



## **Doable characterization of a vinyl chloride plume in confined aquifer beneath a residential area by direct-push method and low flow sampling.**

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A severe contamination by Vinyl Chloride of a confined sandy aquifer has been detected beneath an urbanized area in the Padana Plain immediately to the south of the Po river and far 5 Km to the north of the city of Ferrara (northern Italy), near to a big chemical plant in production from 1940 (contaminated mega-site).

Plume investigation followed three steps with a progressive downscaling:

1. a geologic and hydrogeological characterization of the area,
2. a first sampling of existing long-filtered private boreholes for a gross definition of the plume,
3. the characterization of the plume through direct-push method for the location of a possible source of contamination and for the comparison between different sampling methodologies.

First step put in evidence two different sandy aquifers, an upper unconfined and a lower leaky confined (Würmian sandy aquifer) with the second one in hydraulic connection with Po river. Head contouring of Würmian sandy aquifer puts in evidence the recharge role of Po river and the leaky character of the aquifer.

Second step based on sampling 37 existing long-filtered private boreholes, identified 10 boreholes with VC concentration higher than Italian MAC (0.5 ppb), up more than

8000 ppb, and very low or null concentration of other chlorinated ethanes and ethenes and ethylene.

Third step, composed of a total of 17 direct-push drillings down to a maximum 28 m depth with 3 samples taken at different depth for each vertical, put in evidence the vertical distribution of the contamination, and that the mayor part of the solute was in the upper part of the aquifer. To evidence the vertical structure of the plume a profile of concentration of the VC, of the hydraulic head total and the electrical conductivity has been created.

It has been verified also the effectiveness of sampling by a combined use of an inertial pump for collecting the sample preceded by a short term low flow purging by peristaltic pump.

The implications for the source definition and plume remediation are also discussed.