Master's Thesis: Interpretation of geophysical and geochemical data in a 3D geological model construction of a contaminated site

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Summary

In Sweden, there are 82000 contaminated sites in total and 1300 of them are categorized as the "very high risk" level. In recent years, growing focus is being put on the remediation of the sites contaminated by Halogenated hydrocarbons (Usually chlorinated hydrocarbons). These types of contaminants typically originated from the dry-cleaning facilities or industries using organic chlorine solvents in the past. These chlorinated hydrocarbons usually appear as tetrachloroethene (PCE) and trichloroethene (TCE) at the sites together with their accumulated degradation products.

To carry out in-situ bioremediation at chlorinated hydrocarbons polluted sites is becoming more and more popular but the strong need for comprehensive monitoring and verification of in-situ remediation is greatly demanded. Consequently, the 'MIRACHL' project was established to improve the understanding of in-situ remediation processes through a series of interdisciplinary monitoring approaches such as biogeochemistry, geophysics.

This master thesis work serves as a part of 'MIRACHL' project at Alingsås site, in the Division of Engineering Geology, Lund University. The specific tasks include:

> Conduct Direct Current resistivity and Induced Polarization data processing based on the baseline geophysical data. Together with the data from pre-existing borehole logs and geochemical data, a refined conceptual 3D model of geology and the initial phase of the contaminant plume distribution is to be built up.
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> Conduct seismic refraction and Ground Penetrating Radar (GPR) surveys at the Alingsås site. Data will be processed to derive the bedrock surface topography. The detailed data of bedrock helps to generate a more precise subsurface model.

The methodology adopted in this master thesis work is in the combination of literature study, field investigation as well as software applications. As for the field measurements, instruments for DCIP measurements have been installed already in the beginning of last November. The seismic refraction, as well as the Ground Penetrating Radar, are expected to be conducted in mid-March. In terms of the data processing as well as final modelling, the commercial software Res2DINV will be employed for DCIP data processing. ArcGIS, GeoScene3D will be adopted for the integrated three-dimensional geological model construction.