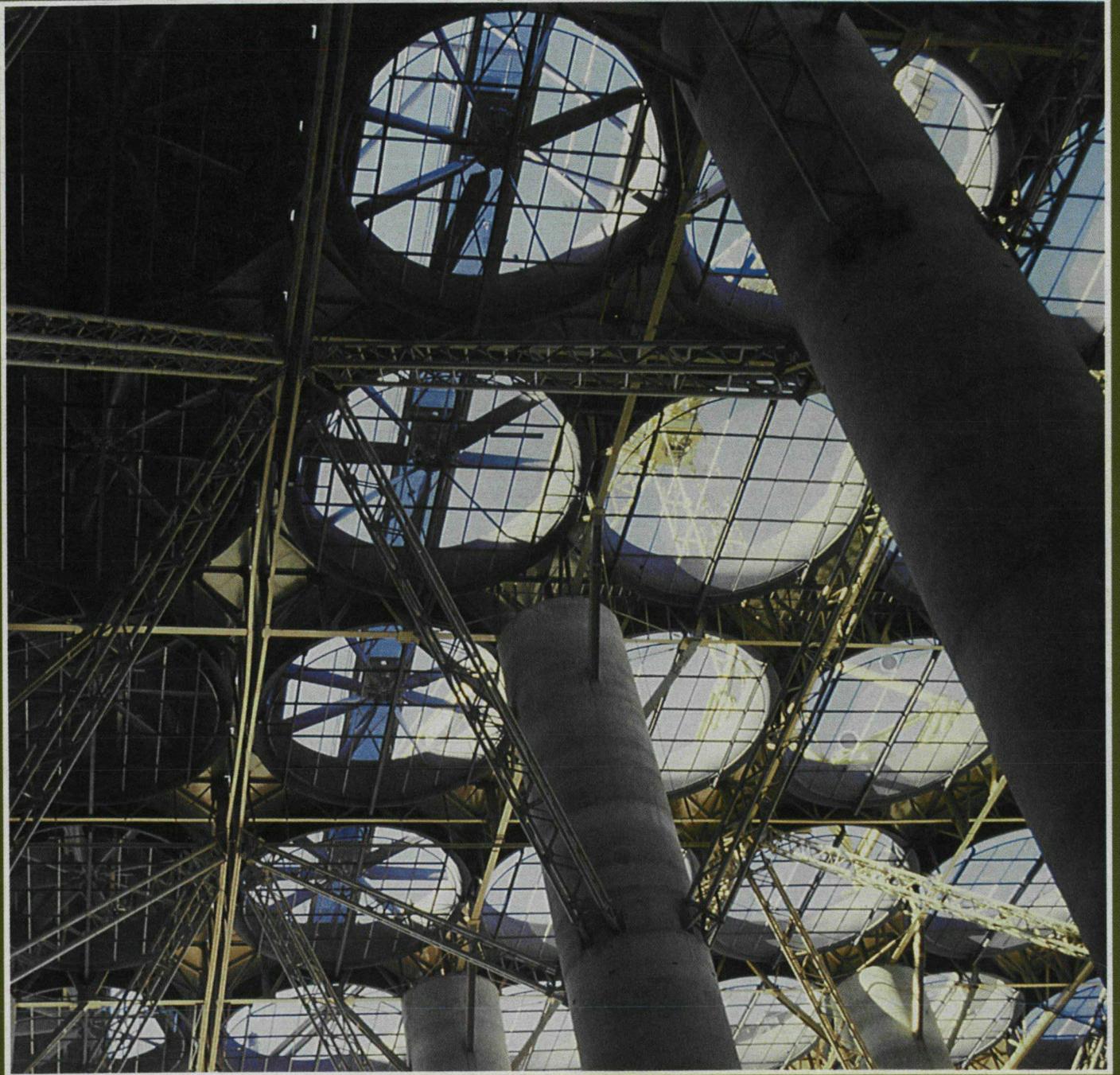


# SA waterbulletin

---

---

ISSN 0248-2244 VOLUME 14 NO 4 AUGUST/SEPTEMBER 1988



---

## DRY COOLING

SA power giant cuts water use by millions of litres

---

## SLYK

Volskaalse aanleg lewer kiemvrye kompos

---

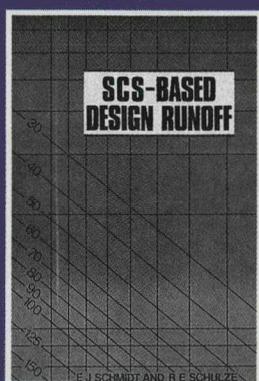
## WYNBOU

Korrekte besproeiing verbeter druiwekwaliteit

00020065

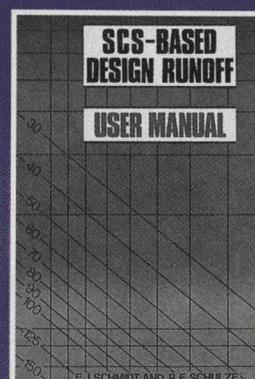
There is a need in southern Africa for hydrological information which will assist engineers and hydrologists responsible for the planning of hydraulic structures, in making economic and safe design decisions.

Three new reports, emanating from a WRC project, now offer an up-to-date guide on the application of SCS-based techniques in design hydrology for small catchments.



Report TT 31/87 Flood volume and peak discharge from small catchments in southern Africa, based on the SCS technique

This report is basically a design manual. In Part 1 detailed background information and theory is given for the professional designer requiring a comprehensive guide to modelling assumptions and research findings. Part 2 outlines procedures for use of the SCS model in southern Africa, and provides a detailed breakdown of the steps required to determine runoff volume, peak discharge and hydrograph shape. Various alternatives to solutions are given and procedures to estimate design runoff depth accounting for the joint association of rainfall and antecedent moisture condition for southern Africa are included. Worked examples are also given in Part 2 of the document. These provide step by step solutions to a range of problems for which SCS-based methods are likely to be applied. Part 3 consists of tables, maps and nomographs for application of the SCS method in southern Africa.



Report TT 33/87 User manual for SCS-based design runoff estimation in southern Africa

A shorter and simpler report is presented as a design aid for use for less expensive structures. The report contains a minimum of theory (given in Parts 1 and 2) to provide the necessary background information to perform manual calculations. It focuses, by way of worked examples (Part 3), on the use of nomographs, tables and maps to provide quick (but thoroughly researched) estimates of runoff volume and peak discharge.



Report TT 32/87 Flood volume and peak discharge from small catchments in southern Africa, based on the SCS technique: Appendices

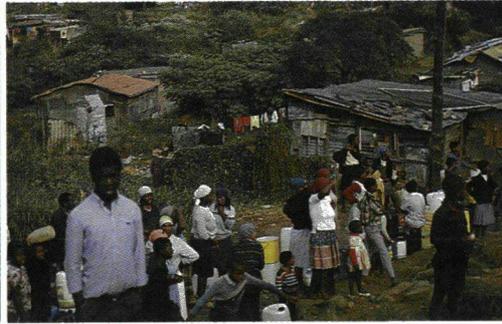
This document contains appendices relevant to reports TT 31/87 and TT 33/87. It consists of tables of hydrological information for each of the climatic zones in southern Africa as well as a computer program.

Reports  
on flood  
estimation  
models  
**NOW**  
available

All three reports are available, free of charge, from the Water Research Commission, P O Box 824, Pretoria 0001. Tel: (012) 28-5461.  
To order, please complete the order card in this Bulletin.



p6



p10



p18

## Inhoud

<b>DRY COOLING</b>	<b>6</b>	Power giant's thirst cooled
<b>WATER SUPPLY</b>	<b>10</b>	The International Water Supply Association concentrating on water information transfer
<b>SLYK</b>	<b>14</b>	Suigbelugting slaag in Stellenbosch
<b>BESPROEING</b>	<b>18</b>	NIWW verander water in wyn
<b>WATER QUALITY</b>	<b>22</b>	Integrated catchment management programme becoming a reality at Zandvlei
<b>WASTE WATER</b>	<b>26</b>	Measurements of initial dilution of a buoyant effluent
<b>Rubrieke</b>	<b>4</b>	Waterfront
	<b>28</b>	Nuusbrokkies/News snippets
	<b>29</b>	Books/Reports
	<b>30</b>	Conferences and Symposia

*Cover: Dry-cooling units at Matimba Power Station*

SA Waterbulletin is a two-monthly magazine on water and water research published by the South African Water Research Commission (WRC), a statutory organization established in 1971 by Act of Parliament. Subscription is free. Material in this publication does not necessarily reflect the considered opinions of the members of the WRC, and may be copied with acknowledgement of source.

Editorial offices: WRC, P O Box 824, Pretoria 0001, Republic of South Africa. Tel. (012) 28-5461.

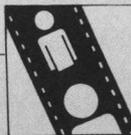
Editor Jan du Plessis, Asst Editor Ilse Lombard, Ed. Secretary Rina Human, Colour separations Litho Technik, Typography and design Nicola van Nikkelen Kuyper, Printing Creda Press, Cape Town.

SA Waterbulletin is 'n tweemaandelikse tydskrif oor water en waternavorsing wat uitgegee word deur die Suid-Afrikaanse Waternavorsingskommissie (WNK), 'n statutêre organisasie wat in 1971 by Wet gestig is.

Intekening is gratis. Stof in dié publikasie weerspieël nie noodwendig die oorwoë menings van lede van die WNK nie, en mag hergebruik word met erkenning van die bron.

Redaksie: WNK, Posbus 824, Pretoria 0001, Republiek van Suid-Afrika. Tel. (012) 28-5461.

Redakteur Jan du Plessis, Asst-redakteur Ilse Lombard, Red. sekretaresse Rina Human, kleurskeidings Litho Technik, Tipografie en uitleg Nicola van Nikkelen Kuyper, Drukkerwerk Creda Press, Kaapstad.



## Aquaculture 1988 Symposium

**T**he Aquaculture '88 Symposium was held recently, focusing on aquaculture research and commercial fishfarming in South Africa.

In his opening address, Dr Kraai van Niekerk, Deputy Minister of Agriculture, said that aquaculture could supply the growing demand for a good protein source at a reasonable price.

Dr van Niekerk pointed out that fishfarmers are not consumers but utilisers of water resources. He said that a large amount of underutilised water in high rainfall areas and irrigation areas could be used for aquaculture.

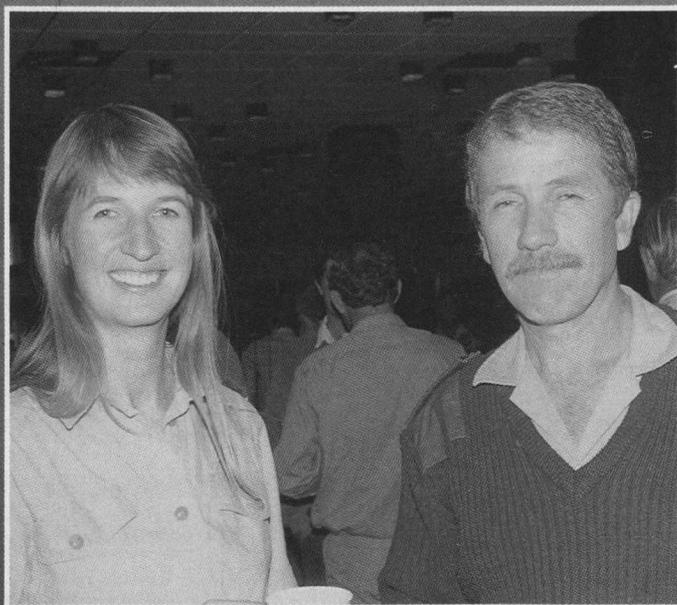
Mr Leo Ray, President of the Fish Breeders of Idaho Inc (USA), delivered the keynote address.

Mr Ray said that the aquaculture industry is still relevantly young in America going back 25 years, but that it is showing great potential.

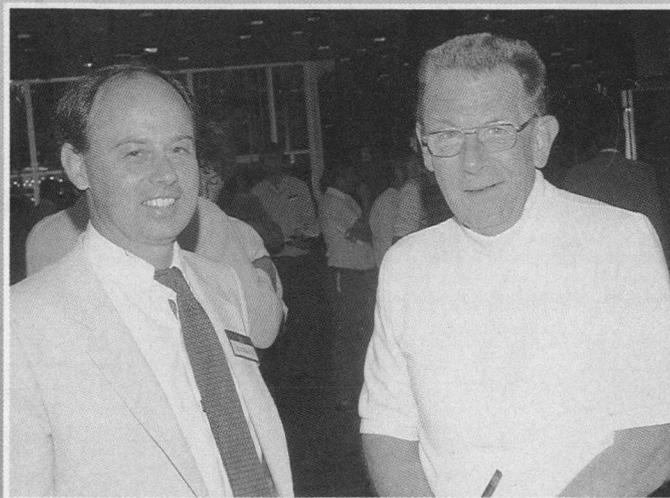
Catfish production, for example, has shown a 30 per cent growth rate per year and at present about 200 thousand tons of catfish is being produced annually.

The Catfish industry is eight times larger than the trout industry which has been practised for about 25 years. Mr Ray believes that this is due to the scientific approach to Catfish farming and the intervention of the government who provided financial support for research.

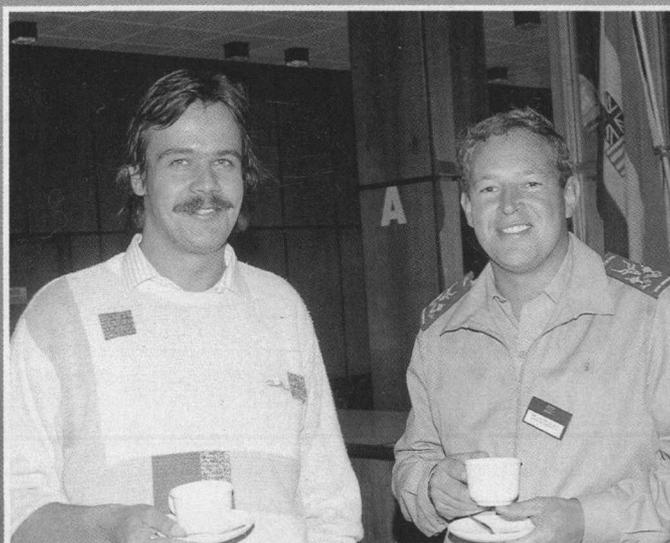
At the symposium, papers were presented on aspects related to the field of aquaculture such as: The culture of sharptooth catfish; Fish disease regulations; SA crocodile farming in perspective; Financial Planning for Aquaculture; Chinese Aquaculture for rural South Africa; Broodstock Selection, etc. W



From left: Mrs and Mr WL Hughes-Games (Gazankulu Fisheries Division).



