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Geophysical and Geological Assessment of Groundwater Occurrences of Northern Kharga, Western Desert, Egypt

A Thesis Submitted for Ph.D. degree of science in Geophysics (Applied Geophysics)

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ABSTRACT

The present study deals with an Integration between four different types of geophysical methods which are land Magnetic, land Gravity, Electrical resistivity and Electromagnetic to assess the groundwater occurrences. The investigated area is located in the Northern part of Kharga, Western Desert of Egypt. It lies between longitudes 30°33'0.00" & 30°43'12.00"E and latitudes 25°37'48.00" & 25°25'12.00" N .The area under study covers about 410 km^2.

The geomorphological features in the area, the study area is about a flat surface consists the depression which stretch about 160km long and from 20km to 80km wide, It is bounded by the Eocene limestone plateau from the east and north, where steep cliffs form a sharp boundary to the depression floor. Geologically, the Upper Cretaceous-Lower Tertiary sedimentary sequence overlies nonconformably the Precambrian basement rocks. This sedimentary sequence comprises the Nubia Sandstone overlain by the Variegated Shale rock units, which are well exposed forming most bedrocks of the depression floor.

Hydrogeologically, The Nubia facies constitutes the main groundwater aquifer in northern El Kharga area. It consists of alternating beds of clay, shale, sand and sandstone, Also it divided in two major Parts Shallow and deep aquifer systems , both of them also divided to four Zones (A, B, C, and D).

The present study aims to evaluate the conditions of groundwater occurrences by identifying vertical and horizontal extensions of the sedimentary succession, especially water bearing formations and the structural elements such as fractures and faults which affected on water bearing formation.

Generally, the magnetic study reveals the basement relief or depth to the basement, Also gravity study reveals the subsurface structures which divided in to major (regional) and detailed structures (residual) which affected on the groundwater occurrences, Also electrical resistivity reveals the subsurface sequence and it’s horizontal and vertical extensions, moreover Time domain

Electromagnetic (TEM) reveals the subsurface sequences and their horizontal and vertical extensions, and the water bearing formations and their horizontal and vertical extensions, the results are represented in magnetic profiles , structural trends, geoelectrical cross sections and maps.

The interpretation of the total intensity of the earth's magnetic field which measured along 12 profiles covering the study area these profiles taking W-E direction to form more or less grid pattern. These are constructed abasement contour map which indicate that the basement depth have value between 250 m to 1500 m in the study area.Also from gravity anomaly Separation, the regional map shows NE-SW gradient occupying the central part of the study area and the high gravity anomalies occupying southern eastern part of the area. The northwestern and the central of southern part reflect low gravity anomalies. Also the residual anomaly map shows 41 fault structures related to local anomalies.

Integration between VES and TEM represented in four geological units show that the sedimentary layers consist of mainly sand layers with intercalations of thin layers of shale and clays, and overlaid by variegated shale. Also, the second and fourth geoelectric unit represented shallow Nubian Sandstone aquifer .Finally, the priority map was formed to identify the best regions for drilling water wells in the future and evaluate the state of drilled wells.

Keywords

Kharga Oasis, Nubian Sandstone, Aquifer, Gravity, Magnetic, TEM, VES.

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