

Mnr HM du Plessis

S4 waterbulletin

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AUGUSTUS — NOVEMBER 1989

WATERVOORSIENING

Waterbeperkings se gevolge nagevors

WATER QUALITY

Researchers look at trihalomethanes

WASTEWATER TREATMENT

New activated sewage pasteurisation process developed

00010038

SEMINAR ON WATER SUPPLY AND SANITATION — TRANSKEI

ORGANISERS

The seminar is organised by the South African National Committee of the International Water Supply Association in conjunction with the Departments of Agriculture and Forestry of the Government of Transkei and the Division of Water Technology, CSIR, with the assistance of the Development Bank of Southern Africa and the Conference Co-ordinators, CSIR.

AIMS

This seminar is the last in a series arranged by the South African National Committee of the INTERNATIONAL WATER SUPPLY ASSOCIATION (IWSA) intended as a contribution to the aims of the INTERNATIONAL DRINKING WATER SUPPLY AND SANITATION DECADE. The 1980's Decade was introduced by the World Health Organisation to improve water supply and sanitation conditions in developing countries. The technical programme will concentrate on appropriate and acceptable technologies used in rural and urban areas in Southern Africa.

WHERE AND WHEN

Wild Coast Sun, Transkei from Tuesday 26 to Wednesday 27 June 1990.

FORM OF SEMINAR

The seminar will consist of invited papers, posters and workshop sessions when open papers will be presented, and will include the following topics:

WORKSHOP CONTRIBUTIONS

Technology transfer in developing areas - covering:

- Community involvement
- Labour intensive methods of construction
- Institutional frameworks
- Health aspects
- Experience in neighbouring states
- Training

POSTER PAPERS

- Focus on Transkei
- Catchment development projects
- Strategies/policies related to water supply and sanitation in Southern Africa
- Technology transfer in developing areas
- Training
- Peri-urban water supply, sanitation and progress

EXHIBITIONS

Manufacturers and suppliers of products and equipment relating to water supply and sanitation, are invited to apply for exhibition

space at the seminar venue. Please give the name of the company and the contact person to whom further information should be sent. Space at the seminar venue is limited and exhibition spaces will be allotted on a first-come-first-served basis.

TOUR

There will be an optional tour leaving the Wild Coast Sun on the morning of Thursday, 28th June and returning the same evening. Places to be visited will include a regional supply scheme; the Umzimvubu Basin and various interesting agricultural projects. There will be an extra charge for participation and further details will be given in the next announcement.

SOCIAL FUNCTIONS

The social functions will include a cocktail party and a "Traditional evening". The Tuesday evening will be kept free for delegates to see the show at the Wild Coast Sun - more details will be given in the next announcement.

ACCOMMODATION

A block booking has been made at the Wild Coast Sun, Transkei. Full details including special tariffs and a hotel booking form will be given in the final announcement.

FEES

The registration fee should be about R350 per person and this will include attendance at all the sessions, a full set of papers, all the social functions and tea and coffee served during the seminar. This fee will not, however, include meals or accommodation.

FINAL ANNOUNCEMENT

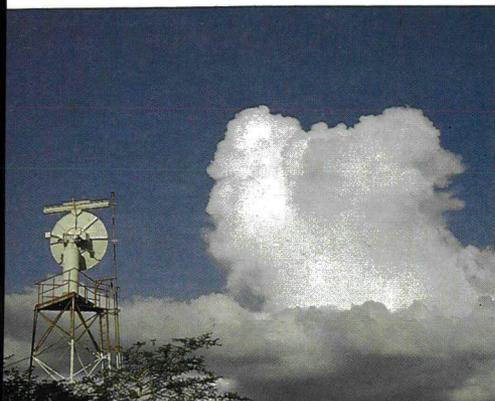
A comprehensive final announcement containing advance details of the programme and including an enrolment form, will be distributed during the first half of April 1990. Persons wishing to make certain that they receive a copy, should fill in and post the tear-off reply form without delay.

CORRESPONDENCE AND INFORMATION

All correspondence related to the seminar should be addressed to:

**The Conference Co-ordinators C.126
CSIR
PO Box 395
PRETORIA
0001**

Tel: (012) 841-3816 or 841-4615 - Cilla Taylor or Monika Mersich; 841-2231 Phil Coombs. Telefax: 86-2856.



p4



p 17



p20

Inhoud

WEERMODIFIKASIE	4	Wolk wetenskaplikes hou werksessie
WATER TREATMENT	6	Second Symposium on Anaerobic Digestion
WNK NAVORSING	9	Voorstelle vir navorsingsprojekte
WATERVOORSIENING	11	WNK-navorsing toon water beperkings se verreikende gevolge
WATER QUALITY	14	Trihalomethanes in drinking water
WATER SUPPLY	17	Seminar highlights the future role of the PC in urban water management
SEWAGE TREATMENT	20	New active sewage pateurisation process produces safe organic fertilizer
RUBRIEKE	4	Nuusbrokkies
	27	Books & Reports
	29	Conferences and Symposia

Voorblad: Droë gebiede en waterbeperkings is nie onbekend aan Suidelike Afrika nie.

SA Waterbulletin is a two monthly magazine on water and water research published by the South African Water Research Commission (WRC), a statutory organisation 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, PO Box 824, Pretoria, 0001, Republic of South Africa. Tel: (012) 33-00340. Fax: (012) 70-5925. Editor: Jan du Plessis. Asst Editor: Helene Joubert, Ed Secretary: Rina Human, Colour separations: Lithotechniek, Design: Nicola Kuyper, Printing: Creda Press, Cape Town.



Wolkwetenskaplikes hou werksessie in wildtuin

Wetenskaplikes en navorsingsbestuurders het van 21 tot 23 Augustus 1989 'n werksessie in die Krugerwildtuin gehou waartydens hulle die vordering wat die afgelope tien jaar op die gebied van reënvalstimuleringsnavorsing in Suid-Afrika gemaak is, indringend bespreek het.

Reënvalstimuleringsnavorsing wat vanuit beide die Nelspruit- en Bethlehem-lughawe onderneem word asook die ondersteunende navorsing deur die WNNR in die PWVS-gebied, is deur die meer as dertig afgevaardigdes in oënskou geneem. Daar is ook beraadslaag oor presies hoe die navorsing voortgesit moet word om die doelstellings op die spoedigste en mees ekonomiese manier te bereik.

