

Vertical Electrical Sounding and Seismic Refraction Techniques in Resolving Groundwater Problems at Kujama Prison Farm, Kaduna, Nigeria

Authors : M. D. Dogara, C. G. Afuwai, O. O. Esther, A. M. Dawai

Abstract : For two decades, the inhabitants of Kujama Prison Farm faced problems of water for domestic and agricultural purposes, even after the drilling of three deep boreholes. The scarcity of this groundwater resource led to the geophysical investigation of the basement complex of the prison farm. Two geophysical techniques, vertical electrical sounding and seismic refraction methods were deployed to unravel the cause(s) of the non-productivity of the three boreholes. The area of investigation covered was 400,000 m² of ten profiles with six investigative points. In all, 60 vertical electrical points were sounded, and sixty sets of seismic refraction data were collected using the forward and reverse approach. From the geoelectric sections, it is suggestive that the area is underlain by three to five geoelectric layers of varying thicknesses and resistivities. The result of the interpreted seismic data revealed two geovelocity layers, with velocities ranging between 478m/s to 1666m/s for the first layer and 1166m/s to 7141m/s for the second layer. From the combined results of the two techniques, it was suggestive that all the three unproductive boreholes were drilled at points that were neither weathered nor fractured. It was, therefore, suggested that new boreholes should be drilled at areas identified with depressed bedrock topography having geophysical evidence of intense weathering and fracturing within the fresh basement.

Keywords : groundwater, Kujama prison farm, kaduna, nigeria, seismic refraction, vertical electrical sounding

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