

NEW TT REPORTS 2013/14

Hydrogeology of Groundwater Region 10: Karst Belt

Reinhard Meyer

This report forms part of a series on the hydrogeology of the various groundwater regions in South Africa. Region 10 (Karst Belt) is the sixth region that will be published; there are 64 Groundwater Regions. The Regions previously published are: 1 (Makoppa dome), 3 (Limpopo Granulite-Gneiss belt), 7 (Polokwane/Pietersburg Plateau), 19 (Lowveld) and region 26 (Bushmanland). The hydrogeology of the Karst Belt is described using available data and gives a good overview of the groundwater conditions in this region.

TT 553/13

ISBN: 9781431203918 Overseas Price: \$35.00

Vadose Zone Hydrology: Concepts and Techniques

Matthys A Dippenaar, J Louis van Rooy, Nelda Breedt, Altus Huisamen, SE Muravha, Sarah Mahlangu & JA Mulders

The vadose zone can also be considered as “the zone between the land surface and the water table” which includes the plant root and intermediate zones and the capillary fringe, representing that portion of the crust where the pore spaces contain water at pressures below atmospheric, air and other gases. The vadose zone falls within a framework overlapping between and combining the specialisation of many different disciplines. Vadose zone hydrology includes the specialist input of notably soil scientists, surface water hydrologists, hydrogeologists and engineering geologists, but such collaborative efforts are still mostly limited to the implications of soil water on biodiversity or the protection offered to the aquifer by the overlying unsaturated media, and hence closely linked with studies in geotechnical engineering and ecology.

TT 584/13

ISBN: 9781431205073 Overseas Price: \$35.00

Optimal utilisation of thermal springs in South Africa

Jana Olivier & Nelia Jonker

The aim of the project was to identify the optimal uses of thermal springs in South Africa. The objectives were three-fold, including the determination of the geological, biological, physical and chemical characteristics of the thermal springs in South Africa; their fitness for current use; and their suitability for alternative uses. Countries around the world have recognised alternative uses for waters and heat generated from thermal springs. Currently, the South African thermal springs are under-utilized.

TT 577/13

ISBN: 9781431204816 Overseas Price: \$30.00

The use of isotope hydrology to characterize and assess water resources in South(ern) Africa

Tamiru Abiye (editor)

Environmental isotopes are routinely employed world-wide in the study of groundwater and surface water, as they provide unique information on transport and interconnectivity of water resources and reservoirs. The term environmental isotope embraces the measurement of isotope ratios of the elements making up the water molecule and of substances dissolved in water. These are subject to environmental processes and undergo changes, for example during evaporation.

TT 570/13

ISBN: 9781431204601 Overseas Price: \$35.00

Groundwater governance: A global framework for action (2011-2014) - Regional diagnosis for the Sub-Saharan Africa Region

Eberhard Braune & Shafick Adams

The Groundwater Governance - A Global Framework for Action (2011-2014) is a joint project supported by the Global Environment Facility (GEF) and implemented by the Food and Agriculture Organisation of the United Nations (FAO), jointly with UNESCO's International Hydrological Programme (UNESCO-IHP), the International Association of Hydrologists (IAH) and the World Bank.

TT 578/13

ISBN: 9781431204823 Overseas Price: \$30.00

Linking property rights, ecosystem services and water resources

Duncan Hay, Bimo Nkhata, Melanie Wilkinson, Kyle Harris, Charles Breen & Jackie Crafford

"What is often referred to as property is really the access right to a stream of benefits from a given set of resources." Neil Meyer. A team of researchers recently conducted a research project for the Water Research Commission. It was entitled 'Embedding Property Rights Theory in Cooperative Approaches to the Management of Aquatic Ecosystem Services in South Africa'.

TT 554/13

ISBN: 9781431203994 Overseas Price: \$32.00

Introduction to the management of EDCs Volume I

Ralph Gregory Melville Heath, Lee Ann Boyd, Oliver Obakeng Malete and Didimalang Masoabi

The aims of this project were to develop a guide to correct sampling and sample preparation in the context of endocrine disrupting chemicals (EDCs). This project also produced the overall introductory chapter for the current

series of EDC management volumes (of which the sampling guide is one). The sampling guide provides an overview of the issues that should be considered when designing a sampling programme (i.e., the how, when, and where). The guide addresses four media, namely, water, sediment, air and biota (typically fish). Quality assurance and quality control are described.

