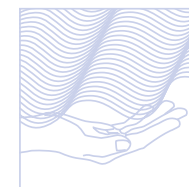


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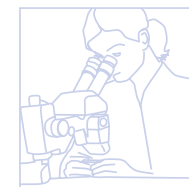
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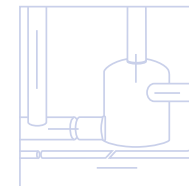
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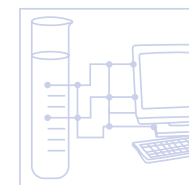
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## from the chair

The year under review marked my second year of formally serving as the Chairperson of the Board of the Water Research Commission (WRC). My association with the WRC has, however, stretched over more than a decade, during which period I played different roles as a Board member, a key stakeholder (representing one of the largest bulk water providers) and prior to that, an academic who contributed to the capacity development and advancement of water research in South Africa. Against this background I take pride in the WRC's achievements, especially during the past three years. During this time the WRC has re-invented and successfully transformed itself into a strategic, dynamic water-centred knowledge hub. During this short period, the WRC has strongly positioned itself as a credible role-player that is held in high esteem by the water sector nationally, in Africa as well as globally. During 2001/02 the new strategy of the WRC was developed and implementation plans formulated. In the following year the focus was shifted towards implementation and rapid transformation. The year under review was characterised by consolidation of the organisation and its re-positioning, both locally and internationally. Since its transformation, the organisation has placed strong emphasis on a number of strategic initiatives including capacity-building, knowledge dissemination and the global positioning of South African water research. These initiatives are of paramount importance for sustaining an effective South African water sector, especially in this dynamic period of implementing wide-ranging new legislation and adapting to new strategic structures that relate to both the management of the resource and the provision of water and sanitation

services.

During the year under review, the WRC strengthened its investment in building and diversifying the water-centred knowledge base in South Africa. This investment in the building of appropriate competencies and capacity, vital for the sustainable operation of our water sector in the medium to long-term, is reflected in a number of capacity-building drives conducted throughout the year. One of these initiatives, which advanced with great strides during the year, was the support of students carrying out water research, with special emphasis on historically disadvantaged students. This year's drive resulted in an increase of 43% above the number recorded in the previous year and is well above the set target for the year. The WRC's commitment to forging links with historically disadvantaged universities and technikons is also indicative of the priority being given to transformation of South Africa's water-related knowledge base. In total, 428 students, of whom about 280 are from historically disadvantaged backgrounds, were supported by the WRC in their efforts to achieve post-graduate qualifications. The WRC also promoted the role of women in the field of water research through being an active partner in the Women in Water initiative. As part of the WRC's drive towards ensuring a future in which appropriate capacity is sustained, the organisation took the initiative of compiling a book, aimed at high-school learners, on potential careers in the water sector.

Providing leadership both locally and globally was also high on the organisation's agenda during the year under review.

# annual

True to its mission and vision, the WRC continued to serve South Africa as a water-centred knowledge hub and, guided by its vision, has succeeded in strengthening its position as a global player, linking South Africa's water-centred knowledge base with that of both the developed and the developing parts of our world. This has resulted in the growth of South Africa's water-centred knowledge through sharing and use. The WRC has played key leadership roles in many local and Africa-focused initiatives aimed both at knowledge sharing and dissemination, as well as the building of appropriate capacity and competence. These include issues related to integrated water resource management, the dialogue on water, the environment and food production (agriculture), the issue of possible implications for our water resources resulting from global climate change, and issues related to various water uses and water services delivery, with special emphasis on water supply and sanitation within the scope of the Millennium Development Goals.

Knowledge sharing and dissemination, as well as public understanding of water knowledge, were strategically and dynamically addressed by the WRC during 2003/04. The WRC focused on leading the sector into the era of knowledge management, with a strong emphasis on sharing knowledge and equipping the sector with knowledge required to manage both the resource and its different uses. The WRC has built networks and supported many water-centred gatherings where knowledge sharing and transfer have been the main focus. The WRC has continued to place high priority on appropriate packaging and timely transfer of knowledge and

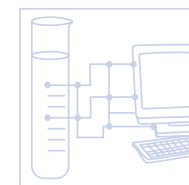
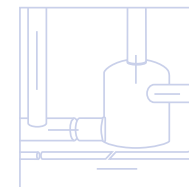
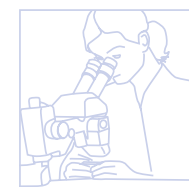
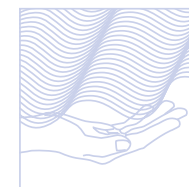
technology products and has successfully launched a number of strategic positioning and marketing initiatives.

Internally 2003/04 was a year of consolidation, enabling the organisation to further establish itself along the set strategic direction. During this year the new strategic structures were solidified and a strong performance-based culture was formed. The WRC has improved its effectiveness in fund management and its investment in knowledge creation. The organisation assessed its research portfolio and consulted widely with many of its stakeholders regarding the scope of its operation and its strategic direction. Feedback from stakeholders affirms the core strategy and operational modality of the WRC.

In conclusion, I wish to thank the Minister of Water Affairs and Forestry, the South African water sector (researchers and practitioners), and the WRC Board members for their support during the year. Special thanks are due to the management and staff of the WRC for their commitment and dedication during the past year and for making the WRC a strong national asset for South Africa.



Prof HC Kasan  
WRC Board Chairperson



# the board

the board



**Prof HC Kasan** (Chairperson)  
*General Manager:  
Water Treatment Technology  
Rand Water*



**Dr R Kfir**  
*Chief Executive Officer:  
Water Research Commission*



**Prof CG Palmer**  
(Vice-Chairperson)  
*Director: Unilever Centre  
for Environmental Water  
Quality  
Institute for  
Water Research,  
Rhodes University:  
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**Mrs MM Matsabu**  
*Director:  
DYNACON  
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**Dr SJ Khoza**  
*Executive Manager:  
Knowledge Management:  
Development Bank of  
Southern Africa*



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**Mr NL Moikangoa**



**Dr BM Molohe**  
Group Executive Officer:  
Agricultural Research  
Council



**Mr AM Muller**  
Director-General:  
Department of Water  
Affairs and Forestry



**Mr RJC Nay**  
Convener: Engineering  
Services,  
City of Johannesburg

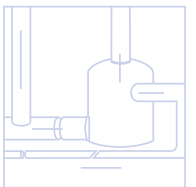
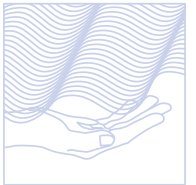


**Dr DJ Merrey**  
Director for Africa:  
IWMI Africa  
Regional Office

**Mr MG Rall**  
Executive Director:  
Mvula Trust



**Mr JS Vilakazi**  
Managing Director  
Black Management  
Forum (BMF)





*The Water Research Commission (WRC), true to its role of as a water-centred knowledge hub, strives to lead and direct the creation of new and appropriate knowledge, facilitates the dissemination and transfer of knowledge and supports the development of suitable competences and a skills base to enable the water sector and the people of South Africa to manage and sustain the nation's scarce water resources, whilst developing and maintaining appropriate water and sanitation services and managing them wisely. During 2003/04 the WRC, with the support of the water sector, established a strategic research portfolio based on identified critical water-related problems and key needs. The WRC uses this strategic portfolio as the basis for directing resources towards developing fitting solutions through a problem-solving approach. Accordingly, the WRC funds and supports research projects and other research-related activities, including the strengthening and the building up of appropriate research capacity. The strategic research portfolio of the WRC provides further focus on key strategic areas (KSAs) which consist of a number of research thrusts and programmes. The WRC actively encourages the dissemination and application of new knowledge derived from its supported research for the formulation of water policy, water resource management, water utilisation for social and economic development (water and sanitation services) and, importantly, the safeguarding of human and ecosystem health.*

*The various WRC activities highlighted below illustrate our strategic commitment to excellence in research, knowledge creation and dissemination.*

## **water resource management**

### **Artificial groundwater recharge – a case of active knowledge dissemination**

The WRC has recently published a high-quality booklet that describes a number of Southern African case studies on artificial recharge and the associated "success factors". The booklet, entitled *Artificial Groundwater Recharge: Wise Water Management for Towns and Cities*, is a culmination of the WRC research which successfully piloted several artificial groundwater recharge schemes in fractured-rock aquifers in Southern Africa. This research has resulted in a considerable awakening of interest in the potential of artificial recharge technology, both as an effective means of contributing to sustainable development of groundwater resources in such aquifers, and to augmentation of water resources in general. The recent production of the booklet addresses a clear need for the transferring of this technology to Southern Africa's hydrogeologists, water engineers and water resource planners. Furthermore, a series of related lectures has been delivered in various centres in Southern Africa with the assistance of the Department of Water Affairs and Forestry (DWAF), the Groundwater Division of the Geological Society of SA, the South African Institute of Civil Engineers, the Groundwater Association of KwaZulu-Natal and the Hydrogeological Association of Namibia.



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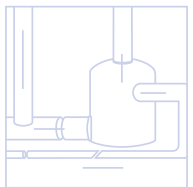
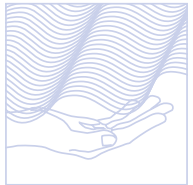
## **Surface water-groundwater interaction – clarification from a South African geohydrological perspective**

A much-needed handbook has been produced by the WRC. The handbook aims to better inform water resource managers and environmentalists about surface water-groundwater interaction. This handbook is of great importance because of the close interdependence of surface and groundwater within the unitary hydrological system. Knowledge of South Africa's water resources is not complete without a clear understanding of the dynamic exchanges which take place between the surface water and groundwater components of the system. Groundwater not only plays a significant role in sustaining base-flow of perennial rivers, but also sustains wetlands across the country under a wide range of climatic, topographical and geological conditions. The book addresses issues that have been found to contribute to poor understanding of surface water-groundwater interaction. Examples of such issues are the inconsistent and incorrect use of terminology, currently prevalent amongst the hydrological fraternity; the common misconception that all river base-flow is derived from groundwater, whereas interflow discharged into streams and rivers from the unsaturated zone also contributes to base-flow; and the fact that water held in, or percolating through, the unsaturated zone is often forgotten, or simply ignored, whereas it plays a key role in the hydrological system and helps to sustain aquatic ecosystems and terrestrial fauna and flora. The study on which the handbook is based also provides focus for future needs including, for example, the need for the development of tools

that will identify and quantify the groundwater contribution to river flow and wetlands (these tools are currently lacking) and the need to produce maps to indicate where groundwater makes a significant contribution to river base-flow.

## **Providing the small-scale miner with knowledge – managing water-related impacts of small-scale mining**

A handbook addressing critical aspects of managing water-related impacts of small-scale mining is now available as a result of the WRC-supported research and stakeholder consultation. The handbook describes appropriate strategies aimed at promoting responsible mining and sound environmental management among small-scale miners. The most important water-related environmental impacts caused by small-scale mining are related to suspended sediment loads due to accelerated erosion of de-vegetated areas and to panning and sluicing operations, increased flood scouring due to excavation of river banks and flood plains, alteration of river channels and flows due to mining of alluvial deposits in the river beds and water quality problems resulting from mobilisation of metal ions, previously trapped as insoluble sulphides, and acid mine drainage. The wash-off of mercury used to concentrate gold increases risks of mercury toxicity to aquatic and terrestrial organisms and miners, whilst wind-blown dusts from unprotected tailings and waste rock dumps may enter aquatic environments with potentially detrimental effects. Although individually many of the effects of small-scale mining on the water environment may well be





insignificant, their cumulative impact when occurring simultaneously, is of long-term significance and could be of great magnitude. The handbook addresses the challenge of managing small-scale mining by providing the small-scale miner with the ability to adopt appropriate and relevant implementation strategies and environmental management systems that are aimed at maintaining a balance between encouraging economic development and preserving high standards of environmental management. Strategies based on legislation, institutional arrangements, technology, best practice guidelines, community participation and capacity-building, and are among those which have been identified for managing water-related impacts of small-scale mining.

**Fractured-rock aquifers related to dolerite ring complexes – viable sources of groundwater supply to communities, provided that ecological impacts are recognised**

Research supported by the WRC has shown that the dolerite ring structures, which are prominent features in the landscape of the Karoo and Eastern Cape, are potentially fruitful drilling targets for groundwater exploitation. Continuation of this research in the Eastern Cape has, in addition, shed light on the dependency of ecosystems, springs and seepages on fractured-rock aquifers related to these dolerite rings, and their vulnerability to groundwater abstraction. Since a large part of the population of the Eastern Cape is dependent on springs and seeps for their water supplies, these findings are key for any future applications. The research required a

multidisciplinary approach involving structural geology, hydrostratigraphy, spring census, geomorphology, wetland and biosystems mapping, and extensive use of spatial analysis and remote sensing, including investigation of a total of 12 exploration boreholes, drilled by DWAF across the south-west rim of the Qoqodala dolerite ring. These boreholes were needed to fine-tune a conceptual model of the ring system. The saucer-shaped intrusion contains three aquifers: shallow, unconfined; medium-depth, semi-confined; and, deep, confined. Because of the shape of the intrusion, the upper unconfined aquifer is very vulnerable to deep drilling, which would create artificial connections between aquifers. The location of wetlands or seeps at low elevation, the direction and density of fracturing, the slope of the inclined sheet, and the shape of the intrusion are factors that must be taken into account when developing groundwater abstraction systems associated with dolerite rings.

**Understanding the hydrology of hillslopes - the key to better management of catchments, riparian zones and wetlands**

A great deal of insight into 3-dimensional hydrological processes has been gained and hydrological modelling capabilities improved, as a result of intensive field measurements, supported by equally intensive laboratory studies, at several hillslope sites in South Africa. The new knowledge regarding hillslope flow path mechanisms is contributing substantially to an improved ability to predict vital hydrological responses, particularly in wetter catchments



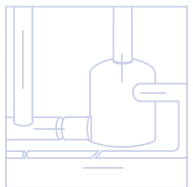
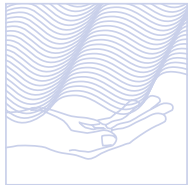
# Highlights

which yield most of the country's water. Hillslope mechanisms at the smaller catchment scale give rise to rapid responses which affect the magnitude of stormflow peaks while, at the larger catchment scale, they have a greater influence on runoff hydrographs. Mechanisms of lateral flow, accumulation and redistribution, as well as residence times of water on the hillslope, determine water storage during wet periods and subsequent release during dry periods and influence the nature and location of desirable land-use practices. Conversely, changes in land-use practices affect all hillslope flow path mechanisms in a number of ways, many of which still need to be defined. Nevertheless, the definition and quantification of the streamflow-generating mechanisms on hillslopes already allows for more appropriate management of catchments, wetlands and riparian zones.

## **Rainfall measurement for water resource management enters a new era**

The measurement of rainfall for water resource management has been revolutionised as a result of the SIMAR (Spatial Integration and Mapping of Rainfall) programme, recently completed after four years of intensive WRC-supported research, having built upon a number of preceding studies which had previously demonstrated the potential of using remote sensing techniques in conjunction with traditional raingauge networks. A decade ago, hydrologists and water resource managers still had every reason to be pessimistic about the state of the country's rainfall monitoring

infrastructure. The national capacity to measure rainfall adequately, specifically for supporting real-time water resource assessment studies and water-related disaster management interventions, appeared to be on the wane because of the rapidly-dwindling number of raingauge stations which reported rainfall measurements on a daily basis. Moreover, measurements received from spatially isolated raingauges were of doubtful value when the real need was to know the quantity and spatial distribution of rain produced by successive rainfall events over a catchment. SIMAR has overcome these limitations and has delivered a number of valuable real-time rainfall data products, the main one being a daily rainfall map with a spatial resolution of 2 km. The groundbreaking achievements of SIMAR include the upgrading and harnessing of the South African Weather Service (SAWS) network of relatively inexpensive, unsophisticated weather radars to satisfy onerous requirements for continuous, real-time, quantitative data acquisition. They further include the development of special mathematical techniques to convert raw radar data to rainfall rates of considerable reliability, the use of satellite data for estimating area-related rainfall where radar coverage is lacking, and the incorporation of data from all available raingauges that report at daily intervals and serve as ground truth at and near raingauge positions. Added to this are the development of state-of-the-art, real-time databases and communication systems and, finally, the world-leading discovery of how best to merge data sets from disparate sources, in a manner which yields products to which the greatest degree of confidence may be attached. Besides





having been funded by the WRC and the SAWS, SIMAR products are a tribute to the outstanding collaborative efforts of the SAWS, the University of KwaZulu-Natal and DWAF.

#### **Expanding the South African National Microbial Water Quality Monitoring Programme to include groundwater**

A monitoring system for assessing groundwater quality using a novel approach was designed through WRC research in support of DWAF's drive to establish national monitoring programmes and information systems for South Africa's water resources, a requirement of the National Water Act of 1998. The guiding principle in the design was to maximise the ability to provide generalised assessments of the microbial quality of aquifers as a whole, whilst minimising the number of costly monitoring boreholes required. The monitoring system seeks to establish the extent to which faecal pollution is contained within the immediate down-gradient flow paths from significant pollution sources. The system allows for the monitoring of groundwater quality to become part of the national water quality monitoring programme, which currently focuses on surface water. The extended monitoring programme proposes to incorporate a process whereby groundwater areas are prioritised for inclusion in the national monitoring programme. A groundwater component to the national water quality monitoring programme is crucial, because of the many potential faecal pollution sources which exist. These currently include large sewage treatment works and dense informal settlements with inadequate sanitation.

