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INTEGRATED FORMATION EVALUATION OF QUATERNARY AQUIFER IN ASSIUT GOVERNORATE, NILE VALLEY, EGYPT, BASED ON VERTICALLY RESISTIVITY SOUNDINGS AND WELL LOGGING ANALYSIS

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ABSTRACT

Groundwater resources are gaining much attention with increasing demands for water due to increasing population, urbanization and agricultural expansion in Egypt. First objective of this paper is to interpret vertical electrical soundings (VES) in a number of stations covering Assiut Governorate to assess defining the geometry of the Quaternary aquifer (QA). The VES interpretation covered the picking of water bearing layer, determination and construction of depth, thickness and true resistivity contour maps of the aquifer. The VES interpretation reflects the outstanding role of QA variation in the studied area.

Second objective is to use open-hole logging data from 52 wells for determining the detailed reservoir characteristics to evaluate the hydrogeologic and petrophysical parameters of the aquifer. The well log analysis procedures are performed in different phases finished by formation evaluation using specially designed program utilizing the level by level technique (each one meter).

Accordingly, the QA petrophysical properties including the total & effective porosity, shale content, permeability, lithology, bulk volume of water (BVW), water salinity and net pay parameters, illustrated in litho-saturation cross-plots and distribution maps. Such parameters are useful in case of subjecting the area to modeling or GIS studies. Correlation of results indicates that the QA decreases in thickness gradually towards the fringes. Total porosity values vary in the range from 23.77% to 39.76%, and the effective porosity from 21.16% to 38.46%, the calculated permeability values reveal the high quality of the studied aquifer. Furthermore, the estimated low shale volume (4.48 to 25.88%) and high sand volume (45.59% - 65.62%) of the water-bearing horizon confirm the good quality of the aquifer. Total dissolved solids (TDS) are in the range from about 400 to 1000 ppm, which means fresh type of groundwater. The obtained results have been verified from the different executed sampling analyses and pumping tests.

Keywords: VES, Reservoir Characterization, Well logging, Formation Evaluation, Groundwater Resources.