TT 560/13 ISBN: 9781431204213 Overseas Price: \$10.00

Endocrine-Disrupting Compounds: Sampling Guide. Volume II

Didimalang Masoabi, Lee Ann Boyd, Thomas Coughlin, Ralph Gregory Melville Heath

The aims of this project were to develop a guide to correct sampling and sample preparation in the context of endocrine disrupting chemicals (EDCs). This project also produced the overall introductory chapter for the current series of EDC management volumes (of which the sampling guide is one). The sampling guide provides an overview of the issues that should be considered when designing a sampling programme (i.e., the how, when, and where). The guide addresses four media, namely, water, sediment, air and biota (typically fish). Quality assurance and quality control are described.

TT 561/13 ISBN: 9781431204229 Overseas Price: \$10.00

Guideline for the management of EDCs in a catchment Volume IV

The aims of this project were to develop a guide to correct sampling and sample preparation in the context of endocrine disrupting chemicals (EDCs). This project also produced the overall introductory chapter for the current series of EDC management volumes (of which the sampling guide is one). The sampling guide provides an overview of the issues that should be considered when designing a sampling programme (i.e., the how, when, and where). The guide addresses four media, namely, water, sediment, air and biota (typically fish). Quality assurance and quality control are described.

TT 562/13 ISBN: 9781431204236 Overseas Price: \$10.00

Status review and requirements of overhauling flood determination methods in South Africa

Stefanus Johannes van Vuuren, Marco van Dijk and Gert Louis Coetzee

This project was undertaken to review the current flood calculations methods and to provide some guidance on the research focus to improve, extend and update the Flood Determination Procedures. The aim of the study is to reflect on the current state of flood determination methods used in South Africa and the short-comings in the existing methods. This then provides the basis to identify the specific research areas and prioritization of research and required updates for flood determination procedures in South Africa.

TT 563/13 ISBN: 9781431204199 Overseas Price: \$35.00

ECOMAG Model: an evaluation for use in South Africa

Evison Kapangaziwiri, Jean-Marc Mwenge-Kahinda, Denis Arthur Hughes and Moipone Precious Mokoena

The Russian ECOMAG model has been suggested as a possible candidate for use in South Africa, and this aims to evaluate its suitability for use under South African conditions. In the absence of the software code, the ECOMAG Model was evaluated qualitatively (without setting up and running it) against the South African equivalent models such as the Pitman and the ACRU. Naturally, each model is constructed to solve practical problems in a particular environment. The ECOMAG was developed specifically for the boreal environment, which is completely different from the South African environment.

TT 555/13

ISBN: 9781431204083 Overseas Price: \$20.00

Testing a Methodology for Environmental Water Requirements in Non-perennial Rivers: The Mokolo River Case Study

MT Seaman, M Watson, MF Avenant, AR Joubert, JM King, CH Barker, S Esterhuysen, D Graham, ME Kemp, PA le Roux, B Prucha, N Redelinghuys, L Rossouw, K Rowntree, F Sokolic, L van Rensburg, B van der Waal, J van Tol & AT Vos

This research has contributed considerably to the knowledge of the ecological functioning of non-perennial rivers and the testing of a method to determine the Environmental Water Requirements (EWRs) for non-perennial rivers. This report should be read in conjunction with the WRC report no TT459/10 (Seaman et al., 2010) where the ecological functioning of non-perennial rivers and the prototype methodology is explained.

TT 579/13

ISBN: 9781431204854 Overseas Price: \$40.00

St Lucia 2001 to 2012: A Decade of Drought

RH Taylor and JB Adams

This document is a record of the impacts of the 2001 - 2012 droughts on the St Lucia estuarine system. In addition to documenting the impacts of the drought on the estuarine system, details of the management interventions are provided.

TT 576/13

ISBN: 9781431204755 Overseas Price: \$30.00

DRIFT: DSS Software Development for Integrated Flow Assessments

CA Brown, AR Joubert, J Beuster, A Greyling & JM King

The previous version of the Reserve Desktop model was based on hydrology and regional parameters, which were largely based on seasonal distributions of stream flow. One recent development in Environmental Water Resource methodology is the flow stressor response method, which links the hydraulic habitat requirements of biota to the hydraulic characteristics of a channel cross-section, to specify the ecological stress conditions that will occur under different flow regimes. The core component of the model uses a desktop approach to define the characteristics of a

representative channel cross-section in the absence of any detailed field surveys. Components of the model deal with hydrology, hydraulics and ecological requirements.