Volgens dr George Green, navorsingsbestuurder by die Waternavorsingskommissie, het die werksessie bevestig:

- ❑ dat 'n hoë vlak van wetenskaplikheid in die uitvoering van die Nelspruit- en Bethlehem-projek gehandhaaf is en dat goeie vordering met die navorsing gemaak is;
- ❑ dat daar in die onmiddellike toekoms minder klem op ewekansige wolkbestrooiingseksperimente gelê moet word en dat

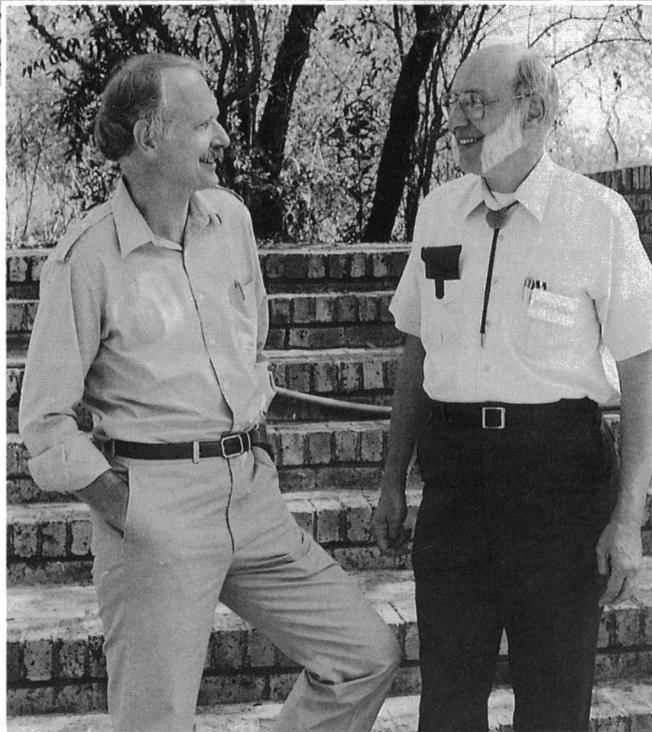
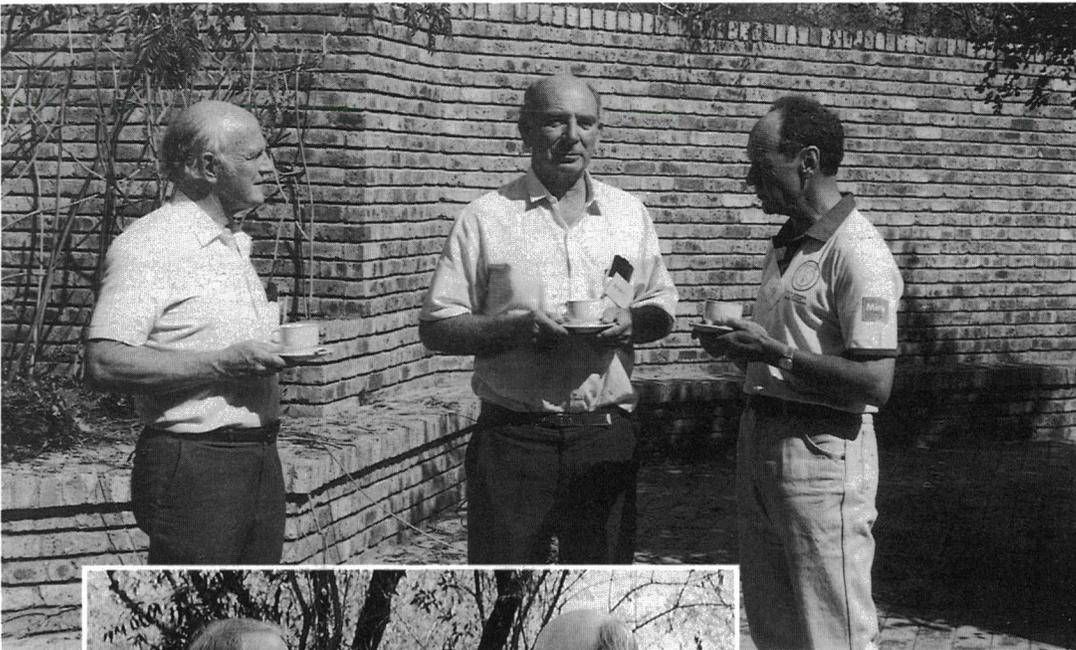
navorsers hulle aandag eerder op die verkryging van 'n beter begrip van die vernaamste neerslagvormingsprosesse moet vestig;

- ❑ dat die Bethlehem- en Nelspruit-navorsingspanne baie meer in gesamentlike ondersoeke kragte moet saamsnoer, eerder as om meesal afsonderlike navorsing te doen;
- ❑ dat veral radarfasiliteite opgegradeer behoort te word.

Dr Green sê Suid-Afrika beskik tans oor 'n goeie navorsingsinfrastruktuur en fasiliteite waarvan sommige uniek is, asook 'n klein groep entoesiastiese navorsers.

"As hierdie hulpbronne op 'n doelgerigte manier aangewend word, is daar geen rede waarom Suid-Afrika nie 'n leidende posisie ten opsigte van reënstimuleringsnavorsing in die wêreld kan inneem nie," sê hy.

Vier oorsese wetenskaplikes is deur die Waternavorsingskommissie genooi om die werksessie by te woon. Dié wetenskaplikes geniet wêrelderkenning vir hulle spesiale kundigheid oor aspekte van reënvalstimuleringsnavorsing soos die aanwending van radar, mikrofisiese prosesse in wolke asook die wiskundige modellering van wolkgedrag en neerslagvorming.



BO: (van links) Mnr M Hodson, dr D Proctor en dr J van Zyl, almal van die Divisie vir Aard-, Mariene en Atmosferiese Wetenskap en Tegnologie, WNNR.

ONDER: Dr Terry Clark, (links) en dr Al Cooper, albei van die National Center for Atmospheric Research (NCAR), Boulder, Colorado, VSA.

BO: Dr Brant Foote, NCAR (links) en dr Paul Smith, South Dakota School of Mines and Technology, Rapid City, South Dakota, VSA.



SECOND SYMPOSIUM ON ANAEROBIC DIGESTION

The second symposium on anaerobic digestion was held at the University of the Orange Free State, Bloemfontein, during September 1989. It was organised jointly by the Department of Microbiology of the University and the Division of Water Technology of CSIR. The objective of the symposium was to assemble engineers, scientists and operators for a comprehensive review of the various disciplines in the field of anaerobic digestion. Emphasis was placed on the state of the art, recent research results and the need for further research. The 21 papers and seven poster papers presented are available as Proceedings from the university.



From left: Overseas speakers Dr Charles Vernin (France), Dr Irene Watson-Craik (Scotland), Prof Willy Verstraete (Belgium) with Mr Piet Odendaal, Water Research Commission.

