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The WRC operates in terms of the Water Research Act (Act 34 of 1971) and its mandate is to support water research and development as well as the building of a sustainable water research capacity in South Africa.

## Groundwater sampling manual updated

*As drought grips large parts of South Africa, the importance of groundwater as a secure source of water for domestic and agricultural needs has become clear. However, whilst many people think of groundwater as an unlimited resource, groundwater does have a finite limit and needs to be managed sustainably to ensure future supply. Groundwater sampling is essential to determining and maintaining the distribution of renewable groundwater resources in South Africa. There is no best single method that will suit all groundwater sampling objectives or is applicable at all sites or times. Thus, as new methods, techniques and equipment are developed, there is a need to continuously update groundwater sampling manuals in line with state-of-the-art practice. The Water Research Commission has developed a new version of its popular groundwater sampling manual to do just that.*

### Background

For many years groundwater sampling has been directed towards evaluating water quality of aquifers for water-supply purposes. Closely allied to this objective has been the curiosity of hydrogeochemists to understand the natural processes that govern changes of groundwater chemistry over the distances and time of long groundwater flow paths.

Attention is also increasingly being paid to contamination of groundwater. With this attention the understanding of the complex hydrogeochemical and hydrogeological processes governing the fate and transport of these contaminants continues to increase.

Closely linked to this has been a proliferation of specialised sampling equipment, complex sampling techniques, and legislation governing sampling at pollution sites.

### Updated sampling manual

The WRC first led the development of a groundwater sampling manual in the early nineties. Now in its third edition, the purpose of the manual is to provide consistent groundwater sampling techniques that will ensure that all groundwater quality data collected is representative of *in situ* groundwater quality.

Using these techniques will reduce sampling error to a minimum. Groundwater quality data collected according to these described techniques can then reliably be used to evaluate hydrogeochemical conditions.

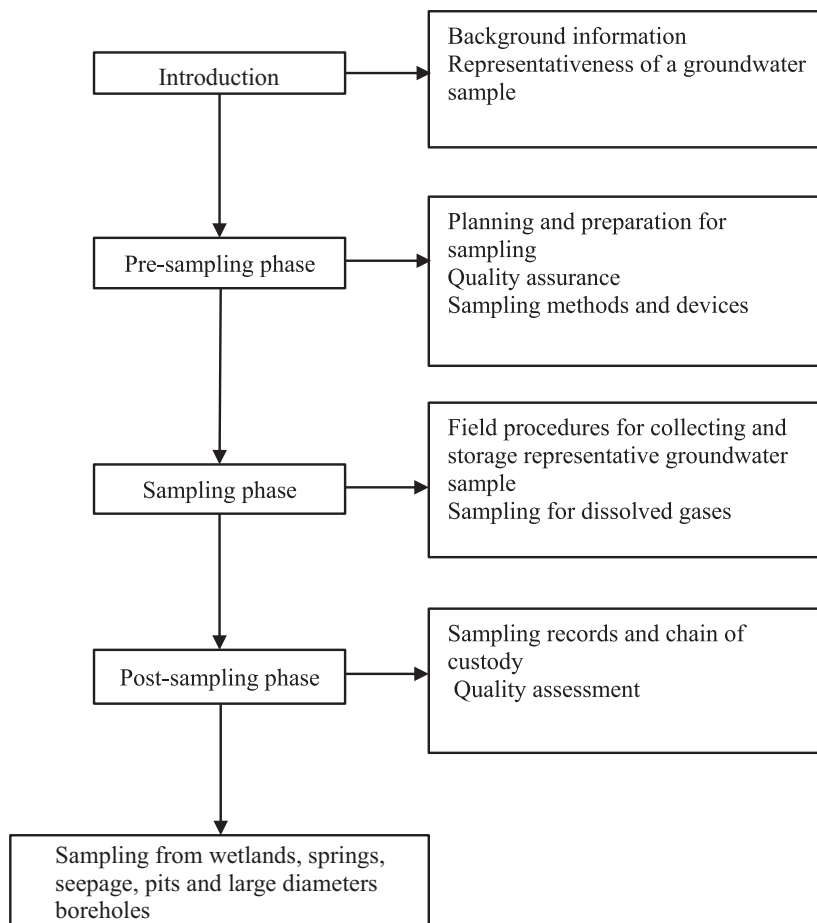
The latest sampling manual has been updated to include guidance regarding:

- Factors that can contribute to sample bias and measures to reduce or eliminate sample bias.
- The use of fluid electrical conductivity profiling as a basic technique to locate groundwater flow zones that can be targeted for sampling.
- Passive sampling devices.
- Use of a stainless steel flow-through bailer as a passive sampling method.
- Decontamination procedures for different determinants.
- Sample preparation, preservation procedures, storage and holding times for different determinants.
- Direct push technology as an emerging sampling approach.
- Sampling of deep boreholes.
- Sampling of dissolved gases in groundwater.
- Evaluation of uncertainties associated with the sampling process and analysis of groundwater samples as part of quality assessment.

Efforts have been made to improve the user-friendliness of the manual, and the manual makes use of decision tree diagrams to guide users on which tool to apply, when and how to collect the representative results while reducing the sampling cost.

The manual comprises three main phases: pre-sampling, sampling and post-sampling.

Figure 1. Flow diagram showing the layout of the sampling manual.



## Use of the manual

The groundwater sampling manual while not exhaustive does provide sufficient technical detail for hydrogeologists involved in water-supply projects to collect groundwater samples using appropriate methods, and to conduct hydrogeochemical investigations of natural systems.

At the same time, the manual provides a fundamental base for the majority of groundwater investigations. The sampling guide assumes that trained groundwater practitioners understand how to design groundwater monitoring networks for different needs and hydrogeological conditions.

To order the report, *Groundwater sampling manual* (Report No. TT 733/17), contact Publications at  
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