TT 575/13 ISBN: 9781431204182 Overseas Price: \$30.00

Manual for Ecostatus determination (Version 2) MODULE B Geomorphology Driver Assessment Index (GAI)

KM Rowntree, with L Kelly and M Rountree

EcoStatus is defined as “the totality of the features and characteristics of the river and its riparian areas that bear upon its ability to support an appropriate natural flora and fauna and its capacity to provide a variety of goods and services”. In essence the EcoStatus represents an ecologically integrated state of the drivers (hydrology, geomorphology, physico-chemical) and responses (fish, aquatic invertebrates and riparian vegetation).

TT 551/13 ISBN: 9781431204052 Overseas Price: \$30.00

The Shared River Initiative Phase II - Part 3 - Development of a participatory framework for understanding water-related ecosystem services within the context of classification and the reserve

Sharon Pollard, Alyona Rydannykh, Derick du Toit and Ariane Laporte-Bisquit

The findings of Phase 1 of the Shared Rivers Initiative (SRI) prompted a second phase.

The aim was to assess the sustainability of the water resources of the six major Lowveld river systems, and the factors that constrain or contribute to this, in order to provide a grounding from which to design and implement real change.

TT 574/13 ISBN: 9781431204700 Overseas Price: \$35.00

The Shared River Initiative Phase II - Part 2 - Legal competence and regulation

Ramin Pejan, Alexandra Robertson, Jonathan Cogger, Dimakatso Sefatsa

The findings of Phase 1 of the Shared Rivers Initiative (SRI) prompted a second phase. The aim was to assess the sustainability of the water resources of the six major Lowveld river systems, and the factors that constrain or contribute to this, in order to provide a grounding from which to design and implement real change.

TT 573/13 ISBN: 9781431204695 Overseas Price: \$35.00

The Shared River Initiative Phase II - Part 1 - Collective action for improved water resources management

Derick du Toit, Sharon Pollard, Jane Burton & Madeleine von Balkom

The findings of Phase 1 of the Shared Rivers Initiative (SRI) prompted a second phase. The aim was to assess the sustainability of the water resources of the six major Lowveld river systems, and the factors that constrain or contribute to this, in order to provide a grounding from which to design and implement real change.

TT 572/13 ISBN: 9781431204687 Overseas Price: \$35.00

Social franchising partnerships for operation and maintenance of water services: Lessons and experiences from an Eastern Cape pilot

Kevin Wall & Oliver Ive

Year after year, the operation and maintenance of too much of South Africa's water services infrastructure has been found to not comply with the required standards. Breakdown of service delivery is too often the outcome. The primary objectives of the Butterworth schools sanitation and water servicing pilot project was the demonstration of the suitability of social franchising partnerships under these circumstances, and the development of a model which can be used for rolling out similar services to the rest of the more than 4000 rural schools across the Eastern Cape.

TT 564/13

ISBN: 9781431204168 Overseas Price: \$25.00

ICTs in the water sector – where do we stand?

Michael Champanis, Ulrike Rivett, Saaligha Gool, and Mphatso Nyemba-Mudenda

Over the last decade ICT systems have become known as a potential solution for developing countries and their information needs. The wide distribution of mobile phones in even the most rural environments has created the suggestion that cellphones are far more than a mere communication tool. Cell-phone systems used for data collection, mobile payment and crowd-sourcing initiative to improve governance and other applications are offering a new way of using technology to improve access and might have the potential to improve service delivery.

TT 571/13

ISBN: 9781431204052 Overseas Price: \$25.00

Guideline for the utilisation and disposal of water treatment residues

Jacoba Elizabeth Herselman

This project is the third in a series of projects undertaken by the WRC to deal with the utilisation and disposal of water treatment residues (WTR). It was undertaken with the specific aim to develop Guidelines that describe the requirements for the disposal and/or use of WTR. The Technical Support Document records the assessment and review of the legislation governing the utilization and disposal of WTR, the international and local literature that assisted in the development of the Guideline and the rationale that was followed to develop the South African WTR Guideline, the associated limits for South African conditions and the outcomes of the risk assessments.

