GEOLOGICAL AND GEOMORPHOLOGICAL IMPACTS ON THE WATER RESOURCES IN CENTRAL SINAI, EGYPT

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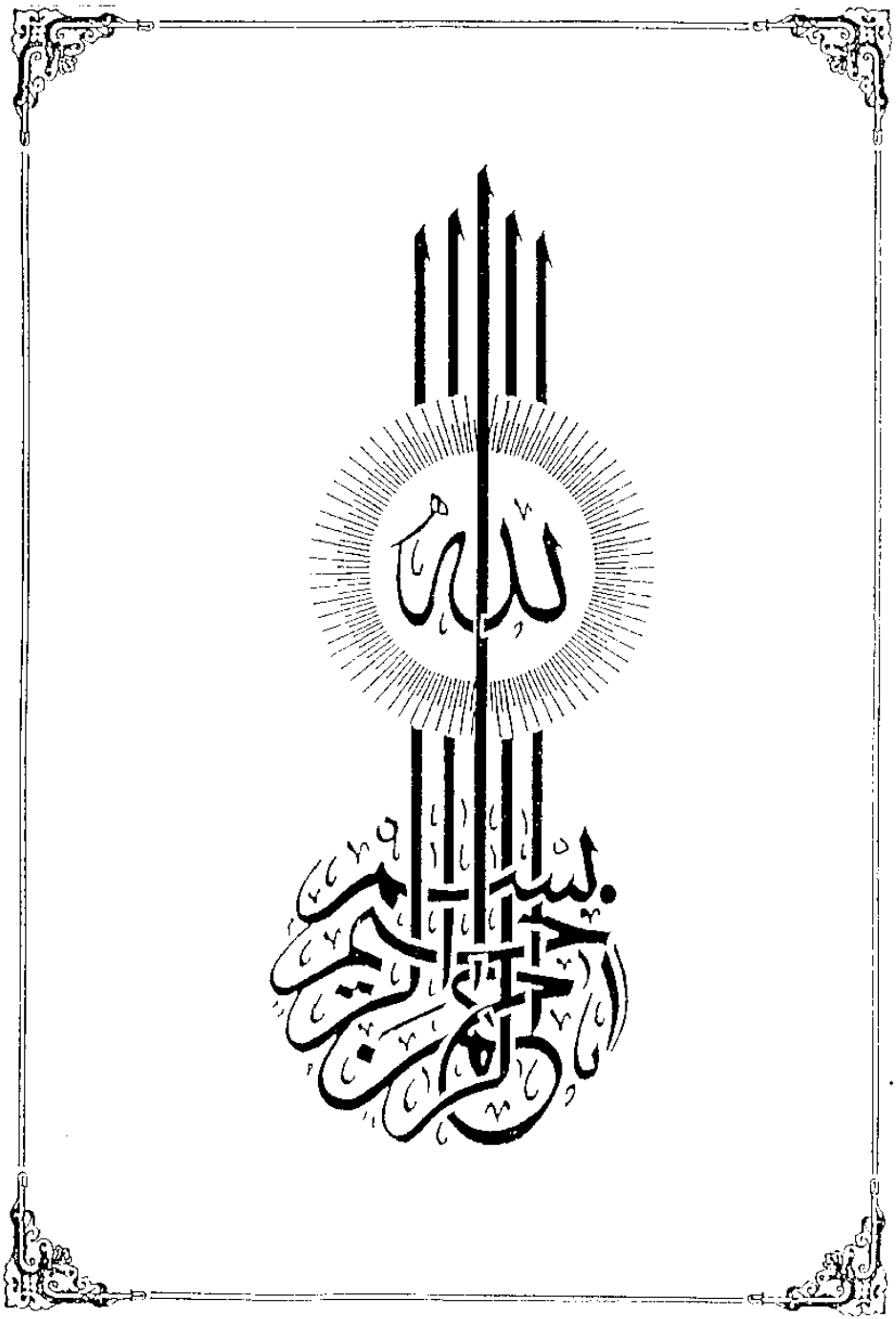

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ABSTRACT

The present thesis deals with the geological and geomorphological impacts on the water resources in Central Sinai. The studied area (about 16900 km^2) is delineated by longitudes 33° 15′ and 34° 45′ E and latitudes 29° 30′ and 30° 45′ N.