OVERSEAS DELEGATES

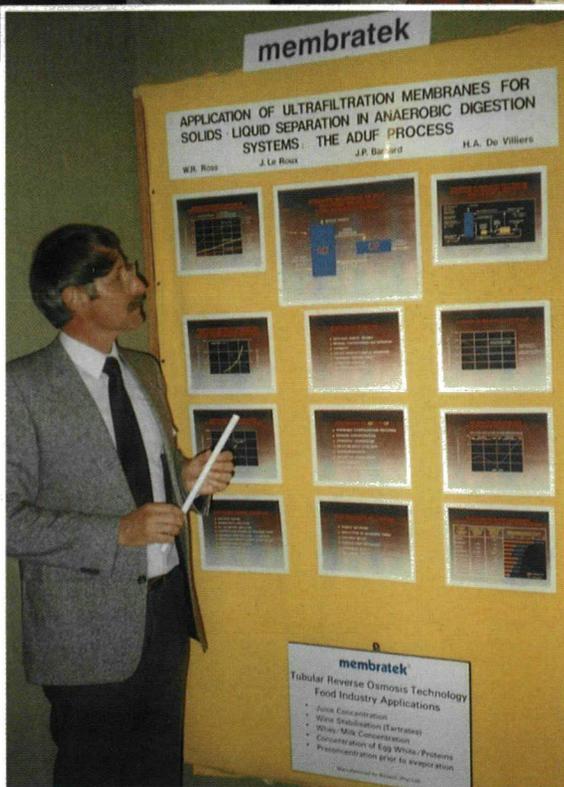
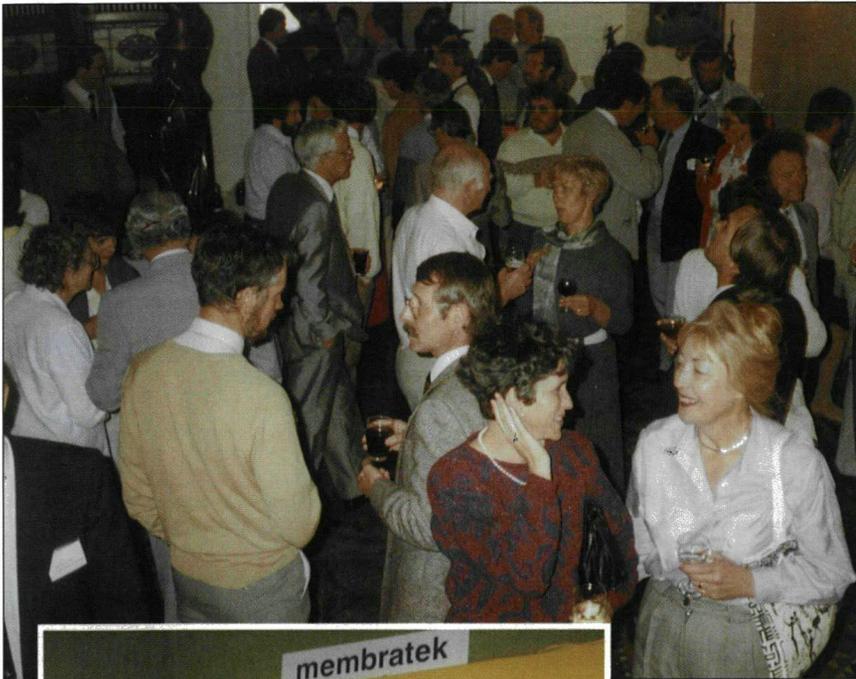
Three overseas guest speakers shared their wide experience and in-depth knowledge of fundamental issues with the delegates as well as their valuable expertise.

Professor W Verstraete from the State University of Gent, Belgium, presented a paper on anaerobic treatment of effluents in Europe. He stated that anaerobic pretreatment of effluents from the food and beverage industry was now standard practice. Priority in anaerobic digestion of effluents had changed from a strive towards high loading and gas production rates to emphasis on reliability and effluent quality. For this reason there was a considerable interest for improved, preferably on-line monitoring of influents, effluents and reactor parameters.

Dr IA Watson-Craik from the University of Strathclyde,

Scotland, summarised the situation regarding the co-disposal of hazardous wastes along with refuse in landfill sites in the United Kingdom. Her paper dealt with the impact of phenol wastewater co-disposal on refuse microbial activity. The results of her research indicated that the co-disposal of phenolic wastewaters, with concentrations from 2 to 6 mM, had no inhibitory effect on the anaerobic catabolism of a representative leachate molecule, hexanoic acid.

Dr C Vernin of the firm SGN in France described the results obtained on two full-scale plants treating wine stillage- lees and stillage from sugar cane molasses. The treatment had been successfully applied using plants designed on the anaerobic filter principle. The biogas produced is used to generate steam and electricity and covers most of the needs of the distilleries.



TOP: Symposium delegates at the Meet and Greet function.

A poster presentation at the symposium

THE FUTURE

The panel discussion vividly demonstrated the value of communication and exchange of ideas. The delegates to the symposium expressed a need for closer co-operation in the anaerobic field between research or-

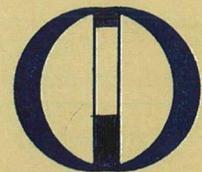
ganisations, consultants, industry, public authorities and government departments. As a first step in this direction it was decided to form a technical division on anaerobic processes under the auspices of the Water Institute for Southern Africa.

SECOND ANAEROBIC DIGESTION SYMPOSIUM:

PROCEEDINGS,
18 TO 20
SEPTEMBER 1989,
BLOEMFONTEIN,
SOUTH AFRICA

SECOND ANAEROBIC DIGESTION SYMPOSIUM

PROCEEDINGS



UOFS



18-20 September 1989
Bloemfontein
South Africa

DWT
CSIR

This publication incorporates the 21 papers and poster papers that were presented at the symposium.

1989: 265 pages

Price: R45,00

ISBN: 086 886 400 5

Available from: Prof TJ Britz, Department of Microbiology, University of Orange Free State, PO Box 339, Bloemfontein, 9300, South Africa. Tel: (051) 401-2676.

FORMATION OF TECHNICAL DIVISION FOR ANAEROBIC PROCESSES

A Technical Division for Anaerobic Processes has been formed under the auspices of the Western Cape Branch of WISA. The terms of reference of this Technical Division are the following:

OBJECTIVES OF THIS TECHNICAL DIVISION

- To serve as a forum for interested persons to discuss common problems in the anaerobic field.
- To act as a communication channel between research organisations, consultants, industry, public authorities and government departments.
- To initiate open meetings, demonstrations, plant visits, workshops and training sessions.
- To document, collect, discuss and disseminate information on all aspects of anaerobic processes.
- To identify research needs and current problem areas.