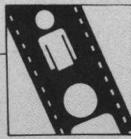
From left: Mr WC Cilliers (Machado Rainbow Trout) and Prof GW Klontz (University of Idaho, USA).



From left: Mr LR Taylor (University of the North) and Mr IH van der Walt (Department of Agriculture and Nature Conservation).



From left: Mr H Viljoen (Brits), Mr EI Tessedorf (Gardenview) and Mr BO Gilbert (Benoni).



## Course held on the design of water quality monitoring systems



From left: Mr HNJ van Brakel, Pres. Steyn Gold Mine, Welkom, and Mr JT Munroe, Pres. Brand Gold Mine, Welkom.

**A** five-day short course on how to design water quality monitoring systems was held from 1 to 5 August at the CSIR Conference Centre in Pretoria.

The course which was attended by more than 80 delegates from all over the country was initiated and organised by Dr Dirk Grobler, Manager of the Water Quality Management Information Systems Programme at the Division of Water Technology, CSIR. This Short Course is annually presented at the Colorado State University, Fort Collins, USA, by Dr Thomas Sanders and Dr Robert Ward. They were invited to present the Short Course in South Africa and to act as the principal instructors. Other instructors included, inter alia, Dr Dirk Grobler and Dr Jane Harris. Dr Harris, also from the Colorado State University, is now doing research in South Africa on water quality networks systems in terms of a tripartite agreement between the Water Research Commission, Department of Water Affairs and the CSIR.

In his opening address, Mr PE Odendaal, Executive Director of the WRC, said that water quality assessment is an expensive process and that decisions with far-reaching implications are based on water quality. He also made the point that most water quality monitoring programmes suffer from the "Data rich but information poor" syndrome. He stressed the importance of a well-designed water quality monitoring systems network and the importance of this in water quality management. The WRC made a financial contribution towards the arrangement of the Short Course. 

**TOP:** From left: Dr Dirk Grobler, CSIR, Mr Plet Odendaal, WRC, Dr Tom Sanders, Dr Robert Ward, and Dr Jane Harris, all three from Colorado State University, USA, and Dr Thys Pieterse, WRC.



From left: Mr V Botes, Mhlatuze Water Board, Richards Bay and Mr G Idema, DWA, CSIR.



From left: Ms E Swart, Dr J Galpin and Mr C Gilfillan, all from the CSIR's Centre for Advanced Computing and Decision Support (CACDS).



From left: Ms I Cawood, Umgeni Water Board, Mr D Dorling, Randfontein Estate Gold Mines and Mr GA Oakes, Rustenburg Platinum Mines.



From left: Mr G Thabeng and Mr T Mogologolo, both from the Department of Water Affairs, Botswana.



From left: Mr W Selkirk, DWA, and Mr MJ McNerney, SABS.



# Power giant's thirst cooled

**Matimba - the Tswana word for "power" — is an appropriate name for the dry-cooled giant power station under construction near Ellisras in the north-western Transvaal. According to a technical publication by Eskom, Matimba is designed to generate 4 000 MW and will have six 665 MW turbo-generator units, making it the largest dry-cooled steam condensing system in the world, followed by the single 365 MW unit at Wyodak in the United States. The adjacent Grootegeeluk colliery has sufficient coal reserves to guarantee Matimba a minimum lifespan of 35 years, extending to a possible 50 years, at 3 800 tons of coal per hour.**

The planning of the Matimba power station started in 1978. A great deal of research had to be done to adapt the dry-cooling technology, applied on relatively small scale in countries like Spain and the USA, to this very large scale application under South African conditions.

This research was done over the past ten years as a collaborative effort by the Water Research Commission (WRC), Eskom, the CSIR and the University of Stellenbosch's Bureau for Mechanical Engineering.

The research involved many different aspects including the effects of atmospheric conditions on cooling performance, the development of computer models to evaluate systems and to optimise performance, a study of corrosion, the extent and effects of hot air recirculation, computer and physical modelling and many related aspects.

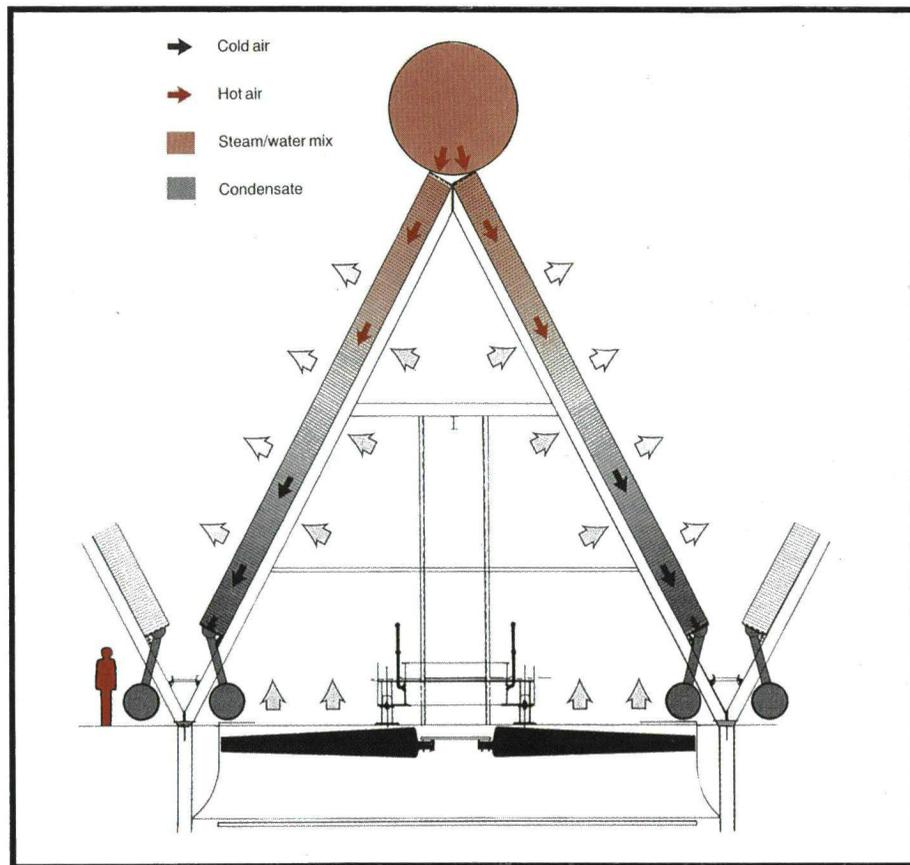
## DRY COOLING AND WATER RESERVES

One of the main reasons for choosing the dry-cooling technology, was the limitation of available water resources in the north-western Transvaal. Although the expense involved in the construction and operation of a coal-fired power station with a dry-cooling system is greater than that for one with a wet-cooling system, the limited water supply overrode economic considerations in determining the choice between the two technologies.

On-going studies to improve the efficiency of water utilisation, have reduced the amount of water Matimba will use, to about 0,8 litres/KW.h. Conventional wet-cooled power stations require 2,5 litres/KW.h.

## COAL RESERVES

The Grootegeluk colliery was originally established by Iscor to extract high-grade metallurgical coal for iron and steel production. Lower grade coal with a high ash content was mined as a by-product. Eskom has developed its technology to the extent that the low-grade coal which would otherwise have no use, can be burnt at Matimba. Through this joint venture, Eskom is helping to utilise the country's resources to the maximum, helping to save high-quality coal for specialised industrial use and for export.



A flow diagram of the dry-cooling system

## ASH DISPOSAL

In line with Eskom's environmental policy, suitable sites were determined for the disposal of coarse and fly ash.

At full load, each boiler produces up to 280 tons of coarse ash and 2500 tons of fly ash per day. The fly ash is conditioned to a moist cake form before being mixed with the coarse ash. The mixed ash is fed to an overland conveyer system which transports the ash to the surface dump where it is stacked and spread. The dump will eventually be covered with a 200 mm layer of topsoil and then grassed.

## DRY-COOLING TECHNOLOGY

There are two basic dry-cooling systems. The indirect dry-cooling system adopts a principle similar to that used in the car radiator, where heat is conducted from the water to the metal of the radiator and from there to the air passing over the finned

tubes. The air remains dry, since it does not come into contact with the hot water. The water is in a closed circuit and evaporation is thus eliminated.

In the direct system, steam from the low-pressure turbine is channelled directly into the radiator-type heat exchanger. The heat is conducted from the steam to the metal of the exchanger. Air passing through the exchanger removes the heat, thus condensing the steam into water to be pumped back to the boiler. Cooling in the direct or indirect system can be achieved either by natural draught in cooling towers or by forced draught using fans. Cooling in the Matimba direct dry-cooling system is by forced draught whereas an indirect natural draught system is used at Kendal power station.

The performance of a dry-cooling system depends on the ambient dry-bulb temperature. Temperatures at Ellisras vary as much as 30 degrees from day to night and in summer will frequently rise into the 40's. Consequently, the rate at which the air draws heat from the heat exchangers will vary considerably, as will the back-pressure at the turbine exhaust. This will affect the efficiency of the turbines so that the

rated 665 MW will only be achieved at ambient air temperatures at or near design temperatures. This disadvantage is offset both by the availability of cheaper coal, and the significant conservation of the already severely limited water resources of the area.

---

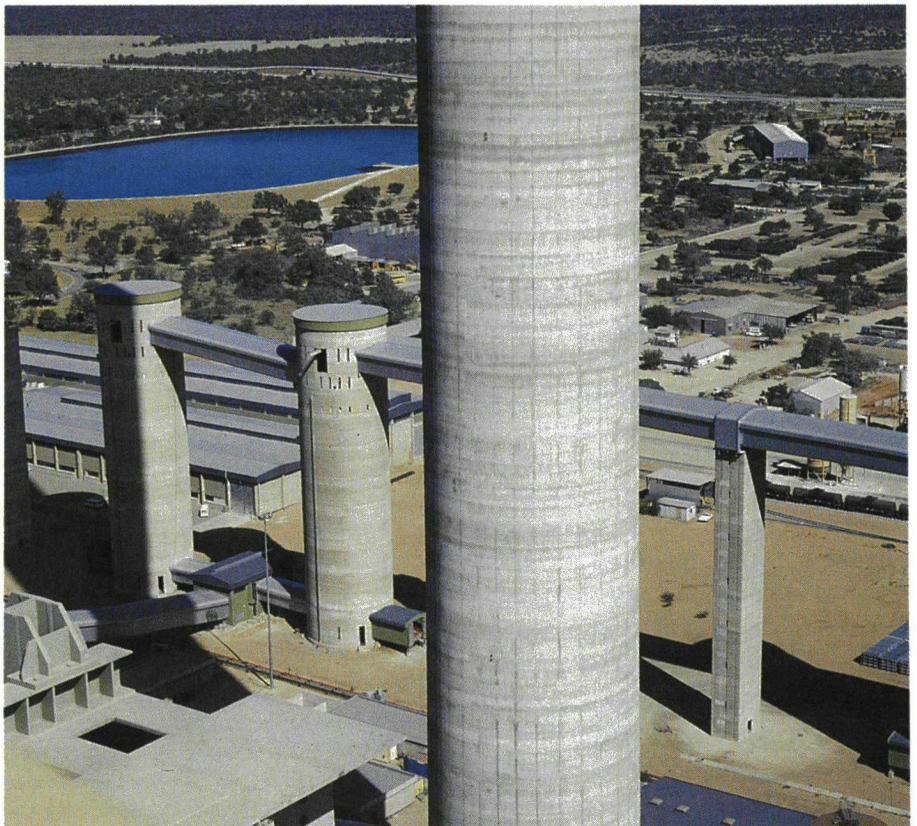
### MATIMBA - THE BASIC CYCLE

---

From the stockpile at Grootegeluk colliery, coal is transported by terrace conveyors to one of six unit silos, each of 4 650 tons capacity. Inclined conveyor belts carry the coal from the silos to each of the five 850 ton capacity boiler mill bunkers. Two control feeders channel the coal into a rotating ball-tube pulverising mill, run at 18 r/min with an operating output of 100 tons per hour. Primary air fans blow the pulverised coal into 20 boiler burners arranged in five levels. Forced draught fans and secondary air, to aid combustion, plus the mixture is then blown into the boiler furnace.

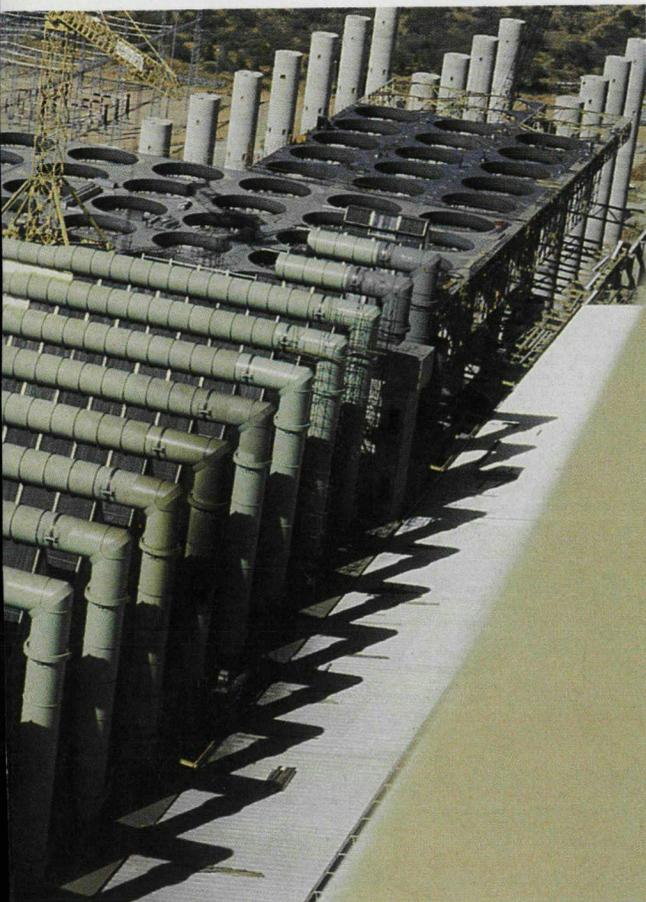
The coal combustion produces coarse ash and fly ash in a ratio of approximately 1:5. The coarse ash drops to the bottom of the boiler and is conveyed away for treatment and disposal. The fly ash is carried in the flue gases to the precipitators where more than 99 per cent of it is removed electrostatically. Induced draught fans draw the cleaned flue gas from the precipitators and discharge it through the chimney into the atmosphere.