The existing landforms, the stratigraphic sequence, the petrographic characteristics and the tectonic elements were studied carefully as main controlling factors on the water resources in Central Sinai. Based on the evaluation of these factors, the groundwater occurrences, the water bearing formations, the hydrochemical properties and the evaluation of the groundwater quality for different purposes are thoroughly elucidated.

Geomorphologically, the studied area is discriminated into two main units of distinct hydrogeological significance . These units are the uplands (watersheds) and the hydrographic basins (water collectors). The former geomorphic unit includes the elevated plateaux, the hilly area and the elevated mountain range (inselbergs). While the later unit embraces the intervening peneplains and the drainage basins. However, the characteristics of each subdivision is determined and the existed drainage basins are classified according to their potentialities depending on the morphometric and drainage parameters.

Stratigraphically, the lithologic sequence in the area of study ranges in age from the Middle Triassic to Pleistocene. The former is represented by Areif El Naqa Formation which has limited geographic surface exposure, restricted to the core of Areif El Naqa anticline. While the later is dominated by vari-sized

alluvium deposits and covers vast areas in the intervening plains and the dissecting drainage basins.

Structurally, the concerned area is classified into four different zones, each of which has its own characteristics. These zones are (from south northward) the stable foreland, the gently folded, the fractured and the strongly folded zones.Most of these zones and their structural elements have a direct implication on the groundwater flow, replenishment and production.

In Central Sinai, the groundwater is tapped from several rock stratigraphic units. These include the following (from younger to older) :

- Pleistocene alluvium sand and gravel; free water table (3 m - 15 m depth) conditions and brackish to saline(1368 mg/l - 7795 mg/l) water.

- Eocene fractured limestone; natural springs and free water table (3.35 m - 22.31m depth) conditions with fresh to saline water (497 mg/l - 6577 mg/l).

- Upper Cretaceous fissured and cavernous limestone; Free water table (3.85 m - 28 m depth) and piezometric surface (35 m - 85 depth) conditions with fresh to saline water (640 mg/l - 6505 mg/l). The great variations in the groundwater salinity is due to the nature of the water bearing zone and the local conditions.

- Lower Cretaceous, ferruginous sandstone; free water table (7.60 m - 14.65 m) and piezometric surface (122 m - 270 m depth) conditions with fresh to saline water (1200 mg/l - 4362 mg/l).

- Upper Jurassic fractured limestone; piezometric surface (98 m-116.5 m depth) with brackish to saline water (2532 mg/l - 4362 mg/l).

- Middle Jurassic ferruginous sandstone and dolomitic limestone; piezometric surface (28 m depth) and free water table (1.9 m - 5.35 m depth) with brackish to saline water (2347 mg/l - 6497 mg/l).

The Pleistocene sand and gravel aquifer is widely distributed in the studied area. It constitutes the main source of groundwater in some localities, e.g. Graiyed area (Wadi El Oqaba) and Wadi El Hemma. The Eocene limestone aquifer is locally developed in Nekhl, El Kuntilla and El Qusaima areas. However, the Cenomanian limestone and the Lower Cretaceous sandstone aquifers have wide geographic extent along the investigated area. On the other hand, the Jurassic aquifers are detected locally in Gebel El Maghara area.

The existing hydrographic basins exhibit variable hydrogeologic conditions. This variability is attributed to the remarkable differences in the morphologic, lithologic and tectonic responses. The morphologic control is manifested through the impact of the watershed extension and altitude, in addition to the channel characteristics. While the role of the fracturing, folding, dip of the beds and basaltic intrusions are discussed in dealing with the tectonic response. On the other hand, the influence of the general lithologic characteristics has been discussed to elucidate their impacts on the hydrogeological properties of the various aquifers.

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