

Delineation of Fracture Zones for Investigation of Groundwater Potentials Using Vertical Electrical Sounding in a Sedimentary Complex Terrain

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Abstract : Vertical electrical sounding (VES) method was used to investigate the groundwater potential at the southern part of Gulumbe district, Kebbi State, north-western part of Nigeria. The study was carried out with the aim of determining the subsurface layer's parameters (resistivity and thickness) and uses the same to characterize the groundwater potential of the study area. The Schlumberger configuration was used for data acquisition. A total number of thirty-three (33) sounding points (VES) were surveyed over six profiles. The software IPI2WIN was used to obtain n-layered geo-electric sections. The geo-electric section drawn from the results of the interpretation revealed that three subsurface layers could be delineated, which comprise of top soil, sand, sandstone, coarse sand, limestone, and gravelly sand. The results of the resistivity sounding were correlated with the lithological logs of nearby boreholes that expose cross-section geologic units around the study area. We found out that the area is dominated by three subsurface layers. The coarse sand layers constituted the aquifer zones in the majority of sounding stations. Thus, this present study concluded that the depth of any borehole in the study area should be located between the depth of 18.5 to 39 m. The study further classified the VES points penetrated based on their conductivity content as highly suitable, suitable, moderately suitable, and poor zones for groundwater exploration. Hence, from this research, we recommended that boreholes can be sited in high conductivity zones across VES 2, 11, 13, 16, 20, 21, 27, and 33, respectively.

Keywords : vertical electrical sounding, resistivity, geo-electric, resistivity, aquifer and groundwater

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