UNIVERSITI TEKNOLOGI MARA

THE ESTIMATION OF SOIL SUYBSURFACE TYPES AND ANALYSIS FOR EFFECTIVENESS OF GPR PENETRATION

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AUTHOR'S DECLARATION

I declare that the work in this thesis 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

The work of detecting buried underground utilities had become one of the most important part in every construction project in order to avoid damaging any existing buried underground utilities. The condition of the buried underground utilities and the soil subsurface conditions can be observed by correctly interpret the radargram image and the textural features contained in them. Due to the nature of the GPR signal, the radargram image produced can be affected by many factors especially the types of soil subsurface in the area where the underground utilities detection are done. This thesis describes a research project done to estimate, identify and analyse the types of soil subsurfaces in three different area in order to assess the GPR penetration capabilities in each of them. Furthermore, this research also involved the use of two GPR antenna frequency of 250 MHz and 500 MHz. A series of scanning are taken at each of the study area with different depth settings, where the depth is set to 3 m and 5 m when using antenna frequency of 500 MHz and 10 m when using antenna frequency of 250 MHz. This are done to compare the depth penetration of the GPR and to see how different antenna frequency is affected in different types of soil subsurface. The processed radargram image are classified according to their textural features and geometry pattern of the profiles by visual interpretation of the interpreter. From the interpretation made, the radargram were manage to be classified into six radarfacies where five of them are interpreted as types of soil subsurface and the other one as the attenuation of the GPR signal due to energy losses producing ambiguity image. Based on the analysis, the percentages of radarfacies contained in each of the study area, how each of the radarfacies affect the average minimum and maximum depth penetration of the GPR, and assessment on the GPR penetration capabilities on different types of soil subsurfaces are obtained. The results presented in this thesis conclude that the types of soil subsurface need to be considered and taken into account when doing GPR scanning as they affect the depth penetration and the radargram image produced.

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