PD ISO/TR 13973:2014

BSI Standards Publication

Artificial recharge to groundwater

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National foreword

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The UK participation in its preparation was entrusted by Technical Committee CPI/113, Hydrometry, to Subcommittee CPI/113/1, Hydrometric methods and instrumentation.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Published by BSI Standards Limited 2014

ISBN 978 0 580 76703 6
ICS 07.060

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This Published Document was published under the authority of the Standards Policy and Strategy Committee on 30 November 2014.

Amendments/corrigenda issued since publication

Date	Text affected

PD ISO/TR 13973:2014

TECHNICAL REPORT

ISO/TR 13973

First edition
2014-11-15

Artificial recharge to groundwater

Recharge artificielle des eaux souterraines

Reference number
ISO/TR 13973:2014(E)

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Published in Switzerland

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Foreword

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary information.

The committee responsible for this document is ISO/TC 113, *Ground water*.

Introduction

Excessive extraction/use of ground water for various applications has resulted in marked lowering of ground water levels. Ground water levels are depleting very fast in various areas threatening ground water sustainability and causing adverse environmental impacts. Artificial recharge to ground water provides augmentation of ground water resources using surplus surface water available. Artificial recharge techniques can be applied to address the following issues:

a) enhance the sustainability of ground water resources in an area where over-development has depleted the aquifer;

b) conservation and storage of surplus water for future requirements;

c) improve the quality of existing ground water through dilution.

The following are basic requirements for recharging the ground water reservoir:

a) availability of surplus water of suitable quality in space and time;

b) suitable hydrogeological environment;

c) identification of sites for augmenting groundwater;

d) cost effective and appropriate artificial recharge techniques and structures.

Availability of source water of suitable quality is one of the prime requisites for ground water recharge. This can be assessed by analysing the water resources available as runoff and rainfall. The physical, chemical, and biological quality of the recharge water is important in planning and selection of recharge method. Age of water used for recharge is also considered important in certain cases.

The hydrogeological situation in each area needs to be appraised with a view to assess the recharge capabilities of the underlying geological formations. Detailed knowledge of geological and hydrological features of the area is necessary for proper selection of site and type of recharge structure. In particular, the input on geological boundaries, hydraulic boundaries, inflow and outflow of waters, storage capacity, porosity, hydraulic conductivity, transmissivity, natural discharge of springs, water resources available for recharge, natural recharge, water balance, lithology, depth of the aquifer, and tectonic boundaries features such as lineaments, shear zones, etc. are required for effective and efficient artificial recharge to ground water.

The aquifers best suited for artificial recharge are those that can hold large quantities of water and do not release them too quickly. The evaluation of the storage potential of sub-surface reservoirs (aquifers) is invariably based on the knowledge of dimensional data of permeable material in floodplain (alluvial), reservoir rock which includes their thickness and lateral extent. The availability of sub-surface storage space and its replenishment capacity further govern the extent of ground water recharge.

Artificial recharge techniques envisage integrating the surface water resources to ground water repositories resulting in changes in the ground water regime, like

a) rise in water level,

b) increment in the total volume of the ground water reservoir,

c) availability for extended period, and

d) quality of ground water.

The upper part of the unsaturated zone is not considered for recharging since it can cause adverse environmental impacts like water logging, soil salinity, dampness, etc.

Artificial recharge projects are site-specific and replication of the techniques even in similar areas is to be based on the local hydrogeological and hydrological environments. Artificial recharge to ground water is generally supported by the remote sensing studies, hydro-meteorological studies, hydro-

geological studies, hydrological studies, soil infiltration testing, geophysical studies, hydro-chemical studies, etc. The studies bring out the potential of unsaturated zone in terms of total volume, which can be recharged.

Artificial recharge of ground water is normally undertaken in the following:

a) areas where ground water levels are continuously declining;

b) areas where substantial volume of aquifer has already been de-saturated;

c) areas where availability of ground water is inadequate in lean months;

d) areas where studies indicate scope for improvement of quality of ground water or areas where salinity ingress into fresh water aquifers has already taken place or is likely to happen in the near future.

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Artificial recharge to groundwater

1 Scope

This Technical Report provides details of methods aimed at augmentation of ground water resources by modifying the natural movement of surface water as a general guide. This Technical Report does not cover the process of deciding and planning artificial recharge within an overall water resource management scheme.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 772, *Hydrometry — Vocabulary and symbols*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 772 apply.

4 Artificial recharge techniques

A wide spectrum of techniques are used to recharge ground water reservoirs. Artificial recharge techniques are broadly categorized as

a) surface spreading techniques,

b) sub-surface techniques, and

c) combination of surface and sub-surface techniques.

Aquifer disposition plays a decisive role in choosing the appropriate technique of artificial recharge of ground water as illustrated in Figure 1.