

PRELIMINARY GEOPHYSICAL CHARACTERISTICS OF THE SUBSURFACE SHALLOW STRUCTURE OF WADI BISHAH AREA, SOUTHERN ARABIAN SHIELD

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Abstract

A geophysical investigation has been conducted in the Wadi Bishah area using D.C resistivity and seismic refraction methods . The results have been integrated with geological information in order to determine , where possible , the depth to the basement , any water-table variations , and the delineation of the hydrostratigraphy .

The study area is complex due to the presence of ductile deformational structures which indicate polyphase folding. The major lithological units are : banded gneisses , metavolcanics , migmatites , and metasediments.

Preliminary analysis of vertical electric sounding curves

reveals the occurrence of three distinct layers. The upper layer is 1-4 m thick with resistivity values between 250-400 ohm-m and this would generally be classed as a moderately resistive layer. This layer is interpreted as being composed of clean sand and unsaturated surficial sediments. The middle layer has a low resistivity (40-150 ohm-m) and is 4-9 m thick. It is proposed that within this layer, sediments and sand are intermixed with water. Evidence from these measurements indicates that the water-table varies in depth between 1-4 m below the surface becoming deeper towards the SE. The lower layer is characterized by a high resistivity (> 1900 ohm-m) . This layer may represent the upper part of the basement. Minor fracture zones are defined by resistivity lows and are marked by V-shaped depressions in the basement rocks .

The depth to the basement rocks is identified from the shallow seismic refraction profiles . This boundary , at a depth of 7-12 m below the surface , marks a change in average seismic velocities from 300 m/sec above this limit to 2600 m/sec below .

This study and previous geological evidence confirm the existence of severe weathering prior to the deposition of the Tertiary sediments. This is indicated by the variation in sediment thicknesses and the ruggedness of the upper surface of basement rocks within the study area.