

# Hydrological and Hydrogeological Evaluation of Proposed Massive Salty Lagoons in western Dessert in Egypt

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## Abstract

Hydropower generation has been proposed by utilizing the difference in the water levels between the Mediterranean Sea and the level of accumulated saltwater in the Qattara Depression. The target of this paper is to represent the study of the accumulated saltwater effect in the Qattara Depression on the Nile Delta drainage and the underneath groundwater reservoir. The main objectives of the research study are to: a) determine the expected evaporation from the accumulated saline water in the depression, b) study the hydrogeological conditions of the Qattara Depression by identifying the flow direction between the Nile Delta and the depression, after filling the depression, and C) study the effect of lagoon accumulated saline water on the Nile Delta fertility and the underneath groundwater layers. The study methodology has been performed utilizing the recent tools of analysis that were not available for the previous studies such as; efficient numerical models, geographic information system (GIS), and Digital Elevation Models (DEM). The effect of salinity on evaporation, from the lagoon, was considered. A number of twenty one boreholes, with average depth of 3900 m, were employed to construct the geological stratification. Hydraulic conductivity values and groundwater levels have been collected from the available boreholes and deep exploratory wells drilled by the oil companies. Mass balance of the lagoon salinity was performed, every separate year for a total period of 50 years. Density dependent model (SEAWAT) via MODFLOW has been employed for a duration of 50 years. The simulation was performed every separate year. It was repeated for different water filling levels (50 m and 60 m below mean sea level). Several well fields are assumed between the filled lagoon and the Nile Delta. The wells screen was assumed in the Moghra, the Limestone, or the deep Sandstone Formations. The results have revealed that the saline lagoon does not affect the Nile Delta drainage. The lagoon accumulated salinity does not reach the Nile Delta. The effect of salinity on the underneath sandstone reservoir is minor due to its upper confining shale layer.

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