SCOPE OF INTEREST

Anaerobic digestion is one of the major biological waste treatment processes in use today. Broad-scale application of the process has been largely in the treatment of municipal sewage sludge and, more recently, in the treatment of strong and medium strength industrial wastes. Advances in the basic understanding of the microbiology and biochemistry of the process, along with advances in hardware technology, have helped to overcome many of the problems associated with anaerobic digestion.

The scope of interest of this Technical Division for Anaerobic Processes should include the following topics:

- Treatment of sewage sludge and effluent
- Treatment of industrial effluents
- Treatment of manures
- Treatment of municipal refuse
- Treatment of land-fill leachates
- Utilisation of biogas
- Control of the anaerobic process and instrumentation
- Fundamental aspects such as microbiology and biochemistry
- Engineering aspects of digestion
- Economic and commercial aspects

ORGANISATION OF TECHNICAL DIVISION

The organisation of the activities of this Technical Division will be undertaken by a committee which would generally comprise representatives from bodies such as:

Research Organisations, Industry, Consultants, Department of Water Affairs, Department of Health, Public Authorities and the Water Research Commission.

The committee will initially be appointed by the Western Cape

8-SA Waterbulletin Augustus / November 1989

Branch of WISA after consultation with interested bodies. Thereafter representatives will be appointed by the Technical Division.

The function of the committee will be to arrange open meetings up to twice a year with unrestricted attendance to discuss various aspects of anaerobic processes. Speakers, on invitation of the committee, will make short presentations on their experience. The topic will then be open for discussion.

THE DR GG CILLIÉ ANNUAL FLOATING TROPHY AND BOOK PRIZE

A new award, the Dr GG Cillie annual floating trophy and book prize was announced at the second symposium on Anaerobic Digestion held in Bloemfontein during 18 to 20 September 1989. The prize will in future be awarded for the best contribution by a university student to anaerobic digestion research in Southern Africa.

The organisers of the symposium had decided to name the trophy after Dr Cillie because of his significant contribution to water research in South Africa over a period of 40 years and particularly in the field of anaerobic digestion. Dr Cillie had served for 12 years as Chief Director of the National Institute of Water Research of CSIR during the period 1972 to 1984.



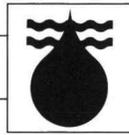
Prof Hans Potgieter presenting Dr GG Cillie with the silver tray

A silver tray was presented to Dr Cillie by Professor Hans Potgieter, Dean of the Faculty of Science of the University of the Orange Free State, as a token of appreciation.

Both the annual floating trophy and book prize, as well as the silver tray were sponsored by the firm of consulting engineers, BS Bergman and Partners, Inc.

Students who wish to be considered for this trophy for 1989 must submit recent published research, a conference paper or a thesis to the Symposium Secretariat before 31 December. The publications committee of WISA will be asked to select the recipient of the trophy. Applications must be submitted to:

Anaerobic Digestion Symposium
PO Box 4345
BLOEMFONTEIN
9300



Dien voorstelle vir navorsingsprojekte nou by WNK in

Submit research proposals to WRC now

Ten einde die WNK in staat te stel om sy begroting vir 1991 vroegetydig en na wense te beplan, moet die voorstelle vir waterna-vorsingsprojekte wat u organisasie vir finansiering gedurende 1991 aan die WNK wil voorlê, die WNK voor 31 Mei 1990 bereik.

In order to enable the WRC to plan its 1991 budget properly and timeously, the proposals for water research projects which your organisation may be planning for submission to the WRC for funding during 1991, should reach the WRC before 31 May 1990.

So danige voorstelle moet die volgende inligting bevat:

- Titel van die navorsingsvoorstel
- Naam (of name) van verantwoordelike navorser(s)
- Instansie wat voorstel indien
- Doelstellings met die navorsing
- Kort motivering vir navorsing (met verwysing na toepassings en moontlike voordele) (maksimum een en 'n half bladsye)
- Termyn van navorsing
- Kort samevatting van werkprogram (maksimum een 'n half bladsye)
- Begroting vir elke jaar met inbegrip van volgende:
 - Salarisse van navorsingspersoneel wat uit projekfondse besoldig word
 - Ander lopende uitgawes
 - Uitgawes ten opsigte van kapitaalgoedere

Alle voorstelle sal gesamentlik na 31 Mei 1990 oorweeg word, waarna u van die uitslag in kennis gestel sal word. Indien u voorstel aanvaar word, sal daar verder met u onderhandel word met die oog op die voorbereiding van 'n finale en meer gedetailleerde navorsingsprojekvoorlegging. Tydens hierdie fase sal daar uit die aard van die saak noue skakeling tussen die betrokke WNK-navorsingsbestuurders en die indiener van die voorstel wees. Uiteindelik sal hierdie finale voorlegging tydens 'n vergadering van die WNK oorweeg en 'n aanbeveling oor die finansiering daarvan aan die Minister van Waterwese gemaak word.

Vroeë voorstelle sal verwelkom word ten einde genoeg tyd te laat om enige onduidelikhede op te klaar.

Such proposals should include the following information:

- Title of the research proposal
- Name (or names) of the researcher(s) in charge
- Name of organisation which submits the proposal
- Research objectives
- Short motivation for research (referring to applications and possible advantages) (maximum one and a half pages).
- Duration of research
- Short resumé of work programme (maximum one and a half pages)
- Budget for every year including the following:
 - Salaries of research personnel to be remunerated from project funds
 - Other running costs
 - Capital equipment costs

All the proposals will be considered jointly after 31 May 1990, after which you will be informed of the result. Should your proposal be accepted, there will be further negotiations with a view to the preparation of a final and more detailed research project proposal. During this phase there will naturally be close cooperation between the WRC research manager concerned and the research proposer. Eventually this final proposal will be considered at a WRC meeting in order to make a recommendation to the Minister of Water Affairs.

Early submission of proposals will be welcomed, in order to allow enough time to resolve any uncertainties.





WNK-navorsing toon waterbeperkings se verreikende gevolge

Vier verslae wat handel oor die sosio-ekonomiese gevolge van waterbeperkings op waterverbruik gedurende die droogte van 1983 tot 1985 is nou op aanvraag by die Waternavorsingskommissie beskikbaar.

