UNIVERSITI TEKNOLOGI MARA

IDENTIFICATION OF GROUNDWATER PROSPECTIVE ZONES IN PERLIS, MALAYSIA USING REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM

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Thesis submitted in fulfillment of the requirements
for the degree of
Master of Science in Civil Engineering

Faculty of Civil Engineering

May 2011

Candidate's Declaration

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

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Faculty   Faculty of Civil Engineering

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Date   May 2011

ABSTRACT

Perlis is situated as the most northern state in Malaysia. Water supply for irrigation and domestic use in Perlis is mainly supplied from surface waters, with groundwater supplementing this supply for localised use. Currently a major portion of water demand in most states in Malaysia is being supplied from surface water sources. These surface water sources are deemed inadequate to fulfill the water demand for the future. Although productivity through groundwater is quite high to fulfill this future water demand groundwater resources have not yet been fully developed through intensive exploration.

Groundwater forms part of the natural water cycle and occupies the pores within the underground strata. Since groundwater cannot be seen directly from the earth's surface, a variety of techniques can provide information concerning its potential occurrence. Geological and geophysical methods, involving interpretation of geological data and field studies and geo-electrical survey methods using resistivity profiling have been employed to investigate groundwater and delineate underlying groundwater aquifers. These conventional methods to investigate groundwater were time consuming and uneconomical. Using a integration of remote sensing and and geographic information system (GIS) techniques, groundwater prospective zones can be positively identified resulting in significant savings of resources.

In this study, the method of integration of remote sensing and GIS was used to model the groundwater potential of the study area as either very high, high, moderate or low in terms of groundwater yield. Groundwater potential was based on a new mathematical model called the Arau Model for Groundwater Potential where six parameters were determined based on civil engineering principles. Geology was the most important parameter since the local geological nature of the study area indicated that several geological formations in the area may be treated as important groundwater aquifers. This study investigated the analysis using Geographic Information System (GIS) of landuse produced from a SPOT remote sensing image of Perlis, together with secondary data which consisted of geology, topography elevation, slope distribution, drainage distribution and rainfall distribution data. These data were analyzed to produce thematic maps, then integrated using the Weighted Linear Combination (WLC) method to predict the most potential groundwater zones in Perlis based on the new model. Reliability Analysis of the result of the study when compared to available data on boreholes and wells in the study area achieved a reliability of 79%.

ACKNOWLEDGEMENTS

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