Groundwater is of primary importance in providing drinking water, especially to inhabitants of rural areas. Monitoring groundwater quality is key to ensuring that water supplied to communities from groundwater sources continues to meet all health and safety requirements.

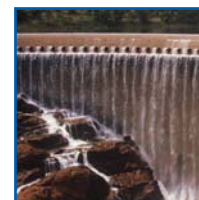
#### **Using newly acquired knowledge for mitigating floods**

Recent research on a flood forecasting system empowered the eThekweni Metro Disaster Management Group to work towards mitigating floods in their area in a proactive way. Some of the innovations relating to the Flood Forecasting System and its components include algorithms for merging of raingauge and weather radar estimates of rainfall over large areas, a rainfield-nowcasting scheme that anticipates where it will rain up to an hour ahead, exploitation of the speed and efficiency of a linear transfer function rainfall/runoff model to make flood nowcasts, a flood water-inundation model for the industrialised Mlazi River flood plain and a GIS-based information system in the Metro Disaster Management Centre. The latter provides an instantaneous visual display of real-time information on current whereabouts of storms, as well as rain and streamflow nowcasts relative to suburbs, townships, rivers, roads, etc. With this new flood forecasting capability, people living near rivers in the area have the potential for receiving life and property-saving warnings about impending floods. Moreover, industries receiving 6 – 12 hour advance warnings will be enabled to evacuate staff and perform controlled shut-downs or take steps to reduce damage to sensitive plants. This

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is a far cry from the situation in September 1987, when an oil refinery and a paper mill were non-operational for 10 days, with serious economic consequences. Further knowledge

dissemination drives are aimed at building similar capabilities at other metropolitan disaster management centres throughout South Africa.

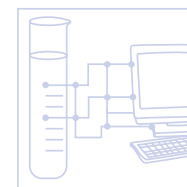
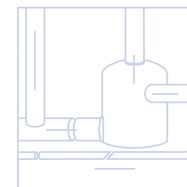
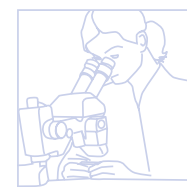
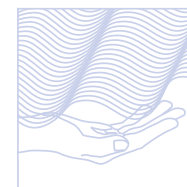


## water-linked ecosystems

### Climate variability and large-scale groundwater abstraction in the Little Karoo: Which impacts more on ecosystems?

A recent WRC study reveals that there is a clear link between certain environmental impacts and large-scale groundwater abstraction from the Table Mountain Group aquifers situated in the Little Karoo. This effect is strongly influenced by climate variability. During the past decades, a period of extremely wet years in the 1970s and 1980s has been followed by a pattern of less variable, lower rainfall over the past 13 years. The combined influence of deep groundwater abstraction and declining precipitation has reduced base-flow in the Vermaak's River and caused drying of two permanent springs which feed the river and also support localised ecosystems.

There appears to be a lag period of seven years between the start of large-scale groundwater abstraction and the resultant impact on river flow. In contrast to springs linked to the Vermaak's River, the majority of springs on the Kammanassie Mountain Range emanate from perched groundwater systems which cannot be influenced by deep groundwater abstraction. Drying of these springs is therefore as a result of their susceptibility to declining and irregular recharge from rainfall and snow as well as groundwater abstraction for agricultural purposes. Combined effects of reduced precipitation and increased groundwater abstraction on river flow and drying of springs in turn impact on riparian and terrestrial vegetation and on Cape Mountain Zebra populations. The above-mentioned findings have direct implications for sustainable exploitation of groundwater in the area.





# highlight

## **Knowledge for better quality of life – the Eastern Cape Estuaries Research Programme: Proud recipient of the Green Trust Award**

The research and capacity-building initiatives have focused on a number of problem areas including the issue of the accumulation of sediment of both marine and land origin in most of the estuaries, largely as a result of human interferences such as abstraction of freshwater upstream and local engineering works. This problem, which has impacted negatively on local economies, is being alleviated through appropriate, estuary-centred management interventions. The over-exploitation, in some of the rural areas, of the goods and services provided by estuaries in the absence of opportunities to generate alternative cash incomes, was also addressed and the successful piloting of ecotourism offered a practical solution. Another key issue to be addressed is the dissonance between the estuarine environment in which communities live and the approach used to produce Integrated Development Plans (IDPs) required by the Department of Local Government. This stems from the fact that inadequate consideration of the environment in the IDP process has resulted in the erosion of the very asset (the estuary) on which development was originally founded. This will be addressed by building of appropriate capacity, in selected local authorities, to include sustainable environmental management considerations in the IDP process.

## **Mainstreaming wetlands management within catchment management plans**

A generic guideline document that will assist Catchment Management Agencies (CMAs) to integrate the development and implementation of effective measures for protection, conservation and management of freshwater wetlands, into catchment management planning was developed with WRC support and WWF funding. The Guideline document includes generic terms of reference for the technical work needed in order to acquire the knowledge which will enable development of an integrated Catchment Management Strategy, which in turn will provide for protection, conservation and management of wetlands in the catchment. The guideline is of utmost importance as, although the South African water and environmental laws are amongst the most progressive in the world, and are often used by others as models, wetlands, in particular palustrine wetlands, like in most other countries do not receive the attention they deserve. Because a wetland by nature represents an inseparable association between a water resource and the land on which it is found, wetlands are often overlooked, with water and land managers each assuming that the other will deal with wetland issues. By facilitating the mainstreaming of wetlands management within the planning process, the guidelines produced through this research will help to ensure that wetland issues receive due attention in future catchment management plans.

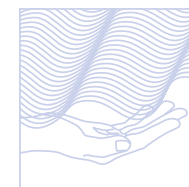
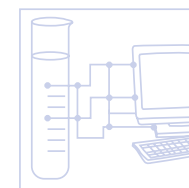
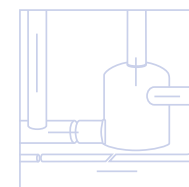
# Highlights

## Under the spotlight – biodiversity in groundwater ecosystems

An amazing discovery of groundwater fauna in karstic areas in South Africa has widened the knowledge on global biodiversity. The same living organisms (amphipods) were even more recently seen whilst examining boreholes in basalt. Since the biology of these amphipods is completely unknown, their discovery in groundwater systems, besides expanding South Africa's contribution to global biodiversity, opens up a new biological/zoological research field. In addition, this discovery calls for the extension of the national responsibility for the protection of this new 'groundwater' branch of its biodiversity. The implications for the management of the groundwater resource are not yet clear, but may be significant considering the important role aquatic fauna play in the management of surface water systems. The scope for future research has been increased with the recent development of new sampling equipment based on a successful Australian design. Previously, owing to the lack of suitable equipment for use in boreholes, it has been impossible to obtain specimens of amphipods for study. The newly acquired ability to obtain specimens is an essential step in the development of understanding of the biodiversity of the groundwater fauna and sets the stage for research into the biology of these organisms.

## A protocol and a reference guide providing information for assessing ecosystem and human health risks

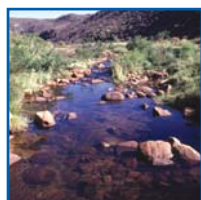
A generic protocol has been developed to guide fish contaminant surveys so that these provide information not only for ecosystem health assessment programmes but also for assessing health risks associated with contaminated water, e.g. through consumption of fish by recreational and subsistence fishermen. In South Africa the pollution of freshwater aquatic systems can be linked to point source discharges (waste water treatment works and industrial effluents) and diffuse surface runoff (agricultural, mining and urban). Through contact recreation, drinking of contaminated water and the consumption of contaminated food, people may be exposed to harmful contaminants released into the environment without adequate consideration of human-health and environmental effects. The protocol is based on catchment information (e.g. anthropogenic activities that could result in chemical pollution), socio-demographic information regarding consumers of freshwater fish in the catchment, sound procedures for field sampling, sample processing and laboratory analyses, and assessments of bioaccumulation potential and health risks associated with contaminants present. The protocol provides a standardised, scientifically-repeatable process that can be used to determine the levels of contaminants in fish and whether the fish can be eaten with minimal risks to humans. An overview of the protocol has been documented in a guide for users such as regulators (government, conservation organisations and health authorities), practitioners (consultants and researchers),





water resource managers, polluters (agriculture, mines and industry) and educational institutions. In addition, a reference guide for practitioners spells out the precise methods to be

applied and provides a set of standardised data sheets for field and laboratory assessments.



## water use and waste management

### A guidebook on household water supply in rural areas with saline groundwater

A WRC guidebook, which provides assistance in identifying and selecting suitable options for developing water supplies from saline groundwater sources, has been produced. Saline or brackish groundwater sources are often available to small and rural communities, but desalination technologies for exploiting these sources are often too expensive or sophisticated to be useful to such communities. The guidebook provides relevant information on a range of water supply options which have the potential to be economically feasible and acceptable to the community. The content of

this guidebook was developed through theoretical research into relevant water supply options, consultations with researchers active in the field of desalination technology, meetings and correspondence with water authorities and field visits to typical target communities where selected water supply options are currently in use. A number of relevant water supply options, ranging from sophisticated desalination technologies to simple household water augmentation methods, such as rainwater collection, have been included, taking into account socio-economic circumstances such as demography, housing structure, water source, water quality, community involvement, participation and willingness to pay. Key technical aspects of each of these options have been identified. The guidebook, therefore, provides guidance on the selection of suitable water treatment options from both a technical and social point of view and offers a very useful tool for promoting the economic provision of safe water to the rural



# Highlights

communities who depend on saline sources for their water supplies.

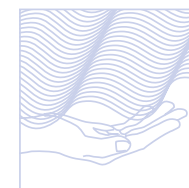
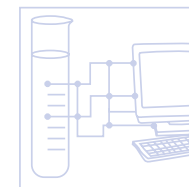
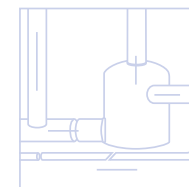
## **Knowledge for sanitation – a low-cost sanitation option for high density settlements**

WRC studies conducted with the support of Ethekwini communities have shown that the shallow-sewer system, which has been implemented successfully in Brazil, Greece, Australia, the US, India, and become the norm in Pakistan, can be an effective low-cost solution to the contentious problem of sanitation provision in low-income and informal settlements in South Africa. The technology is also well-suited to community-upliftment projects in high-density settlements. The concept involves relaxation of the design parameters of conventional sewerage systems, allowing for shallower pipe-laying depths, smaller-diameter pipes and flatter gradients. What is particularly attractive about the application is that very few residences need to be relocated to accommodate the infrastructure. The concept also includes the empowerment of communities to construct, operate and manage sewerage systems through acquisition of the necessary technical and organisational skills. A group of citizens, living together in a micro-drainage catchment area (condominium), work to install, operate and manage their own sewer system. This not only helps community members to better their circumstances, but also reduces the operational load on service providers. The local authority needs only to provide one connection to the catchment area. Like a

conventional water-borne sanitation system, shallow sewers are gravity systems, with collector mains designed and constructed to full water-borne standards. Condominium sewers, however, are in areas of little traffic, so can be laid much shallower. The Ethekwini trials showed the cost of installing such systems to be about half the cost of full water-borne sewers. The systems have generally been well-received by participants.

## **A non-invasive method for the detection and characterisation of fouling on membrane surfaces**

A novel method for the detection and characterisation of fouling layers on membranes has been developed. This is highly significant for ensuring the cost-effective use of membranes in the treatment of industrial effluents. The method is based on the use of differential ultrasonic waves and mathematical manipulation of the returned waves. Fouling can be detected on a membrane surface in its casing within 15 seconds of initiation of the fouling. Techniques used thus far for the monitoring of membrane fouling include cameras, through-the-membrane measurements using optical microscopy, NMR techniques and, recently, ultrasonic techniques. Research leading to the new method also highlights the growth in sophistication of the ultrasonic technique, which now enables fouling to be measured in nano-dimensions, or before there are any signs of a flux decline. The ultrasonic amplitude gives a straight-line relationship with fouling resistance. It is possible to relate a





spectrum of the unfouled membrane to that of the fouled membrane and obtain very accurate analyses in the short term. The time difference in waves arriving from the membrane itself and the fouling layer provides information on the thickness of the fouling layer. It is further possible to resolve the spectra into frequencies where the frequency of the fouling layer, now in a 3-D plot, is at a different location to that of the membrane. This technology has been applied with success to the fouling of membranes in industrial effluent and the first commercial prototype of a meter to monitor fouling in membrane plants will be produced before the end of 2004.

### **An expert system for designing water treatment plants**

A software package that applies expert system technologies to water treatment plant design has been developed based on WRC-supported research. The package has been released for general use by design engineers and students. The software allows data input, unit process design and modelling, process selection, and dynamically responding water-treatment plant design, modelling and sensitivity analyses. The unit processes are text-book designs that can perform sizing of the units, provide estimation of performance and effects on water, assess relative applicability to various situations, and issue warnings related to limits and design criteria. The data incorporated into the programme were collated from public sources of information, as well as from interviews with Southern African experts in the field. Users are allowed full access to all formulae and other data in the knowledge base and can

therefore adapt the knowledge base to suit their experiences and situations. A rule-base has been added to enhance process selection, adding sophisticated decision-making power to the largely technically-based unit process "text-book" design and calculation-engine components. Knowledge about the unit processes already in the plant design, their relative positions, upstream water qualities and suitable candidate processes for a position in the plant can be used as information by the rule-base. The rule-base also forms part of the knowledge base and can easily be edited by the user to adapt the decision logic to suit specific requirements.

### **Guidelines on economic regulation of water services**

A guideline document providing practical applications of economic regulation of water services has emanated from WRC research focusing on measures which promote effectiveness, efficiency, financial viability and sustainability of water services providers, thereby helping to protect the interests of the public and consumers. The guide aims to assist regulators or regulating authorities in answering key questions such as the appropriateness of the average pricing levels; the levels of investment by water services providers (including the issues of adequate and efficient investments in infrastructure and efficient operations and operating decisions); and the relevance of various institutional / governance models to appropriate pricing levels and investments in infrastructure. The document addresses both bulk and retail water and sanitation, including on-site sanitation services and pit-

# Highlights

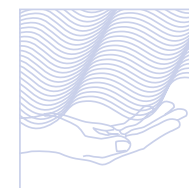
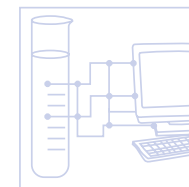
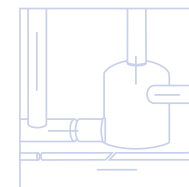
emptying and water services for households, commerce, institutions and industry.

## **Small water treatment systems: Will an approval/certification system help to ensure sustainability?**

A basic and practical tool for use in the approval process for new water treatment systems to be built for small rural communities in South Africa was developed. The tool uses a questionnaire-based approach. Initially, it had been postulated that use of an approval/certification system, possibly based on a USA National Sanitation Foundation (NSF) standard would help to ensure the sustainability of small rural water treatment systems. However, in testing the hypothesis, it became clear that a local system of approval could not use USA-NSF standards as reference, as they tend to focus on advanced treatment processes that are inappropriate for conditions in rural South Africa. The questionnaire-based approach was tested on 22 small water supply projects and found to be highly suitable. In addition to confirming the applicability of the tool, the test resulted in applicable findings, indicating that while many of the tested operational treatment systems continued to function, the functioning in most cases was not entirely satisfactory. The fact that the schemes were still functional cannot be attributed entirely to either good design or good management practices in the communities, but rather to continued financial and technical interventions by DWAF and or local municipal government structures.

## **Improving water and sanitation services in deprived urban and peri-urban areas: An award-winning partnership project**

A pilot project carried out through an innovative partnership has successfully overcome obstacles and has resulted in improved water and sanitation services in the deprived urban and peri-urban areas of Inanda-Ntuzuma, Durban, Edendale and Pietermaritzburg in KwaZulu-Natal. The project has gained international recognition and has recently been awarded the Impumelelo Award for innovation. Local governments in South Africa face the critical challenge of delivering services to the poor while under severe financial and capacity constraints. The changing politico-institutional framework in South Africa has created high expectations of delivery among the poor. Public-private partnerships are often proposed as a vehicle for delivery, but these arrangements have commonly been perceived to be to the benefit of large companies alone. At times the poor feel that their voice is not heard at the negotiation table and in the departments deciding on implementation of services. The challenge has thus remained for municipalities that are not well-resourced, to work out open-ended partnerships which will accelerate and sustain services. The successful KZN project, initiated and supported by the KZN Business Partners for Development (BPD) and the WRC, addresses such partnerships. The project forms one of a cluster of eight related international projects coordinated by BPD and conducted under the auspices of the World Bank. Numerous lessons learnt from the pilot project which used the BPD model, where partnerships between business, government and civil society sectors were explored, were





captured for the benefit of the sector. In short, an example of an important lesson learnt concerns the issue of governance, where the key role of community participation and the need to establish community 'ownership' and establish a 'social licence' to work in poor communities were found to be essential for long-term service sustainability and improved level of cost recovery. Another example of a key lesson learnt is the need for active involvement of NGOs, which played a mediating role between communities and service providers.