Die verslae is getitel:

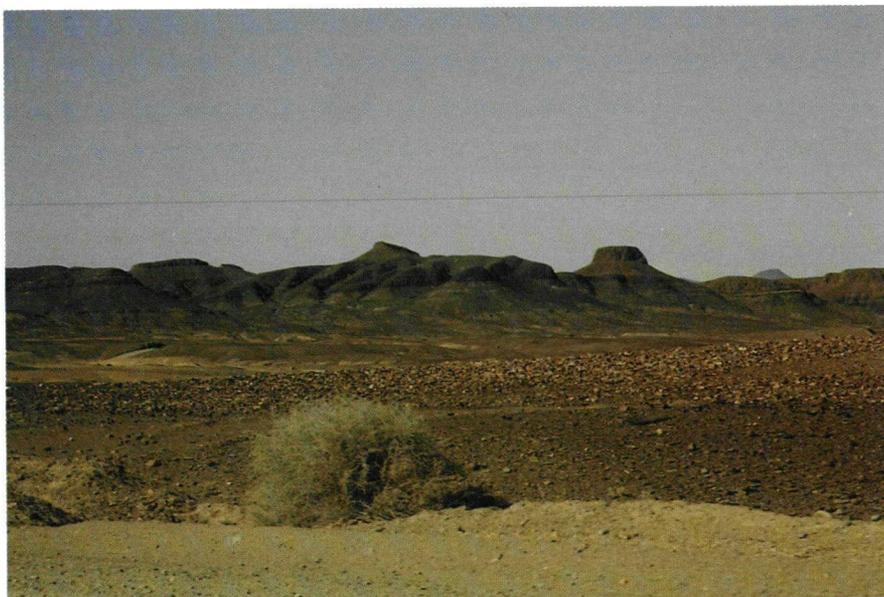
- Die sosio-ekonomiese gevolge van waterbeperkings op besproeiingsboerderye, mynbou, elektrisiteitsvoorsiening en die Sentrale Owerheid (WNK-verslagnr 167/1/87).
- Finansiële en sosiale implikasies van waterbeperkings vir huisbewoners in geselekteerde gebiede (WNK- verslagnr 169/1/86).
- The socio-economic effects of water restrictions on local authorities, selected industrial and commercial establishments and other private agencies (WRC Report no 168/1/89).
- 'n Samevattende verslag oor die sosio-ekonomiese gevolge van waterbeperkings 1983 tot 1985 (WNK- verslagnr 167/2/88).

Die Waternavorsingskommissie het na aanleiding van die waterbeperkings wat sedert 1983 op verskeie sektore en watervoorsieningstelsels van toepassing was, drie instellings genader om die aard en die omvang van die waterbeperkings na te vors. Die instellings was die Instituut vir Sosiale en Ekonomiese Navorsing (ISEN) van die Universiteit van die Oranje-Vrystaat, Die Buro vir Marknavorsing van die Universiteit van Suid-Afrika en die Sentrum vir Toegepaste Maatskaplike Navorsing van die Universiteit van Natal.

Al drie instellings het oor die totale ondersoekgebied, bestaande uit die Ngagenerivier-staatswaterskema, die Umgeni-opvanggebied, die Rietrivier-staatswaterskema, die Vaalharts-staatswaterskema en die Vaalrivierstelsel, navorsing gedoen maar elkeen op afsonderlike sektore gekonsentreer.

Volgens die verslae was die totale netto tasbare effek van die waterbeperkings nagenoeg R666,32 miljoen. Huishoudings het die grootste aandeel in hierdie bedrag gehad, naamlik R262,04 miljoen gevolg deur die sake- en dienstesektor, Eskom, die landbousektor, die mynbousektor, sentrale owerheidsinstellings en plaaslike owerhede.

Eksemplare van die verslae kan by die Waternavorsingskommissie bestel word deur die poskaart wat in hierdie Bulletin ingesluit is te voltooi en aan Posbus 824, Pretoria 0001 te pos.



Reënval het sedert 1975 tot 1985 'n afname getoon en daarmee saam het die afloop van riviere en die stand van damme ook begin daal. Die stand van damme in die Vaalrivier en Natal het in die eerste drie maande van 1983 so kwaai gedaal dat waterbeperkingsmaatreëls ingestel moes word. In die geval van Rietrivier het omvattende waterbeperkings reeds sedert 1980 gegeld. Namate toestande rakende die stand van damme verander het, is afkondigings daarvolgens aangepas ten einde te voorsien dat die beskikbare watervoorraad teen die toenemende verbruikstempo aan die nooddaaklike behoeftes sou voldoen in die lig van die rivierafloop wat waarskynlik verag kan word tot die einde van die droogteperiode.

TASBARE GEVOLGE VAN WATERBEPERKINGS

Tasbare invloede is dié waaraan 'n geldwaarde gekoppel kan word, terwyl nie-tasbare invloede dié is waaraan geen geldwaarde gekoppel kan word nie.

Die totale netto tasbare gevolge van waterbeperkings op die onderskeie sektore binne die vyf watervoorsieningstelsels wat in die afsonderlike verslae gehanteer is, kom op R666,32 miljoen te staan.

Huishoudings binne munisipale gebiede is die swaarste deur die 1983- en die daaropvolgende waterbeperkings geaffekteer. Die totale bedrag vir die Ngagane- en Umgeni-gebiede beloop R6,51 miljoen vir 'n periode van om en by 14 maande terwyl die impak op die Vaalrivierstelsel vir 'n periode van 24 maande op R255,53 miljoen te staan kom. Dit gee 'n totaal netto tasbare impak vir huishoudings van R262,04 miljoen.

Naas huishoudings beloop die effek op die sake- en dienstesektor bykans R189 miljoen wat ook vir 'n periode van 14 en 24 maande vir onderskeidelik Natal en die Vaalrivierstelsel bepaal is.

Die gevolge van waterbeperkings op Eskom is bykans R73 miljoen, wat sedert die aanvang van waterbeperkings (1983) vir 'n periode van 12 maande bepaal is. Die effek op die landbousektor beloop die bedrag van R66,14 miljoen, met die impakte bepaal vir 'n tydperk van 12 tot 14 maande.

Die effek op die mynbousektor sowel as die owerheidsinstansies is oor 'n periode van 12 maande vasgestel, wat die effek op onderskeidelik R45,63 en R21,27 miljoen te staan bring. Die omvang van waterbep-

erkings op plaaslike owerhede is ook tot 'n periode van 24 maande bepaal met 'n bedrag wat op net meer as R9,58 miljoen te staan kom.