Heat released by the burning coal is absorbed by the boiler feedwater inside the many kilometres of tubing which form the boiler furnace walls. The maximum continuous rating of each boiler at the turbine stop valve is 577 kg/sec with a superheated steam temperature and pressure of 535 degrees C and 16,1 MPa respectively. The steam is led through a superheater to the high-pressure turbine where it expands, causing the turbine to spin at a speed governed to 3 000 r/min. After exhausting some of its energy in the high-pressure turbine the steam is reheated in the boiler reheater and passed through the intermediate-pressure turbine and then to the two low-pressure turbines. The generator rotor, coupled to the turbine shaft, is a cylindrical electro-magnet enclosed in a gas-tight housing. Electricity passes from the stator windings to a transformer which raises the voltage from 20 kV to the transmission voltage of 400 kV.



*The coal conveying and storage system at Matimba, with the water reservoir in the background.*

## COOLING AND RECIRCULATION



Steam from the low-pressure turbines is condensed in a direct dry-cooled condenser. To compensate for small losses in the steam/condensate cycle, demineralised make-up water is added at this point. The condensate then passes through low-pressure heaters to a de-aerator and condensate storage tank.

From there two boiler-feed pumps feed the water through the high-pressure heaters into an economiser where it absorbs additional heat from the flue gases before entering the furnace tube walls to recommence the cycle.

Direct dry-cooled condensers are located adjacent to the turbine house. Steam from the turbines is condensed in the finned tubing which constitutes the condensers. There are approximately 400 km of finned tubing to each condenser unit. Each condenser unit is composed of eight rows of six modules each, of which five are condenser modules and one is a dephlegmator module. Whereas the purpose of the condenser modules is solely to condense the steam, the dephlegmator modules also provide for the extraction of incondensable gases and air. Heat from the steam circuit is removed by air blown over the condenser tubing by the forty-eight 9,1 m diameter forced draught fans beneath each module.

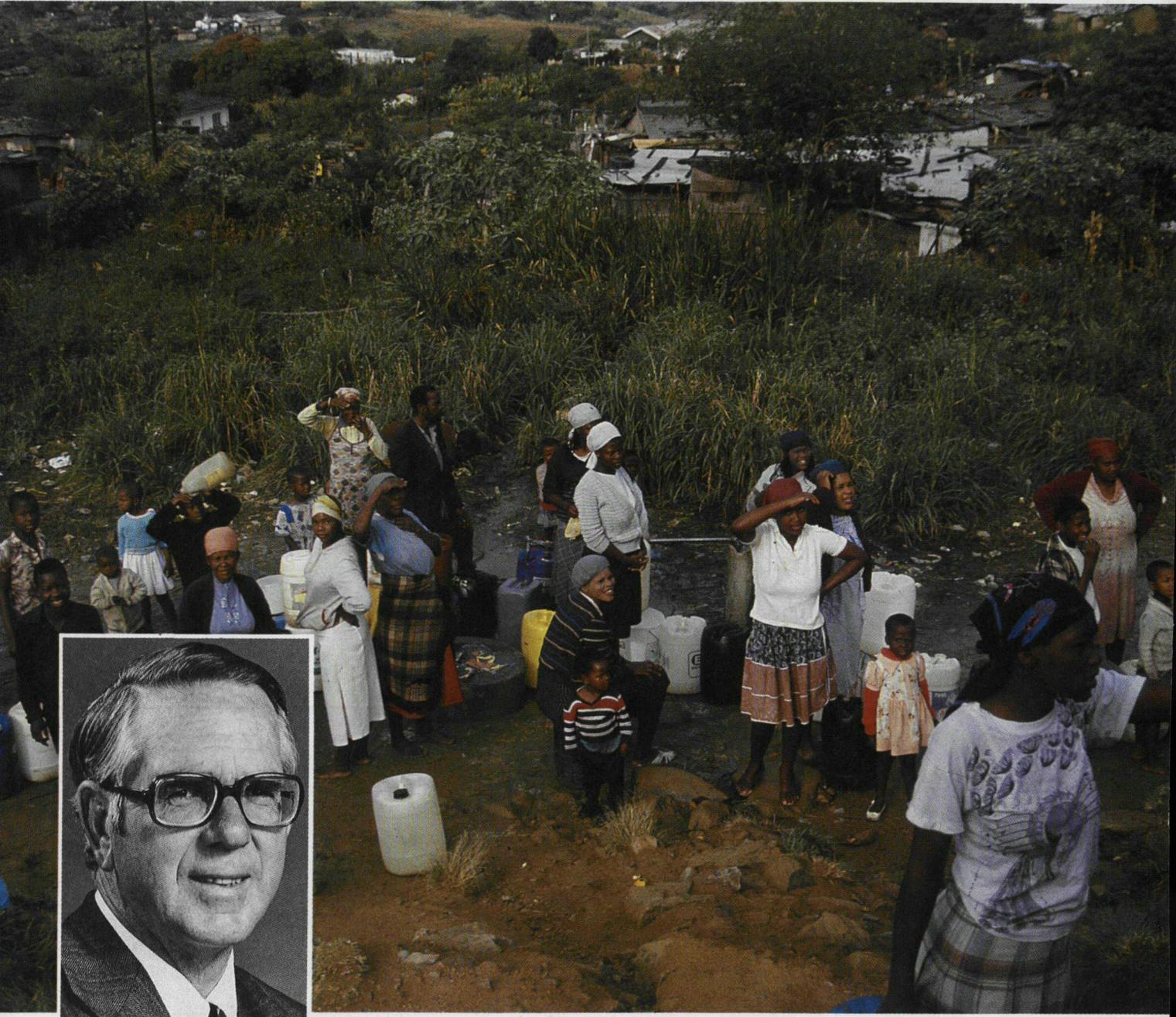
This giant project is a technical achievement that South Africa can be proud of. It is only through the combined research and development efforts of Eskom, the WRC, the CSIR and the University of Stellenbosch that a project of this size and nature could have been tackled with confidence. Matimba confirms the fact that South Africa is a world leader in the development and application of dry-cooling technology and will in future be a focal point in this field. 

*TOP: A view, from the roof of the boiler house, across the completed dry-cooling units with those under construction, in the background.*

*BELOW: Visiting Matimba recently, were (from left): Mr John Begg (Construction Site Manager, Matimba), Mr Alex Ham (General Manager Engineering, Eskom), Dr Frik Schutte (Research Manager, WRC), Dr Nico Stutterheim (Commissioner, WRC) and Mr Lood Rothman (Senior General Manager, Eskom).*



## The International Water Supply Association



*Dr R J (Bob) Laburn  
current Chairman of the SA  
National Committee of the  
IWSA.*

# Concentrating on water information transfer

Somewhat older than its sister organization, the IAWPRC, the International Water Supply Association (IWSA) celebrated its fortieth birthday last year. It was 1947 when a group of countries in Western Europe decided to form an international association of water supply undertakings. The aims were then, as they still are today, to form an association to promote and stimulate the exchange of knowledge and experience in the water industry among managers, engineers, scientists and others concerned with water supply.

**F**rom a small beginning in the late forties the International Water Supply Association (IWSA) has grown into an organization with 78 member countries around the world, which are responsible for 90 per cent of the world's water supply. The latest country to apply for membership is the People's Republic of China, with over a billion inhabitants, about a fifth of the world's population. Cause for celebration indeed at the symposium on 'Water 2000', held in Nice from 8 to 11 September last year.

### How does South Africa fit into IWSA?

Contact between the water industry and the IWSA is normally via the National Committee. It was in May 1960 when the first meeting was held to establish the SA National Committee of the IWSA. Membership was confirmed in 1961 at the Berlin Congress with the CSIR being the Corporate Member for South Africa. Under IWSA rules there can only be one Corporate Member per country; other grades of membership are Associate, Individual and just recently Student. By 1960 the National Committee, then under the chairmanship of Dr N Stutterheim, was made up of representatives from: CSIR, NIWR (now DWT), Department of Water Affairs, Institute of Municipal Engineers of SA, Chamber of Mines of SA, Rand Water Board and SA Institution of Civil Engineers.

Since then the membership has undergone many changes and the following organizations have joined those mentioned above: Committee of Water Boards, Department of Development Aid, Department of National Health and Population Development, OFS Goldfields Water Board, SA Bureau of Standards, SA Pump Manufacturers' Association, Vaal River Catchment Association, Umgeni Water, Water Research Commission and the Water Institute of Southern Africa.

The list of past chairmen of the National Committee reads rather like a Who's Who at the CSIR, including such notable figures as Dr WS Rapson, Dr N Stutterheim, Dr S Meiring Naudé, Dr C van der Merwe Brink and Mr JP de Wit.

With the recent restructuring of the CSIR, a new constitution for the National Committee was drawn up in terms of which the Corporate Member is now the SA National Committee. The CSIR will continue its support through the Division of Water Technology, although the National Committee will enjoy more autonomy in the future than has been the case in the past.

The chairman is currently Dr RJ Laburn, a former Chief Engineer of the Rand Water Board and for some years since his retirement from the Board, a consulting engineer.

Bob Laburn has played a very active role in the IWSA over many

years. He currently represents South Africa on the Scientific and Technical Council of the IWSA and was for some years Chairman of the IWSA's Standing Committee on Water Transport and Distribution. Returning from one of these meetings some years ago, he almost lost his life at Nairobi, when the Lufthansa Boeing 747 in which he was travelling crashed on take off. After many years of devoted service, particularly in the international arena, it is hardly surprising that the IWSA should have conferred honorary membership upon him at its Paris Congress in 1980. This is an honour he shares with only 26 people throughout the world.

In its early days the activities of the National Committee tended to concentrate almost entirely on South African participation in the IWSA international congresses. During the early seventies Dr Gerrie Stander, then President of the International Association on Water Pollution Research (IAWPR) suggested that both the IWSA and IAWPR National Committee should jointly organize a regional conference in Swaziland. The first week in June 1975 saw the Southern African Conference on Water Supply and Pollution Control taking place at the Royal Swazi Hotel and Spa. It attracted delegates from most countries in southern Africa and speakers from the UK, the USA, the Netherlands, the World Health Organization (Brazzaville), the World Bank, as well as speakers from places nearer home. The conference helped to create an awareness of water supply and water pollution problems amongst the leaders of what are now independent and self-governing National States.

In October 1980 the National Committee appointed a subcommittee under the chairmanship of Dr LRJ van Vuuren to coordinate South African participation in the International Drinking Water Supply and Sanitation Decade. The aims of the Decade are summarized as the provision of a safe and sufficient water supply for all with adequate sanitation by 1990. This subcommittee has expanded rapidly through the Decade and now has representatives from Transkei, Bophuthatswana, Venda and Ciskei, recently joined by QwaQwa, the Development Bank and various government departments and organizations concerned with the Water Decade. In addition to collecting baseline data on water supply and sanitation in the developing areas, the subcommittee embarked on a programme of technology transfer by means of seminars. The first of these was held at Thohoyandou, Venda, in September 1983 and attracted 170 delegates. The feedback was positive and a second one was held in Ciskei at the Horseshoe Motel, near King William's Town in February 1985. The third seminar was held at the Mmabatho Sun Hotel, Bophuthatswana in June 1986 and was opened by His Excellency Dr Lucas M Mangope, President of Bophuthatswana. This seminar attracted some 220 delegates and was attended by Mr LR Bays, Secretary-General of the IWSA from England, who also delivered the closing address.

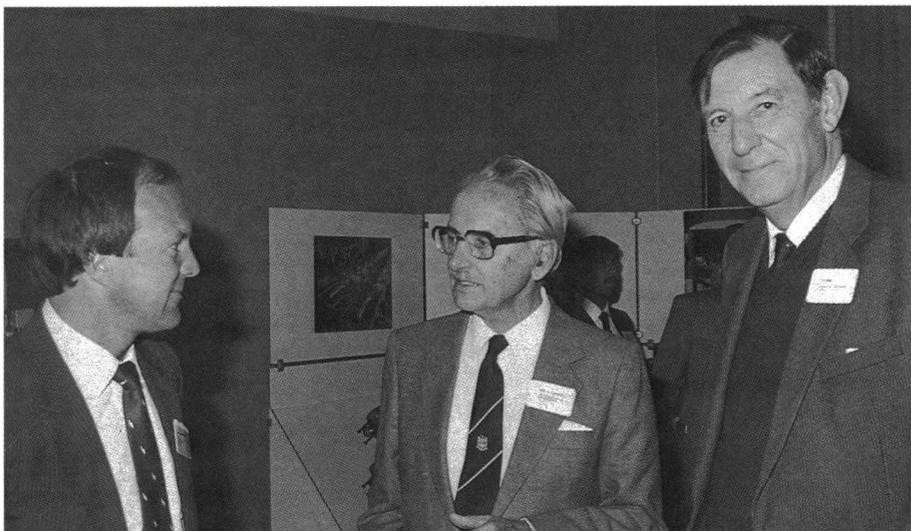
# IWSA'S SEMINAR ON WATER SUPPLY

The most recent event in the IWSA's seminar series was held in Durban at the end of June and was particularly concerned with water supply and sanitation problems in KwaZulu. It was organized by the SA National Committee of the IWSA, the Division of Water Technology of the CSIR, the Government of KwaZulu, assisted by the the Department of Development Aid and the Conference Co-ordinators of the CSIR. The seminar was held in the Elangeni Hotel and proved by far the most popular yet with 406 delegates including exhibitors.

