

Chusak Kererat 2014: Modeling Approach for LNAPL Migration Containment using Soil Cement Column. Doctor of Engineering (Civil Engineering), Major Field: Civil Engineering, Department of Civil Engineering. Thesis Advisor: Associate Professor Suttisak Soralum, Ph.D. 181 pages.

The leakage of hydrocarbons from the underground storage tanks is a significant problem which affects human health and environment. Light nonaqueous phase liquid (LNAPL) migration can widely spread in subsurface, especially in sandy soil layer. Therefore, this study focuses on the behavior of LNAPL migration which is under with and without containment for the case of flow and no flow conditions. The physical models and numerical models were performed to evaluate the performance of a soil cement wall used as containment barrier, the effects of groundwater flow on LNAPL migration and to investigate an appropriated pattern of containment. Gasoline and paraffin liquid were used to represent LNAPL. The 1 g model tests and centrifuge modeling experiments at 30 g were performed as the physical model. Numerical simulations were used for comparing to the physical models and to investigate the appropriated pattern of containment. The model parameters for numerical simulation were determined from laboratory testing.

The results from the 1 g model tests show the correlations of the horizontal distance and the contaminated area between gasoline and paraffin liquid. All tests from centrifuge models show that the water level was depressed due to the large volume of LNAPL confined between the walls. The depth of a soil cement wall should be designed to a greater maximum depth to account for the self-weight of the contaminants and the groundwater flow effects. In addition, numerical simulations were performed and validated with the physical model test results. Both methods showed a good agreement as they provided similar behavior of the LNAPL migration and confirmed the effective performance of the soil cement wall as a containment barrier.

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