

# OR/18/052 Introduction

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Lapworth, D J, Crane, E J, Stuart, M E, Talbot, J C, Besien, T, and Civil, W. 2018. Micro-organic contaminants in groundwater in England: summary results from the Environment Agency LC-MS and GC-MS screening data. *British Geological Survey Internal Report*, OR/18/052.

A large variety of organic compounds are used in huge quantities for a range of purposes (e.g. manufacturing, food production, healthcare). Some of these have been identified as micro-organic (MO) (low concentration) contaminants in the environment. Interest in the occurrence of MO contaminants in the water environment continues to grow, and more sensitive analytical methods have led to an increasing number of these substances being detected in groundwater. The data analysis carried out as part of this project will allow the Environment Agency to: better understand the risks to groundwater from emerging substances, answer questions from key stakeholders, feed into a future chemicals strategy, contribute to the EU Groundwater Watch List work and contribute to the Government's 25 Year Environment Plan.

This report describes the results from summarising Environment Agency groundwater monitoring data for trace organic compounds from two targeted scanning semi-quantitative methods. The GC-MS method has been regularly used for groundwater since 2001 and provides semi-quantitative data for neutral, hydrophobic compounds amenable to separation by gas chromatography. These include a wide range of industrial compounds, halogenated solvents and trihalomethanes (THMs), plasticisers and pesticides, with relatively few pharmaceuticals. The LC-MS method has been more recently introduced and complements the GC-MS method by providing data on polar, more hydrophilic compounds including many pesticides and pharmaceuticals, as well as perfluorinated compounds (PFCs). Some compounds, such as atrazine, are detected by both methods.

The aim of this project is to analyse Environment Agency GC-MS and LC-MS semi-quantitative screening data for emerging contaminants in groundwater and to produce summary statistics, charts and a summary report.

These objectives were addressed by a series of tasks:

- Development of a methodology for processing the raw data from the Environment Agency's Water Information Management System (WIMS) to deal with data entry errors and produce a 'clean' database ([see Methods](#))
- Development of a statistical procedure ([see Methods](#))
- Visualisation of summary results in bar charts (frequency of detection and maximum concentration), box plots, summary tables and spatial plots ([see Results from GC-MS and LC-MS datasets](#))
- Provision of context by commenting on key substances with high frequency of detections and spatial hotspots, comparison with previous studies in the UK and implications for the use of targeted scanning methods compared to quantitative analytical suites ([see Emerging substances in UK groundwater](#)).

The dataset includes data from 63 sites which are not part of the Groundwater Quality Monitoring Network (GWQMN). Some samples may have been intentionally collected from, or close to, known contaminated sites for a specific purpose other than general screening. Such samples could contain relatively high concentrations of contaminants. The remit of this study was to assess all available

groundwater data and therefore we have not made a distinction between data collected for different reasons in this analysis.

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