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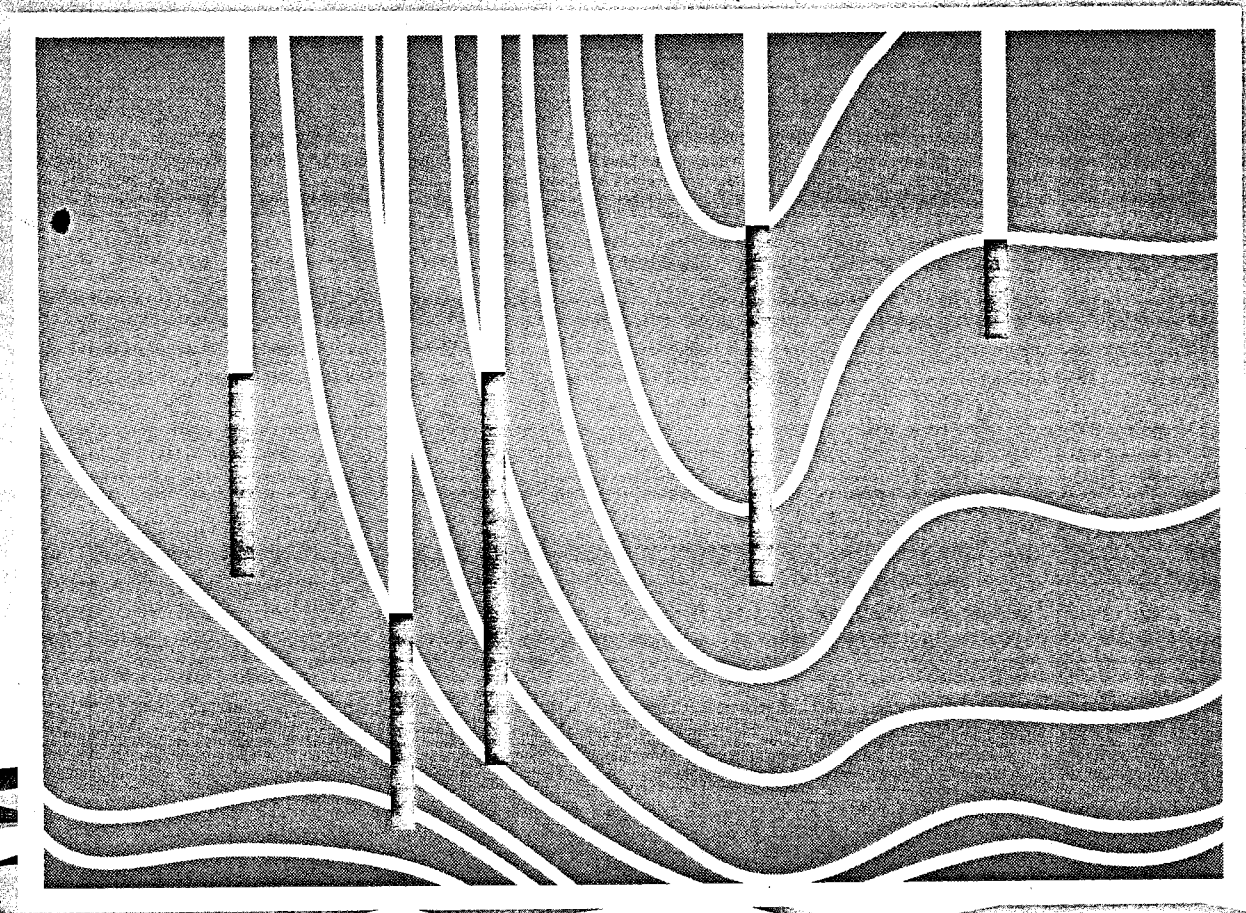
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WORLD METEOROLOGICAL ORGANIZATION

WMO

OPERATIONAL HYDROLOGY REPORT No. 31

MANAGEMENT 66/66848
OF
GROUNDWATER OBSERVATION PROGRAMMES



by Y. Bachmat



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FOREWORD

Groundwater is a major source of water supply for a large percentage of the world's population; in many cases it is the only source.

The evaluation, rational development and management of any groundwater resources require a thorough knowledge of the subsurface environment and an understanding of the hydrogeological processes that govern the occurrence, movement and yield of groundwater.

The variations of the levels and quality of groundwater in time and space provide valuable information on the physical and chemical characteristics of the groundwater reservoir. For this purpose, the systematic measurement of groundwater levels and the regular collection of water samples from wells for quality determination have been a common practice in many countries for a long time, frequently as part of the responsibilities of national Hydrological Services. However, the concept of a groundwater observation programme as part of a management-oriented information system is relatively new.

Recognizing the need for guidance on the planning and implementation of a groundwater observation programme with this new dimension, the WMO Commission for Hydrology entrusted the preparation of a technical report on the management of groundwater observations to Dr Y. Bachmat (Israel), its rapporteur on groundwater.

This report, approved by the Commission at its seventh session (1984), is the first WMO publication in the field of groundwater. It is hoped that it will be useful in providing guidance for all those involved in the planning, design and operation of groundwater observation programmes.

