Advanced Borehole Geophysical Logging for determine the geohydrologic character and Assessment of Groundwater Potential by using Nuclear Magnetic Resonance.

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Advanced Borehole Geophysical Logging for determine the geohydrologic character is being utilized under the detailed exploration project for carbonate rock areas nationwide (Phase 1), supported by Groundwater Development Fund. The project aims to exploration groundwater resources in the deep Karst aquifer for all activities driving the economy and supporting urbanization. The drilling method uses a coring drill, the core sample form hole are completely preserve. However, core samples insufficient for groundwater aquifer studies.

Borehole Geophysical Logging refers to the application of geophysical instruments within a borehole to measure subsurface properties. Advanced Borehole Geophysical Logging includes measuring natural electrical potentials (Self Potential), electrical resistivity values, and natural gamma ray, the temperature-conductivity of water within the boreholes, borehole diameter measurements (Caliper) and Nuclear Magnetic Resonance (NMR) technology.

The study in the area of Ban Khao Ha Yod, Pluang Thong Subdistrict, Bo Thong District, Chonburi Province, through core drilling to a depth of 0-45 meters, reveals predominantly weathered and partially altered bedrock transitioning to black shale at depths of 45-140 meters. Geophysical survey results from the boreholes indicate low electrical resistivity values and high natural gamma ray values, suggesting the presence of finely dispersed clay components within the rock. Borehole diameters at distances of 40-50 and 105-110 meters are larger than elsewhere, indicating the presence of fractures or voids. Temperature readings at these fracture zones are lower compared to other areas. Electrical conductivity of water is higher in these fracture zones compared to non-fractured zones. NMR results indicate the presence of groundwater in the fracture zones at distances of 40-50 and 105-110 meters, with water content of 50% and 25% respectively, and permeabilities of 235.3 and 5.7 meters/day, respectively.

According to the study, advanced borehole geophysical logging demonstrates a consistency with the core samples, thereby facilitating a more precise delineation of aquifer layers and clearer determination of groundwater hydrology. It is recommended that future studies utilize test pumping data for comparative analysis with NMR results to achieve greater accuracy.

Keywords: Borehole Geophysical Logging, Nuclear Magnetic Resonance, geohydrologic character, Karst Aquifer