#### **Technical and financial decision-support for sewage sludge treatment**

An authoritative reference document, which reviews and evaluates the applicability and cost implications under South African conditions of sludge management technologies that are available both locally and internationally, has been produced. Previously, local sewage sludge handling agencies lacked decision-making support regarding technical performance and relative costs of alternative sludge treatment and management options. This document therefore fills a critical gap in the country's ability to deal effectively and efficiently with this growing waste disposal problem. The document reviews current sludge management practices in South Africa, gives estimates of quantities and qualities of sludge produced, provides a brief description of commonly used sludge treatment and disposal methods and describes the possible utilisation and disposal routes available within the South African legal framework. The sludge treatment

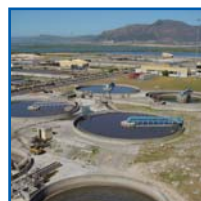
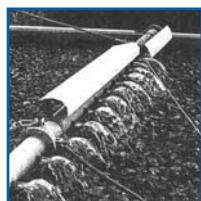
requirements and available technologies for each of the utilisation or disposal routes are listed in matrix form for easy reference and use. Knowledge generated internationally that has been adapted to suit South African conditions is also included. Processes considered appropriate for South African circumstances are described in so-called technology sheets that can be easily updated. First-order cost estimates are given for established processes. Typical case studies are presented to illustrate the use of the sludge-management decision matrix and the cost sheets.

#### **Effective use of soil covers in coal-mine rehabilitation reduces acid mine drainage**

A new protocol for effective use of soil covers in helping to control pollution from coal mines has been developed, based on research addressing the beneficial role of soil covers in controlling the potentially serious problem of acid mine drainage from coal discard deposits during and after the rehabilitation of coal mines. In the absence of soil covers, compaction and treatment of coal discard deposits prolonged, but did not prevent, acid breakthrough in the leachate. A key finding was that for soil covers to be effective in reducing rainfall infiltration and oxygen ingress to acceptable limits, they have to be at least 1 m thick. This is considerably thicker than current practice. Acid drainage was not observed in association with reduced rainfall-related outflows when soil covers were 1 m thick. Under these conditions leachate in fact showed a slight decrease in

# Highlights

sulphate concentrations, indicative of the reduced sulphide oxidation rates also responsible for reducing acid drainage.



## water utilisation in agriculture

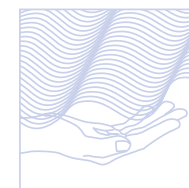
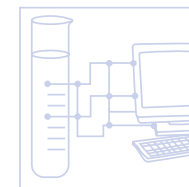
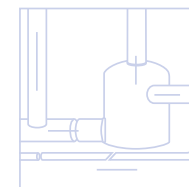
### **New knowledge – the key for turning a liability into a valuable resource: Shallow water tables reduce irrigation requirements of crops**

Experiments conducted over a period of three years have shown that water tables between 1 m and 1.8 m in depth, far from being a liability, can be a valuable resource for the irrigation farmer. Depending on crop, soil texture and depth of water table within the above-mentioned range, the water table was able to contribute between 21% and 63 % of the crop's seasonal water use. During the period of peak water uptake, a constant water table at 1 m contributed up to 90 % of daily evapotranspiration in all crops considered. Considering that approximately 260 000 ha of irrigated arable land in South Africa has shallow water tables, understanding the capillary contribution from a water table towards a crop's

water requirements could be the foundation for the development of an important management tool to conserve irrigation water. Without such a tool, this contribution could easily be overlooked and the crop wastefully over-irrigated. Clearly, irrigation scheduling methods must be modified, where necessary, to account for contributions from water tables. Simulation models, which are able to satisfactorily simulate water uptake from shallow water tables, provide the necessary guidance in this regard.

### **In-field rain-water harvesting enhances rainfall-use efficiency, food security, and sustainable crop production**

An in-field rain-water harvesting (IRWH) system for the production of field crops has been successfully tested on small plots in a semi-arid farming area. The principle is to grade soils between rows in such a way that water is concentrated in the root zone directly beneath crop rows, while losses due to





runoff and deep percolation are minimised. Resulting increases in crop yield have been quantified, and the added benefit of different mulch combinations, aimed at reducing evaporation from the soil surface, demonstrated. Soil fertility aspects, with the focus on nitrogen, have been clarified. The technology has been successfully transferred to the small-scale farmers on whose plots the experiments were carried out and also to the Department of Agriculture. Technicians from previously disadvantaged communities have been fully equipped to provide further guidance in the application of the IRWH system.

### **Cheap and simple irrigation scheduling using wetting front detectors – an international award-winning technology**

Wetting front detectors (WFDs) provide the means for irrigation farmers, whether they be small-scale, emerging farmers or established, commercial farmers, to achieve a higher degree of irrigation efficiency at relatively low cost. The award-winning technology, based on an Australian invention, has been extensively tested in South Africa, with outstanding results. One of the features of the use of WFDs is that it encourages users to follow a “learning-based” approach. It enables irrigators to address the most fundamental of questions – whether or not applied irrigation water penetrates to the desired depth in the root zone in order to replenish the water used by the crop. For this, detectors are placed in pairs, a shallow one about half-way down the managed root zone and a deeper one towards the bottom of the managed root

zone. If detectors are rarely activated, the crop is likely to be under-irrigated. If both detectors regularly respond to irrigation, the crop is likely to be over-irrigated. Ideally, irrigation should fall between the two extremes. In testing, WFDs were installed on a number of farms throughout South Africa, including commercial and small-scale farms. They were tested in annual and perennial crops, different soil types and with a range of irrigation systems. Farmers’ perceptions of irrigation scheduling changed soon after being introduced to the WFDs. Some farmers were quick to accept the WFD as a decision-support tool and all farmers gained confidence in the ability of WFDs to monitor the movement of the wetting front. With this knowledge, farmers acquire both the incentive and the base needed to learn more about the various biophysical factors which affect the water requirements of the crops they irrigate.

### **Deficit irrigation studies serve to improve irrigation scheduling in deciduous fruit orchards**

The knowledge gained from studying responses of deciduous fruit trees under varying regulated deficit irrigation (RDI) management systems has helped to improve the scheduling of irrigation under conditions of limited water supply and assisted in the formulation of RDI strategies. Particular studies have focused on the effects of RDI on the production and quality of peaches in the Western Cape. In fruit trees with normal crop loads, fruit size, mass, quality and production are found to be not sensitive to water deficits during various



# Highlights

growth stages. However, there is a tendency towards reduced shoot growth when water deficits occur during certain fruit growth stages. With a normal crop load, the application of deficit irrigation during the slow fruit-growth or the post-harvest growth stages can therefore result in the saving of substantial amounts of water, provided that normal irrigation is applied during the other growth stages. A combination of high crop load and water deficits during the ripening stage results in smaller fruit and lower production. Irrespective of crop load, substantial soil water deficits can be tolerated during any one of the growth stages without seriously affecting the final fruit size, fruit mass, fruit quality, or production. However, normal (full) irrigation must then be applied during the other stages. When trees bear heavy crop loads, deficit irrigation, despite reducing seasonal water consumption, cannot be recommended as a water-saving strategy owing to the negative effects on fruit quality and production.

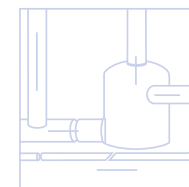
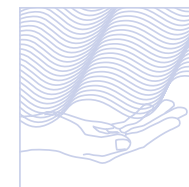
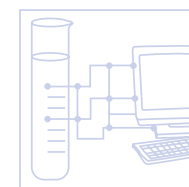
## **Decision-support facilitates economic management of irrigation water (quantity and quality) for non-point source (NPS) pollution reduction within river catchments**

A suitable decision-support system for quantifying economic environmental tradeoffs of measures for non-point source (NPS) pollution abatement was developed. The system also gives rise to important policy implications. The causes and extent of agricultural NPS pollution are not straightforward, due in part to the complex relationship between agricultural production and damages from water pollution involving

physical, biological and economic links. How well NPS pollution control policy performs, often depends on how well these links are understood and represented in decision-support tools. The research to develop the system was conducted in the Gamtoos River catchment. Spatial variability in the Gamtoos catchment was taken into account by delineating 22 sub-catchments and 129 hydrological response units of which 53 were being used for irrigation purposes. The effects of 229 alternative crop, water and fertiliser input combinations on nitrate pollution parameters were thereafter simulated using the Soil and Water Assessment Tool (SWAT), thereby providing the inputs for spatial optimisation models used to quantify the economic and environmental tradeoffs. A key finding was that increasing water cost would not necessarily improve river water quality, especially if this resulted in farmers using water more efficiently on larger areas of irrigated land. Increased water use efficiency could then reduce return flows with a concomitant reduction in streamflow and, therefore, the amount of water available for dilution, thus decreasing the quality of river water.

## **Women play a central role in sustainability of irrigation in Black developing communities**

Costly irrigation schemes for emerging irrigation farmers can be considerably more sustainable when developed on the basis of good understanding of local social and economic circumstances within those communities for whom the





schemes are to be established. Clear actions need to be taken to address such circumstances during the establishment of irrigation schemes. Studies in two small-scale irrigation schemes, Keat's Drift and Esiphongweni, both located in KZN, revealed socio-economic realities that, if overlooked, would impact negatively on the future of irrigation schemes. The most important of these are gender biases. Development initiatives have ignored women in most irrigation scheme development stages. Full participation of women, particularly in the pre-design stages, is critical but difficult to achieve. In cases where there has been a balance in crafting local irrigation institutions that are sensitive to the needs of women, performance and sustainability have increased. The studies

further indicated that women are involved in the most laborious work on irrigation schemes, while men are only involved in switching pumps on and off, opening and closing valves and the application of pesticides. There is a need to find and promote a more appropriate balance between the productive roles of the members of the scheme. Given the socio-economic circumstances of Black communities in South Africa, irrigation development will continue to be supported by funding agencies who must be encouraged to be sensitive to issues and factors that may or may not be quantifiable, but which may ultimately lead to success or failure of the irrigation scheme.



# Executive

## executive report

*The members of the Executive of the Water Research Commission (WRC) submit this report, as approved by the WRC's Board of Commissioners, to the South African Parliament through the Minister of Water Affairs and Forestry. This report forms part of the audited financial statements for the period 01 April 2003 to 31 March 2004. The report has been compiled in accordance with the requirements of the Public Finance Management Act (PFMA) and focuses on corporate governance practices and structures. The report also addresses the mandate and core business of the WRC, the WRC's achievements against a number of key challenges that are critical for the long-term operation and sustainability of the organisation, as well as progress made during the year under review with regard to key performance areas and relevant strategic objectives.*

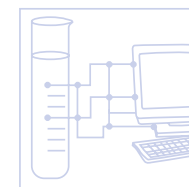
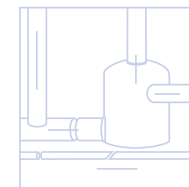
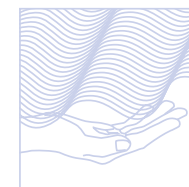
### Introduction

The year under review marks significant progress toward the positioning of the WRC as a 'hub' for water-centred knowledge in South Africa, the SADC region, the African continent and globally. The WRC has played key leadership roles in many local and Africa-focused initiatives aimed at knowledge sharing and dissemination as well as the building of appropriate capacity and competence to address many of the issues that are critical to the water sector. These include issues related to integrated water resource management, the dialogue on water, the environment and food production (agriculture), the issue of the possible implications for our

water resources resulting from global climate change, and issues related to various water uses and water services delivery, with special emphasis on water supply and sanitation within the scope of the Millennium Development Goals.

Internally 2003/04 has been a year of consolidation, allowing the organisation to further establish itself along the set strategic direction. During this year the new strategic structures were solidified and a strong performance-based culture was formed. Under the competent and skilful leadership of its Board of Commissioners, the organisation further developed and refined its core strategies and implementation plans and established a comprehensive research portfolio. The sound corporate governance and strategic direction provided by the Board and the Board's committees guided the WRC in the continuous assessment of current procedures, the development of a number of new policies and the review of a number of its processes and support systems

During the year under review the WRC conducted numerous workshops, consulted widely with many stakeholders and researchers and fine-tuned its research portfolio accordingly. The WRC focused on leading the sector into the era of knowledge management, with a strong emphasis on sharing knowledge and equipping the sector with knowledge required to manage both the resource and its different uses. Building on the notion of knowledge being an unlimited resource that grows with use, the WRC has strategically strived to establish the appropriate water-centred knowledge base





(competence and capacity) which will allow South Africa to best manage the resource, water, which becomes potentially scarcer with use. The WRC has built networks and supported many water-centred gatherings where knowledge-sharing and transfer have been the main focus. The WRC has continued to place high priority on appropriate packaging and timely transfer of knowledge and technology products and successfully launched a number of strategic positioning and marketing initiatives.

The WRC's investment in building and diversifying the water-centred knowledge base in South Africa during the year under review is reflected in the capacity-building drives carried out through the funding of various research projects and other knowledge transfer initiatives. Approximately 428 students, of whom about 280 are from historically disadvantaged backgrounds, were supported in their efforts to achieve post-graduate qualifications while contributing to many of the WRC's research projects. This is an increase of 43% above the number recorded in the previous year and is well above the set target for this year. The WRC also supported the role of women in the field of water research and encouraged women to take leadership in various key positions within the sector. In addition, as part of the organisation's drive towards ensuring a future in which an appropriate knowledge base is sustained, the WRC has compiled a book on potential careers in the water field.

The WRC's activities during the year under review were directed by its mission, to serve South Africa as a water-

centred knowledge hub, and guided by its vision, to become a global player, linking South Africa's water-centred knowledge base with that of both the developed and the developing parts of our world. This has resulted in the growth of South Africa's water-centred knowledge (through sharing and use) and progress towards achieving sustainability of use of our limited water resources with the prospect of improving the quality of life of all South Africans.

## **Mandate**

The WRC was established in 1971 (the Water Research Act, Act No 34 of 1971) following a period of water shortage. It was deemed to be of national importance to generate new knowledge and to promote the country's water research purposefully, owing to the view held that water would be one of South Africa's most limiting factors in the 21st century. In 1971, water research and development (R&D) in South Africa was limited to a few institutions and the funding level was moderate. There was no research co-ordination and an apparent neglect of some key research fields. In addition, there was little strategic direction or leadership that would provide the identification of priority areas or appropriate technology transfer. Being a water-stressed country, South Africa needs progressively to find innovative ways of managing water resources to ensure that the basic needs of its citizens are met, that social and economic development are not restricted through lack or poor quality of water, and that sustainability of water resources and of water-dependent

# e r e p o r t

ecosystems is secured.

The mandate (of the WRC) highlights the following functions to be carried out by the organisation:

- Promoting co-ordination, co-operation and communication in the area of water research and development
- Establishing water research needs and priorities
- Stimulating and funding water research according to priority
- Promoting effective transfer of information and technology
- Enhancing knowledge and capacity-building within the water sector.

South Africa remains threatened by water shortages. At the same time, water quality issues are becoming more acute and climate change may result in a higher frequency of extreme events. The management of water resources needs to adapt dynamically to such changing circumstances. Challenges posed by the integrated management of both the resource and its uses, issues of water supply and sanitation and the provision of related services and the building and sustaining of a competence-base that will allow the water sector to maintain and further grow its capabilities, skills and ability to address these key issues, are overwhelming. The role of the WRC as a water-centred hub and its dynamic, strategic realignment with the needs of our country and more specifically, the water sector, are therefore critical to the meeting of these challenges.

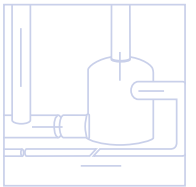
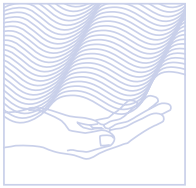
## The core business of the WRC

The WRC functions as a 'hub' for water-centred knowledge. It is a networking organisation, linking various players within the water sector and working through local and global partnerships. The WRC provides novel (while practical) ways of packaging knowledge and transforming knowledge into knowledge-based products which form the basis for new water resource and water service management practices for the water sector and the community at large, both locally and globally.

The WRC strives to expand its role as a global leader in water-centred knowledge, a position toward which it has made great progress, playing increasingly key roles in the SADC region, the African continent and within a number of global networks and other initiatives.

## Corporate governance

The WRC, under the competent direction of its Board of Commissioners, continues to manage its strategic and operational affairs within a sound corporate governance framework, complying strictly with both the Water Research Act and the PFMA and Treasury Regulations. During the year under review the organisation strongly adhered to sound management and control practices. The various committees of the Board provided an effective structure for guiding the WRC throughout the year.





**Risk management, audit and fraud prevention related policies**

The WRC developed an appropriate risk management plan which addressed key strategic and operational issues relating to the WRC's macro- and micro- environment during the year under review. This included the re-assessment of previous risks and the identification of new risk areas, as well as the revision of risk-severity ratings, taking into consideration the internal and external environment in which the WRC operates. The WRC developed and implemented its strategic and operational plan based on the risk areas identified. The plan was approved by the Board of the WRC and was also used as a basis for the internal audit of the organisation.

