

Analytical model to quantify crude oil spill volume in sandy layered aquifers

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Abstract: Crude oil spills have far-reaching consequences not only from the point of view of economic considerations but also from the point of view of environmental pollution. This is particularly important in oil-producing countries like Saudi Arabia. In an attempt to study this phenomenon further, an analytical and experimental study was undertaken. In this study analytical estimation of crude oil spills in layered sandy soils was performed by vertically integrating the oil content function. This function exhibits discontinuities at the interfaces of different soil layers. The influence of layering on the estimation process was examined by comparing the analytical results with and without the layering. An experimental setup was used to assess the prediction of the analytical model formulated. The experimental results, for homogeneous soils, were compared with predictions of previous analytical and empirical models. This study shows that analytical as well as empirical models consistently underestimate the actual spill volume in soils. Furthermore, analytical predictions were shown to depend on how close the system was to hydrostatic equilibrium. It also shows that soil layering is a very significant factor that should be incorporated in quantifying the extent of aquifer contamination.