TT 559/13

ISBN: 9781431204090 Overseas Price: \$25.00

WATCOST: Manual for a costing model for drinking water supply systems

Chris D Swartz, Peter Thompson, Presantha Maduray, Gerhard Offringa and Godfrey Mwiinga

This project developed a user-friendly costing model, "WATCOST", for estimating costs of drinking water supply systems. This allows economic comparison between different water treatment and supply options being considered for a water supply scheme(s). It further also allows costing reports to be done for existing water treatment systems, which assists with budgeting and asset management processes. The aim of WATCOST is two-fold: firstly, the manual

can be used as a reference document for information on costing data for water supply projects, with actual costing figures that can be obtained from the tables and graphs in the document.

TT 552/13 ISBN: 9781431204014 Overseas Price: \$35.00

Guidelines for the Selection and Use of Appropriate Home Water-Treatment Systems by Rural Households

Maggy NB Momba, Jocelyne K Mwabi, Bhekie B Mamba, Barbara M Brouckaert, Chris D Swartz, Gerhard Offringa & Robert O Rugimbana

A number of home water-treatment systems (HWTs) are being used internationally by rural communities without access to potable water services. These HWTs vary from the simplest, such as using cloth as filter, to the most sophisticated systems treating greywater to potable standards. Although various devices have been reported on extensively in the literature, little is known locally about the existing options and little has been done to assist local communities in making informed choices on whether a specific device should be selected. This project therefore aimed to evaluate HWTs for local application and provide guidelines for the selection and use of appropriate HWTs by rural households.

TT 580/13 ISBN: 9781431504892 Overseas Price: \$35.00

Guidelines on using the refined and translated web-enabled Water Safety Plan Tool (2013 version)

Unathi Jack and Philip de Souza

Water Safety Planning is a systematic process that aims to consistently ensure acceptable drinking water quality that does not exceed the numerical limits in SANS 241 by implementing an integrated water quality management plan, which includes a risk assessment and risk management approach from catchment to point of delivery. In so doing the process allows for better understanding of water supply systems. Once the risk has been identified, control measures can be put into place to mitigate these risks.

TT 581/13 ISBN: 9781431204953 Overseas Price: \$35.00

Energy Efficiency in the South African Water Industry: A Compendium of Best Practices and Case Studies

Chris Daniel Swartz, Marlene van der Merwe-Botha, Susan Delia Freese

Energy will in future become a high cost item for municipalities and utilities which operate and maintain water and wastewater processes. Energy consumption will continue to increase as more people are provided with water and sanitation and new technologies are implemented to meet stricter effluent and potable water quality requirements. To position the water sector globally with regard to energy consumption, the Global Water Research Coalition (GWRC) embarked on a project entitled Energy Efficiency in the Water Industry: A Compendium of Best Practices and Case Studies, which looks at these best practices worldwide.

TT 565/13 ISBN: 9781431204304 Overseas Price: \$30.00

Stasoft V user manual

JFC Friend

Stasoft was developed by JFC Friend under the leadership of the late Prof Loewenthal at the University of Cape Town during the late 1980s, early 1990s. Unfortunately the software was not designed at that stage for the current new Windows-based environment present on all computing platforms, as that only happened years later. However, the original program was developed in Turbo Pascal. The new Stasoft V program was developed to be functional on new operating platforms (Windows 7 and higher). The program has the same calculation functions that were available in Stasoft III, with enhanced menu and help facilities

TT 585/13

ISBN: 9781431205127 Overseas Price: \$35.00

Community engagement in drinking water supply management: A review

Ulrike Rivett, Derek Taylor, Chenai Chair, Bianca Forlee, Mandisi Mrwebi, Jean-Paul van Belle, Wallace Chigona

This study provides the necessary background information on community engagement in drinking water services delivery and the role of ICTs in incentivising public participation. This study is based on the notion that an increase in community engagement – particularly in rural areas – would result in an increased understanding of the current shortcomings of drinking water supplies, an increased understanding of the communication challenges between communities, Water Service Authorities (WSA) and Water Service Providers (WSP) as well as an improved experience of greater transparency and accountability for all stakeholders.

TT 583/13

ISBN: 9781431205068 Overseas Price: \$20.00

TIPS for Sewering Informal Settlements

Lina Taing, Neil Philip Armitage, Nangolo Ashipala & Andrew Spiegel

Informal dwellings tend to be laid out in a manner that is not conducive for retrofitting drainage according to conventional engineering standards. Coupled with unfavourable ground conditions (ranging from settlements in flood-prone areas to discontinued landfills), retrofitting and/or installing conventional sewerage in such conditions is inherently problematic, particularly in situations where residents refuse to relocate (even temporarily) for fear of further marginalisation.