The plan meets the requirements of both the PFMA, which requires all public entities to maintain an effective, efficient and transparent system of financial and risk management and internal control, and of the Treasury Regulations which specify that the accounting authority (the Board) must ensure that risk assessment is conducted regularly to enable emerging risks to be identified and addressed timeously.

The WRC appointed an audit firm to undertake an internal audit of the organisation. Prior to the audit, the audit plan had been reviewed and recommended for approval by the Audit Committee of the Board, and thereafter approved by the Board of the WRC. The audit addressed financial and other strategic risk areas. The outcomes of the audit indicated significant improvements in many of the WRC's financial practices. Both the audit results and the WRC management's

reply, addressing planned actions intended to bring about further improvements, were reviewed and approved by the Audit Committee and the Board.

During the year under review the WRC developed additional supporting policies to enhance the comprehensiveness of its existing fraud prevention plan and code of ethics. The WRC has adhered to its corporate values and integrated these values into all its undertakings, both internal and external.

**Governance structures**

During the year 2003/04 the WRC operated under the leadership of its current Board of Commissioners, members of which were appointed (or re-appointed) by the Minister of Water Affairs and Forestry on 1 June 2002 for a period of three years ending 31 May 2005.

**Board members**

Prof HC Kasan (Chair)	Mr NL Moikangoa
Prof CG Palmer (Vice-Chair)	Dr BM Molohe
Dr R Kfir	Mr AM Muller
Dr SJ Khoza	Mr RJC Nay
Ms MM Matsabu	Mr MG Rall
Dr DJ Merrey	Mr JS Vilakazi

Mr AM Muller, Director-General of the Department of Water Affairs and Forestry and Dr Rivka Kfir, Chief Executive Officer of the WRC are ex officio members.



# e r e p o r t

## Board meetings held

### 2003 (Apr – Dec)

17 June 2003	Board meeting
7 August 2003	Board meeting
7 October 2003	Board meeting
2 December 2003	Special Board meeting (strategic planning)

### 2004 (Jan – March)

21 January 2004	Special Board meeting (Chairperson and Chairpersons of Board Committees)
4 March 2004	Board meeting

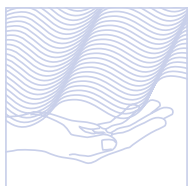
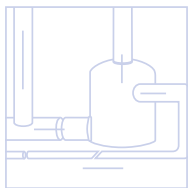
The committees established by the Board to assist in the execution of its various duties, together with the membership, terms of reference and meeting dates of these committees are as follows:

### Executive Committee of the Board (ExCo)

<b>Members</b> Prof HC Kasan (Chairperson) Dr R Kfir (CEO) Dr SJ Khoza Dr BM Molohe	<b>Terms of Reference</b> The main function of the ExCo is to perform specific tasks, at the request of the Board, which need to be addressed as matters of urgency.
<b>Meetings</b> 15 December 2003	

### Audit and Finance Committee of the Board

<b>Members</b> As a result of the resignation of Mr CHH Scheepers during 2003, the Audit and Finance Committee was re-constituted and currently consists of the following members Mr RJC Nay (Chairperson) Dr R Kfir (CEO) Mr JN Campbell (co-opted) Ms MM Matsabu Prof EM Stack (co-opted) Mr JS Vilakazi Mrs Z Scholtz (Com. Secretary) The following representatives from the organisations (as indicated), attended meetings during 2003-04: <b>WRC</b> Mr V Radebe, Mr A Rampershad <b>Office of the Auditor-General:</b> Mr J Grobbelaar, Ms S Nieft, Ms M Strydom, Mr S Zulu, Ms K Naicker <b>PriceWaterhouseCoopers</b> Mr C Bezuidenhout, Mr G de Jager <b>Malan Du Preez</b> Mr P Dames, Ms J Kruger	<b>Terms of Reference</b> <ul style="list-style-type: none"> <li>• Ensure compliance with the PFMA and advise on applications for exemption deemed necessary in the interests of enhancing the WRC's performance</li> <li>• Monitor and advise on the collection of revenue due to the WRC.</li> <li>• Evaluate short-, medium- and long-term plans and budgets</li> <li>• Assess requests by management for adjustments in water research rates and charges (levies) and make recommendations to the Board</li> <li>• Review the external audit process at key stages of planning and execution, in terms of addressing (i) critical risk areas (ii) scope and (iii) effectiveness</li> <li>• Review external audit results, and make recommendations to the Board on acceptability of financial statements and on addressing significant differences between management and the external auditors</li> <li>• Review, from time to time, the WRC's financial policies and accounting procedures and controls, <i>inter alia</i> in the light of external audit results</li> <li>• Advise on labour dispute strategies</li> <li>• Monitor the scope and effectiveness of the internal audit function from the financial perspective</li> <li>• Monitor the ethical conduct of the WRC, its management and senior officials, from the financial perspective</li> <li>• Report to the Board on an ongoing basis.</li> </ul>
<b>Meetings</b> <b>2003 (Apr – Dec)</b> 22 May, 29 July, 23 September <b>2004 (Jan-March)</b> 20 February	





Human Resources Committee of the Board (HR Committee)	
<b>Members</b> Under the current Board, the Human Resources Committee consists of the following members: Mr JS Vilakazi (Chairperson) Dr R Kfir (CEO) Mrs MM Matsabu Prof CG Palmer Mrs Z Scholtz (Com. Secretary)	<b>Terms of Reference</b> <ul style="list-style-type: none"><li>• Draft the CEO's performance agreement and assess performance on an annual basis.</li><li>• Advise on the structure and composition of the Executive</li><li>• Review transformation and employment equity plans and assess progress with respect to milestones and targets.</li><li>• Review career pathing and personnel development strategies and monitor implementation of skills development programmes.</li><li>• Review and advise on job level assessment policy and procedures.</li><li>• Advise on amendments to the conditions of employment and remuneration structure.</li><li>• Review and monitor the effectiveness of the WRC's performance management system.</li><li>• Advise on labour dispute strategies.</li><li>• Monitor the scope and effectiveness of the internal audit function from the human resource perspective.</li><li>• Report to the Board on an ongoing basis</li></ul>
<b>Meetings</b> <b>2003 (Apr – Dec)</b> 15 May, 18 September <b>2004 (Jan-March)</b> 12 February, 16 March (special HR meeting)	

Research Policy and Strategy Committee of the Board (RPS Committee)	
<b>Members</b> Under the current Board, the Research Policy and Strategy Committee consisted of the following members: Dr S Khoza (Chairperson) Dr R Kfir (CEO) Dr GC Green Dr DJ Merrey Mr NL Moikangoa Dr BM Molope Mr AM Muller Prof CG Palmer Mr MG Rall Mrs Z Scholtz (Com. Secretary)	<b>Terms of Reference</b> <ul style="list-style-type: none"><li>• Review and advise on the alignment of research goals and plans with national policy and priorities and the mission of the WRC</li><li>• Assess and advise on the balance and appropriateness of research strategies (short-, medium- and long-term) in meeting such goals</li><li>• Ensure that research plans and strategies are aligned with the WRC's policy for capacity-building and are appropriately designed to meet capacity-building objectives</li><li>• Advise on the partitioning of research funds among primary application areas</li><li>• Review and make recommendations regarding the acceptability of proposed research programmes</li><li>• Monitor progress at the level of research programmes and primary application areas and evaluate outcomes with regard to stated goals, including those concerned with capacity-building, technology transfer and knowledge management</li><li>• Review policies and procedures for ensuring beneficial exploitation of research products</li><li>• Monitor the scope and effectiveness of the internal audit function from the research perspective</li><li>• Report to the Board on an ongoing basis.</li></ul>
<b>Meetings</b> <b>2003 (Apr – Dec)</b> 15 May, 18 September <b>2004 (Jan-March)</b> 17 February	

Key challenges

During 2003/04 the WRC addressed a number of key challenges that link closely to its key performance areas (KPA's).

• Africa/International relationships

Positioning of the WRC in the SADC region, Africa and globally, was further carried out in line with the objectives of South Africa's water sector (government, industry and academia) as well as the Science and Technology (Research and Development) sector. During 2003/04 the WRC focused on developing partnerships for knowledge generation and knowledge dissemination. Knowledge and experience gained from the previous year formed the basis for strengthening ongoing initiatives and the building of a number of highly strategic new initiatives. It is clear that during this year, the WRC enhanced its position substantially, resulting in the opening up of more strategic opportunities.

Positioning of the WRC in Africa included establishing formal links (e.g. Memorandums of Understanding) with the SADC Water Division, the African Water Utilities Partnership, the Institute for Water and Sanitation Development (IWSD, Harare, Zimbabwe), and NETWAS (Nairobi, Kenya).

The WRC has maintained and strengthened its participation in a number of global initiatives. These include the Penta-Party

# annual report

(for drinking water research) and the Global Water Research Coalition (GWRC) initiatives, which resulted in South Africa's participation in a number of co-operative projects and strategic workshops. The WRC strengthened its collaboration with the Water Supply and Sanitation Collaborative Council (WSSCC) and Streams of Knowledge (a coalition of a number of resource centres focusing on water and sanitation). The WRC also expanded its collaboration with key water research organisations and funders, resulting in additions, through leverage, to the organisation's funds within a number of research areas. Leverage of funds was effectively also achieved via specific support, in the form of the provision of key equipment, to a WRC research project by the International Atomic Energy Agency (IAEA). During 2003/04, the WRC continued to work in partnership with a number of research organisations supporting sustainable development, e.g. the International Water Management Institute (IWMI) and the International Resource Centre (IRC).

## • Innovation and commercialisation

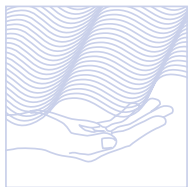
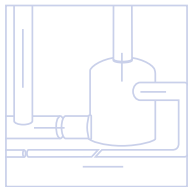
During 2003/04 the WRC developed and adopted an Intellectual Property and a Benefit Sharing Policy aimed at improving the transfer and application of water-centred knowledge and increasing revenue via related commercialisation activities. The WRC reviewed its patent portfolio and identified a new modality for managing this portfolio. One of the products resulting from WRC funding, Synexa Bio, was sold to Merck (a pharmaceutical company) in the USA by its licence holder. This product, developed jointly

by Dr Winston Leukes of Rhodes University and Dr Ed Jacobs of the University of Stellenbosch, comprises high-value enzymes that will be used in research on HIV.

## • Capacity-building

During 2003/04 approximately 428 students were supported by the various WRC projects (an average of about 2 students per ongoing active project). This represents a substantial increase of 43% from the 300 students reported in the previous (2002/03) annual report. Of the total number of students, about 280 students, i.e. 66%, are from disadvantaged backgrounds. The table below provides a breakdown of the student numbers per organisation:

Organisation	Number of disadvantaged Students	Total number of students
Council for Geosciences	1	2
C Swartz	5	5
Coaltech 2002	4	6
CSIR	10	19
Durban Institute of Technology	3	4
Du Pisanie		2
Ecosun cc	2	1
Envi-Sabi Scientific	3	3
Endocrine Consortium *	22	28
ERWAT	4	4
Highveld Biological Association	1	3
Institute for Water Research (Rhodes)	5	9
Institute of Natural Resources	7	9
Lowveld College of Education	2	2





Organisation	Number of disadvantaged Students	Total number of students
McCracken Solar Stills	1	2
Northern Gauteng Tech		1
Palmer Development	1	1
Pegasus	1	1
Peninsula Tech	8	10
PE Technikon	1	1
Phillip Pybus	1	1
PU for CHE	3	5
Pulles, Howard & de Lange	9	10
Rand Afrikaans University		2
Rhodes University	13	24
SA Weather Services	1	1
SRK	1	2
Stewart Scott	1	2
Tech Wits	2	4
Tech SA	3	3
Technikon Pretoria	17	22
Umgeni Water	2	2
University of Cape Town	16	34
University of Durban-Westville	2	2
University of Free State	15	25
University of Fort Hare	6	6
University of Natal	28	42
University of the North	3	5
University of Port Elizabeth	5	14
University of Pretoria	25	35
University of Stellenbosch	13	26
University of the Western Cape	21	27
University of the Witwatersrand	8	17
University of Venda	4	4

\* The EDC consortium includes the universities of Fort Hare, Pretoria, Stellenbosch, Technikon Pretoria, CSIR, and the ARC

The WRC has strengthened its involvement in building learning frameworks and knowledge dissemination networks. Examples are the Water Information Network (WIN) which is led by the WRC and aims at building capacity through knowledge sharing and transfer in the area of water and sanitation services. The WRC has continued to strengthen its links to regional (e.g. WARFSA and Waternet), African and global (e.g. Streams of Knowledge and the Dialogue on Water, Food and the Environment) initiatives and organisations, which concentrate on knowledge sharing and capacity-building. The WRC has supported the exposure of students (the next generation of practitioners) to local and international knowledge, by supporting their attendance of and contribution to local and international conferences and other gatherings.

The WRC has developed a booklet on careers in water. Furthermore, feature articles on careers in water containing interviews with people successful in the water field have been published in a supplement to *The Water Wheel* (Vol **2**, No 2), the WRC's journal devoted to public understanding of water science. During National Water Week of March, 2004, the WRC opened its doors to a number of schools. In addition, the WRC supported the SA Youth Water Prize (August 2003). The WRC continues to contribute towards key national initiatives /activities regarding capacity-building and many members of its senior management play key roles in various national committees and associations directed at building our water-centred knowledge base.

# annual report

- **Public understanding of science**

To date a number of editions of *The Water Wheel* have been published. As indicated above, one of these editions included a supplement addressing careers in the water field. During National Water Week (March 2004) the WRC published a special edition of *The Water Wheel* aimed at increasing public understanding of water science. This edition was made available to public bodies such as schools and public libraries. The WRC, at the invitation of SASOL, participated in the SASOL TechnoX scientific exhibition aimed at high school learners and held in Sasolburg in August 2003. The WRC is in the final stages of developing a booklet to illustrate the economic impact of selected research projects, which will inform the public of the value of R&D for the water sector.

- **Diversification of income**

During the past year the WRC developed different modalities for improving both traditional and new sources of income. The current financial year has been crucial for building the appropriate strategic framework for the above with emphasis on understanding leverage of funds/income for the WRC's projects that are of strategic importance. Such leverage can be both monetary and in kind.

### **Financial perspectives**

During 2003/04 the WRC achieved a total income of R90.4m, which is very close to the budgeted figure of R93.7m

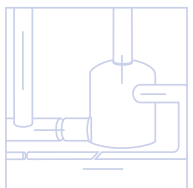
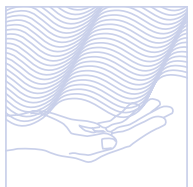
(excluding budgeted provision for transfer of unutilised research funds, which is not reflected in the actual income). The ratio of actual levy income to total income achieved (89.1%) was below the same ratio for the previous financial year of 92.9% (see table below). This reflects both a decrease in levy income and a desirable increase in percentage of non-levy income from a figure of 7.1% (2002/03) to an achieved figure of 10.9% for 2003/04.

### **Income indicators based on audited financial statements**

Indicator (%)	03/04	02/03
Levies as percentage of total income	89.1	92.9
Other sources of income as percentage of total income	10.9	7.1

The actual levy income shown for 2003/04 declined by R19.4m from the levy income reflected for 2002/03. This can be partially attributed to inclusion of arrear levy income. In 2002/03, levy income had grown by R19m, i.e. to R99.9m from the R80.9m recorded in 2001/02. However, most of this uncharacteristically large increase was due to an increment of R15.5m in arrear levy income in 2002/03. The reduced incremental arrear levy income of R1.7m in 2003/04 has restored a more normal pattern of levy income, when the levy income of R80.9m in 2001/02 is compared to R80.6m in 2003/04. This is reasonable considering that it was achieved without the benefit of an increase in the levy rate.

A set of financial ratios serving as key indicators of business



# Executive



efficiency was developed and applied during this financial year. These indicators are based on a cash-flow budget and the budgeted/planned ratios are compared to ratios achieved based on actual cash-flow.

• **Business efficiency indicators based on cash (budgeted and paid out)**

Indicator (%)	03/04 (budgeted)	03/04 (cash paid out)
Research project funding as % of total expenditure *, **	61.8	60.0
Research support (research project and support and technology transfer)/total expenditure**	72.9	75.2

\* The budgeted research project funding is calculated after deduction of the amount budgeted for transfer of unutilised research project funds

\*\* Total expenditure is calculated after deduction of the amount budgeted for transfer of unutilised research project funds and excluding provisions for leave, medical, retirement benefits and bad debts

The budgeted ratio of research funding can be compared to the ratio resulting from cash paid out for research activities. As shown in the table above, an insignificant difference of 1.8% is reported. The difference between these ratios is probably due to a payout of research funds which is lower than the budgeted amount and can also be attributed to the implementation of a new process of fund management. During 2003/04 the WRC introduced a sound and efficient system of payment against project deliverables. An effect of the change in system was that invoices for payment against deliverables scheduled around the end of the financial year mostly did not arrive in time to qualify for payment in 2003/04. Although actual pay-out related directly to research projects

was reduced, the overall expenditure on research support has met or even exceeded the planned ratio set for 2003/04 (see table above). This reflects the WRC's success in meeting its commitment to supporting knowledge dissemination and sharing (via publications and conferences) and protection (via maintenance of patents).