Wanneer die impak van waterbeperkings volgens watervoorsieningstelsels vergelyk word, blyk dit dat die impak die grootste op die Vaalrivierstelsel was (R450,03 miljoen), gevolg deur die Umgeniopvanggebied (R77,54 miljoen), met die Vaalhartsstaatswaterskema in die derde plek met R32,99 miljoen. Daar moet egter in gedagte gehou word dat waterbeperkings by drie van die vyf gebiede (Vaalrivierstelsel, Vaalhartswaterskema en die Rietrivierstaatswaterskema) nog van toepassing was nadat die opnames gedoen is. Die effekte weergegee is dus slegs vir sekere terme en die omvang kan veel groter wees as die gevolge tot en met die opheffing van die beperkings bepaal sou word.

'n Probleem wat by die bepaling van die tasbare impakte ondervind is, was om die gevolge van waterbeperkings van dié van droogtes en ekonomiese toestande te skei. Daar is egter besondere moeite gedoen om die effek wel te skei. Die gevolg is dat die tasbare impakte, soos in die studie weergegee, grootliks gesuiwer is van voornoemde faktore terwyl daar ook voorsiening gemaak is vir moontlike dubbeltelling en kansellering van gevolge.

NIE-TASBARE IMPAKTE

Die indeling wat by nie-tasbare impakte gevolg is, is om eerstens aandag te gee aan die effekte by huishoudings en daarna binne die werksituasie van die onderskeie sektore.

In die geval van huishoudings is daar onderskeid gemaak tussen die impak op gewoontes en die op lewenskwaliteit. Gewoontes wat by stedelike huishoudings geaffekteer is, is ook by boere beïnvloed, alhoewel die intensiteit daarvan verskil het. Ook het verskille tussen watervoorsieningstelsels voorgekom. Gewoontes en komponente van lewenskwaliteit is byvoorbeeld meer drasties by die Ngaganerivier-staatswaterskema as by die Vaalrivierstelsel beïnvloed terwyl sportbeoefening en ontspanning relatief minder geaffekteer is. Komponente van lewenskwaliteit wat in 'n groot mate deur waterbeperkings beïnvloed is, is die voorkoms van tuine terwyl die benutting van swembaddens deurgaans nie te ernstig geraak is nie.

'n Sintese van die nie-materiële gevolge van waterbeperkings binne die werksituasie omsluit aspekte soos:



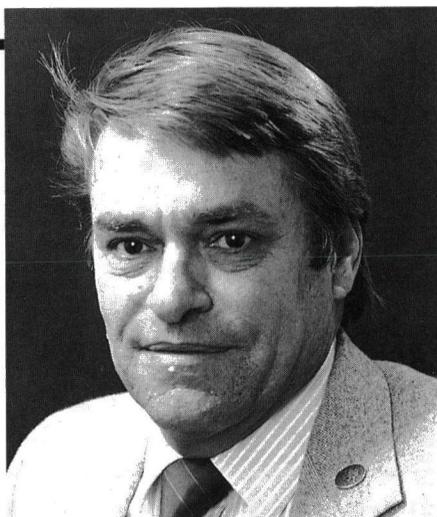
- afdanking van personeel,
- versteuring van normale werksaktiwiteite,
- konflik tussen waterbeheerper soneel en die publiek,
- ongerief en werkspanning,
- onsekerheid, en
- wysiging van langermynbeplanningsprojekte.
- Uit die ondersoek het dit na vore gekom dat die aard en omvang van die impak van waterbeperkings deur 'n verskeidenheid faktore beïnvloed is, waarvan die tipe beperkingsmaatreëls, die termyn van die waterbeperkings en die spesifieke sektore wat geaffekteer is van die vernaamste is. Dit blyk asof die intensiteit van waterbeperkings 'n verhoudelik groter impak het op die nie-tasbare gevolge terwyl die termyn van die beperkings weer 'n groter rol in die geval van die tasbare effekte speel.
- Om 'n aanduiding te kry van die orde-grootte van die tasbare effek is dit met die Departement van Waterwese se jaarlikse begroting vergelyk. Vir die 1983/84-jaar was die begroting in die omgewing van R312 miljoen. Die totale impak van waterbeperkings op die onderskeie sektore beloop meer as R600 miljoen vir 'n termyn wat gemiddeld net langer as 'n jaar is. Voor-gaande dui daarop dat die orde-grootte van die impak van waterbeperkings met betrekking tot die jaarlikse begroting van 'n instansie soos die Departement van Waterwese van betekenisvolle omvang is.
- Ten opsigte van die effektiwiteit en aan-vaarbaarheid van waterbeperkings-maatreëls, is bevind dat die bereik van die beoogde waterbesparing deur die Owerheid onder andere afhanklik is van die aanvaarbaarheid en praktiese im-plementeerbaarheid daarvan deur die eindverbruiker. Wat toekomstige wa-

terbesparingsmaatreëls betref, moet onder andere op die volgende gelet word:

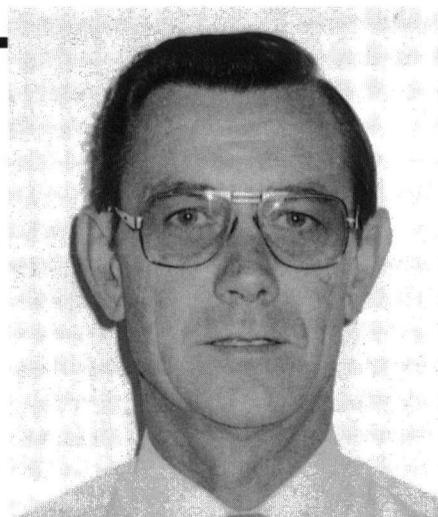
- Die nadelige gevolge van die beperkingsmaatreëls vir die verbruikers is groter en die aanvaarbaarheid minder as dit eensydig vanaf owerheidsweë en sonder oorleg met die potensiële geaffekteerdes afgekondig en ingestel word.
 - Die beperkingsmaatreëls behoort nie van 'n algemene aard te wees nie maar moet by die besondere be-hoeftes van individue en instellings aangepas word. Hierdie aangeleentheid is veral van toepassing op verbruikers soos besproeiingsboere wat in 'n meerdere mate van water afhan-klik is. 'n Hoeveelheidsbeperking op water blyk vir besproeiingsboere meer aanvaarbaar as 'n tydsbeperk-ing te wees.
 - Hoewel die klem in die navorsing op die negatiewe gevolge geplaas is, is egter bevind dat alle geaffekteerdes ook sekere positiewe gevolge kon identi-fiseer. Die vernaamste daarvan is die waardering van die kosbaarheid van water en die spaarsamige gebruik daarvan.
 - Aangesien dit moeilik is om die meeste sektore met mekaar te vergelyk is daar slegs gepoog om ten opsigte van die landbousektor binne die onderskeie watervoorsieningstelsels 'n vergelyk te tref. Veranderlikes wat hier 'n rol speel is onder andere die grootte van die boerdery-eenheid, die grootte van die besproeiingseenheid en die gedeelte wat die besproeiingsoppervlakte van die totale boerdery-eenheid uitmaak.
- Oor die algemeen blyk dit dat hoe groter die besproeiingsoppervlakte in verhouding tot die boerdery-eenheid is (soos in die geval van die Vaalhartsstaatswaterskema) hoe groter is die totale netto tasbare effek vir die boerdery per hektaar.