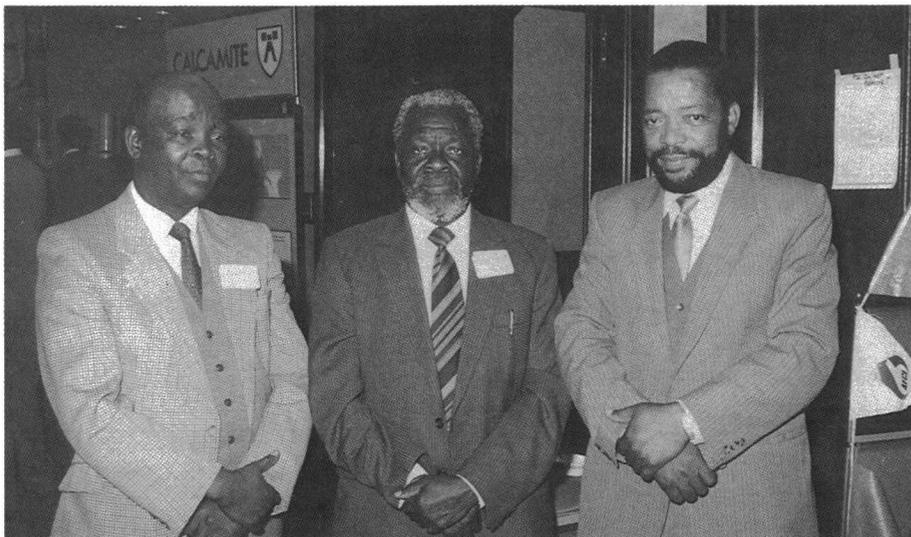
The Keynote Address, which was to have been delivered by the Chief Minister of KwaZulu, the Honoured Mangosuthu G Buthelezi, was read for him by the Honoured Stephen Sithebe, Minister of Welfare and Pensions. This followed the Welcome by Mr G van der Wall, Director General of the Department of Development Aid.

The first two papers in the plenary sessions examined the current status in the metropolitan and rural areas and these were followed by the importance of water in primary health care. After lunch attention was turned to Umgeni Water's contribution to the Water Decade in KwaZulu and a strategy for the year 2000, followed by a look at the Inanda Project - an urban development strategy. After tea, the final papers in the plenary sessions dealt with rural development - the role of non-government agencies, legal aspects concerning water in rural and urban development in KwaZulu, and lastly, the development of the private sector and financial implications - funding and maintenance.

As with the previous three seminars in the Decade, the second day was taken up with technical visits. Immediately after breakfast delegates boarded the six buses, which then headed south, stopping first at KwaMakhutha sewage treatment works, where extensions to the works were explained. Not far away was the Umlazi sewage treatment works, situated on the southern bank of the Isipingo River, which was seen from the bus. Delegates were also shown the Mfolweni township with its basic services for the resettlement of squatters and selfhelp pit latrines. After the first few latrines had been successfully erected, the community responded well to the scheme. On through Umbumbulu, Umpumulanga, Hammarsdale, Inchanga, the next stop was The Valley Trust. Situated in the Valley of a Thousand Hills, the Trust is well-known by many who work in the area of appropriate technology and the approach is a holistic one with concern for the individual's total needs. Ferrocement tanks in different stages of construction, VIP latrines and spring protection were amongst the different schemes on view. After a picnic lunch, the buses headed for the Inanda Dam, currently in an advanced stage of construction and which will have a gross storage capacity of 70 million m<sup>3</sup>.



From left: Mr RM Robertson, Murray, Biesenbach and Partners, Prof DC Midgley, Wits University, and Mr JF Pool, Kangwane Housing Trust.



From left: Nkosi R Mazambo, Department of Health, KwaZulu, Nkosi MA Ngcobo, Ndwedwe Development Council, and Nkosi LG Dlamini, Minister of Agriculture and Forestry.

# AND SANITATION IN KWAZULU

Provision is made for raising the level in future and increasing the capacity to 225 million m<sup>3</sup>. Driving through Inanda Newtown, the buses eventually reached Ziphembeleni Secondary School, where a tree was planted by Nkosi Ngcobo and the President of the IWSA, Jan Dirickx, handed over a cheque to the Headmaster.

The final day was devoted to workshop sessions dealing with technical aspects of water supply and sanitation; community aspects with special reference to boreholes, springs and community involvement; economic aspects: privatisation and cost recovery. The last technical session took the form of a panel discussion addressing the question 'What have we forgotten?'. On the panel were several amakosi, the Director of The Valley Trust and a local councillor. All that remained was the Closing Address by the Secretary-General of the IWSA, Mr Leonard Bays, who is looking forward to his next visit to southern Africa.

The main purpose of the seminar was technology transfer in water supply and sanitation - a sharing of knowledge and experience, but the non-technical part of the programme was also important.

Special mention must be made of the musical opening of the programme by the Choir of Ziphembeleni Secondary School. In the evening delegates were entertained to a civic reception at the City Hall by His Worship the Mayor of Durban, Councillor Henry P Klotz. The following evening a special buffet dinner was arranged by courtesy of Umgeni Water Board. The Great Illanga Room had been transformed into a Zulu kraal and the Secretary-General made a spectacular entry on a rickshaw. He was promptly arrested and charged with some crime for which he would be tried by a Zulu Court. Found guilty, a rapid change of clothing, and Leonard Bays was inducted as Chief for the night.

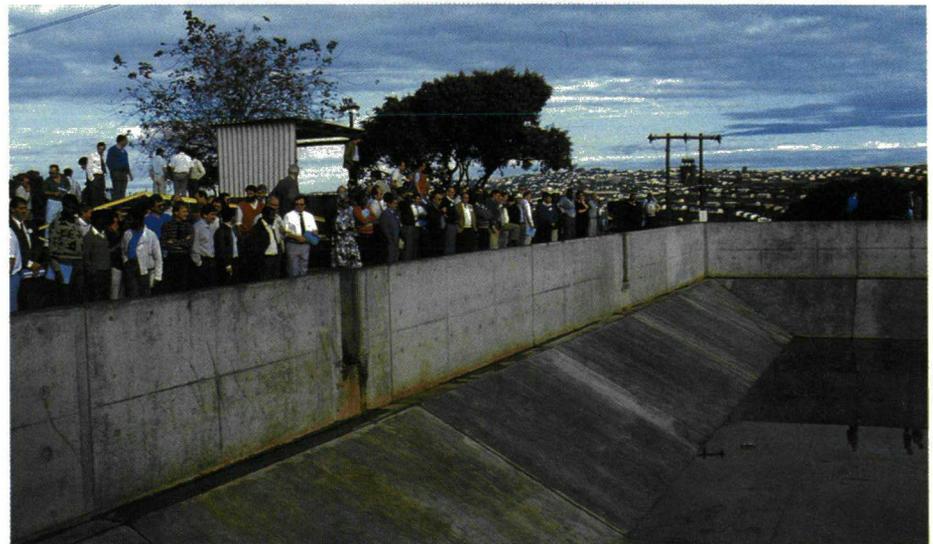
As delegates headed for home in different directions, the question being asked by many of them was 'Where will the next seminar be held?'. Several suggestions have been made, but a decision has still to be taken. This information will, however, be released in a later issue of SA Waterbulletin.



From left: Nkosi ET Xolo, Ezinggolweni Council, and Nkosi C Khawula, Emzumbeni Council, KwaZulu.



From left: Dr LRJ van Vuuren, BS Bergman and Partners, and Dr G Tredoux, CSIR.



Delegates visiting the KwaMakhutha Purification works.

# Suigbelugting slaag in Stellenbosch

**D**ie munisipaliteit van Stellenbosch het 'n aanleg gebou waar rioolslyk deur die proses van suigbelugting gekomposteer word. Dit is die eerste aanleg in Suid-Afrika waar hierdie proses vol skaals toegepas word. 'n Kiemvrye, bruikbare kompos word as eindprodukt verkry wat die munisipaliteit met sukses kan bemark.

Die Divisie vir Watertegnologie van die WNNR, het vroeër ondersoek ingestel na die suigbelugtingsproses wat met welslae in Amerika gebruik word, om dit vir Suid-Afrikaanse toestande aan te pas. Die navorsing is deur die Waternavorsingskommissie (WNK) gefinansier. In die finale verslag, getiteld: Forced aeration composting of sewage sludge: Prototype study (WNK-verslag nr 101/1/87), wat verlede jaar deur die WNK gepubliseer is, het die Divisie bevind dat suigbelugting tegnologie doeltreffend en ekonomies voordelig is vir die kompostering van slyk.

Na aanleiding van hierdie navorsing, het Stellenbosch se munisipaliteit besluit om die suigbelugtingsproses by hulle rioolwerke te implementeer.

Die rioolwerke op Stellenbosch het voorheen slyk droogbeddings gebruik vir die ontwatering van die rioolslyk in die somermaande. In die winter, tydens die reënseisoen, is die slyk in slykdamme gepomp waar dit vir twee tot drie jaar geberg moes word.

Hierdie slykhanteringsprosesse het 'n bergingsprobleem veroorsaak. Die droë slyk wat uit die slykbeddings verkry is, was nie kiemvry nie en dus was die wegdoeningsmoontlikhede beperk.

Die inkomende riool by die werke bestaan hoofsaaklik uit huishoudelike rioolwater en net 'n klein hoeveelheid nywerheidsuitvloei. Stellenbosch het ook 'n wisselende invloed as gevolg van die groot studentebevolking in die dorp.

Uit die navorsingsresultate het dit geblyk dat die suigbelugtingsproses sou voldoen aan die dorp se behoeftes. Die proses lewer 'n bruikbare kompos as finale produk

wat bemark kan word en dus die bergingsprobleem oplos. Verder het die wisselende invloed, en dus hoeveelhede slyk, geen invloed op die proses nie en die kompostering kan in die wintermaande wanneer dit baie reën, onverpoosd bedryf word. Die reënwater loop teen die hoop af wat met 'n laag kompos bedek is. Die temperatuur in die hoop is baie hoog en water wat in die hoop sou insypel, sal as waterdamp vrygestel word.

Mnr PC Schoonees, Stadsingenieur van Stellenbosch, sê dat die hoë gehalte van die kompos en die bruikbaarheid daarvan as groei- en ontkiemingsmedium, die deurslag gegee het vir die toepassing van suigbelugting by die rioolwerke.

## SUIGBELUGTING

Om die nuwe komposteringsmetode te implementeer, het die munisipaliteit hoofsaaklik 'n sentrifuge, vier belugters en outomatiese tydskakelaars aangekoop.

Volgens mnr Schoonees het die aankoop en installasie van die nodige toerusting en die inrig van die terrein ongeveer R357 duisend beloop.

Die proses by Stellenbosch werk as volg:

'n Sentrifuge word ingespan om die rou slyk te ontwater. Die ontwaterde slyk word dan met kruiswagens na 'n gruisvloer vervoer wat gestruktureer is om reënwater te laat afloop. Die slyk word hier in 'n verhouding van 1:1 met houtblokkies vermeng om die slyk porieus te maak.

Die gemengde hope word in 'n piramiedvorm gepak ongeveer 1,2 meter hoog. Die rioolwerke beskik oor vier belugters wat lug deur die hope blaas of suig. Daar word beoog om nog twee aan te skaf sodat die volle slykproduksie deur middel van hierdie proses gekomposteer kan word. Tans word ongeveer 50 persent van die totale produksie deur suigbelugting gekomposteer.

Die "nat" hope word bedek met 'n lagie reeds vervaardigde droë kompos. Die

hope word vir drie weke belug deur middel van die belugters wat vir ongeveer vyf minute elke halfuur lug deur die hope suig.

Na die belugtingsproses lê die hoop nog drie weke vir veroudering en dan word die houtblokkies uitgesif vir hergebruik.

## TEMPERATUUR

Hoë temperature, selfs tot 80 grade Celsius en hoër, word in die hope verkry. Die temperatuur word bo, onder en in die middel van die hoop gemeet.

Om die eiers van die parasiet Ascaris lumbricoides te vernietig, moet die temperatuur van die hoop hoër as 55 grade Celsius gehou word. Dit word maklik bewerkstellig en die kompos is dus ontsmet.

Nog 'n voordeel van die hoë temperatuur van die komposhoop, is dat die slyk verder ontwater word, deur die verdamping van water uit die hoop.

## OORLASPROBLEME

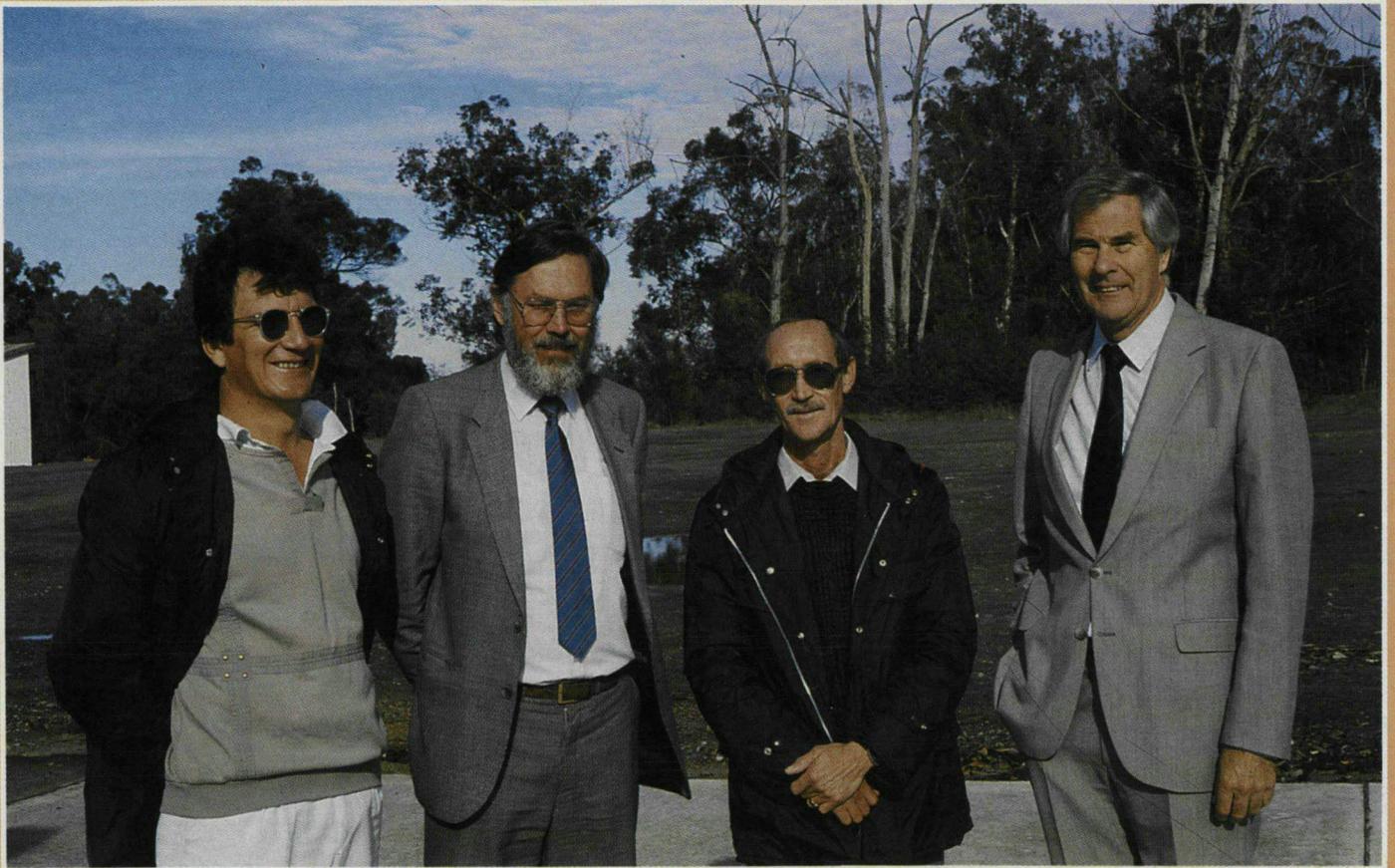
Die rioolwerke lê net langs die munisipale stortingsterrein. Dit kan dus maklik vlieg lok.