TT 557/13

ISBN: 9781431204120 Overseas Price: \$30.00

The South African Guidelines for Sustainable Drainage Systems

Neil Philip Armitage, Michael Vice, Lloyd Fisher-Jeffes, Kevin Winter, Andrew Spiegel & Jessica Dunstan

Stormwater management in the urban areas of South Africa has and continues to predominantly focus on collecting runoff and channeling it to the nearest watercourse. This means that stormwater drainage currently prioritises quantity (flow) management with little or no emphasis on the preservation of the environment. The result has been a significant impact on the environment through the resulting erosion, siltation and pollution. An alternative approach

is to consider stormwater as part of the urban water cycle, a strategy which is being increasingly known as Water Sensitive Urban Design (WSUD) with the stormwater management component being known as Sustainable Drainage Systems (SuDS).

TT 558/13

ISBN: 9781431204137 Overseas Price: \$35.00

Water Reuse for Industrial Wastewater

Wade Edwards, Marshall Sheerene Sheldon, Petrus Jacobus Zeelie, Debbie De Jagers, Leendert Gideon Dekker and Cornelius Carlos Bezuidenhout

This project investigated the application of the dual stage operations strategy in a pilot plant evaluation of a MBR (dsMBR) for the on-site treatment and recovery (reuse) of industrial trade effluent. The goal of the study was to use the MBR system as a pre-treatment for the reduction of the wastewater pollution load so that a downstream reverse osmosis (RO) system can be incorporated to facilitate a zero liquid discharge strategy as well as effluent reuse potential for the industrial partner.

TT 556/13

ISBN: 9781431204113 Overseas Price: \$35.00

Improving Plot Holder Livelihood on Smallholder Canal Irrigation Schemes

Wim van Averbek

The main thrust of the work was aimed at testing a number of farming system innovations but attention was also given to social resource constraints. The research was conducted in the Limpopo Province, which is the heartland of smallholder irrigation schemes in South Africa, more specifically canal schemes, which were the first type of schemes to be constructed. A survey of all registered smallholder irrigation schemes in the Vhembe District was conducted. The findings confirm the continued relevance of canal irrigation and show that gravity-fed canal schemes are more likely to be operational and to last longer than pumped schemes.

TT 566/13

ISBN: 9781431204441 Overseas Price: \$40.00

Growing Green Maize on Canal Schemes in Vhembe: Production Guidelines

W van Averbek, Khathutshelo Ralivhesa, Sibonelo Mbuli, Tsunduka Khosa, Kgabo Manyelo

The main thrust of the work was aimed at testing a number of farming system innovations but attention was also given to social resource constraints. The research was conducted in the Limpopo Province, which is the heartland of smallholder irrigation schemes in South Africa, more specifically canal schemes, which were the first type of schemes to be constructed. A survey of all registered smallholder irrigation schemes in the Vhembe District was conducted. The findings confirm the continued relevance of canal irrigation and show that gravity-fed canal schemes are more likely to be operational and to last longer than pumped schemes.

TT 567/13

ISBN: 9781431204458 Overseas Price: \$20.00

Production Guidelines for Small-Scale Broiler Enterprises

Khathutshelo Ralivhesa, Wim van Averbeké & Francois Siebrits

The main thrust of the work was aimed at testing a number of farming system innovations but attention was also given to social resource constraints. The research was conducted in the Limpopo Province, which is the heartland of smallholder irrigation schemes in South Africa, more specifically canal schemes, which were the first type of schemes to be constructed. A survey of all registered smallholder irrigation schemes in the Vhembe District was conducted. The findings confirm the continued relevance of canal irrigation and show that gravity-fed canal schemes are more likely to be operational and to last longer than pumped schemes.

TT 568/13

ISBN: 9781431204465 Overseas Price: \$25.00

Guidelines on Management of Working Animals

Timothy Simalenga, Siphosibanda, Peta Jones

The main thrust of the work was aimed at testing a number of farming system innovations but attention was also given to social resource constraints. The research was conducted in the Limpopo Province, which is the heartland of smallholder irrigation schemes in South Africa, more specifically canal schemes, which were the first type of schemes to be constructed. A survey of all registered smallholder irrigation schemes in the Vhembe District was conducted. The findings confirm the continued relevance of canal irrigation and show that gravity-fed canal schemes are more likely to be operational and to last longer than pumped schemes.

TT 569/13

ISBN: 9781431204472 Overseas Price: \$25.00