

DETERMINAND SUITES AND SAMPLING FREQUENCY FOR GROUNDWATER QUALITY MONITORING IN ENGLAND AND WALES

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Biographical Sketches of Authors

John Chilton is a hydrogeologist with the British Geological Survey and has more than 25 years experience in the UK and overseas. His principal research interests include nitrate and pesticides from agricultural and non-agricultural sources. He has provided guidance on approaches for groundwater quality monitoring to WHO and the UN Economic Commission for Europe as well as to the Environment Agency through this and previous projects. Chris Milne has 14 years experience as a chemist, the last nine of which have been in the Survey. His research interests include the interactions between metal pollutants and humic substances, arsenic in groundwater and baseline hydrochemical studies in the UK and Europe, and monitoring programmes. Ian Fox is a senior chemist with the National Laboratory Service of the UK Environment Agency. Marianne Stuart has 20 years experience as an organic geochemist with the British Geological Survey. Since 1989 she has been working in the groundwater programme, researching the fate and behaviour of pesticides and industrial solvents in groundwater, wastewater reuse and approaches to groundwater quality monitoring. Following five years as a hydrogeologist in her native Belgium, Irina Gaus has been nearly three years in the British Geological Survey. Her work in this and other studies has included statistical and geostatistical analysis of temporal and spatial variability of groundwater quality data and mathematical modeling of hydrogeological and hydrochemical problems. Kamrul Hasan is a hydrogeologist who worked as a research assistant at University College, London before joining the National Groundwater and Contaminated Land Centre of the UK Environment Agency in 2001. He was the Agency's project leader for this study.

Abstract

The United Kingdom has an increasing range of national and European regulatory and other drivers for the monitoring of groundwater quality. These regulatory requirements translate into a broad range of information objectives and the UK's Environment Agency has initiated several activities in order to address these objectives. The British Geological Survey was asked to develop a sound, practical and cost-effective framework for determinand suite and sampling frequency selection.

The conceptual approach aims to use limited monitoring resources effectively by focusing sampling where quality changes are most likely to occur. Determinands have been divided into those with rapid and slower hydrochemical responses. Aquifers are considered to be confined or unconfined and to have relatively fast or slow groundwater movement. These factors are combined in a simple matrix to obtain suggested sampling frequencies, which range from once every few years in confined aquifers with slow moving groundwater and for determinands which respond slowly, to quarterly for responsive parameters in the more sensitive hydrogeological environments.

To guide choice of determinands to be monitored, land-use has been considered as a surrogate for human activities and hence pollution risk. Determinands have been divided into "standard" analytical suites, which need to be measured everywhere, and "selective" suites which are measured only where land-use above the aquifer outcrop suggests contamination risk. GIS-based, multi-class land-use mapping has then been used to indicate which determinand suites should be assigned to individual monitoring sites. The approach has been validated against known analytical results for three pilot areas in England.

