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Application of Geophysical Methods to investigate the Polluted Site and river bottom mud.

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Investigation of many polluted sites indicates that DNAPL plume in the subsurface is able to penetrate a low permeable layer such as clay or silt-caly layer. These DNAPL plume within the low permeable Layer will gradually diffuse to the high permeable layer to affect the accuracy of investigation and remedial design. As to the deeper zone affected by the penetration of DNAPL, the investigating technique of conventional bore-hole sampling design is always limited to the first unconfined aquifer, it is no longer suitable for DNAPL detecting underneath. Precisely define the boundary and the distribution of high and low permeable layer is the key to conduct a successful DNAPL detecting.

Point information derived from the conventional bore-hole sampling is difficult to be used for locating the DNAPL pollution due to the uncertainty of DNAPL migration and the soluble-phase distribution of the DNAPL partitioned into ground water between the low and high permeable layer. Recently, non-invaded technologies such as geophysical technology have been introduced to provide The plane and space information of pollution in subsurface by referring a few bore-hole dates. The most common used geophysical technologies are ground-penetrating radar method (GPR) and electrical resistivity tomography (ERT). Both methods have their limitations when its survey is affected by the existence of surface objects such as building structure or heavy pavement. This drawback can be overcome by using geophysical well logging. The information of multi-wells logging could be used to interpret the permeability of subsurface, the dominate flow path and the hot-spot for evaluating the distribution of pollution and the efficiency of remediation in different time sequences.

This study would first discuss how the DNAPL and its soluble-phase components invade into the low permeable layer based on the field observation. Then, the geophysical technologies are being introduced and compare to the bore-hole investigation alone. Finally, a case study using various geophysical technologies including geophysical well logging are introduced to snapshot the complex profile of subsurface DNAPL distribution for improving future application.

Geophysical Techniques for Near-Surface Hydrological Investigations:

Traditionally, the location and geometrical characterization of fractures and/or fracture zones are recognized by outcrop observations, knowledge of the geological setting and extrapolation from geological data sets etc... Most geophysical methods, such as electrical resistivity mapping, are able to detect variations in the subsurface that could possibly be due to fracturing, such as increased moisture content but only provide a proxy indicator of true fracture orientation, structure and density. At some point in the last few decades, almost every conceivable geophysical technique has been applied to the problem of locating subsurface, groundwater and pollutant flow though these porous and fractured media. Of the available methods, GPR, ERT and EM techniques are deemed the most appropriate. With EM conductivity (e.g., EM 31) considered but discounted due to the presence of surface metallic structures (e.g., steel pathway stabilizing rods, handrail anchors, etc) and a lack of suitable survey space in the investigation areas.

キーワード: Electrical Resistivity Tomography, Ground Penetrating Radar, Horizontal Loop Electromagnetic Method
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