The net income for the 2003/04 financial year was R10.7m in comparison with R8.4m for 2002/03. This is a result of the introduction of improved financial management and control of both internal and external processes including administration services and the management of research funds.

**Key performance areas (KPA's)**

Apart from addressing the key challenges described above, the WRC views its KPA's and associated goals and objectives as a route for translating the organisation's vision into strategic measures. These were developed using a balanced scorecard approach, which supports an output-driven organisation. The WRC has identified five KPA's:

- Stakeholder relationships
- Financial perspectives
- Learning and innovation
- Internal processes
- Organisational transformation

A summary table, indicating progress and achievements with



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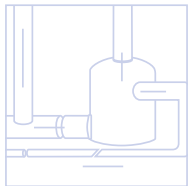
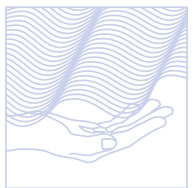
respect to goals and objectives for each of the KPAs, is presented below:

Goals	Performance Indicators	Achievements
<b>Improved stakeholder relationships</b>	<ul style="list-style-type: none"> <li>Improved local and international positioning of the WRC with special emphasis on Africa</li> <li>New initiatives regarding public understanding of water-related issues</li> </ul>	<ul style="list-style-type: none"> <li>Achieved – A strategic promotion plan was developed and implemented. Examples of improved positioning include the leadership roles the WRC took regarding the Water Information Network, Streams of Knowledge, the Global Water Research Coalition, the Africa Water Forum, the African Water Utilities Partnership and many other networking initiatives</li> <li>Achieved - Examples include a special edition of <i>The Water Wheel</i> made available during Water Week; a 'Careers in Water' supplement published in <i>The Water Wheel</i> and the WRC's support/sponsorship of the SA Youth Water Prize</li> </ul>
<b>Effective financial practice</b>	<ul style="list-style-type: none"> <li>Improved financial policies, systems and practices</li> <li>Increased and diversified income</li> <li>Growth in research funding</li> </ul>	<ul style="list-style-type: none"> <li>Great improvements made, as recorded in the internal audit report</li> <li>Achieved – all targets for both external direct income (local and international sources) and leveraging of project funds have been exceeded</li> <li>The ratio of 73% of research fund/total expenses has been achieved.</li> </ul>
<b>Increased level of innovation and learning (including competence and capacity-building)</b>	<ul style="list-style-type: none"> <li>Improved commercialisation of IP</li> <li>Improved knowledge base as indicated by capacity-building drives</li> </ul>	<ul style="list-style-type: none"> <li>Achieved - IP policy has been developed and implemented; Contracting procedures have been revised; Benefit sharing agreement has been finalised; Patent portfolio has been reviewed.</li> <li>Target exceeded - During 2003/04 the WRC supported about 428 students of whom about 280 are of historically disadvantaged backgrounds. This is an increase of 43% above the numbers recorded in the previous year's plan. A booklet on careers in water is in press (also see challenges above)</li> </ul>

Goals	Performance Indicators	Achievements
<b>Improve business excellence through effective internal processes</b>	<ul style="list-style-type: none"> <li>Functional excellence</li> <li>Management excellence</li> </ul>	<ul style="list-style-type: none"> <li>A more efficient system of payment, i.e. payment against research deliverables, was instituted.</li> <li>Despite a reduction in research expenditure due to the new payment system, set objectives for research support as indicated by financial indicators were met.</li> <li>A business flow analysis was undertaken as a basis for improving the fund management process/system</li> <li>A number of new administrative and HR-related policies have been developed</li> <li>Impact assessment tool has been developed and implemented</li> </ul>
<b>Appropriate organisational transformation</b>	<ul style="list-style-type: none"> <li>Improved competence level</li> <li>Accelerated equity and redress</li> <li>Implemented new management process and system</li> </ul>	<ul style="list-style-type: none"> <li>Achieved – as reflected in training courses successfully completed</li> <li>Achieved - The target set in the equity plan was met and all recruitment drives were based on the equity policy</li> <li>Achieved - New performance management policy has been developed and implemented</li> </ul>

## Human resources

During 2003/04 the WRC's organisational structure (see organogram) underwent only minor changes from the structure which had been newly implemented in accordance with its core strategy in 2002/03. One of the PR/Communications posts was abolished and a new contract post for an Intellectual Property Manager created. The current structure (i.e. at the end of the year under review), in making allowance for core and direct support functions, provides for 45 permanent staff members and 3 employees on contract.



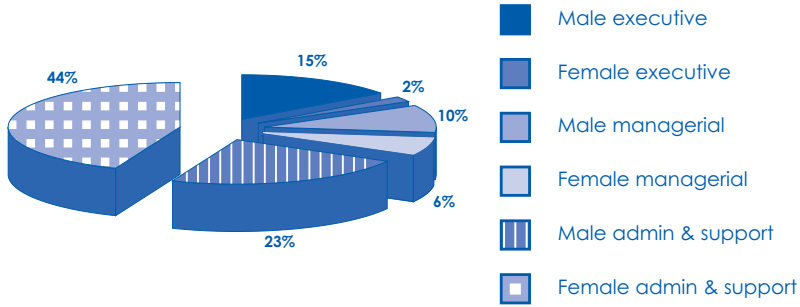
# Executive

Job evaluation and grading of jobs in the WRC are based on the Public Service (Equate) system. During the year changes in IT and PR/Communications functions necessitated the re-evaluation of 2 jobs.

In terms of composition by race, there was little change in the number of Black staff during the year under review, as there is still one vacant post to be filled. Female staff members still represent the majority, with staff comprising 52% females and 48 % male employees. At Executive level the proportion of Black members remained at 8% (50% of all Executive members) by the end of 2003/04.

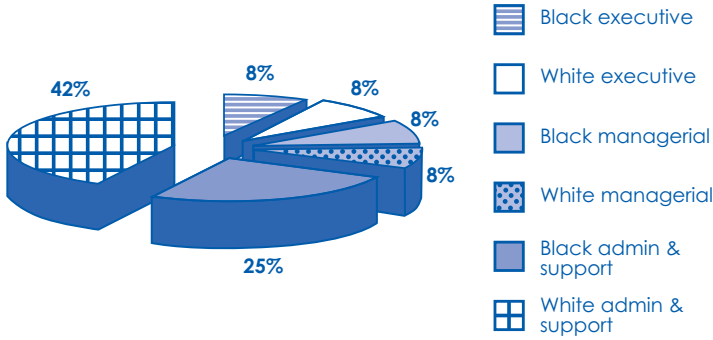
Staff composition by gender

Male	48%	Female	52%
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Staff composition by race

Black	42%	White	57%
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WRC support for staff education and training

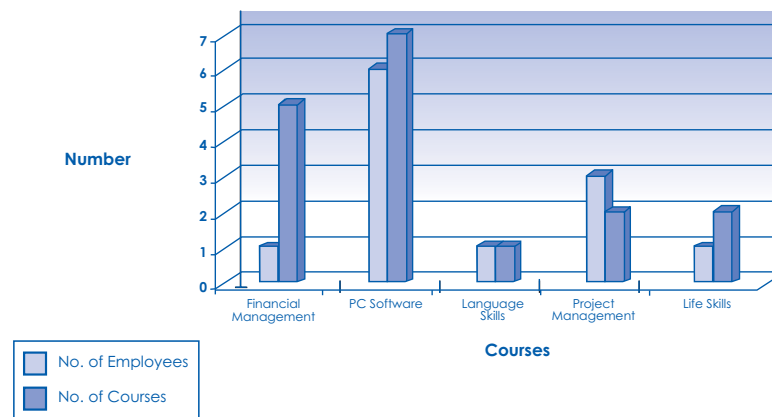
The WRC continued to support the development of its staff members via formal tuition and shorter-term training courses. During 2003/04 special emphasis was placed on enhancing performance of personnel both as individuals and as individuals within the team (WRC) context. To this end, all employees participated in an in-house training course (Investment in Excellence: Part 1 - Preparing the Individual and Part 2 - Bridging the Individual to the Team) over a total period of 5 days. Participation in courses on financial management, PC software, project management, language skills and life

# e r e p o r t

skills was also supported. In addition, 4 staff members (8%) continued to be engaged in studies, supported by the WRC, for an array of degrees and diplomas.

Formal Studies	No of Individuals	Status
MBA	1	Ongoing
Masters in Public Policy	1	Ongoing
Public Relations	1	Ongoing
Office Admin	1	Ongoing

**Training courses**



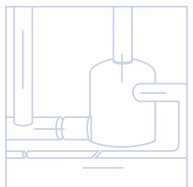
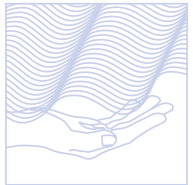
## Research portfolio and key strategic areas (KSAs)

During 2003/04 the WRC assessed its research portfolio and consulted widely with many of its stakeholders regarding the

scope of its operation and its strategic direction. In general, the portfolio as planned for the year under review was well received by the various stakeholders. The KSA-based structure, with its four water-centred KSAs and its knowledge-centred KSA, continued to form the core operating framework for WRC-funded R&D, was further consolidated and became accepted generally.

During the year under review (2003/04), the WRC as a whole, through its various KSAs and crosscutting domains, supported a total of 395 research projects, including 371 non-solicited and 24 new solicited projects. This group of solicited projects was the first to be initiated in accordance with the WRC's new strategy, i.e. to allocate a significant proportion of available funding to solicited projects that are specifically designed to pro-actively address critical research needs. During 2003/04 solicited projects (to which 52% of available funds for new research was allocated), therefore, already comprised 44% of the 54 new projects which were initiated. Of the 395 projects supported, 341 are ongoing, multi-year research projects. However, the ongoing projects, despite making up 86% of all projects, have been allocated less than 50% of the available funds, reflecting a move to fewer, larger projects, and also the fact that many projects were already in their final stages of completion during 2003/04.

For the year under review, the distribution of research project funds among the various categories of research provider (these being tertiary educational institutions, science councils, consultants, governmental institutions and NGOs) was in



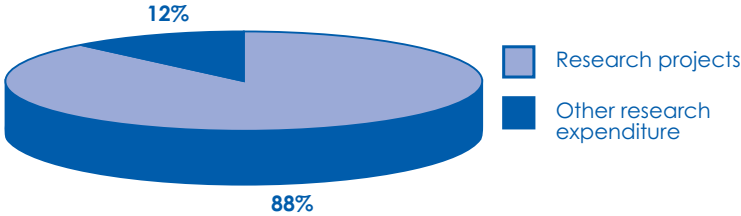
# executive



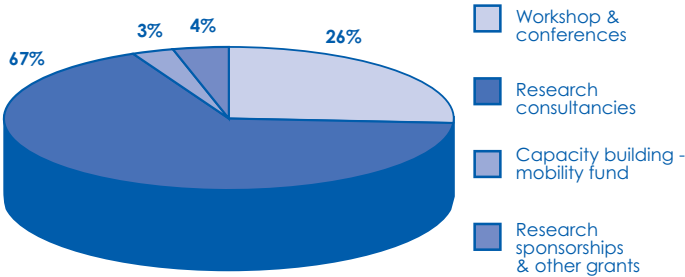
general similar to that of the previous year (2002/03), when higher education institutions (university and technikons) were the major contributors to WRC-funded research and thus also the major recipients of funds.

The strategic allocation of research project funds between the water-centred research KSAs for 2003/04 resulted in Water Resource Management receiving 31% of the funds, Water-Linked Ecosystems 13%, Water Use and Waste Management 40% and Water Utilisation in Agriculture 14%. The balance (2%) was allocated to the crosscutting domains (1%) and held in the central fund (1%). The relative allocation of funding to research focusing on water resources (including water-linked ecosystems) and water utilisation (domestic, municipal, industrial and agricultural, including effluent treatment and management) has remained very similar to that of the previous year (2002/03).

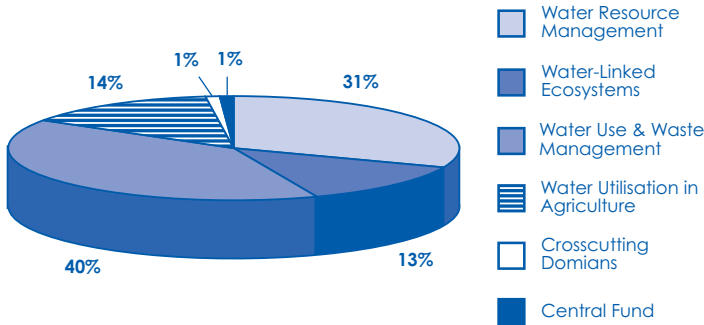
**Percentage allocation of research funds to:**



**Percentage allocation of non-project research funds to other research-related activities**



**Percentage allocation of project funds to KSAs and crosscutting domains**



The four water-centred KSAs (Water Resource Management, Water-Linked Ecosystems, Water Use and Waste Management and Water Utilisation in Agriculture) and the 5th knowledge-centred KSA (Water-Centred Knowledge), commenced

# annual report

operation during 2002/03, building new working relationships and operational modalities in support of both the internal and the external environments. New KSA-specific research portfolios were initiated.

During 2003/04 the KSAs consulted widely with many of their stakeholders regarding their scope of operations and strategic direction, and accordingly refined their strategic and business plans. As part of this process, numerous workshops were arranged and other knowledge-sharing activities undertaken in support of further development of each KSA's research portfolio. The KSAs continued to operate as strategic units which place emphasis on knowledge generation, dissemination and transfer, as well as capacity-building. They have provided strong leadership, directing and supporting water-centred knowledge generation in South Africa, linking and networking with local players and supporting strong partnerships with global players. The Water-Centred Knowledge KSA, in particular, has supported a number of knowledge sharing and dissemination initiatives, including the assumption of the leadership of WIN.

The call for research proposals during 2003/04 (for projects due to commence in 2004/05) was based on KSA-specific research portfolios and included a call for both solicited and non-solicited research proposals.

The following section presents a short summary that highlights the scope and objectives of research activities undertaken during 2003/04 by each of the KSAs.

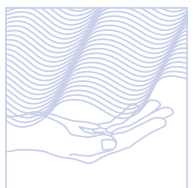
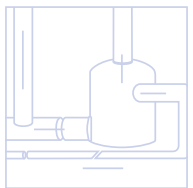
## **water resource management**

The strategic focus of this KSA for 2003/04 continued to be guided by the principles and objectives of the National Water Act (NWA) of 1998. This KSA supports the implementation of the Act by developing tools and technologies for water resource assessment and guidelines and decision-support systems to support decision-makers in achieving equitable and efficient allocation of water resources among competing needs. During 2003/04 the research led by this KSA placed emphasis on multidisciplinary approaches that provide decision-makers and planners with appropriate tools that enable them to address social, environmental and economic factors in the planning of water resource development.

During 2003/04 the research portfolio included new initiatives and current projects addressing the objectives mentioned above. Overall, about R21.6m was invested in 144 projects. Of these, 15 projects were initiated during the year under review while 129 were ongoing. During the year under review 36 projects were finalised and 49 reports published.

## **water-linked ecosystems**

Water-linked ecosystems are defined as in-stream (fully aquatic), riparian (dependent on water stored in the river banks and linked to the river) and water-table dependent (dependent on a water table, but not on surface water). During the year under review this KSA continued to focus on the protection and sustainable utilisation of the aquatic





environment and biota (in-stream, riparian and groundwater). This includes addressing research needs around the international conventions on environmental management (e.g. biodiversity) as well as human needs from the aquatic environment (e.g. sustainable management for equitable ecosystem resource utilisation, recreation and ecotourism).

During 2003/04 the research portfolio included new initiatives and current projects addressing the objectives mentioned above. Overall, about R9.2m was invested in 51 projects, of which 8 projects were initiated during the year under review while 43 were ongoing. During the year under review 18 projects were finalised and 22 reports published.

#### **water use and waste management**

During the year under review, this KSA focused mainly on the domestic, industrial and mining water sectors and aimed to proactively and effectively advance technology, science, management and policies relevant to water supply and waste and effluent management in the municipal, commercial, industrial and mining sectors. Special emphasis was given to institutional and management issues concerning the provision of water services (water supply and sanitation).

The research portfolio for 2003/04 included new initiatives and current projects addressing the objectives mentioned above. Overall, about R27.4m was invested in 144 projects, of which 24 projects were initiated during the year under review while 120 were ongoing. During the year under review 52 projects

were finalised and 47 reports published.

#### **water utilisation in agriculture**

The strategic focus of this KSA during the year under review was on increasing the efficient use of water for the production of food, fibre, fuelwood and timber, ensuring sustainable water resource use, reducing poverty and increasing the wealth of people dependent on water-based agriculture. The needs and requirements of present and future generations of subsistence, emergent and commercial farmers are being addressed through the creation and application of water-efficient production technologies, models and information systems within the following inter-related subsectors of agriculture, i.e.

- Irrigated agriculture
- Dryland agriculture
- Woodlands and forestry
- Grasslands and livestock watering
- Aquaculture

During 2003/04, the research portfolio included new initiatives and current projects addressing the objectives mentioned above. Overall, about R9.9m was invested in 48 projects. Of these, 7 projects were initiated during the year under review, while 41 were ongoing. During the year under review 16 projects were finalised and 10 reports published.