Trihalomethanes in drinking water

The final report of a two-year investigation into the occurrence of trihalomethanes in South African drinking water has been released by the Water Research Commission (WRC).



Dr RA van Steenderen



Mr SJ Theron

The project, funded by the WRC, was carried out by the Division of Water Technology at the CSIR, and the researchers, Dr RA van Steenderen, Mr SJ Theron and Mrs ACW Engelbrecht, tried to determine the concentration of trihalomethanes in South African drinking waters, comparing the values obtained with the limits for drinking water set by authorities in overseas countries.

As far back as 1974 it was discovered that when chlorine is added to drinking water supplies in the concentrations required for disinfection, it reacts with the organic content of the water to produce trihalomethanes (THM's). Of these THM's chloroform usually accounts for at least 75 per cent of the total THM's.

For human consumption, the THM's could possibly be regarded as potential carcinogens i.e. compounds shown to have caused cancer in one or more species of laboratory animals but not yet in humans. However,

the statements encountered from various epidemiological authorities on this topic namely, that seventy to ninety per cent of human cancer is caused by contact with chemical substances, should be taken seriously and all efforts must be made to limit these compounds in drinking waters.

FORMATION

THM formation is influenced by, inter alia, temperature, pH, chlorine dosage and by seasonal changes. Systematic studies have also indicated that THM production could be roughly proportional to the initial dissolved organic carbon (DOC) concentration. High levels of THM's in final drinking waters would, therefore, be an indicator of inefficient treatment processes concerning the removal of organic materials. The latter raises the question as to whether the present conventional water purification treatment plants are capable of effectively removing organic material from water.

OFFICIAL GUIDELINES

To limit the long term exposure of the public to THM's, the United States Protection Agency (USEPA) in 1979 promulgated a maximum contaminant level of 100 microgram per litre total trihalomethanes (THM's) in drinking waters. Examples of other countries who have subsequently set guidelines for THM's include West Germany (25 µg/l), Switzerland (25 µg/l) and the Netherlands (1 µg/l).

In South Africa there are no official criteria or guidelines for THM's but the trend until



Mrs ACW Engelbrecht

now by various organisations was to use the USEPA THM value as a guideline when judging water quality.

In the report the researchers mention that facilities to evaluate the occurrence and concentration of THM's, organohalogen precursors and dissolved organic carbon concentrations in South African water sources are extremely limited, due to the sophisticated measuring instruments required. Except for water supplies in Windhoek and in Pretoria area little was known about the occurrence of these determinants in other parts of the country.

For this project, forty sampling sites throughout South Africa were chosen and as large a percentage of the population as possible was included. Only tap waters from drinking-water reticulation systems were sampled. The sample sites were selected where qualified personnel could take the samples, measure the free chlorine on site and dispatch the samples. (In most cases

municipalities, water boards and research organisations collaborated.)

Apart from the determination of THM's, pH and DOC, the presence of bromide and free residual chlorine were also measured, i.e. the determinants which could influence THM formation.

In addition the influence of the diversity of physical/chemical treatment processes on THM values was investigated and efforts were made to determine the relationship, if any, between DOC and THM concentrations.

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Results and discussion

- Based on average results, 36 out of 40 sample sites contained less than 100 µg/l THM.
- Since few samples contained free chlorine when sampled for THM's, samples were re-chlorinated in the laboratory to 1 milligram per litre residual chlorine. In the latter case 32 out of 40 sample sites contained less than 100 µg/l THM.
- The eight sample sites which were subjected to re-chlorination in the laboratory and which exceeded 100 µg/l THM were those sites where the raw water sources were known to be recipients of treated sewage effluents.
- On average, waters directly from the tap contained 45 µg/l THM. Upon post chlorination to 1 mg/l residual chlorine this value rose to 74 µg/l.
- The assumption that high THM values coincide with high DOC concentrations when waters are disinfected with chlorine, was confirmed. This emphasizes the importance of DOC removal in a water purification process to inhibit THM formation.
- The probability level of the relationship between THM and DOC values of samples taken from the tap, was in the order of 90 per cent. Reasons why only

RA VAN STEENDEREN
SJ THERON
ACW ENGELBRECHT

AN INVESTIGATION INTO THE OCCURRENCE AND CONCENTRATION OF TRIHALOMETHANES AND THEIR PRECURSORS IN SOUTH AFRICAN DRINKING WATERS

Report to the
WATER RESEARCH COMMISSION
by the
DIVISION OF WATER TECHNOLOGY, CSIR

WRC Report No 194/1/89

16 per cent of the THM values could be ascribed directly to the DOC content were the exclusions of the following in the statistical evaluations: seasonal influences, consideration of different raw water sources, different chemical treatments and chlorine dosages at the treatment plants.

- Forty five per cent of the treatment plants encountered, used aluminium sulphate while a further 40 per cent used a polyelectrolyte. The other 15 per cent represented ferric chloride, polyaluminium chloride, lime and combinations of the flocculants mentioned. It is at this stage therefore not possible to correlate THM removal with the chemicals used as flocculants.
- The presence of bromide, when re-chlorination was applied favoured the formation of bromoform to that of chloroform when no bromide was present.
- The influence of pH on THM formation could not be established due to most of the final waters having virtually the same pH.
- The THM values obtained are in most instances on par with those reported by overseas authorities. South African drinking waters appear to be well within the USEPA criterium of 100 µg/l.

Copies of the report are available free of charge from the Water Research Commission, PO Box 824, Pretoria 0001. Tel: (012)330-0340. To order, please complete the postcard in this Bulletin.



Seminar highlights the future role of the PC in urban water management

The Water Institute of South Africa (WISA) and the Water Research Commission (WRC) jointly hosted a one day seminar to consider the technical aspects of analysing and managing water reticulation networks.

On August 30, approximately 100 delegates attended the workshop on the Management and Analysis of Municipal Water Supply, held at the Farm Inn in Pretoria.

Seven papers were delivered ranging from the theory of computer aided design, (CAD), to the practical application of computer models to assist in the management and planning of existing networks.

