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Standard Guide for Design of Ground-Water Monitoring Systems in Karst and Fractured-Rock Aquifers[1]

This standard is issued under the fixed designation D 5717; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

ϵ[1] NOTE—Paragraph 1.5 was added editorially October 1998.

INTRODUCTION

This guide for the design of ground-water monitoring systems in karst and fractured-rock aquifers promotes the design and implementation of accurate and reliable monitoring systems in those settings where the hydrogeologic characteristics depart significantly from the characteristics of porous media. Variances from government regulations that require on-site monitoring wells may often be necessary in karst or fractured-rock terranes (see 7.3) because such settings have hydrogeologic features that cannot be characterized by the porous-media approximation. This guide will promote the development of a conceptual hydrogeologic model that supports the need for the variances and aids the designer or governmental reviewer in establishing the most reliable and efficient monitoring system for such aquifers.

Many of the approaches contained in this guide may also have value in designing ground-water monitoring systems in heterogeneous and anisotropic unconsolidated and consolidated granular aquifers. The focus of this guide, however, is on unconfined karst systems where dissolution has increased secondary porosity and on other geologic settings where unconfined ground-water flow in fractures is a significant component of total ground-water flow.

1. Scope

1.1 *Justification*—This guide considers the characterization of karst and fractured-rock aquifers as an integral component of monitoring-system design. Hence, the development of a conceptual hydrogeologic model that identifies and defines the various components of the flow system is recommended prior to the design and implementation of a monitoring system.

1.2 *Methodology and Applicability*—This guide is based on recognized methods of monitoring-system design and implementation for the purpose of collecting representative ground-water data. The design guidelines are applicable to the determination of ground-water flow and contaminant transport from existing sites, assessment of proposed sites, and determination of wellhead or springhead protection areas.

1.3 *Objectives*—The objectives of this guide are to outline procedures for obtaining information on hydrogeologic characteristics and water-quality data representative of karst and fractured-rock aquifers.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This guide offers an organized collection of information or a series of options and does not recommend a specific course of action. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this guide may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 653 Terminology Relating to Soil, Rock, and Contained Fluids[2]

D 5092 Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers[3]

D 5254 Practice for Minimum Set of Data Elements to Identify a Ground-Water Site[3]

[1] This guide is under the jurisdiction of ASTM Committee D-18 on Soil and Rock and is the direct responsibility of Subcommittee D18.21 on Ground Water and Vadose Zone Investigations.

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[2] *Annual Book of ASTM Standards*, Vol 04.08.

[3] *Annual Book of ASTM Standards*, Vol 04.09.

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