# annual report

## Looking ahead

During the next financial year the WRC will strive to further strengthen its position as a water-centred knowledge hub in South Africa while linking South Africa's water sector with the African and the global water sector. The WRC will continue to dynamically align itself to the short-, medium-, and long-term research needs and other knowledge-based initiatives as required for supporting the management of South Africa's water resource, its uses and their related services. This will include the development of an adequate knowledge base addressing appropriate competence, skills and capacity and the improvement of the WRC's capabilities and processes to further ensure effective dissemination, sharing and transfer of water-centred knowledge.

## Board approval

The annual financial statements of the WRC and wholly owned subsidiary for the year ended 31 March 2004, which appear on pages **42** to **57** of this report, were approved by the WRC Audit and Finance Committee on behalf of the Board at its meeting held on 27 May 2004.

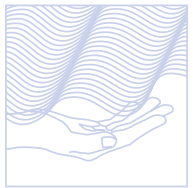
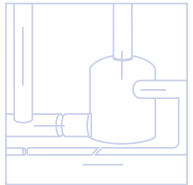
These statements are signed on behalf of the WRC Board by:



Dr R Kfir  
WRC Chief Executive Officer



Prof HC Kasan  
WRC Board Chairperson





**REPORT OF THE AUDITOR-GENERAL TO PARLIAMENT  
ON THE FINANCIAL STATEMENTS OF THE WATER  
RESEARCH COMMISSION FOR THE YEAR ENDED 31  
MARCH 2004**



**A U D I T O R - G E N E R A L**

**1. AUDIT ASSIGNMENT**

The financial statements as set out on pages 42 to 57, for the year ended 31 March 2004, have been audited in terms of section 188 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996), read with sections 3 and 5 of the Auditor-General Act, 1995 (Act No. 12 of 1995). These financial statements, the maintenance of effective control measures and compliance with relevant laws and regulations are the responsibility of the accounting officer. My responsibility is to express an opinion on these financial statements, based on the audit.

**2. NATURE AND SCOPE**

**2.1 Audit of financial statements**

The audit was conducted in accordance with Statements of South African Auditing Standards. Those standards require that I plan and perform the audit to obtain reasonable assurance that the financial statements are free of material misstatement.

An audit includes:

- examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements,
- assessing the accounting principles used and significant estimates made by management, and
- evaluating the overall financial statement presentation.

Furthermore, an audit includes an examination, on a test basis, of evidence supporting compliance in all material respects with the relevant laws and regulations which came to my attention and are applicable to financial matters.

I believe that the audit provides a reasonable basis for my opinion.

**2.2 Audit of performance information**

The Water Research Commission has reported its performance on pages 31 to 33 of its financial statements, under the title "Directors' report". My assessment covers only that section, but does not include all other pages of the director's report. To

assess this additional information adequately would require a separate examination. I did review the entire report for consistency with the performance information.

I assessed the performance information against the entity's predetermined objectives set out in the Core Strategic Plan.

I believe that the audit provides a reasonable basis for my opinion.

### 3. AUDIT OPINION

#### 3.1 Audit of financial statements

In my opinion, the financial statements fairly present, in all material respects, the financial position of the Water Research Commission at 31 March 2004 and the results of its operations and cash flows for the year then ended, in accordance with prescribed accounting practice and in the manner required by the Public Finance Management Act, 1999 (Act No. 1 of 1999).

#### 3.2 Audit of performance information

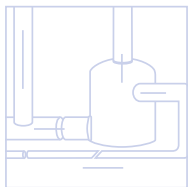
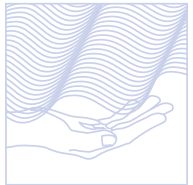
In my opinion, the performance information furnished in terms of section 55(2)(a) of the PFMA fairly presents, in all material respects, the performance of the Water Research Commission for the year ended at 31 March 2004 against predetermined objectives, on a basis consistent with that of the preceding year.

### 4. APPRECIATION

The assistance rendered by the staff of the Water Research Commission during the audit is sincerely appreciated.

**A H Muller**  
for Auditor-General

**Pretoria**  
**26 July 2004**





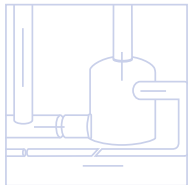
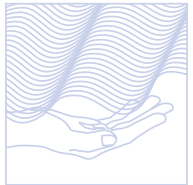
**Water Research Commission and Wholly Owned Company  
Balance Sheet as at 31 March 2004**

	NOTES	Water Research Commission		Consolidated	
		2004	2003	2004	2003
		R	R	R	R
<b>ASSETS</b>					
<b>Non-current assets</b>					
Property, plant and equipment	2	39,479,114	38,260,591	37,307,443	36,281,741
Interest in subsidiary	3	1,034,559	1,356,594	7,576,365	7,874,620
Other investments	4	9,318,227	9,139,423	-	-
Other loans	5	29,126,328	27,764,573	29,126,328	27,764,573
Intangible asset	6	-	1	-	1
		-	-	604,750	642,547
<b>Current assets</b>					
Trade and other receivables	7	97,566,034	85,994,729	98,051,427	87,307,533
Cash and cash equivalents	18	35,796,674	38,238,046	35,930,056	39,140,576
		61,769,360	47,756,683	62,121,371	48,166,957
<b>Total assets</b>		<u>137,045,148</u>	<u>124,255,320</u>	<u>135,358,870</u>	<u>123,589,274</u>
<b>EQUITY AND LIABILITIES</b>					
<b>Capital and reserves</b>					
Accumulated fund		95,797,807	87,114,992	93,819,749	86,371,163
<b>Non-current liabilities</b>					
Provisions	8	16,359,614	13,600,120	16,359,614	13,600,120
Benefit plans	9	1,516,030	1,100,120	1,516,030	1,100,120
		14,843,584	12,500,000	14,843,584	12,500,000
<b>Current liabilities</b>					
Trade and other payables	10	24,887,727	23,540,208	25,179,507	23,617,991
<b>Total equity and liabilities</b>		<u>137,045,148</u>	<u>124,225,320</u>	<u>135,358,870</u>	<u>123,589,274</u>

# Statements

## Water Research Commission and Wholly Owned Company Income Statement for the year ended 31 March 2004

	NOTES	Water Research Commission		Consolidated	
		2004	2003	2004	2003
		R	R	R	R
<b>INCOME</b>		90,395,44	107,592,021	89,002,074	106,640,722
Water research levies		80,561,878	99,982,535	80,561,878	99,982,535
Income on investment	11	4,346,251	3,965,394	3,083,330	3,120,831
Other interest		907,264	710,301	908,281	713,491
Valuation of investments		1,207,978	-	1,207,978	-
Profit on sale of fixed assets		4,738	18,091	4,738	18,091
Provision for projects written off		874,471	-	874,471	-
Other income		2,492,864	2,915,700	2,361,398	2,805,774
<b>EXPENDITURE</b>		81,712,629	99,208,504	81,553,488	101,904,080
Administrative services		3,853,033	4,570,764	3,875,820	4,586,241
Amortisation of intangibles		-	-	37,797	37,797
Audit fees - external		172,148	100,794	185,393	123,120
Audit fees - internal		243,852	295,853	243,852	295,853
Depreciation of property, plant & equipment		428,355	412,009	432,334	477,972
Directors' emoluments	12	251,271	255,641	251,271	255,641
Municipal services and security		-	-	428,839	187,181
Provision for bad debts		1,122,946	9,084,588	1,122,946	9,084,588
Rental and maintenance		1,671,381	1,344,173	957,674	3,698,868
Research projects and support	13	51,298,825	62,437,811	51,298,825	62,437,811
Staff expenditure	14	17,592,111	14,600,113	17,640,030	14,612,250
Technology transfer	15	5,078,707	4,184,120	5,078,707	4,184,120
Valuation of investments		-	1,922,638	-	1,922,638
<b>Net income for the year</b>		<u>8,682,815</u>	<u>8,383,517</u>	<u>7,448,586</u>	<u>4,736,642</u>





**Water Research Commission and Wholly Owned Company**  
**Statement of Changes in Equity for the year ended 31 March 2004**

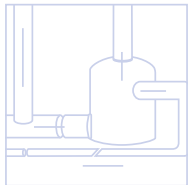
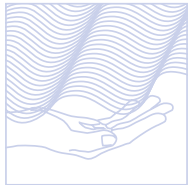
	<b>Water Research Commission Accumulated fund R</b>	<b>Consolidated Accumulated fund R</b>
Balance at 1 April 2002	78,731,475	81,634,521
Net income for the year	<u>8,383,517</u>	<u>4,736,642</u>
Balance at 31 March 2003	87,114,992	86,371,163
Net income for the year	<u>8,682,815</u>	<u>7,448,586</u>
Balance at 31 March 2004	<u><u>95,797,807</u></u>	<u><u>93,819,749</u></u>



# Statements

## Water Research Commission and Wholly Owned Company Cash Flow Statement for the year ended 31 March 2004

	NOTES	Water Research Commission		Consolidated	
		2004 R	2003 R	2004 R	2003 R
<b>Net cash flow from operating activities</b>		14,446,839	6,170,642	14,237,531	1,848,124
Cash receipts		86,370,585	91,716,153	87,008,267	80,977,509
Cash payments		(77,177,261)	(90,221,206)	(76,762,347)	(82,963,707)
Net cash generated by/(outflow from) operating activities	17	9,193,324	1,494,947	10,245,920	(1,986,198)
Interest received		5,253,515	4,675,695	3,991,611	3,834,322
<b>Net cash outflow from investing activities</b>		(434,162)	(5,328,102)	(283,117)	(884,586)
Purchase of fixed assets		(117,838)	(945,680)	(145,597)	(2,520,179)
Proceeds from sale of fixed assets		16,257	44,985	16,257	-
(Increase)/decrease in investments		(153,777)	1,635,593	(153,777)	1,635,593
Increase in investment in subsidiary		(178,804)	(6,063,000)	-	-
<b>Net increase in cash and cash equivalents</b>		14,012,677	842,540	13,954,414	963,538
Cash and cash equivalents at the beginning of the year		47,756,683	46,914,143	48,166,957	47,203,419
<b>Cash and cash equivalents at the end of the year</b>	18	<u>61,769,360</u>	<u>47,756,683</u>	<u>62,121,371</u>	<u>48,166,957</u>





**Water Research Commission and Wholly Owned Company  
Notes to the Financial Statements for the year ended 31 March 2004**

**1 Accounting policies**

The financial statements are prepared in accordance with Generally Accepted Accounting Practice on the historical cost basis and incorporate the following principal accounting policies which are consistent with those applied in the previous year, unless otherwise stated.

**1.1 Property, plant and equipment**

Land and buildings are not depreciated. Depreciation on office equipment (20%), office furniture (10%), photo and computer equipment (33.33%) is calculated annually on the straight-line method at the rates indicated. Motor vehicles are depreciated on a pro rata basis calculated on the basis of kilometres travelled annually as a portion of the expected useful life of the vehicles. The rates are appropriate to reduce each asset to its estimated residual value over the period of its useful life.

**1.2** Capital assets purchased by organisations with research grants are written off in the year purchased. These remain assets of the Water Research Commission until the project for which they were acquired has been concluded and the Water Research Commission has decided on the disposal thereof.

**1.3 Research projects and research support services**

Payments made by the Water Research Commission are accounted for as advances. In cases where audited statements are not received on time, the payments are accounted for as expenditure. It is the policy of the Water Research Commission that its management may allow overspending on a project budget in a given year, only if acceptable reasons are given, provided the total contract amount is not exceeded.

**1.4 Investments**

**1.4.1** Investments in subsidiaries are recognised at cost less accumulated impairment losses.

**1.4.2** The company classifies its investments in equity securities into the category of available-for-sale. The classification is dependent on the purpose for which the investments were acquired. Purchases and sales of investments are recognised on the trade date, which is the date that the company commits to purchase or sell the asset. Cost of purchase includes transaction costs. Available-for-sale investments are subsequently carried at fair value. Realised and unrealised gains and losses arising from changes in the fair value are included in the income statement in the period in which they arise.

**1.5 Intangible assets**

No value is attributed to internally developed patents. Costs incurred on patents, whether purchased or created by the Water Research Commission, are charged to the income statement during the period in which they are incurred.

**1.6 Consolidation principles**

The consolidated financial statements incorporate the financial statements of the Water Research Commission and its wholly owned company. The results of the subsidiary are included from the effective date of acquisition. Goodwill, being the excess of the cost of acquisition over the fair value of the net assets of the acquired subsidiary at the date of acquisition, is amortised on a straight-line basis over the period of expected benefit. Inter-group transactions and balances are eliminated on consolidation.

# Statements

## Water Research Commission and Wholly Owned Company Notes to the Financial Statements for the year ended 31 March 2004

### 1.7 Post employment pension benefit costs

The company operates two defined benefit plans, the assets of which are generally held in separate trustee-administered funds. The pension and provident fund plans are generally funded by payments from employees and the company, taking into account the recommendations of independent qualified actuaries. For defined benefit plans the defined benefit obligation, the related current service cost, and where applicable, past service cost are determined by using the projected unit credit method. Actuarial gains or losses are recognised immediately in the income statement.

### 1.8 Post employment medical aid benefit costs

The company operates a defined medical aid benefit plan. No plan assets are held to fund the benefit plan. For defined benefit plans the defined benefit obligation, the related current service cost, and where applicable, past service cost are determined by using the projected unit credit method. Vested service costs and actuarial gains or losses are recognised immediately in the income statement.

### 1.9 Revenue

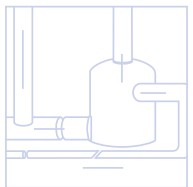
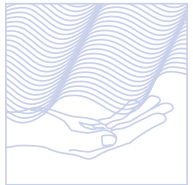
The Department of Water Affairs and Forestry, Rand Water and Umgeni Water Boards collect levy income. The rate of the levy is approved by the Minister of Water Affairs and Forestry on an annual basis. Revenue recognition of levy income represents amounts received and receivable from the Department of Water Affairs and Forestry, Rand Water and Umgeni Water Boards.

### 1.10 Financial instruments

Financial instruments carried on the balance sheet include cash and bank balances, investments, receivables, payables and liabilities. These instruments are carried at their estimated fair values. The particular recognition methods adopted are disclosed in the individual policy statements associated with each item.

### 1.11 Cash flows

For the purpose of the cash flow statement, cash includes cash on hand and deposits held on call with Corporation for Public Deposits and bank balances.





**Water Research Commission and Wholly Owned Company**  
**Notes to the Financial Statements for the year ended 31 March 2004**

**2 Property, plant and equipment**

**2.1 Fixed property**

CARRYING VALUE: End of year

- Cost

- Improvements

Fixed property consists of Erf 706 Rietfontein, Pretoria, Gauteng.

The Directors' value the property at R6,500,000.