It is with great pleasure that I express the gratitude of WMO to Dr Y. Bachmat for the time and effort he has devoted to the preparation of this report.



(G.O.P. Obasi)
Secretary-General

S U M M A R Y

This report discusses, as a relatively new concept, the groundwater observation programme as part of a management-oriented information system and emphasizes the importance of such a programme for the rational management of groundwater resources. The report consists of eight chapters: Chapter 1 discusses the purpose and scope of groundwater-related observations, with much attention given to the role of hydrological information in groundwater management and to the information-generating processes. Chapters 2 and 3 dwell briefly on the definition and objectives, and on the planning and the management of a groundwater observation programme. Chapter 4 deals with the feasibility study which considers such topics as: the survey of data needs, inventory of existing data and programmes, problem identification and formulation as well as conceptual decisions and design concepts.

The main part of the report is devoted to the preliminary and detailed designs and is contained in Chapters 5 and 6 respectively. Chapter 5 discusses, *inter alia*, the classification and types of groundwater networks and the preliminary design process. It considers in detail the preliminary design of the basic network, covering such topics as: general guidelines, network elements, design criteria and policies and methods. It also provides a step-by-step procedure of a formal network design.

The detailed design of the basic network covered in Chapter 6 focuses on the selection of observation sites, the frequency of observations and the design and installation of observation wells. The operation and maintenance of the network is also described in detail.

The final two chapters (7 and 8) are devoted to monitoring and control of a groundwater observation programme and to its administration.

RESUME

Le rapport traite d'un concept relativement nouveau, à savoir les programmes d'observation des eaux souterraines considérés comme composante d'un système d'information plus spécialement destiné à la gestion, et fait ressortir l'importance d'un tel programme pour l'administration rationnelle des ressources en eau souterraine. Il comprend huit chapitres : le chapitre 1 traite de l'objet et du champ des observations relatives aux eaux souterraines, en insistant sur le rôle des données hydrologiques dans la gestion de ces eaux et sur le processus conduisant à la production de l'information. Les chapitres 2 et 3 évoquent brièvement la définition et les objectifs des programmes d'observation des eaux souterraines ainsi que la planification et la gestion de ces programmes. Le chapitre 4 est consacré à l'étude de faisabilité à effectuer notamment sur les thèmes suivants : besoins en données, recensement des données et des programmes existants, détermination et formulation du problème, décisions conceptuelles et principes d'organisation.

La partie principale du rapport est constituée par les chapitres 5 et 6 qui intéressent respectivement l'organisation préliminaire et l'organisation détaillée des réseaux. Dans le chapitre 5, les auteurs étudient, entre autres, la classification et les types de réseaux

d'observation des eaux souterraines et leur conception préliminaire. Ils examinent de manière approfondie la conception préliminaire du réseau de base sous, notamment, les intitulés suivants : directives générales, éléments du réseau, critères, politiques, méthodes de conception. Ils décrivent également la manière de procéder par paliers à l'organisation d'un réseau bien structuré.

La description de l'organisation détaillée du réseau de base faisant l'objet du chapitre 6 est axée sur le choix des sites d'observation, la fréquence de celles-ci, la conception et la réalisation des puits d'observation. Elle s'étend aussi à l'exploitation et l'entretien du réseau.

Les deux derniers chapitres (7 et 8) sont consacrés au suivi et au contrôle des programmes d'observation des eaux souterraines et à leur administration.

РЕЗЮМЕ

Этот отчет рассматривает в качестве относительно новой концепции программу наблюдений за грунтовыми водами как часть информационной управленческой системы и подчеркивает важность такой программы для рационального управления ресурсами грунтовых вод. Отчет состоит из 8 глав: глава 1 рассматривает цель и объем наблюдений за грунтовыми водами с уделением значительного внимания роли гидрометеорологической информации в управлении грунтовыми водами и предоставлению информации. Глава 2 и 3 кратко рассматривают определение и задачи, а также планирование и управление программой наблюдений за водными ресурсами. Глава 4 содержит обзор таких тем, как: обзор потребностей в данных, инвентаризация существующих данных и программ, определение и постановка проблем, а также концептуальные решения и концепции проектирования.

Основная часть отчета посвящена предварительным и детальным проектам и содержится соответственно в главах 5 и 6. Глава 5 содержит, среди прочего, классификации и типы сетей грунтовых вод и предварительный процесс проектирования. В главе детально рассматривается предварительное проектирование основной сети и такие темы, как: основные направления работ, элементы сети, критерии проектирования, политику и применяемые методы. Глава также предоставляет поэтапную процедуру оперативного проектирования сети.

Детальный проект основной сети, рассматриваемый в главе 6, сфокусирован на выборе точек наблюдения, частоте наблюдений и проектировании, а также строительстве колодцев для проведения наблюдений. Детально рассматривается также функционирование и обслуживание сети.

Заключительные две главы (7 и 8) посвящены мониторингу и контролю программы наблюдений за грунтовыми водами и ее осуществлению.