

High-resolution imaging of the groundwater potentials with geoelectrical resistivity tomography in fluvial deposit, Machang, Kelantan, Malaysi

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The first high-resolution images of the groundwater potentials obtained with the geoelectrical resistivity tomography are presented. The geoelectrical resistivity profiling surveys were conducted to determine the characteristics of the subsurface and the groundwater within the aquifer. They made up of twenty one traverse lines of different site location with Wenner configuration. The Machang plain is covered with Quaternary sediments overlying granite bedrock. The drainage system is dendritic with the main river flowing into the South China Sea. The relatively high resistivity contrast between the Quaternary basinal clastic sediments and the pre-Quaternary bedrock opened the way to extract geological information from geoelectrical resistivity explorations. All the high-resolution electrical images show a remarkable resistivity contrast between relatively low resistivity values in the shallow layers and relatively high resistivity zones in the deeper subsurface. The fluvial Machang is one of the more complex components of the Quaternary deposit of the Kelantan Delta. The thickness of Quaternary deposit in the southern and northern part ranges from 5 m to 20 m respectively. The geometry of the pre-Quaternary bedrock, the location and dip of the groundwater potential are imaged. The high-resolution electrical images allow us to trace of the groundwater potential geometry of the basin. The electrical imaging highlights the irregular shape of the basin, which is bordered by Machang Boundary Range and Kelantan River at the east and west side respectively. In longitudinal cross-section, the groundwater potentials appear as a mosaic of good, bad and moderate for an aquifer with resistivity value of 20 – 100 ohm.m, 100 – 200 ohm.m and 200 – 350 ohm.m respectively. Different groundwater potentials or basins are separated by intrabasinal highs of pre-Quaternary bedrock. In transverse cross-section, the basin is an irregular, generally dipping to the northwest. It allows the shallow aquifer flow to the Kelantan River as the ending border of the area at the northwestern side.