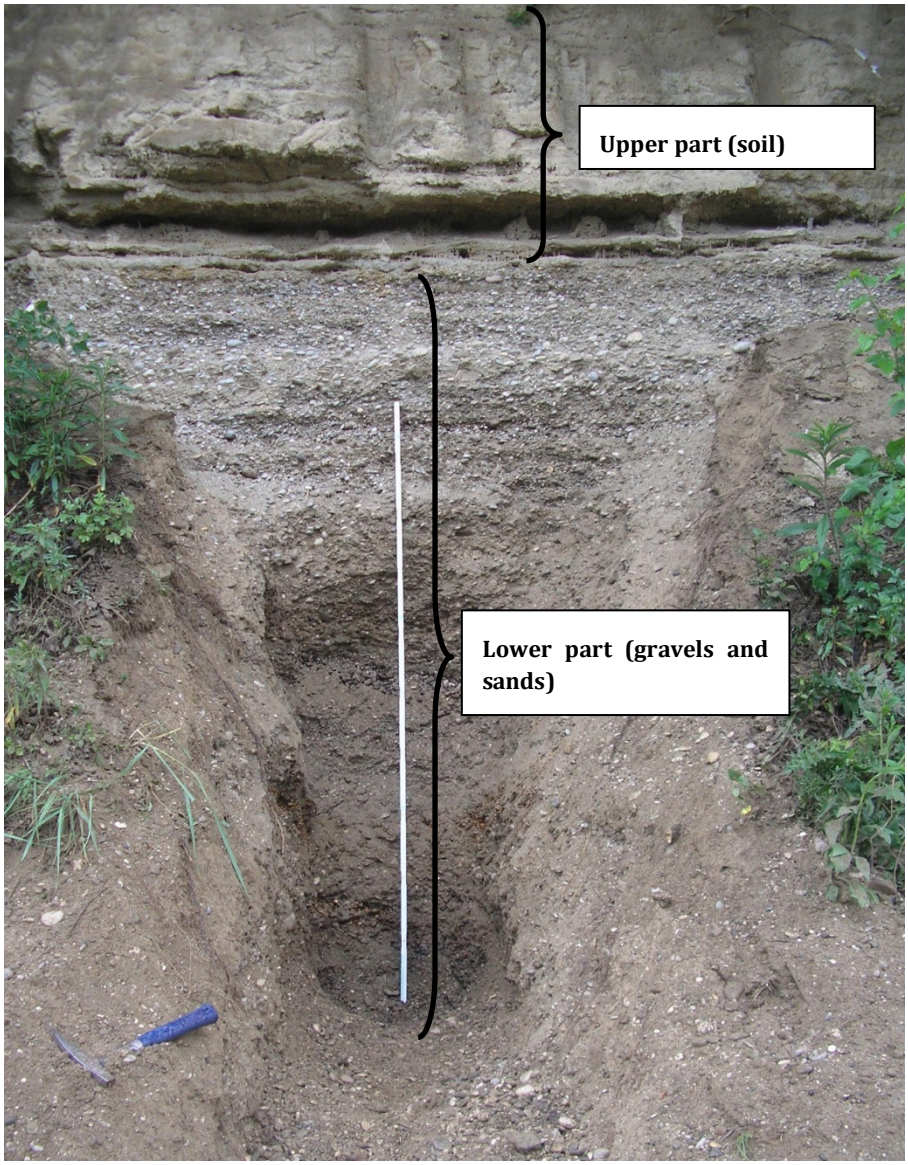

Figure 2. Unsaturated zone profile (upper part - soil; lower part - gravels and sands). White label presents scale of two meters. Photo: Stanko Ružičić.

First part (upper 2.5 meters) is hydromorphic soil, which is developed on alluvial sediments. These types of soils emerge in river valleys on alluvial deposits after flooding. Structure of this type of soils is mainly loamy, in some parts clayey with loam. Second part (lower 2.7 meters) are unsorted alluvial sediments, which consist of gravels and sands, mainly unstratified. Pebbles are mainly rounded and oval in shape. Sands reveal different granulation, from gravely to silty sands. In some places, these sediments are red to black in colour.

Laboratory work, which is in progress, includes mineralogical (XRD, CEC), chemical (trace elements using AAS) and sedimentological (grain size analysis) analyses of samples from investigated profile.

Modelling will be performed using Hydrus 1D software (Šimůnek et al., 1998).

With current study, we are trying to establish procedure for description, sampling, analysis and modelling of unsaturated zone profile of unconfined Quaternary aquifer. Future investigations will be expanded to more profiles in Zagreb aquifer area.

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