UNIVERSITI TEKNOLOGI MARA

DETECTION OF PERMEABILITY OF HYDROCARBON CONTAMINATION IN SUBSURFACE USING ELECTROMAGNETIC WAVE

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AUTHOR'S DECLARATION

I declare that the work in this disertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Subsurface contaminated by hydrocarbon is a pressing environmental issue with many industrial sites having some degree of near-surface pollution. The aim of the research is to investigate spectral content of GPR signal attenuation and scattering within the hydrocarbon contaminated site and to analyse the parameters of GPR. Non-invasive method, Ground Penetrating Radar (GPR), have been used widely. Their uses have tended to be restricted to plume mapping and contamination. GPR is an electromagnetic system used in non-destructive investigation of subsurface. It is based on the emission by an antenna coupled to the ground, of short electromagnetic pulses of harmonic waves sweeping a certain frequency band. In this research, the simulation of radar signals GPR, using Reflexw. The operation of this research is based on the investigation of hydrocarbon contaminated soil plume using electromagnetic wave by determining the parameters of GPR which is dielectric constant, permittivity, and permeability. The simulation has been performed on contaminated soil and it led to find that the electromagnetic waves are very sensitive to variations in the dielectric permittivity and electrical conductivity. The graphs produce in this thesis are used to simulate the real subsurface conditions, a comparison between the GPR response of clean and contaminated areas where the subsurface material contains and not contains hydrocarbon contaminants. The result shown contaminated material and non-contaminated material all exhibit different. Thus, GPR should be able to detect the signals for soil with and without contaminants. The spectral GPR responses and the recorded data can provide overview of the contaminant distribution.

TABLE OF CONTENT