**2.2 Motor vehicles**

CARRYING VALUE: Beginning of year

- Cost

- Accumulated depreciation

MOVEMENTS during year

- Disposals

- Depreciation

CARRYING VALUE: End of year

- Cost

- Accumulated depreciation

**2.3 Office furniture**

CARRYING VALUE: Beginning of year

- Cost

- Accumulated depreciation

MOVEMENTS during year

- Acquisitions

- Depreciation

CARRYING VALUE: End of year

- Cost

- Accumulated depreciation

<b>Water Research Commission</b>		<b>Consolidated</b>	
<b>2004</b>	<b>2003</b>	<b>2004</b>	<b>2003</b>
<b>R</b>	<b>R</b>	<b>R</b>	<b>R</b>
-	-	6,541,804	6,514,045
-	-	615,855	615,855
-	-	5,925,949	5,898,190
40,446	72,340	40,446	72,340
68,975	146,956	68,975	146,956
(28,529)	(74,616)	(28,529)	(74,616)
(3,504)	(31,894)	(3,504)	(31,894)
-	(26,894)	-	(26,894)
(3,504)	(5,000)	(3,504)	(5,000)
36,942	40,446	36,942	40,446
68,975	68,975	68,975	68,975
(32,033)	(28,529)	(32,033)	(28,529)
936,735	152,497	939,661	160,842
1,204,820	367,073	1,259,008	421,261
(268,085)	(214,576)	(319,347)	(260,419)
(70,103)	784,238	(73,028)	778,819
60,430	837,747	60,430	837,747
(130,533)	(53,509)	(133,458)	(58,928)
866,632	936,735	866,633	939,661
1,265,250	1,204,820	1,319,438	1,259,008
(398,618)	(268,085)	(452,805)	(319,347)

# Financial Statements

## Water Research Commission and Wholly Owned Company Notes to the Financial Statements for the year ended 31 March 2004

### 2.4 Office equipment

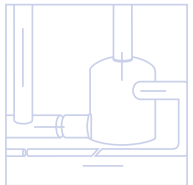
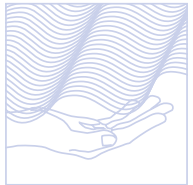
CARRYING VALUE: Beginning of year  
 - Cost  
 - Accumulated depreciation  
 MOVEMENTS during year  
 - Acquisitions  
 - Depreciation  
 CARRYING VALUE: End of year  
 - Cost  
 - Accumulated depreciation

### 2.5 Computers

CARRYING VALUE: Beginning of year  
 - Cost  
 - Accumulated depreciation  
 MOVEMENTS during year  
 - Acquisitions  
 - Disposals  
 - Depreciation  
 CARRYING VALUE: End of year  
 - Cost  
 - Accumulated depreciation

### Total property, plant and equipment

Water Research Commission		Consolidated	
2004	2003	2004	2003
R	R	R	R
163,157	240,954	164,212	302,553
908,196	858,253	1,513,637	1,463,694
(745,039)	(617,299)	(1,349,425)	(1,161,141)
(93,420)	(77,797)	(94,474)	(138,341)
15,541	49,943	15,541	49,943
(108,961)	(127,740)	(110,015)	(188,284)
69,737	163,157	69,738	164,212
923,737	908,196	1,529,178	1,513,637
(854,000)	(745,039)	(1,459,440)	(1,349,425)
216,256	384,026	216,256	384,026
1,249,735	1,191,744	1,249,735	1,191,744
(1,033,479)	(807,718)	(1,033,479)	(807,718)
(155,008)	(167,770)	(155,008)	(167,770)
41,867	57,991	41,867	57,991
(11,517)	-	(11,517)	-
(185,357)	(225,761)	(185,357)	(225,761)
61,248	216,256	61,248	216,256
414,854	1,249,735	1,280,085	1,249,735
(353,606)	(1,033,479)	(1,218,836)	(1,033,479)
1,034,559	1,356,594	7,576,365	7,874,620





**Water Research Commission and Wholly Owned Company**  
**Notes to the Financial Statements for the year ended 31 March 2004**

	<b>Water Research Commission</b>		<b>Consolidated</b>	
	<b>2004</b>	<b>2003</b>	<b>2004</b>	<b>2003</b>
	<b>R</b>	<b>R</b>	<b>R</b>	<b>R</b>
<b>3 Interest in subsidiary</b>				
<b>3.1</b> Shares at cost	755,939	755,939	-	-
Loan to subsidiary	8,562,288	8,383,484	-	-
	<u>9,318,227</u>	<u>9,139,423</u>	<u>-</u>	<u>-</u>
<b>3.2</b> The following information relates to the Water Research Commission's interest in its subsidiary: Erf 706 Rietfontein (Proprietary) Limited is incorporated in South Africa. The total issued ordinary share capital of the company is held by the Water Research Commission and amounts to R1.				
<b>4 Other investments - unlisted</b>				
Old Mutual	23,620,962	23,623,416	23,260,962	23,623,416
Momentum Wealth and NIB	5,505,366	4,141,157	5,505,366	4,141,157
	<u>29,126,328</u>	<u>27,764,573</u>	<u>29,126,328</u>	<u>27,764,573</u>
National Treasury has granted exemption from investing surplus cash with the Corporation for Public Deposits in terms of Treasury regulation 31.3.3. National Treasury has also confirmed that the above investments are in compliance with Treasury regulation 31.3.5.				
<b>5 Other Loans</b>				
Company for Research on Atmospheric Water Supply	-	1	-	1
	<u>-</u>	<u>1</u>	<u>-</u>	<u>1</u>

The loan with the Company for Research on Atmospheric Water Supply was settled during the year.



# Financial statements

## Water Research Commission and Wholly Owned Company Notes to the Financial Statements for the year ended 31 March 2004

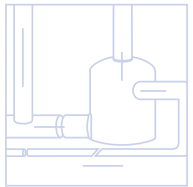
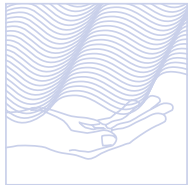
	Water Research Commission		Consolidated	
	2004	2003	2004	2003
	R	R	R	R
<b>6 Intangible asset</b>				
<b>6.1 Goodwill</b>				
Opening carrying amount	-	-	642,547	680,344
Amortised for the year	-	-	37,797	37,797
Closing carrying amount	-	-	604,750	642,547
Gross carrying amount	-	-	755,939	755,939
Accumulated amortisation	-	-	(151,189)	(113,392)
<b>7 Trade and other receivables</b>				
Water research levies	32,003,287	30,951,406	32,003,287	30,951,406
Project advances	14,418,740	15,397,837	14,418,740	15,397,837
Value added tax	-	-	-	744,396
Hydrological Information Centre	-	43,226	-	43,226
Personal computer loans	4,072	2,610	4,072	2,610
Motor scheme	-	72,271	-	72,271
Other	319,766	1,640,168	453,148	1,798,302
	46,745,865	48,107,518	46,879,247	49,010,048
Provision for doubtful debts	(10,949,191)	(9,869,472)	(10,949,191)	(9,869,472)
<b>Total receivables</b>	<b>35,796,674</b>	<b>38,238,046</b>	<b>35,930,056</b>	<b>39,140,576</b>

## 8 Provisions

Provisions were made for the following:

	Balance at beginning of year	New provisions	Balance at end of year	Balance at beginning of year	New provisions	Balance at end of year
<b>2004</b>						
Leave Pay	1,100,120	415,910	1,516,030	1,100,120	415,910	1,516,030
	<u>1,100,120</u>	<u>415,910</u>	<u>1,516,030</u>	<u>1,100,120</u>	<u>415,910</u>	<u>1,516,030</u>
<b>2003</b>						
Leave Pay	-	1,100,120	1,100,120	-	1,100,120	1,100,120
	<u>-</u>	<u>1,100,120</u>	<u>1,100,120</u>	<u>-</u>	<u>1,100,120</u>	<u>1,100,120</u>

The leave pay provision represents the potential liability in respect of leave outstanding.





**Water Research Commission and Wholly Owned Company**  
**Notes to the Financial Statements for the year ended 31 March 2004**

**9 Benefit plans**  
**Pension and provident schemes**

The company has made provision for pension and provident schemes covering substantially all employees. All eligible employees are members of the defined benefit schemes administered by ABSA Bank Ltd. The assets of these schemes are held in administered trust funds separately from the company's assets. Scheme assets primarily consist of investments in m Cubed Investments Life Limited. The funds are governed by the Pension Funds Act of 1956.

The defined benefit schemes administered by the company are valued actuarially at an interval of not more than three years using the projected unit credit method. The scheme was last actuarially valued on 31 March 2004. At that time all were certified by the reporting actuary as being in a sound financial position, subject to the continuation of their current contribution rates. In arriving at his conclusion, the actuary took into account the following assumptions at balance sheet date (expressed as weighted averages):

	<b>Pension fund</b>	<b>Provident fund</b>
General inflation rate	5.0%	5.0%
Valuation rate	9.0%	9.0%
Expected investment return	9.2%	9.2%
Salary inflation	6.5%	6.5%

Any deficits advised by the actuaries are funded either immediately or through increased contributions to ensure the ongoing soundness of the schemes. Contributions are fully expensed during the year in which they are funded.

**Post retirement medical aid scheme**

The company has made provision for post employment medical aid benefit scheme covering substantially all employees. All eligible employees are members of the defined benefit scheme.

The defined benefit schemes administered by the company are valued actuarially at an interval of not more than three years using the projected unit credit method. No plan assets are held by the company to fund the obligation. The scheme was last actuarially valued on 31 March 2004. At that time the reporting actuary certified that the vested liability for continuation members will fluctuate depending on the mortality rate of current continuation members and the rate of new retirements over the next few years. The active member liability will be affected by whether the actual withdrawals match those expected and the rate of medical aid inflation. In arriving at his conclusion, the actuary took into account the following assumptions at balance sheet date (expressed as weighted averages):

	<b>Medical aid fund</b>
Investment returns	12.5%
Medical aid inflation rate	10.5%
Withdrawal rates	Medium
Percentage married on retirement	90.0%
Retirement age	65
Early retirement age	55

# Financial statements

## Water Research Commission and Wholly Owned Company Notes to the Financial Statements for the year ended 31 March 2004

### 9 Pension benefit plan (continued)

Present value of plan obligation  
Fair value placed on assets

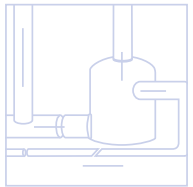
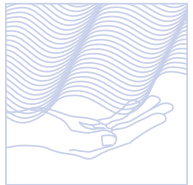
Obligation at beginning of the year  
Expensed in the income statement  
Prior years service costs  
Current service costs  
Interest costs  
Expected return on assets  
Actuarial gains  
Contributions to the fund

#### Provident benefit plan

Present value of plan obligation  
Fair value placed on assets

Obligation at beginning of the year  
Expensed in the income statement  
Prior years service costs  
Current service costs  
Interest costs  
Expected return on assets  
Actuarial gains  
Unrecognised asset  
Contributions to the fund

Water Research Commission		Consolidated	
2004	2003	2004	2003
R	R	R	R
20,229,000	-	20,229,000	-
(19,026,000)	-	(19,026,000)	-
1,203,000	-	1,203,000	-
-	-	-	-
2,304,000	-	2,304,000	-
3,865,000	-	3,865,000	-
1,428,000	-	1,428,000	-
1,673,000	-	1,673,000	-
(1,289,000)	-	(1,289,000)	-
(3,373,000)	-	(3,373,000)	-
(1,101,000)	-	(1,101,000)	-
1,203,000	-	1,203,000	-
-	-	-	-
5,415,000	-	5,415,000	-
(5,415,000)	-	(5,415,000)	-
-	-	-	-
-	-	-	-
20,000	-	20,000	-
(1,305,000)	-	(1,305,000)	-
35,000	-	35,000	-
471,000	-	471,000	-
(548,000)	-	(548,000)	-
(849,000)	-	(849,000)	-
2,216,000	-	2,216,000	-
(20,000)	-	(20,000)	-
-	-	-	-





**Water Research Commission and Wholly Owned Company**  
**Notes to the Financial Statements for the year ended 31 March 2004**

**9 Post retirement medical aid plan (continued)**

Present value of plan obligation

Fair value placed on assets

Obligation at beginning of the year

Expensed in the income statement

Contributions to the fund

**Benefit plans:**

**Pension benefit plan**

**Provident benefit plan**

**Post retirement medical aid plan**

**10 Trade and other payables**

Amounts due to Research Contractors

SA Rainfall Enhancement Programme

Other

Outstanding cheques

Value-added tax

PAYE outstanding

Provision for projects written off

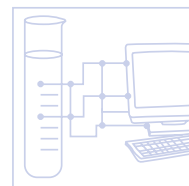
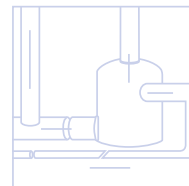
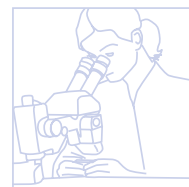
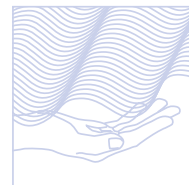
**Total payables**

<b>Water Research Commission</b>		<b>Consolidated</b>	
<b>2004</b>	<b>2003</b>	<b>2004</b>	<b>2003</b>
<b>R</b>	<b>R</b>	<b>R</b>	<b>R</b>
13,640,584	12,500,000	13,640,584	12,500,000
-	-	-	-
<u>13,640,584</u>	<u>12,500,000</u>	<u>13,640,584</u>	<u>12,500,000</u>
12,500,000	12,500,000	12,500,000	12,500,000
1,751,029	475,051	1,751,029	475,051
(610,445)	(475,051)	(610,445)	(475,051)
<u>13,640,584</u>	<u>12,500,000</u>	<u>13,640,584</u>	<u>12,500,000</u>
1,203,000	-	1,203,000	-
-	-	-	-
13,640,584	12,500,000	13,640,584	12,500,000
<u>14,843,584</u>	<u>12,500,000</u>	<u>14,843,584</u>	<u>12,500,000</u>
18,878,435	17,802,370	18,878,435	17,802,370
-	166,108	-	166,108
2,392,852	2,840,861	2,684,632	2,918,644
98,669	31,424	98,669	31,424
4,393,000	2,716,934	4,393,000	2,716,934
17,405	674	17,405	674
<u>25,780,361</u>	<u>23,558,371</u>	<u>26,072,141</u>	<u>23,636,154</u>
(892,634)	(18,163)	(892,634)	(18,163)
<u>24,887,727</u>	<u>23,540,208</u>	<u>25,179,507</u>	<u>23,617,991</u>

# Financial statements

## Water Research Commission and Wholly Owned Company Notes to the Financial Statements for the year ended 31 March 2004

	Water Research Commission		Consolidated	
	2004	2003	2004	2003
	R	R	R	R
<b>11 Income on investments</b>				
Interest on loan to subsidiary	1,262,921	844,563	-	-
Interest on other investments	341,396	287,045	341,396	287,045
Interest on deposits and cash investments	2,741,934	2,833,786	2,741,934	2,833,786
	<u>4,346,251</u>	<u>3,965,394</u>	<u>3,083,330</u>	<u>3,120,831</u>
<b>12 Disclosure of emoluments of all Board Members (Directors) in terms of section 28 of Treasury Regulations</b>				
Fees for services as Director	64,500	84,000	64,500	84,000
Basic salary (Chairman)	134,078	124,464	134,078	124,464
Sums paid by way of allowances	52,693	47,177	52,693	47,177
	<u>251,271</u>	<u>255,641</u>	<u>251,271</u>	<u>255,641</u>
<b>13 Research projects and support</b>				
Subsistence and travel	1,861,767	2,041,800	1,861,767	2,041,800
Research projects	44,561,923	54,535,993	44,561,923	54,535,993
Research consultancies	4,875,135	5,860,018	4,875,135	5,860,018
	<u>51,298,825</u>	<u>62,437,811</u>	<u>51,298,825</u>	<u>62,437,811</u>
<b>14 Staff expenditure</b>				
Human resources	14,832,617	13,499,993	14,880,536	13,512,130
Leave pay provision	415,910	1,100,120	415,910	1,100,120
Pension benefit costs valuation	1,203,000	-	1,203,000	-
Medical benefit costs valuation	1,140,584	-	1,140,584	-
	<u>17,592,111</u>	<u>14,600,113</u>	<u>17,640,030</u>	<u>14,612,250</u>
<b>15 Technology transfer</b>				
Publications	3,929,305	3,480,084	3,929,305	3,480,084
Conferences	695,099	495,767	695,099	495,767
Maintenance of patents	454,303	208,269	454,303	208,269
	<u>5,078,707</u>	<u>4,184,120</u>	<u>5,078,707</u>	<u>4,184,120</u>





Water Research Commission and Wholly Owned Company  
Notes to the Financial Statements for the year ended 31 March 2004

16 Taxation

No provision was made for normal tax as the Water Research Commission is exempt from income tax in terms of Section 10(1)(cA)(I) of the Income Tax Act.

17 Reconciliation of net income with cash generated from operating activities

Net income  
Adjustments for:  
Profit on the sale of fixed assets  
Depreciation  
Amortization of intangibles  
Provisions  
Benefit plans  
Valuation of investments  
Interest received  
Net income before changes in working capital  
Changes in working capital  
Decrease/(increase) in debtors  
Increase in creditors

Net cash generated/(utilised) by activities

18 Cash and cash equivalents

Cash and bank balances  
Amounts immediately recoverable

Water Research Commission		Consolidated	
2004	2003	2004	2003
R	R	R	R
8,682,815	8,383,517	7,448,586	4,736,642
(4,738)	(18,091)	(4,738)	(18,901)
428,355	412,009	432,334	477,972
-	-	37,797	37,797
415,910	1,100,120	415,910	1,100,120
2,343,584	-	2,343,584	-
(1,207,978)	-	(1,207,978)	-
(5,253,515)	(4,675,695)	(3,991,611)	(3,834,322)
5,404,433	5,201,860	5,473,884	2,499,308
3,788,891	(3,706,913)	4,772,036	(4,485,506)
2,441,372	(11,182,082)	3,210,520	(11,783,326)
1,347,519	7,475,169	1,561,516	7,297,820
9,193,324	1,494,947	10,245,920	(1,986,198)
29,360,084	34,089,340	29,712,095	34,499,614
32,409,276	13,667,343	32,409,276	13,667,343
61,769,360	47,756,683	62,121,371	48,166,957



# State statements

## Water Research Commission and Wholly Owned Company Notes to the Financial Statements for the year ended 31 March 2004

### 19 Financial instruments

#### 19.1 Credit risk

##### *Accounts receivable*

Accounts and other receivables are presented net of allowance for doubtful debts, estimated based on prior experience and the current environment. The credit risk with respect to accounts receivables is limited due to their dispensation across different geographical areas in South Africa.

##### *Cash and bank*

The credit risk in respect of cash resources is limited as the counter party is a high quality credit institution with a sound reputation.

#### 19.2 Fair values

The carrying amounts of cash and short-term deposits, accounts receivables, accounts payable and short-term liabilities approximated their fair values due to the short-term maturities of these assets and liabilities.

#### 19.3 Investment risk management

Old Mutual, Momentum Wealth and NIB manage the investments of the Commission and have a sound reputation. The investment strategy is to maximise long-term capital growth and return on the investment portfolio while maintaining a low level of risk within the portfolio.

### 20 Related party transaction

#### 20.1 Controlling entities

Erf 706 Rietfontein (Pty) Ltd is wholly owned by the Water Research Commission.

#### 20.2 Directors

No transactions other than directors emoluments disclosed in note 12 were entered into during the year.