Die komposhope is egter heeltemal reukloos en as 'n vlieg dalk eiers daarin sou lê, sal die hoë temperatuur in die hoop dit vernietig.

Mnr Schoonees sê dat doeltreffende bestuur enige oorlasprobleme kan uitskakel.

## ARBEID

Stellenbosch se rioolwerke is nie groot genoeg om 'n ten volle gemeganiseerde stelsel vir kompostering deur suigbelugting, te regverdig nie. Die vermenging van die slyk met die houtblokkies en die vorming van die komposhope word dus met die hand gedoen.



*Van links: mnr WG Pridgeon (assistent-superintendent), mnr JE McGlashan (navorsingsbestuurder, WNK), mnr SC Roos (superintendent) en mnr PC Schoonees (stadsingenieur, Stellenbosch).*



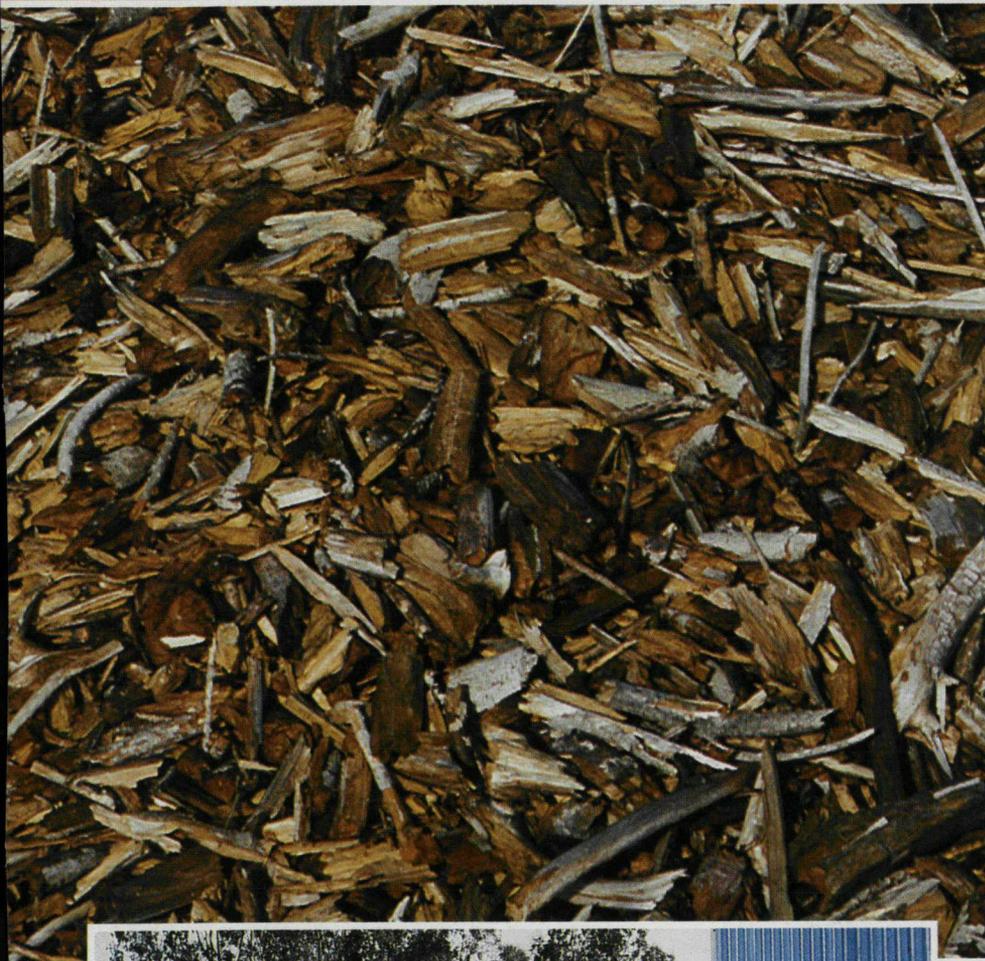
*Die temperatuur van die kompos word op verskillende vlakke in die hoop gemeet.*



BO: Die slyk word in 'n verhouding van 50/50 met houtblokkies vermeng om dit porieus te maak.



BO: Lug word deur die slykhoop geblaas of gesuig deur middel van belugters.



"Dit lyk of hande-arbeid heelwat goedkoper sal wees as 'n meganiese stelsel en verskaf ook werk aan vier of vyf mense wat reeds bykomend in diens geneem moes word," sê mnr Schoonees.

Personeel by die werke vind dit nie moeilik om die proses te bedryf nie. Hulle neem hittelesings, doen suurstofoetse, hou die belugtingsproses dop en teken die resultate noukeurig aan. Mnr Schoonees sê dat die proses 'n nuwe uitdaging aan hulle bied.

## KOMPOS

Omdat die kompos kiemvry is, kan dit as groei- en ontkiemingsmedium gebruik word.

Mnr Hannes Nell, navorser by die Divisie vir Watertegnologie in Bellville en projekteier van die suigbelugtingsprojek, sê dat die kompos goed vergelyk met soortgelyke produkte wat op die mark beskikbaar is.

Verskeie groeitoetse is met die kompos uitgevoer. 'n Groei-indeks word bepaal deur plantjies in die kompos te plant en dit te vergelyk met plantjies wat in veengrond, ingevoer uit Duitsland, geplant is. Die plantjies, gewoonlik gort, groei vir 'n week, word afgesny, gedroog en geweeg. Die massa per plant word dan bereken en gedeel deur die massa van die kontroleplant uit die veengrond.

In 'n onlangse toets met kompos wat deur die suigbelugtingsproses geproduseer is, was die groei-indeks 0,93.



BO: 'n Sentrifuge word gebruik om die geaktiveerde slyk te ontwater voordat die slyk gekomposteer word.

## BEMARKING

Mnr Stanley Roos, superintendent by die rioolwerke sê die berging van die droë besmette slyk was altyd 'n groot probleem. Met hierdie "skoon" produk voorsien hulle egter geen probleme om van die kompos ontslae te raak nie. Daagliks word oproepe ontvang van belangstellende boere wat die kompos wil koop vir gebruik op hulle lande.

Volgens munisipale regulasies, sal tenders gevra word en die koper sal die kompos by die rioolwerke moet afhaal.

Die suigbelugtingsaanleg by Stellenbosch word ook as 'n demonstrasie-aanleg bedryf. Plaaslike owerhede, konsultante, regeringsdepartemente en nywerhede wat in die suigbelugtingsproses belangstel, is welkom om die aanleg te besoek en die praktiese toepassing van die proses te besigtig.

# NIWW verander water in wyn

**D**ie Navorsingsinstituut vir Wingerdbou en Wynkunde (NIWW) op Stellenbosch is reeds geruime tyd besig met navorsing om die doeltreffendste besproeiingsmetodes vir die verbouing van tafeldruiwe en wyndruiwe te probeer vind.

In een van die navorsingsprojekte wat reeds drie jaar lank bedryf word, ondersoek die NIWW die effek van besproeiing op die kwaliteit van die rooidruifkultivar, Pinotage.

Dr Johan van Zyl, bestuursadviseur by die Departement Landbou en Watervoorsiening, voorheen verbonde aan die NIWW, was nou betrokke by die navorsing.

"By die produksie van druiwe en ander vrugte is die hoeveelheid wat geproduseer word nie die enigste oorweging nie. Die kwaliteit van die produk is baie belangrik," sê dr Van Zyl.

In lande soos Frankryk waar wingerdbou reeds honderde jare beoefen word, word besproeiing van wyndruiwe nie algemeen toegepas nie. Daar word gemeen dat besproeiing die uiteindelijke kwaliteit van die wyn benadeel. In Europa reën dit egter baie in die somermaande en besproeiing is dus onnodig.

Vorige navorsing op Stellenbosch en Robertson op die witdruifkultivars, Chenin blanc en Colombar, het getoon dat besproeiing nie noodwendig die kwaliteit van die druiwe of die wyn wat geproduseer word, benadeel nie.

Dr Van Zyl meen dat by die witwyne besproeiing selfs die kwaliteit van die wyn kan verhoog. Die voorwaarde is egter altyd dat die hoeveelheid water beheer en op die regte tyd toegedien moet word.

Die rooidruifkultivars is egter meer gevoelig vir besproeiing. As besproeiing lukraak toegepas word, kan dit byvoorbeeld die kleur van die wyn beïnvloed deurdat die kleurstowwe verdun word. Onbesproeide wingerde lewer gewoonlik 'n donkerder rooiwyn.

Uit die navorsing op die witwinkultivars het geblyk dat die plant se voginhoud beheer moet word om 'n goeie kwaliteit druiwe te produseer. Te veel water, byvoorbeeld hanepootdruie veral in die rypwordingstadium, lei tot groot druiwekorrels met 'n waterige smaak wat nie eiesoortig aan die kultivar is nie. Die geurstowwe word verdun en 'n swakker kwaliteit vrug word verkry.

Dr Van Zyl meen dit is beter om tydens die rypwordingstadium by die beplande besproeiingstye, byvoorbeeld twee

keer per week, te hou, maar die hoeveelheid water te verminder sodat die grond eintlik van onder af uitdroog.

Die tipe besproeiingstelsel wat gebruik word, sal ook bepaal hoe die boer hierdie laaste besproeiingsperiode aanpas. Drupbesproeiing kan tot met oestyd toegepas word omdat die plant gewoon is aan die gereelde toediening van klein hoeveelhede water. Waar die boer egter van vloed- of sprinkelbesproeiing gebruik maak, moet dit twee tot drie weke voor oestyd heeltemal gestaak word.

## ROOIDRUIFKULTIVAR

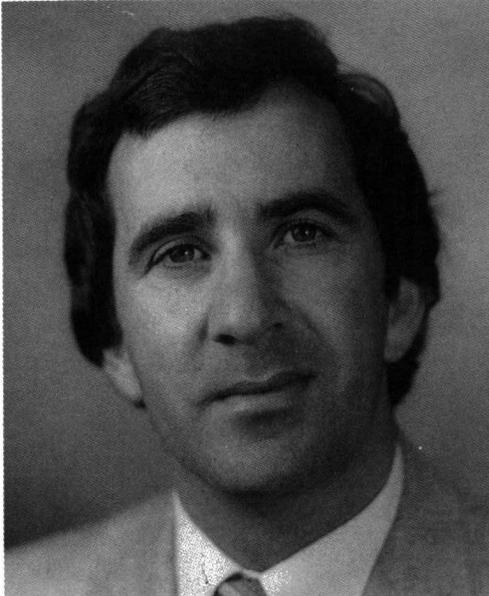
Om vas te stel wat die effek van besproeiing tydens rypwording op die kwaliteit van 'n rooidruifkultivar is, het die navorsers 'n volwasse wingerd van die Pinotagekultivar op die Nietvoorbij-proefplaas te Stellenbosch gebruik.

Vanaf die botstadium in September tot die blomstadium einde Oktober, is geen besproeiing op die proefterrein toegepas nie. Die tipiese geel Clovelly grond was nog nat genoeg na die winterreëns.

Aan die begin van die blomstadium, is die wingerd in twee dele verdeel waarvan een deel ten volle besproei is en die ander glad nie. Die belangrike vraag was egter wat die invloed van besproeiing tydens die rypwordingsfase, Januarie en Februarie, is.



Die kontroleperseel wat glad nie besproei is nie.



Dr Johan van Zyl, bestuursadviseur by die Departement Landbou en Watervoorsiening.

terwyl die grondwaterinhoud en die wingerd se reaksie deurentyd gemonitor is. Tydens oestyd is druiwemonsters ontleed en klein hoeveelhede proefwyn van elke behandelingsperseel gemaak. Die proefwyn is eers deur 'n paneel wynproeërs beoordeel en daarna ontleed vir 'n aantal kwaliteitseienskappe.

## RESULTATE

### Plantreaksie

Hierdie proefneming het aangetoon dat besproeiing in die vroeë deel van die groeiseisoen (voordat die druiwe verkleur oftewel deurslaan) 'n groter invloed op die groei, produksie en die kwaliteit van die druiwe gehad het as tydens rypwording. Die produksie kan byvoorbeeld met tot 50 persent verhoog word deur die vroeë besproeiings teenoor 'n verhoging van 20 tot 30 persent met water-toedienings tydens rypwording.

Die navorsing het ook weer eens die resultate van vorige ondersoeke herbevestig dat 'n droëlandwingerd (II) wat tydens rypwording 100 persent besproei word nie die produksieverlies teenoor die besproeide stokke (I) kan inhaal nie.

Besproeiing voor rypwording het ook die suurkonsentrasie van die druiwe verhoog. Persele wat die hele seisoen lank geen water ontvang het nie, het voor oestyd blare verloor en die korrels het ingekrimp. Die suikerinhoud van hierdie droëlandkontrole was ook laer omdat fotosintese feitlik totaal tot stilstand gekom het.

### Wynkundig

Die navorsers het gevind dat die Pinotage druiwe baie goed reageer op besproeiing.

Die besproeiing veroorsaak 'n verdunning van die kleurstowwe en die v yn is dan 'n bietjie ligter van kleur as dié van die onbesproeide persele. Droëbehandelings het wyn met meer antosianiene gelewer.

Die proepaneel wat die wyn beoordeel, het egter gevind dat die Pinotage wyn van die besproeide persele vroeër drinkbaar is as dié afkomstig van die droëland druiwe. Waar die wingerd nie besproei word nie, is die wyn harder en sal dit langer moet verouder voordat dit bemark kan word. Daar is dus dié voordeel dat Pinotage wyn van 'n besproeide wingerd gouer bemarkbaar is.

