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Comparing Hydraulic Conductivity Measurement Tools for Flux and Storage Zones Delineation in a Brazilian High-Resolution Site Characterization

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Background/Objectives. In contaminated sites, assessment and remediation is essential to develop a strong conceptual site model (CSM) with manageable uncertainties. It is necessary to identify the hydrogeological heterogeneities in detail to properly develop the CSM. Defining the variability of hydraulic conductivity of an aquifer is a key step to understand and detect possible areas of flow, transport and storage. This information is essential in remediation projects, reducing the cost and work time. This paper presents a comparison between the resistivity piezocone test (RCPTu), pore pressure dissipation test (PPDT), direct-push slug test (DPST) and traditional slug test in a high resolution site characterization program to map the hydraulic conductivity variation.

Approach/Activities. The studies areas are two contaminated sites: one on Sorocaba, São Paulo State, Brazil, which has a benzene plume in the dissolved phase and other in São Paulo city, also in São Paulo State, Brazil, contaminated by TCE.

In Sorocaba site, six RCPTu tests were performed, in a straight line, parallel to the preferential flow direction, in order to develop the hydrostratigraphic profile. In three of the six RCPTu tests, pore pressure dissipation tests (PPD) were carried out every 0.30 m in depth to estimate the hydraulic conductivity (K) profile. Three DPSTs (0.30 m screen) were also conducted to estimate K. Another four traditional slug tests were performed inside the monitoring wells installed in the site, in order to compare the hydraulic conductivity values obtained using different methods (RCPTu, PPD, direct push punctual slug tests and traditional slug tests in monitoring wells).

In São Paulo site, eight RCPTu tests were done. In each test, with two or three PPDT were performed, in points with lower hydraulic conductivity was estimated. In same points, there was conducted DPST, for comparison between tools. Extra DPST were performed in point with higher hydraulic conductivity was estimated, for development of an appropriate CSM.

Results/Lessons Learned. It was concluded that: (1) the identification of hydrogeological heterogeneities is crucial and directly influences the remediation project; (2) RCPTu tests worked out perfectly well as a high resolution site characterization tool; (3) RCPTu tests also worked out well to define the hydraulic conductivity profile and to identify the storage and flow zones; (4) the pore pressure data registered during the RCPTu tests can be considered a good quali-quantitative information of K estimated by the PPD tests; and (5) the K values estimated by PPD tests presented a good agreement with those ones estimated by the slug tests (in both methods: direct push and in monitoring wells).