بسم الله الرحمن الرحيم

شبكة المعلومـــــات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

﴿ قـــسـم ﴾

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون آية تغيرات

يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %

بعض الوثائق الأصلية تالفة

بالرسالة صفحات

لم ترد بالأصـــل

ENVIRONMENTAL IMPACT OF ARTIFICIAL RECHARGE ON GROUNDWATER IN BUSTAN EXTENSION AREA

By

SEIF SEIFEN GHALY IBRAHIM
B.Sc. Petroleum Engineering (Drilling & Production),
Suez Canal University, 1974

A Thesis Submitted in Partial Fulfillment
of
The Requirement for the Master Degree
in
Environmental Engineering

ENGINEERING DEPARTMENT
INSTITUTE OF ENVIRONMENTAL
STUDIES AND RESEARCH
AIN SHAMS UNIVERSITY

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APPROVAL SHEET

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ABSTRACT

Artificial recharge of aquifers is considered one of the options for conserving the excess flow of Nile water through storing into aquifers for eventual reuse. In the desert areas located at the fringes of the Nile Valley and Delta, huge investments are made for land reclamation with locally pumped groundwater as the aquifers receive little or no replenishment. This will lead to depleting the groundwater ultimately.

To over come these problems, the depleting aquifers could be recharged artificially with excess Nile Water during the winter irrigation closure period and possibly with treated domestic sewage water transported from nearby sewage stations. The terms of reference therefore include the following :

A. Selection of suitable locations for artificial recharge.
B. Estimation of the quantities and qualities of the excess water to be recharged.
C. Types of artificial recharge (Basins, injection wells).
D. Preliminary selection of sites that might be considered as pilot schemes for aquifer, recharge.
E. Conveyance systems, taking into account the possible use of existing infrastructure.
F. Environmental studies.

The artificial recharge experiments at El-Bustan extension area have been executed, using the surface water as a principal source for recharge. Infiltration by basins has been found technically and financially feasible and results indicated that the basin infiltration rates between 0.7 and 0.1 m/day. Higher rates could be observed when the basin is egularly cleaned and contains deeper gullies for settlement of fine clay particles.

The controlled artificial recharge is of great benefit to improve water management through storing of excess water, where the availability of water in time does not coincide with the water demands at the same time. This technique will be successful to improve the water quality and to minimize evaporation rate from groundwater to optimize water resources management in Egypt. Artificial recharge should be applied on a large scale in Egypt. Artificial recharge through infiltration basins or injection wells should be used as a management option in areas where a seasonal surplus of surface water exists.

Summary

This work concentrates on using the artificial recharge of groundwater to recharge the aquifer in the areas suffering from shortage of surface or rain water. The environmental impact of applying the different techniques of the artificial recharge are studied. The approach utilized in this study is considering the invention of the most suitable regions in Egypt for applying the artificial recharge and selecting one of them as a case study. The most two economic techniques of the artificial recharge are applied, which are the basin method for surface recharging and well method for deep recharging. Then, two fields are designed and constructed in the study area, one field for each method of recharging. The changes in the main hydrogeological and hydrochemical parameters, due to changing the main affecting parameters, are monitored. By analysing the results, the applicability of the artificial recharge in the selected area is evaluated. In addition, the technical efficiency of each method of artificial recharge is estimated according to the chosen design of the different components of experimental station of artificial recharge.

The thesis consists of six chapters:

Chapter 1 includes the importance of the artificial recharge as a tool for the water resources management and testing the technical applicability of artificial recharge under the Egyptian conditions.

Chapter 2 involves the previous work in the field of the artificial recharge.

Chapter 3 contains the general description of the study area, which is El-Bustan Extension area: climatic, geologic, geomorphologic, hydrologic, hydrochemical and land use conditions.

Chapter 4 explains the factors affecting the site selection of the artificial recharge experimental station and the design of the

different components of the experimental station. In the experimental station of basin method, the influence of different designs of the basin bottom on the infiltration rate is studied. The piezometric head of the aquifer, the injected water quality and the groundwater quality are monitored, for a period of about three years in the experimental station of basin method due to changing the water level in the recharging basin. The same parameters are monitored for a period of more than two months in the experimental station of well method, due to changing the injection rate.

Chapter 5 discusses and analyses the results of applying the two techniques of artificial recharge under the imposed design and the surrounding conditions.

Chapter 6 includes the conclusion and the recommendations.