### Waterverbruik

Die resultate toon hoe verstommend min besproeiingswater wyndruifwingerde in die Wes-Kaapse Kusgebied nodig het om 'n goeie produksie te lewer. Vir die Clovelly grond van die proefwingerd was een besproeiing per week heeltemal voldoende om waterstres dwarsdeur die seisoen baie laag te hou. Selfs met hierdie 100 persent besproeiing van blom tot oes is 'n netto hoeveelheid van 350 mm water tot oestyd toegedien. Byna ewe goeie resultate is behaal deur waterhoeveelhede tydens rypwording met 33 persent in te kort. Sodoende was die totale besproeiingstoediening tot oestyd tussen 250 mm en 300 mm.

Daar moet onthou word dat 'n addisionele 75 mm water as na-oes besproeiing by al die behandelings toegedien is.

Elkeen van die twee groepe is in Januarie in vyf subgroepe verdeel. Die behandelings kan skematies só voorgestel word:

#### Winterreën

Botstadium: (September)  
Grond is nat

Blomstadium: (Oktober/November)	I Volle besproeiing	II Onbesproei
---------------------------------	---------------------	---------------

Véraison: (Januarie) (Rypwordingstadium)	<ul style="list-style-type: none"> <li>- Onbesproei</li> <li>- 100% besproei</li> <li>- 66% besproei</li> <li>- 33% besproei</li> <li>- Een besproeiing aan die begin van rypwording</li> </ul>	<ul style="list-style-type: none"> <li>- Onbesproei (Kontrolle)</li> <li>- 100% besproei</li> <li>- 66% besproei</li> <li>- 33% besproei</li> <li>- Een besproeiing aan die begin van rypwording</li> </ul>
---	---	---

Oes: (Februarie/Maart)

Die persele is weekliks besproei met behulp van mikrospuite,



*Die perseel wat ten volle besproei is, het welig daar uitgesien.*



*Die perseel het in die blomstadium geen besproeiing ontvang nie, maar is tydens rypwording 100 persent besproei. Die produksieverlies as gevolg van die droë toestande in die blomstadium kon egter nie ingehaal word nie.*



'n Interessante bevinding wat ooreenstem met vorige werk, is dat 'n eenmalige besproeiing 'n oesverhoging van tussen 20 en 30 persent tot gevolg gehad het. Die besproeiing het bestaan uit 100 mm water wat aan die begin van die rypwordingstadium (deurslaan), toegedien is. Hierdie relatief klein hoeveelheid water is dus baie effektief aangewend. Die groot reaksie op min water tydens deurslaan is nie verrassend nie, aangesien alle natuurlik gestoorde grondwater normaalweg op daardie stadium opgebruik is en dit die stadium is waarop die wingerdstokke ernstige waterstres begin ondervind.

Persele wat meer as 100 mm water tydens rypwording ontvang het, het geen adisionele verhoogde opbrengs of enige ander voordeel opgelewer nie. Persele wat net 50 tot 60 mm water tydens rypwording ontvang het, het egter swakker resultate gegee.

### AANBEVELINGS

Dit blyk dus uit die eksperiment dat boere wat net genoeg water vir een besproeiing het, dit by voorkeur aan die begin van rypwording (einde van Desember tot die eerste helfte van Januarie) behoort te gee. Waar daar meer water beskikbaar is en van permanente stelsels gebruik gemaak word, kan die besproeiing in November by blomtyd begin. Tydens rypwording kan die hoeveelheid water verminder word tot 66 persent van die werklike besproeiingsbehoefte op daardie stadium.

Dr Van Zyl beklemtoon verder dat grondtipe en druifkultivar 'n invloed het op die skedulering van besproeiing. Dit is daarom van groot belang dat besproeiingsaanbevelings nooit blindelings gevolg moet word nie. 'n Gesonde oordeel oor die wingerdstok se toestand - veral lootgroei is 'n goeie maatstaf - is noodsaaklik en die aanwending van wetenskaplike hulpmiddels word aanbeveel. W

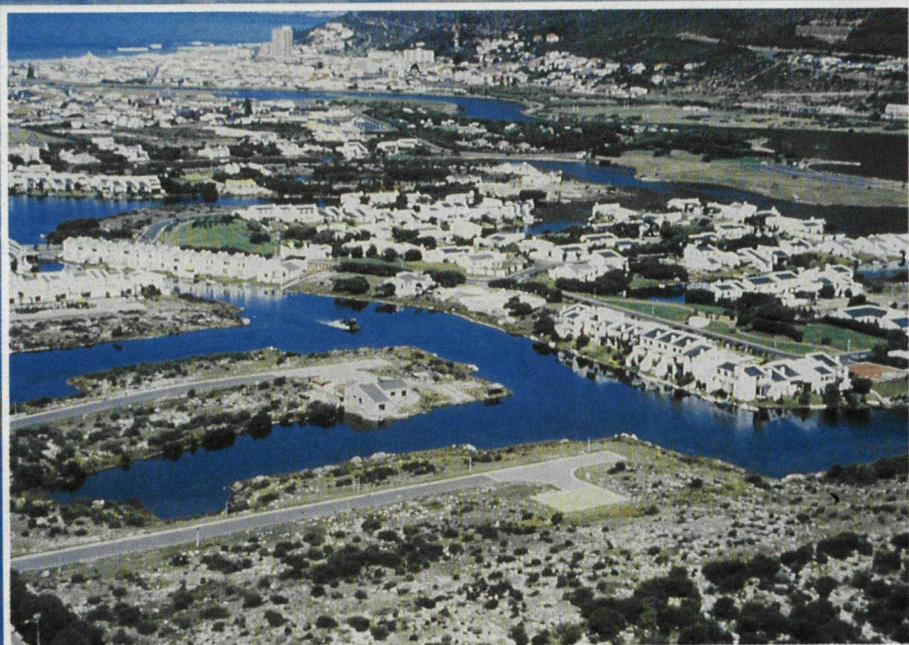
*LINKS: Deur slegs een besproeiing van ongeveer 100 mm aan die begin van die rypwordingsperiode toe te dien, is die oes tussen 10 en 30 persent verhoog.*

---

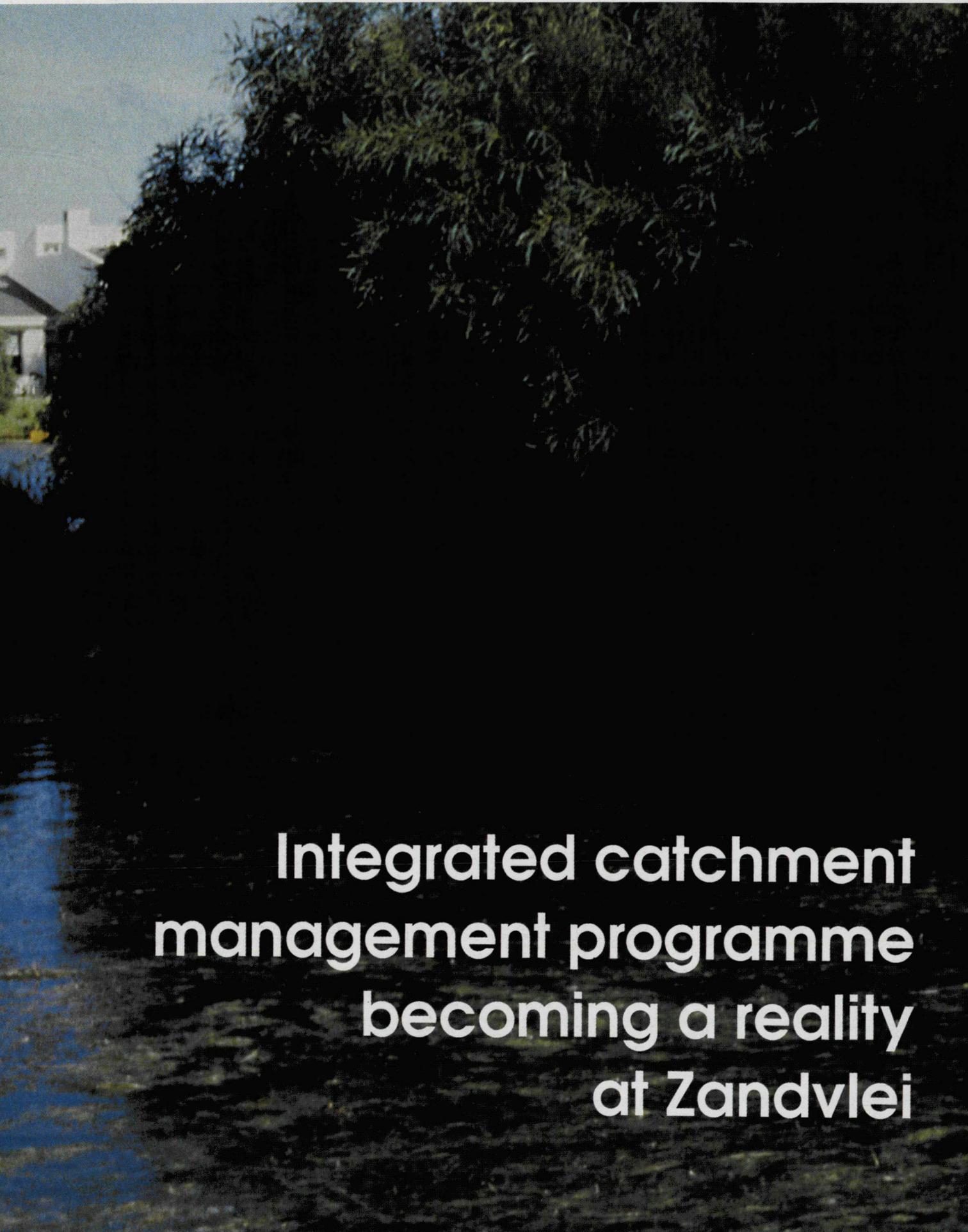
## WATER QUALITY

---

*Main picture: View of Marina da Gama from the northern shores of Zandvlei which are maintained in a natural state as a bird sanctuary.*



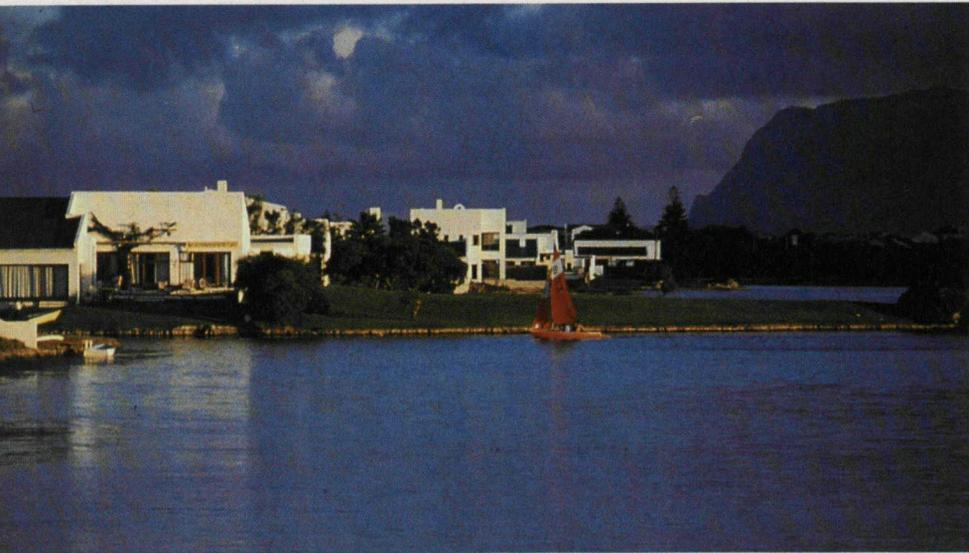
*Aerial view of Zandvlei looking toward False Bay showing location in relation to mountains.*

A photograph of a riverbank with dense green trees and a house in the background. The water is dark and reflects the surrounding greenery. The text is overlaid on the bottom right of the image.

**Integrated catchment  
management programme  
becoming a reality  
at Zandvlei**



TOP: *Potamogeton* in the waters of Zandvlei.



*Recreational use of Zandvlei.*

ZANDVLEI. Site of Marina da Gama with its tranquil canals and gleaming white cottages. The perfect backdrop to hordes of colourful sails and sailors. Zandvlei. Adjacent to historic Muizenberg, nestled under the peaks of the Steenberg at the southern edge of metropolitan Cape Town. Zandvlei. Home from home to city residents and holiday-makers from throughout South Africa; recreational venue extraordinaire. Zandvlei. Home to large populations of *Potamogeton* (Sago Pond Weed), and *Myriophyllum* and *Ceratophyllum* (Parrot's Feather and its relations) - water weeds that threaten to upset the idyllic portrait of this inland waterbody as a recreational asset.

Cape Town's City Planner's and City Engineer's Departments have recently reaffirmed their commitment to ensure that Zandvlei (and all of the inland waters under the Council's area of jurisdiction) is managed in such a way as to ensure the best possible water quality compatible with the multiple uses to which the lake is put. Like many urban water bodies in South Africa, Zandvlei suffers from excessive inputs of the plant nutrients, nitrogen and phosphorus, which stimulate the growth of extensive stands of *Myriophyllum* and *Ceratophyllum* in the rivers entering the vlei, and of *Potamogeton* in the main body of the vlei. Unlike many urban water bodies in South Africa, the source of this nutrient input does not lie at the outfall of a waste-water treatment plant: the nutrient source is distributed throughout the catchment, which is largely devoted to urban residential development (although some agricultural and forestry activities and light industry are also located in the drainage basin). For this reason, the management of water quality in the Zandvlei catchment involves more than point source pollution control and abatement. Water quality management in the Zandvlei catchment requires integrated

catchment management as suggested in the SA Waterbulletin (WRC 1986).

That seemingly simple management option begins to look more complex when the Cape Town Municipal boundary is drawn on a map of the Zandvlei catchment - roughly half of the drainage basin lies within the city limits whilst most of the remainder is controlled by the Regional Services Council of the Western Cape with small portions falling under the control of various State Departments. Within the city limits, activities which affect the amount and nature of the pollutants reaching Zandvlei fall under the aegis of some six City Branches. The roles and responsibilities of the major actors are summarised in the Table.

