
Executive Summary

This report describes guidelines on setting Resource Quality Objectives (RQOs) for groundwater as part of implementation of the Resource Directed Measures under the National Water Act (1998). It is the product of a Water Research Commission funded project and links to parallel projects on Classification and the Reserve (Xu *et al.*, 2003) and aquifer dependent ecosystems (Colvin *et al.*, 2003a).

This report presents step by step guidelines on an approach to setting RQOs which is aligned to the overall approach defined for all water resources and the Classification of groundwater (Xu *et al.*, 2003). Recommendations on potential implementation measures are given. Two useful references are given with this report. Appendix A lists important parameters and key indicators for extractive uses of groundwater which may be chosen as RQOs. Appendix B gives an overview of reference hydrochemical conditions for different aquifer types in South Africa. Terminology relevant to implementing the Resource Directed Measures (RDM) for groundwater is explained in section 5.

The legal definition of RQOs is wide ranging and presents an opportunity for comprehensive groundwater protection for sustainable use. RQOs should be set in consultation with stakeholders as part of the catchment visioning process and implemented through catchment strategies, Source Directed Controls, land-use planning and license conditions. The RQOs will link closely to the Reserve and their level will be determined by the Class given according to Chapter 3 of the NWA.

The process to determine RQOs requires an understanding of groundwater resources and their boundary conditions, uses of groundwater, the importance of various uses, the current degree of modification of the resource and the agreed degree of modification of the resource. In this context, key characteristics of the resource which support its sustainable use, for both extractive and environmental purposes, are identified and suitable resource indicators quantified for different classes of modification or impact.

The steps to set a suite of RQOs to protect a significant groundwater resource are recommended as follows:

1. Broadly characterise the groundwater resource.
2. Define the aquifer attributes which support or limit the recognised uses.
3. Define the risk to uses with respect to hazards present in the catchment and aquifer vulnerability.
4. Select key measurable indicators which relate to the resource itself or land-use impacts
5. Quantify the reference conditions, present status, sustainability threshold and variability of these resource indicators.
6. Outline the management actions that may be necessary to ensure different levels modification/ protection are maintained.
7. The Minister, in consultation with the CMA, sets a value for the resource indicator: the RQO.

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It is expected that a suite of RQOs will be set for a groundwater management unit including:

- water levels in each groundwater response unit, and the seasonal and inter-annual variability of water levels related to natural climate variation;
- water quality - the concentrations of key water quality constituents (related to the use of groundwater in the area) including: salinity, fecal coliforms, nutrients and trace elements and their spatial, seasonal and inter-annual variability;
- aquifer structure and composition, including: aquifer integrity; the pollution attenuation potential of the natural land types; natural recharge rates and extent of recharge areas; natural discharge rates and the extent of discharge areas; regional and local flow regimes.

Each RQO should be defined as:

- The resource attribute (eg – water level below ground surface);
- The area where it should apply (the groundwater management unit) and the groundwater response unit;
- The acceptable temporal and spatial range of values;
- The level of accuracy required in monitoring and required sampling techniques;

- The frequency and density of monitoring data necessary to ensure compliance.

These RQOs will provide objectives for catchment decision-making which frame the vision for sustainable use of the resource. The RQOs are simple and measurable limits which will require regular monitoring and adaptive management to maintain. Activities which impact on the RQO will be regulated by water use licensing and land-use planning.

An M.Sc thesis was completed at University of the Western Cape by Tholeka Mafanya in partnership with this project (Mafanya, 2002). Ms. Mafanya studied groundwater use and protection in the Mbazwana area of northern KwaZulu Natal as a case study.

It should be noted that this document aims to support the broad programme of implementation of the RDM. The full process of "internalisation" by DWAF and CMAs of our recommendations will continue after the completion of this project and will be necessarily inclusive and extensive. It is not the aim of this project to complete that process internalisation and realisation of this approach, as that requires further work by the Department.

It is accepted that the implementation of RQOs will be a long and dynamic process and this report is seen as the beginning of that process for groundwater, not the end.