AIN SHAMS UNIVERSITY
FACULTY OF SCIENCE
GEOPHYSICS DEPARTMENT

APPLICATION OF GEOELECTRICAL MEASUREMENTS FOR DETECTING THE GROUND-WATER SEEPAGE IN CLAY AND LIMESTONE QUARRIES AT HELWAN, SOUTHEASTERN CAIRO, EGYPT

A THESIS SUBMITTED FOR PARTIAL FULFILLMENT FOR THE REQUIREMENTS OF THE DEGREE OF MASTER OF SCIENCE (M.SC.) IN GEOPHYSICS

BY

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CAIRO-2018

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(B.Sc. in Geophysics – Faculty of Science – Ain Shams University – 2012)

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Approval Sheet

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Note

The present thesis is submitted to the Faculty of Science, Ain Shams University, in partial fulfillment for the requirements of the Master degree of Science in Applied Geophysics. Besides the research work materialized in this thesis, the author has attended eleven postgraduate courses for one academic year in the following topics:-

1) Geophysical Field Measurements.
2) Numerical Analysis & Computer Programming.
3) Petrophysical Properties of Rocks.
4) Advanced Well Logging.
5) Formation Evaluation.
6) Reservoir Evaluation.
7) Subsurface Geology.
8) Geophysical Prospecting.
9) Sedimentary Basin Analysis.
10) Fluid Dynamics.
11) English Language.

He successfully passed the final examination in these courses.

Prof. Dr. Sami Hamed Abdel-Nabi

Head of Geophysics Department

بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

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عِلْمًا (114) ﴾

DEDICATION

TO

MY FATHER,
MOTHER AND
SISTER

TO

EVERY DEAR
HELPFUL FRIEND

Mohammed Salah

ACKNOWLEDGMENTS

Firstly and before all, my complete praise is for ***Almighty God, Allah,*** *lord of the universe, who guided and blessed me during the preparation of this work.*

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Mohammed Salah

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ABSTRACT

The qualitative and quantitative interpretations of the available geophysical data (particularly gravity and electrical resistivity data) are carried out in the study area to indicate subsurface geological inferences. The area under study is located at Helwan, southeastern Cairo between latitudes 29º46' N & 29º50' N and longitudes 31º21' E & 31º25' E.

The interpretations of the gravity data are done in the form of separation of the regional and residual gravity anomalies, in which the regional gravity anomalies reflect the deep seated geological effects and the residual anomalies reflect the shallow seated geological effects. After that the filtering of Bouguer gravity anomalies is carried out. This technique is used to separate the residual anomalies from the regional anomalies from the anomalies existed within a certain interval of depth. It is also beneficial in attenuating the extraneous factors affecting a certain depth range and enhancing the wanted effects of the other depth ranges. In addition, trend analysis is applied on the results of discriminating the faulting picture at successive levels (0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5 & 5 Kilometers) to determine the fault systems dissecting the sedimentary section and the basement complex. Accordingly, the major tectonic trends are mainly oriented NNE-SSW, NW-SE, NNW-SSE, ENE-WSW & NE-SW in decreasing orders. Finally, the depths to the basement are determined and ranging between 1.9 km & 3.2 km.

Ten vertical electrical soundings in addition to seven dipole-dipole profiles are conducted in Helwan limestone quarry. On the other hand, fifteen vertical electrical soundings are conducted in Helwan clay quarry. These measurements are done to know the detailed information about the source and extension of the water seepage on the floor of

quarries. In Helwan clay quarry, the results suggest passage of groundwater from the adjacent areas via channel ways formed due to the excavation process. All over the measured area, there are some sand lenses intercalated with clays & during the excavation process, some channels formed and the groundwater started to percolate through these channels forming many water pools along the quarry floor. On the other hand, in Helwan limestone quarry; the results suggest passage of groundwater from the adjacent areas via channel ways formed due to reopening of the fissures and cracks in the fault zone. The fissures are a direct consequence of maximizing explosive quantities, groundwater percolates through the new rock openings in the fault zone from the source at the NW direction of the quarry to the lower level in the quarry floor.

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