Recognising that any integrated catchment management programme for Zandvlei would require the participation of all of the various authorities and City Council departments having responsibilities in the catchment, the City Planner and City Engineer took the initiative, in mid-1986, to form an Inland Waters Management Team under the chairmanship of the Deputy City Engineer (Water and Drainage), Mr Dennis Hodson. This committee carefully considered the status of all the inland waters of Greater Cape Town and decided, during early 1987, to focus attention in the first instance on Zandvlei for a variety of technical and socio-economic reasons. Firstly, there existed an already considerable body

of scientific data on the vlei (see Morant & Grindley 1982, for example); secondly, the vlei was heavily utilised for recreational purposes; thirdly, Zandvlei was suffering from some of the problems characteristic of those occurring in other metropolitan Cape Town inland waters; fourthly, there was a concerned body of local residents living in close proximity to the vlei; fifthly, the perception that the vlei would prove amenable to the use of catchment management techniques; and, finally, the experience gained in working on a compact catchment would be of considerable benefit when dealing with the larger and/or more problematic water bodies within the municipal boundaries. A Zandvlei Working Group was formed to develop a coordinated strategy for the control of non-point source pollution entering the vlei.

Whilst it is still too early in the process of strategy formulation to identify with certainty the various management options that will be considered to alleviate the problems arising from nutrient enrichment in Zandvlei, it is likely that any solution will involve aspects of sanitation, stormwater management, civil engineering and town planning. In addition, the Inland Waters Management Team has recently solicited the opinions of Zandvlei users and is liaising closely with representatives of the local ratepayers' association in the development of a management plan that will meet the needs and aspirations of the people of Greater Cape Town. Interested parties are invited to contact the Inland Waters Management Team Secretariat (Mr Guy Boddington or Dr Jeff Thornton) at the Town Planning Branch, City Planner's Department, Cape Town Civic Centre (telephone 021-210-2149 or 210-3620).

**Table**

AGENCY	BRANCH	MAJOR AREA OF RESPONSIBILITY
Cape Town City Council	Sewerage	Stormwater runoff vlei level maintenance flow and rainfall gauging pollution control
	Scientific Services	vlei level gauging physico-chemical monitoring bacteriological-biological monitoring
	Parks and Forests	weed harvesting amenity maintenance
	Cleansing	dredging of waterways litter and silt removal street cleaning and related activities
	Town Planning	Zoning Scheme administration <u>ad hoc</u> investigations
Regional Services Council (WC)	Health	administration of health standards
	Engineers	dredging of waterways litter and silt removal street cleaning and related activities stormwater runoff

## REFERENCES

- Morant, PD and JR Grindley (1982). Estuaries of the Cape.  
Part II: Synopsis of available information on individual systems. Report No 14: Sand (CSW 4). CSIR Research Report 413, Stellenbosch.  
WRC (1986). Zandvlei ideal for integrated catchment management programme. SA Waterbulletin 12(1), 30.

## SUBMITTED BY:

**City Engineer's Department and City Planner's Department, Cape Town City Council, P O Box 1694, Cape Town, 8000.**



*Researchers used fluorescent Rhodamine-B dye to test effluent dilution theories in the sea off Camps Bay near Cape Town.*

G TOMS  
W A M BOTES

**MEASUREMENTS OF INITIAL  
DILUTION OF A BUOYANT  
EFFLUENT**

# Measurements of initial dilution of a buoyant effluent

Report to the  
WATER RESEARCH COMMISSION  
by the  
NATIONAL RESEARCH INSTITUTE FOR OCEANOLOGY  
COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH

WRC Report No. 160/1/88  
CSIR-NRIO Report No. C/SEA 8766

by G Toms and WAM Botes

A report to the Water Research Commission by the National Research Institute for Oceanology, CSIR

**P**roposals for the discharge to sea of domestic and industrial wastes require thorough and cautious evaluation of environmental and engineering implications. In recognition of this and the increasing pressure of population and industry on South Africa's coastal resources, the Water Research Commission contracted the National Research Institute for Oceanology (NRIO) in 1984 to assist in the compilation of a Guide for the Marine Disposal of Wastewater by Pipeline.

To support its contribution to the guide, the NRIO was requested to conduct several experiments at sea in order to test the validity of theoretical predictions of the initial dilution of buoyant effluent discharged at the sea bed by pipeline. These predictions form a vital link in the design process.

The NRIO conducted four experiments at sea, three on the existing Camps Bay outfall pipeline and a fourth on an experimental simulated discharge port in Hout Bay. This report describes these experiments and compares the full-scale initial dilution measurements with the corresponding theoretical predictions.

## DEFINITION

The initial dilution of a buoyant effluent is traditionally defined as the dilution that the effluent undergoes by virtue of its discharge momentum and its buoyancy relative to the surrounding sea water. In the case of a submerged discharge of effluent from an outfall port at the sea bed the discharge momentum usually plays a minor role in entraining uncontaminated sea water and hence in diluting the effluent compared to the buoyancy of the effluent

relative to the surrounding sea water. Initial dilution, however, is significantly affected by properties of the surrounding sea water, notably the ambient current, flowing across the rising effluent plume and the vertical density differences in the sea water often present due to temperature differences with depth. The ambient current can dramatically enhance the mixing process while the density differences can inhibit these to the extent that the buoyant plume is prevented from surfacing. These effects are shown in Figure 1 in the report.

In view of the complications caused by the influence of currents and density gradients it is very convenient to use a standard comparative estimate of initial dilution when considering proposed or alternative designs for outfalls. Despite the trend in recent years of taking the dynamics of the discharge area into account and predicting initial dilution in moving stratified water designers and particularly licensing authorities often resort to the use of a standard prediction of initial dilution at the water surface above the diffuser in stagnant (zero current), uniform (zero density gradient) ambient sea conditions.

It was the purpose of the work described in this report to investigate the validity of the widely used initial dilution prediction techniques for stagnant unstratified sea conditions and to comment on their applicability to typical sea and outfall conditions.

During 1984 and 1985 the NRIO performed a series of prototype experiments in order to detect the initial dilutions achieved in the case of full-scale discharge conditions with ambient sea conditions as close as possible to those of stagnant and unstratified water. Three tests were conducted on an operating outfall at Camps Bay near Cape Town and another test was subsequently done on a pilot experimental set-up at Hout Bay where the discharge of fresh water could be accurately controlled through a horizontal single-port diffuser. The four experiments with Rhodamine-B as tracer material were conducted in near stagnant conditions with maximum current speeds (mid depth) of only 6 cm/s and very little stratification. Results showed consistent surface dilution values a factor of two to three times greater than predicted for stagnant uniform conditions. However, when

ambient currents and stratification were taken into account the measured results compared well with theoretically predicted values.

**The general conclusion is made that the assumption of stagnant-uniform sea conditions will result in the underprediction of surface dilutions during very calm conditions by a factor of two to three times. Considering this difference together with the fact that completely stagnant conditions do not occur at sea the applicability of the stagnant-uniform design condition is questioned.**

Chapter 2 of this report contains a review of previous studies involving initial dilution measurements at sea reported in the literature. In Chapter 3 the experiments conducted by the NRIO in 1984 and 1985 are fully described. Chapter 4 presents a review of the theoretical prediction of initial dilution and provides theoretical predictions for the corresponding NRIO experiments at Camps Bay and Hout Bay. In Chapter 5 measurement is compared with theory and conclusions are given in Chapter 6.

In Appendix A the choice of and use of Rhodamine-B dye as tracer are discussed while Appendix B contains a report compiled by the National Institute for Water Research (NIWR) of the CSIR. The NIWR took the opportunity to investigate faecal coliform counts after initial dilution and compare these with the NRIO-measured dilutions using the dye and tracer.

1988 124 pages.

Free of charge.

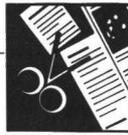
ISBN 0 908356 99 4

WRC Report no 160/1/88

CSIR-NRIO Report no C/SEA 8766

Available from the  
Water Research Commission,  
P O Box 824, Pretoria 0001.  
Tel (012)-28-5461.

W



## TWO NEW IAWPRC SPECIALIST GROUPS PROPOSED

### SPECIALIST GROUP ON MONITORING AND CONTROL OF ENVIRONMENTAL CONTAMINANTS

This Study Group will address issues of environmental contamination from a global perspective, drawing on the diverse speciality areas of IAWPRC membership. Specifically, the Study Group will provide the opportunity for engineers, ecologists and environmental toxicologists to interact and address issues of mutual concern. The Study Group will emphasize physical, chemical and biological monitoring with particular attention paid to integration of control technology to achieve environmental protection.

#### GOALS

- Review of techniques to detect and assess the effect of toxic substances in the water environment.
- Develop engineering methods of eliminating or detoxifying environmental contaminants in the water environments.
- Review standards for the control of toxic substances among nations and develop a world strategy for the control of environmental toxicity in water.
- Propose methods to integrate environmental monitoring (physical, chemical and biological) with wastewater treatment design to reduce environmental impacts.
- Encourage speciality conferences which provide additional opportunities for interaction between engineers, ecologists and environmental toxicologists.
- Develop methods for predicting transformation, transport and effects.
- Develop methods for assessing risks associated with environmental contaminants.
- Facilitate interaction between control engineers and environmental scientists.

#### Activities

- Sponsor one half-day session at 1988 Brighton Conference on the subject of case studies where environmental contaminants controlled or modified design of treatment and disposal works.

- Sponsor a speciality conference in 1989.
- Sponsor one-day session at Kyoto in 1990.
- Sponsor a speciality conference in 1992 perhaps in Kyoto.
- Develop a technology transfer paper on this topic that appeals to the Third World.

For more information contact IAWPRC Secretariat, Executive Director, IAWPRC, 1 Queen Anne's Gate, London SW1H 9BT, UK. Tel: 01-222 3848, Telex: 918518 WASSOC G., Telefax: 01-222 1811 Attention IAWPRC.

### SPECIALIST GROUP ON COMPUTING

Computer software, particularly microcomputer software, is becoming an increasingly important issue in water pollution control. IAWPRC has formed a Task Group on Microcomputer Software to consider specific issues related to this topic. The Task Group first met in February 1985 to consider steps IAWPRC should take to encourage the exchange of microcomputer software. The group met again in November 1986. During this second meeting, it became obvious that microcomputer software, and computing in general, will be an issue that IAWPRC must address on a continuing basis and a recommendation of the Task Group was that it be reconstituted as Specialist Group to deal with these issues.

The terms of reference of the Specialist Group on Computing are to continue the work of the Task Group on Microcomputer Software by:

- Advising IAWPRC on the potential for the use of computers, particularly microcomputers, in water pollution control.
- Considering ways in which IAWPRC can contribute towards the enhanced usage of microcomputers in water pollution control.
- Producing and updating the Software Catalog recommended by the Task Group.

Initiate new, continuing activities within IAWPRC related to computing in water pollution control, such as:

- Organizing software forums at biennial or specialized conferences.
- Fostering the international exchange of

information on computing in water pollution control through publication of a newsletter.

- Providing review articles for Water Research and suggesting and reviewing submissions to Water Quality International.
- Investigating the need and feasibility of organizing a specialized conference/exhibition series on computing in water pollution control.
- Identifying the potential for technology transfer and continuing education in computing and making suggestions to the Sub-Committee on Technology Transfer.

#### MEMBERSHIP

It is expected that this Specialist Group will interact with, and draw its membership from, other specialist groups. If Group membership is large, members will be solicited for a nominal membership fee to cover mailing costs for newsletters.

Interested parties should contact: Thomas O Barnwell, Jr., Center for Water Quality Modelling, Environmental Research Laboratory, US Environmental Protection Agency, Athens, GA 30613, USA.

#### OU POSTE

#### KRY

#### NUWE NAME

Die Waternavorsingskommissie (WNK) het op sy laaste vergadering besluit om die poste benamings wat die wetenskaplike personeel van die WNK se range aandui, te verander. Voortaan sal die WNK-poste as volg bekend staan (Engelse benamings tussen hakies):

Hoofadviseur (Chief Adviser) word Adjunkuitvoerende Direkteur (Deputy Executive Director), Senior Adviseur (Senior Adviser) word Navorsingsbestuurder (Research Manager), Adviseur (Adviser) word Assistent-navorsingsbestuurder (Assistant Research Manager) terwyl die pos van Assistent-adviseur (Assistant Adviser) ook as Assistent-navorsingsbestuurder (Assistant Research Manager) bekend sal staan.

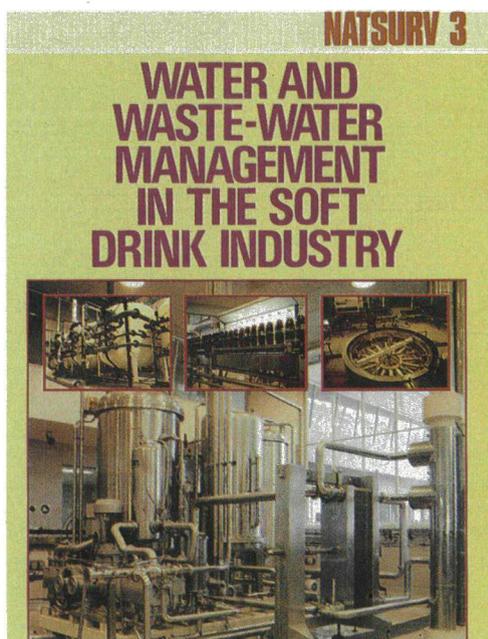


### WATER AND WASTE-WATER MANAGEMENT IN THE SOFT DRINK INDUSTRY

A guide prepared for the Water Research Commission by Binnie and Partners.

Transport costs have resulted in soft drink manufacturing plants being situated in the majority of large towns in South Africa. Thus, there are numerous carbonated soft drink bottling/canning plants, dairies and several fruit juice packaging plants which collectively produce approximately 1,5 million m<sup>3</sup> of soft drink a year (85 per cent from carbonated soft drink bottling/canning plants, 10 per cent from dairies, 5 per cent from fruit juice packaging plants). This requires approximately 4,0 million m<sup>3</sup> water of which between 50 per cent and 80 per cent is discharged as effluent.

The average Specific Water Intake (SWI) was found to be 2,7 m<sup>3</sup> water per m<sup>3</sup> of soft drink. Improvements in SWI can be achieved through implementation of water saving/reclamation techniques and improved water management. The target SWI should be set at 2,3 volume/volume.