#### 19.4 Price risk

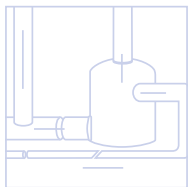
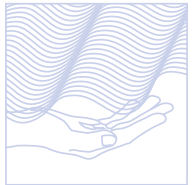
Due to the nature and extent of the Commission's investments, the Commission is not unduly exposed to price risks as investments are in unit trusts, cash and deposits which are classified into the category of available-for-sale.

#### 19.5 Interest rate risk

Due to the nature and extent of the Commission's investments, the Commission is not unduly exposed to interest rate risks as at least 80% of the investments are held in unit trusts.

#### 19.6 Other risks

Cash flow and liquidity risks of the Commission are minimal as the investments in units trusts are available within 3 working days. The Commission does not have any foreign accounts receivables, foreign accounts payable or derivative market instruments.





**ERF SEWE-NUL-SES RIETFontein (PTY) LTD**  
**FINANCIAL STATEMENTS FOR THE YEAR ENDED 31 MARCH 2004**

	PAGE
<b>Contents</b>	
<b>Approval of financial statements and general information</b>	59
<b>Financial Statements</b>	63-71
The following report and statements in respect of the year ended 31 March 2004 are presented in compliance with the requirements of the Companies Act, 1973:	
<b>Report of the Auditor General</b>	60-61
<b>Directors' Report</b>	62
<b>Balance Sheet</b>	63
<b>Income Statement</b>	64
<b>Statement of Changes in Equity</b>	65
<b>Cash Flow Statement</b>	66
<b>Detailed Income Statement</b>	67
<b>Notes to the Financial Statements</b>	68-71

# Statements

## ERF SEWE-NUL-SES RIETFontein (PTY) LTD

### Approval of Financial Statements

The Directors' Report and Financial Statements set out on pages 62 to 71 were approved by the Board of Directors and were signed on its behalf by:



Prof H.C. Kasan



Dr R. Kfir

31 May 2004

### General Information

#### Directors:

Prof HC Kasan  
Dr R Kfir  
Dr GC Green

#### Registered office:

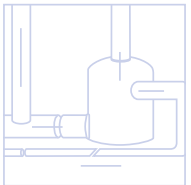
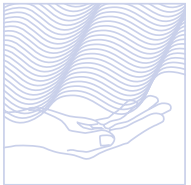
301 Watko Building  
491, 18th Avenue  
Rietfontein  
PRETORIA

#### Registration number:

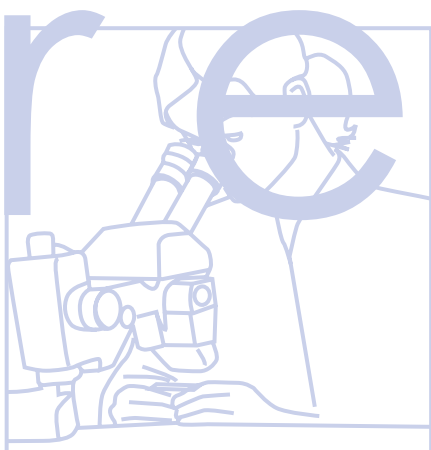
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#### Main business and purpose:

The main business of the company is to own the immovable property known as Erf 706 Rietfontein, in addition and supplementary to the aim of the Water Research Commission, (WRC) and to place the property at the disposal of the WRC as their main place of business.



# report of the auditor-general



## REPORT OF THE AUDITOR-GENERAL TO PARLIAMENT ON THE FINANCIAL STATEMENTS OF ERF SEWE-NUL- SES RIETFontein (PROPRIETARY) LIMITED FOR THE YEAR ENDED 31 MARCH 2004



AUDITOR - G E N E R A L

### 1. AUDIT ASSIGNMENT

The financial statements as set out on pages 62 to 71, for the year ended 31 March 2004, have been audited in terms of section 188 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996), read with sections 3 and 5 of the Auditor-General Act, 1995 (Act No. 12 of 1995). These financial statements, the maintenance of effective control measures and compliance with relevant laws and regulations are the responsibility of the accounting officer. My responsibility is to express an opinion on these financial statements, based on the audit.

### 2. NATURE AND SCOPE

The audit was conducted in accordance with Statements of South African Auditing Standards. Those standards require that I plan and perform the audit to obtain reasonable assurance that the financial statements are free of material misstatement.

An audit includes:

- examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements,
- assessing the accounting principles used and significant estimates made by management, and
- evaluating the overall financial statement presentation.

Furthermore, an audit includes an examination, on a test basis, of evidence supporting compliance in all material respects with the relevant laws and regulations which came to my attention and are applicable to financial matters.

I believe that the audit provides a reasonable basis for my opinion.

### 3. AUDIT OPINION

In my opinion, the financial statements fairly present, in all

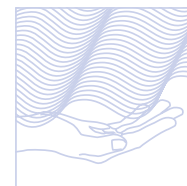
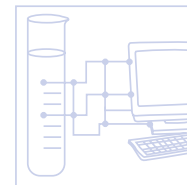
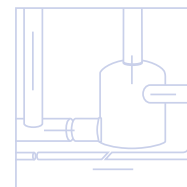
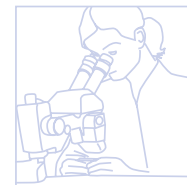
material respects, the financial position of Erf Sewe-Nul-Ses Rietfontein (Pty) Ltd at 31 March 2004 and the results of its operations and cash flows for the year then ended in accordance with generally accepted accounting practice and in the manner required by the Companies Act.

#### 4. APPRECIATION

The assistance rendered by the staff of Erf Sewe-Nul-Ses Rietfontein (Pty) Ltd during the audit is sincerely appreciated.

**A H Muller**  
for Auditor-General

**Pretoria**  
**24 July 2004**





## **ERF SEWE-NUL-SES RIETFontein (PTY) LTD**

### **Director's Report for year ended 31 March 2004**

#### **General Review**

- a) To review the business and operations of the company for the above accounting period generally, the directors draw attention to the balance sheet, income statement, equity and cash flow statement attached, where the business of the company, the results and state of affairs are clearly reflected.
- b) The Fourth Schedule to the Companies Act, 1973, requires the Directors to report on any material facts or circumstances which occurred between the accounting date and the date of their report. No such material facts or circumstances occurred.
- c) Improvements to the fixed property totalling R27 759 were made in this financial year and capitalised.
- d) No dividends were paid or declared during the accounting period and we have no recommendation to make (2003-RNil).
- e) The Directors and certain members of staff of the Water Research Commission, for whom an administration fee is paid, managed the business of the company. No third person was involved in managing the company.

#### **Specific Matters**

- a) The main aim of the company is that of owning the immovable property known as Erf 706 Rietfontein, including all permanent improvements, and to use the property for the purpose of promoting the operations of the Water Research Commission.
- b) No shares were allotted or issued by the company for the year ended 31 March 2004.
- f) The names of Directors, including the changes that have taken place in the appointments during the accounting period, are shown below. No secretary was appointed.

Prof H.C. Kasan  
Dr R. Kfir  
Dr G.C. Green

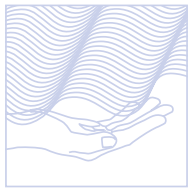
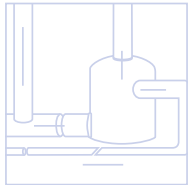
The company is wholly owned by the Water Research Commission.



# Statements

## Water Research Commission and Wholly Owned Company Balance Sheet as at 31 March 2004

	NOTES	2004 R	2003 R
<b>ASSETS</b>			
<b>Non-current assets</b>			
Property, plant and equipment	4	6,541,806	6,518,026
<b>Current assets</b>			
Trade and other receivables		540,586	1,607,628
Cash and cash equivalents	7	188,575	1,122,354
Investment	5	352,011	410,274
		-	75,000
<b>Total assets</b>		<b>7,082,392</b>	<b>8,125,654</b>
<b>EQUITY AND LIABILITIES</b>			
<b>Capital and reserves</b>			
Share capital	2	(1,826,869)	(630,437)
Accumulated profits		1	1
		(1,826,870)	(630,438)
<b>Non-current liabilities</b>			
Interest-bearing borrowings	3	8,340,568	7,564,123
<b>Current liabilities</b>			
Trade and other payables		568,693	1,191,968
Current portion of borrowings	3	346,973	372,607
		221,720	819,361
<b>Total equity and liabilities</b>		<b>7,082,392</b>	<b>8,125,654</b>





**Erf Sewe-Nul-Ses Rietfontein (Pty) Ltd**  
**Income Statement for the year ended 31 March 2004**

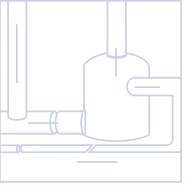
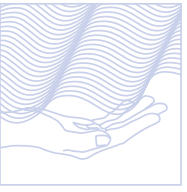
	NOTE	2004 R	2003 R
<b>Revenue</b>		1,265,052	1,188,161
Other income		1,017	3,190
Operating expenses		(1,198,735)	(3,955,863)
Profit/(loss) from operations		67,334	(2,764,512)
Finance costs		(1,263,766)	(844,563)
<b>Loss before taxation</b>		(1,196,432)	(3,609,075)
Taxation	6	-	-
<b>Loss after taxation</b>		(1,196,432)	(3,609,075)
The loss from operations was determined after the following items which require separate disclosure in terms of the Companies Act:			
Auditors' remuneration		13,245	22,326
Depreciation			
- Furniture and fittings		1,054	5,419
- Equipment		2,925	60,544

# Statements



**Erf Sewe-Nul-Ses Rietfontein (Pty) Ltd**  
**Statement of Changes in Equity for the year ended 31 March 2004**

	Share Capital R	Accumulated Profits R	Total R
Balance at 1 April 2002	1	2,978,637	2,978,638
Net loss for the year	-	(3,609,075)	(3,609,075)
Balance at 31 March 2003	1	(630,438)	(630,437)
Net loss for the year	-	(1,196,432)	(1,196,432)
Balance at 31 March 2004	1	(1,826,870)	(1,826,869)





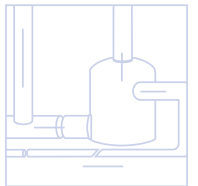
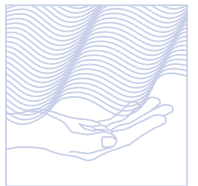
Erf Sewe-Nul-Ses Rietfontein (Pty) Ltd  
Cash Flow Statement for the year ended 31 March 2004

NOTE	2004 R	2003 R
<b>Cash outflow from operating activities:</b>	(284,308)	(3,762,661)
Operating loss before taxation	(1,196,432)	(3,609,075)
Adjustment for:		
Depreciation	3,979	65,963
Investment income	(1,017)	(3,190)
Finance charges	1,263,766	844,563
Operating profit/(loss) before working capital changes	70,296	(2,701,739)
Working capital changes	908,145	(219,549)
Decrease/(increase) in debtors	933,779	(716,578)
(Decrease)/increase in creditors	(25,634)	497,029
Cash generated/ (utilised) by operating activities	978,441	(2,921,288)
Interest received	1,017	3,190
Finance costs	(1,263,766)	(844,563)
<b>Cash inflow/(outflow) from investing activities:</b>	47,241	(1,620,294)
Additions to property and equipment	(27,759)	(1,620,294)
Proceeds from investment	75,000	-
<b>Cash flow from financing activities:</b>		
Increase in long-term borrowings	178,804	5,591,713
<b>Net (decrease)/increase in cash and cash equivalents</b>	(58,263)	208,758
Cash and cash equivalents at beginning of year	410,274	201,516
<b>Cash and cash equivalents at end of year</b>	<b>352,011</b>	<b>410,274</b>

# Financial statements

**Erf Sewe-Nul-Ses Rietfontein (Pty) Ltd**  
**Detailed Income Statement for the year ended 31 March 2004**

	2004 R	2003 R
<b>INCOME</b>		
Rent received	1,266,069	1,191,351
Municipal expense recoveries	1,026,970	1,004,132
Interest received	228,310	178,056
Sundry income	1,017	3,190
	9,772	5,973
<b>EXPENSES</b>		
Administration and management fee	2,462,501	4,800,426
Auditors' remuneration	282,006	418,439
Bank charges	13,245	22,326
Depreciation	4,383	2,647
- Equipment	2,925	60,544
- Furniture and fittings	1,054	5,419
Insurance	37,961	10,822
Interest paid	1,263,766	844,563
Legal fees	11,663	-
Municipal services and levies	285,884	187,181
Regional services council	916	1,175
Rent – meter readings	1,239	1,852
Repairs and maintenance	362,844	3,121,653
Secretarial fees	1,845	-
Security	142,955	109,663
Staff expenditure	47,919	12,134
Telephone	1,896	2,008
<b>Loss before taxation</b>	<u>(1,196,432)</u>	<u>(3,609,075)</u>





**Erf Sewe-Nul-Ses Rietfontein (Pty) Ltd**

**Notes to the Financial Statements for the year ended 31 March 2004**

**1. Accounting policies**

The financial statements have been prepared on the historical cost basis. The following are the principal accounting policies of the Company which are consistent in all material respects with those applied in the previous year, except as otherwise indicated.

**1.1 Property and equipment**

Land and buildings are not depreciated and all improvements are capitalised against the fixed property. Furniture and fittings and equipment are stated at historical cost less depreciation. Depreciation is provided on the straight line method at the following rates:

- Furniture and fittings @ 10%
- Equipment @ 20%

**1.2 Revenue**

Revenue consists of rental income excluding value added tax.

**1.3 Financial instruments**

Financial instruments carried on the balance sheet include cash and bank balances, investments, receivables, creditors and liabilities. These instruments are carried at their estimated fair values. The particular recognition methods adopted are disclosed in the individual policy statements associated with each item.

**1.4 Cash flows**

For the purposes of the cash flow statement, cash includes a bank balance.

# Financial statements

## Erf Sewe-Nul-Ses Rietfontein (Pty) Ltd Notes to the Financial Statements for the year ended 31 March 2004

### 2. Share capital

#### Authorised

4 000 Ordinary shares of R1 each

#### Issued

1 Ordinary share of R1 each

### 3. Long-term borrowings

#### Water Research Commission

Total borrowings

Less: Current portion of borrowings

Long term portion of borrowings

The loan is unsecured and repayable over 14 years. Interest was charged at 15% on the monthly balance.

During the year R 1,830,000 (2003 - R630,500) of the loan was subordinated by the Water Research Commission.

### 4. Property, plant and equipment

#### 4.1 Furniture and fittings

Carrying value: Beginning of year

- Cost

- Accumulated depreciation

Additions

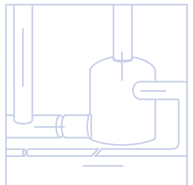
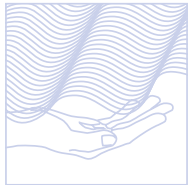
Depreciation

Carrying value: End of year

- Cost

- Accumulated depreciation

2004 R	2003 R
4,000	4,000
1	1
8,562,288	8,383,484
221,720	819,361
8,340,568	7,564,123
1	2,926
2,926	8,345
54,188	54,188
(51,262)	(45,843)
-	-
(2,925)	(5,419)
1	2,926
54,188	54,188
(54,187)	(51,262)







**4. Property, plant and equipment (continued)**

**4.2 Equipment**

- Carrying value: Beginning of year
- Cost
- Accumulated depreciation
- Additions
- Depreciation
- Carrying value: End of year
- Cost
- Accumulated depreciation

**4.3 Fixed property comprise:**

- Erf 706, Rietfontein, Pretoria, Gauteng
- At cost
- Improvements

**Total property, plant and equipment**

The Directors' value the property at

**5. Investment**

ABSA Bank: (unsecured) 32 day deposit

**6. Income tax**

No provision has been made for taxation as the company should be exempt from taxation as a wholly-owned subsidiary of an exempt organisation. Confirmation of the company's exempt status is pending. Due to the loss incurred, no provision would be required in any event.

2004 R	2003 R
1	1,055
1,055	61,599
605,441	605,441
(604,386)	(543,842)
-	-
(1,054)	60,544
1	1,055
605,441	605,441
(605,440)	(604,386)
615,855	615,855
5,925,949	5,898,190
6,541,804	6,514,045
6,541,806	6,518,026
6,500,000	6,500,000
-	75,000

# Statements

	2004 R	2003 R
<b>7. Cash and cash equivalents</b>		
Bank balance	352,011	410,274
<b>8. Financial instruments</b>		
<b>8.1 Credit risk</b>		
Financial assets which potentially subject the company to concentrations of credit risk consist principally of cash, short-term deposits and trade receivables. The company's cash equivalents and short-term deposits are placed with high credit quality financial institutions. Trade receivables are presented net of the allowance for doubtful receivables.		
<b>8.2 Fair values</b>		
The carrying amounts of cash and short-term deposits, accounts receivables, accounts payable and short-term liabilities approximated their fair values due to the short-term maturities of these assets and liabilities.		
<b>9. Related party information</b>		
<b>9.1 Controlling entity</b>		
The company is wholly owned by the Water Research Commission.		
<b>9.2 Directors</b>		
The Directors named in the attached Directors' report each held office as a Director of the company during the year ended 31 March 2004.		