The average Specific Pollution Load (SPL) was found to be 4,0 kg COD/m<sup>3</sup> of soft drink. A reduction in SPL can be achieved by improved management and by effluent treatment processes. The target SPL for untreated effluent should be set at 3,5 kg COD/m<sup>3</sup> soft drink.

The target for TDS should be set at 5 kg TDS/m<sup>3</sup> soft drink for plants with bottle-washers and 1,5 kg TDS/m<sup>3</sup> soft drink for plants without bottle-washers.

1988 20 pages

Price: Free of charge

ISBN 0 908356 90 0

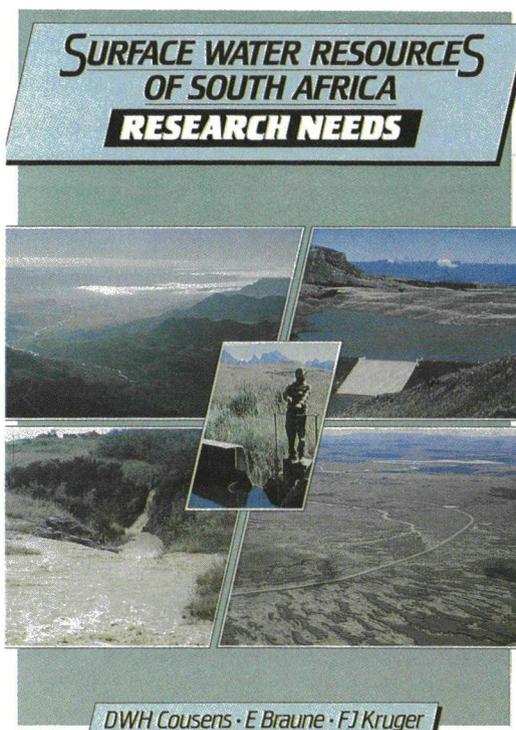
Available on request from the Water Research Commission, P O Box 824, PRETORIA 0001, Telephone (012) 28-5461.

S A Waterbulletin August/September 1988

### SURFACE WATER RESOURCES OF SOUTH AFRICA: RESEARCH NEEDS

by DWH Cousens, E Braune and FJ Kruger

This document is a Water Research Commission 'master plan' which describes needs and priorities for research into surface hydrology. It is the intention to refine, revise and update the plan regularly. Furthermore, in time, this plan will be integrated with those for other areas of water research of interest to the Water Research Commission.



The WRC encourages all relevant research and funding organisations to use this master plan to guide their decisions in the interests of effective coordination. If resource allocations are made which bear this plan in mind, it will undoubtedly enhance the coordination of water research in South Africa which is a statutory responsibility of the WRC.

The information from this plan, consisting of research activities, goals, objectives and priorities has been entered into a computerised data base which will be regularly revised and updated. The latest information is available at present from the WRC on request. Research organisations, when starting new research or submitting proposals for funding, are encouraged to indicate, by identifying the relevant research objective identification number (see Appendix A), which objective their research addresses, if any.

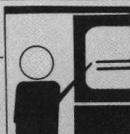
In summary, the objective of this plan is to enhance the coordination of research by providing an improved decision-making aid to help with the allocation of resources.

1988 79 pages.

Free of charge.

ISBN 0 947447 016.

Available on request from the Water Research Commission, P O Box 824, Pretoria 0001. Telephone (012) 28-5461.



## OZONE

A conference on ozone in water quality management will be held in London, UK, from 18 to 20 October 1988.

Enquiries: Professor R Perry, Public Health and Water Resource Engineering, Department of Civil Engineering, Imperial College, London SW 7 2 BU.

## VLOEDE

'n Konferensie oor vloede in perspektief word van 20 tot 21 Oktober 1988 in die WNNR-konferensiesentrum in Pretoria aangebied. Onderwerpe dek vloedoor-sake, rampbestuur, vloednagevolge, heropbou en tegnologie in perspektief.

Navrae: Die Konferensiekoördineerder C.104, WNNR, Posbus 395, Pretoria 0001.

## MICRO-IRRIGATION

The fourth international micro-irrigation congress will be held in Albury-Wodonga, Australia, from 23 to 28 October 1988.

Enquiries: Congress Secretariat, P O Box 29, Parkville, Victoria 3052, Australia.

## WATER MODELLING

A conference on water modelling and measurement will be held in Harrogate, UK, from 7 to 9 November 1988.

Enquiries: Dorothy Thompson/Lynne Staples, BHRA, Fluid Engineering Centre, Cranfield, Bedford, MK 43 OAJ, UK.

## DAMONTWERP

'n Kursus getiteld Damontwerp '88 word vanaf 7 tot 10 November 1988 deur die Departement Siviele Ingenieurswese aan die Universiteit van Pretoria aangebied. Die klem sal hoofsaaklik op die nie-hidrologiese aspekte van damontwerp vir kleiner damme val.

Navrae: Prof A Rooseboom, Departement Siviele Ingenieurswese, Universiteit van Pretoria, Pretoria 0002. Sluitingsdatum 30 September 1988.

## HYDROLOGY

A conference on the advances in ground-water hydrology will be held in Tampa, Florida, USA from 16 to 18 November 1988.

Enquiries: AH 3416 University Ave SE, Ste 200, Minneapolis, MN 55414, USA.

## SAND FILTRATION

A conference on the advances in slow sand filtration will be held in London, UK, from 23 to 24 November 1988.

Enquiries: Dr N Graham, Public Health & Water Resource Engineering, Department of Civil Engineering, Imperial College, London SW7 2BU.

## POLMET 88

An international conference on pollution in the metropolitan and urban environment will be held in Hong Kong from 28 November to 2 December 1988. Papers are invited for the technical sessions which will include: Environmental management practice, Industry and environment, Air Quality management.

Enquiries: Polmet 88 Secretariat, c/o Hong Kong Institution of Engineers, 9/F Island Centre, No 1 Great George Street, Causeway Bay, Hong Kong.

## URBAN WATER

An international conference on the cost and price of water in urban areas will be held in Paris, France, from 6 to 8 December 1988.

Enquiries: ENPC/DFCAI - Department International, 28 Rue des Saints - Pe'eres, 75007 Paris, France.

## WATER POLLUTION

The thirtieth Convention of the SA Chemical Institute will be held on 15 to 20 January 1989 at the Johannesburg Sun. The Convention will accommodate a number of themes including "Environmental Protection" which will incorporate Water Pollution.

Enquiries: Prof J Boeyens, University of the Witwatersrand, Department of Chemistry. Tel: (011) 716-2076.

## AQUACULTURE

An international symposium on water quality in aquaculture will be held in Los Angeles, California, from 12 to 16 February 1989.

Enquiries: Aquaculture '89, c/o Crest International, 940 Emmett Av., Suite 14, Belmont, CA 94002, USA.

## GROUNDWATER

A symposium on contaminant transport in groundwater will be held from 4 to 6 April 1989 in Stuttgart, West Germany.

Enquiries: Dr W Kinzelbach, Institut für Wasserbau, Universität, Stuttgart, Pfaffen-waldring 61, D-7000 Stuttgart 80, West Germany.

## MEMBRANES

An international technical conference on membrane separation processes will be held in Brighton, England, from 24 to 26 May 1989.

Enquiries: Lorraine Grove, Conference Organiser, Membrane Separation, BHRA, The Fluid Engineering Centre, Cranfield, Bedford MK 43 OA, UK.

## WATER QUALITY

An international conference on the design of water quality information systems will be held at the Colorado State University, USA, from 7 to 9 June 1989. Call for papers.

Enquiries: Thomas G Sanders, Program leader, Environmental Engineering, Department of Civil Engineering, Colorado State University, Fort Collins, CO 80523 USA.

## RIVER BASINS

The 5th river basin management conference will be held in Rovaniemi, Finland, from 31 July to 4 August 1989.

Enquiries: The Secretary, Ms Anja Holmsten, P O Box 250, SF-00101 Helsinki, Finland.

## WASTE MANAGEMENT

An international symposium on waste management problems in agro-industries will be held from 25 to 27 September 1989 in Istanbul, Turkey. Call for papers.

Enquiries: Mrs Bilsen Belen Baykal, Symposium on Waste Management problems in agro-industries, Istanbul Technical University, Insaat Fakültesi, 80626 Maslak, Istanbul, Turkey.

## PIPES

An international conference on pipeline construction will be held in Hamburg, Germany, from 23 to 27 October 1989. Call for papers.

Enquiries: Internationaler Kongress Leitungsbau '89, c/o Hamburg Messe und Congress GmbH, Congress Organisation, P O Box 30 24 80, D-2000 Hamburg 36, Federal Republic of Germany.

# TECHNOLOGY TRANSFER SYMPOSIUM: ADVANCES IN BIOLOGICAL PHOSPHORUS REMOVAL BY THE ACTIVATED SLUDGE PROCESS

27 October 1988

## Recent findings of WRC funded research at Johannesburg and the University of Cape Town

### ORGANIZERS AND OBJECTIVES

In August 1983 the Water Research Commission entered into an agreement with the City Council of Johannesburg to study the enhancement of biological phosphate removal from sewage by altering process feed composition. During a three year period the Council undertook a number of plant scale investigations, as well as fundamental studies to unlock the secrets of biological phosphorus removal that have eluded researchers for so long.

Results of this research were reported at a Technology Transfer Symposium held in Johannesburg on 30 October 1986.

During this research a number of problems were identified, which have been investigated during 1987 and 1988. These include elutriation of volatile fatty acids and denitrification of return sludge.

At the same time the University of Cape Town, amongst others, has been engaged in research into other aspects of biological phosphate removal. Both parties have made positive contributions to the understanding and application of biological phosphate removal, during the past two years.

To ensure technology transfer, the Water Research Commission in collaboration with the City Council of Johannesburg and the University of Cape Town has organized this symposium to present and discuss the results obtained during the contract period. The symposium is intended to serve as a discussion forum for all who are interested in biological removal of phosphorus from wastewater.

A number of papers will be presented and ample time will be provided for discussion. Certain aspects will be expanded on in a poster display.

### VENUE

Indaba Hotel and Conference Center  
Sandton, Johannesburg, 27 October  
1988.

### DOCUMENTATION

A complete set of papers to be presented  
will be provided for each delegate.

### REGISTRATION FEE

Registration fee R60,00

(Includes luncheon, tea and all documen-  
tation).

A late registration fee of R10,00 will be  
levied on all registrations received after  
10 September 1988.

Cheques should be made payable to:  
City Treasurer.

As the venue will only accommodate 200  
people it is advisable to register early to  
avoid disappointment.

### REGISTRATION CARD

Please complete and return the registra-  
tion card in this Bulletin together with your  
payment by 10 September 1988.

### ENQUIRIES

Dr L Lötter, City Health Department, P O  
Box 1477, JOHANNESBURG 2000. Tel:  
(011) 728-7373.

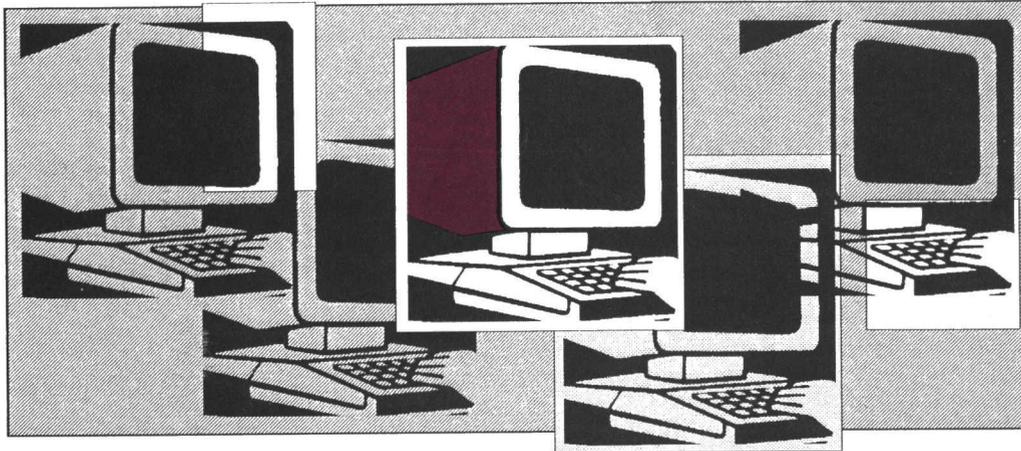
### PROGRAMME

08h30 - 09h00	Registration
09h00 - 09h15	Opening Address
09h15 - 10h15	Full Scale experimentation: Production of volatile acids. On-line monitoring. HA Nicholls, Johannesburg City Health Department
10h15 - 10h45	TEA
10h45 - 11h15	Full scale experimentation: Comparison of different process configurations HA Nicholls, Johannesburg City Health Department
11h15 - 11h45	Design considerations in nutrient removal activated sludge plants AR Pitman, Johannesburg City Engineer's Depart- ment
11h45 - 12h30	Some fundamental aspects of nutrient removal and their relevance to plant operation LH Lötter, Johannesburg City Health Department
12h30 - 13h00	Poster viewing
13h00 - 14h00	LUNCH
14h00 - 15h00	Kinetics of biological phosphorus removal MC Wentzel, Department of Civil Engineering, Univer- sity of Cape Town
15h00 - 15h30	Steady-state design for biological nutrient removal Prof G v R Marais, Department of Civil Engineering, University of Cape Town
15h30 - 16h00	TEA
16h00 - 17h00	Bulking in nutrient removal plants Prof G Ekama, Department of Civil Engineering, Univer- sity of Cape Town
	COCKTAIL PARTY

# C·C·W·R

## Computing Centre for Water Research

A technology transfer agent to help South African water researchers communicate and share information, data and programs.



The CCWR was established as a national computing facility accessible to all water researchers and scientific consultants in South Africa.

The CCWR can:

- Give you access to the computer networks, UNINET and CSIRNET
- Supply you with specialised computer software
- Provide computing specialists to help solve your water research problems
- Provide daily or monthly rainfall data from over 9 000 weather stations
- Supply a variety of research results, information and data
- Provide an electronic mail connection to fellow CCWR users countrywide
- Effect file transfers between users
- Provide indirect access to the hydrological information system (HIS) at the Department of Water Affairs
- Provide the opportunity to conduct joint computer based research with colleagues at other institutions around the country
- The CCWR also provides research results, information and data to scientific consultants on a variety of electronic media.
- A small handling fee is charged.

---

For further information contact the Computing Centre for Water Research, c/o University of Natal, P O Box 375, Pietermaritzburg, 3200. Telephone number (0331) 63-320 ext 177/178. Telex number 64-3292.