Guest speaker for the occasion was Professor Johannes Gessler from Colorado State University. He is spending a year of sabbatical leave in South Africa .

COMPUTER SOFTWARE

As personal computers have advanced and more and more appropriate software becomes available, attitudes of local authority engineers have changed from reasons why computer analysis of distribution networks is unnecessary, to descriptions detailing either their experience with applied programmes or planned applications of computer programs. "Fifteen years ago," explains Prof Gessler, "I had just completed what turned out to be the first pipe network analysis program for any PC, based on the simultaneous solution of the linearized equations. I got into the habit of asking water supply engineers I met, whether they were analysing



Delegates at the one-day seminar on managing water reticulation networks

distribution systems by computer. I expected to hear that they did so, but using large main frames, and I was prepared to explain to them that the time of main frames was soon to be over and that one will, in the near future, do such analyses on PCs. However, what I got as an answer was a dozen reasons why computer analysis of distribution systems was not necessary, indeed undesirable: there existed too much uncertainty in the planning goals, too much wrong data on the existing network, too much variation in the demands, etc. The only answer I did not get was the true reason: limited availability of good software."

Representatives from both Durban Corporation and the Johannesburg City Council described the reasons for going the computer route into the 90s.

Acceptable accuracy is one that is consistent with the reliability of the input data, but a continuous simulation program is not a 'magic' package to optimise a trunk main system, cautioned Randall Wells of the Durban Corporation. Considerable time and

effort is required to gather accurate input data and to calibrate the model to deliver meaningful results. Good calibration of a computer representation is an art which requires considerable experience and is time consuming. But it is of paramount importance. Calibration at one set of operating conditions and water use, warned consulting engineer Dennis Behrmann, does not necessarily imply calibration in general, although confidence in the accuracy of model results increases with an increase in the range of conditions for which the model is calibrated. The complexity of the new generation of models was also recognised by Prof Gessler who believes that real time simulations are expert systems requiring extensive training of the managers in order to run these systems for maximum benefit.

Consulting engineer, Dr Erik Loubser, expressed concern at the considerable attention recently focussed on infrastructure in general and more specifically on the problems of maintenance and improvements of water supply systems. "The optimization of



such improvements have been studied extensively, but without the inclusion of the effects of storage costs on the optimization procedure", he said. "This is crucial as the issue at stake is the trade-off between pipe costs and storage costs. In general, a larger, more expensive combination of pipes in the network would require smaller, less expensive storage tanks for balancing of peaks in the water demand. The importance of this pipe cost/storage cost trade-off in the optimization process can be investigated by introducing a tank sizing and costing algorithm into an existing pipe network optimization model."

JOHANNESBURG

The importance of a complete and credible data base was also highlighted by Mr Stan Verrier of the Johannesburg Department of Water and Gas. The unaccounted for water (UAW) losses are an important measure of the success of a distribution management system. According to Mr Verrier, Johannesburg are tackling the five basic components of UAW simultaneously and in this regard are looking at alternative methods of meter reading, embarking on a mains replacement programme, implementing a meter replacement programme as well as trying to reduce underground leakage from the network through a comprehensive active water loss control and leak detection exercise.

All of this information contributes to the data base which is the very foundation of the decision making system. The importance of complete and up to date information cannot be over-emphasised. This information can, through PCs, be made available to all managers at all levels wherever it is needed. With this in mind Johannesburg is planning to computerise the water distribution system and in the long-term, to establish a system which will integrate information from various sources in a manner which will facilitate real time, on line management of the network.

DURBAN

Durban's Water Supply Branch have adopted a similar computerised route. Having searched the market place for a suitably dynamic programme for the analysis of water systems, they finally settled for a local product which is technically superior, competitively priced and unaffected by present adverse exchange rates. Randall Wells, also pointed out the software benefits offered locally ranging from direct access to program updating and the full technical back-up service, whereas such services for overseas packages are or could be affected by trade embargo's.

Supporting the approach of the local authorities, Mr Dennis Behrman pointed out that to calculate flow and pressure for a pipe conveying water, the only two equations that need to be considered are the continuity equation and the energy equation. The solution to these equations for a simple system can be found manually. However, for complex systems having more than one reservoir, multiple loops, PRV's, non-return valves etc, the equations now need to be solved simultaneously using numeral techniques, such as linear theory or the Newton-Raphson method. The PC is clearly the best tool available for this task and is improving by the day.

Quoted Prof. Gessler, "We have heard the argument many times that the latest developments in hardware are so fast that you will never have to worry again about the time it takes to generate an answer. But every time the computers get faster, we think up new tricks for the program to perform. These new tricks require a few million more calculations and so the computing time once again becomes an issue".

Authors and titles of the papers presented:

- ❑ Prof J Gessler: Computer Aided Design and Management of Distribution Systems.
- ❑ Dr BF Loubser: The Significance of Storage in Optimal Pipe Network Design.
- ❑ Mr S Verrier: Analysis and Management of a Water Reticulation System.
- ❑ Dr CA Constantinides: Analysis, Design and Planning of Water Supply Systems — A Comprehensive Approach.
- ❑ Mr Z Szecsei: Data Capture for Network Applications in GIS.
- ❑ Mr R Wells: Application of a Real Time Network Simulation Programme to Durban's Trunk Main System.
- ❑ Mr D Behrman: The Practical Application of the use of Network Analysis Models.

A limited number of copies of the above papers presented at the Workshop are available on request, from:

The Librarian
Water Research Commission
P O Box 824
PRETORIA
0001

New active sewage pasteurisation process produces safe organic fertiliser

An enterprising team of South Africans has cracked one of the world's great needs - how to turn quickly and cost-effectively human sewage into viable high quality organic fertiliser. A treatment plant located close to the Morula Sun hotel in Bophuthatswana is proving the process and Plateau Agencies, who own the rights to the process, are confident that South Africa and the rest of the world will welcome the process called ASP (Active Sewage Pasteurisation).

The process converts sewage solids into an environmentally safe, totally sterilised, effective, organic fertiliser. The product of this plant - treatment is effected in minutes - is sufficiently rich in nutrients to be applied beneficially to agricultural land and can be produced in liquid or solid form.

Achieving full and immediate pasteurisation has been uneconomic until now due to high costs involved in heat pasteurisation. Also, natural sewage is low in nitrogen and phosphate. ASP is a complete solution.

Negotiations are well advanced with leading overseas countries to introduce the concept to major existing sewage plants - some relating to some of the world's leading cities.

The breakthrough not only allows sludge to be used for fertiliser; it also may in some instances replace conventional sewage sludge disposal methods, such as waste ponds, land-fills and incineration techniques, which are becoming both exorbitantly expensive to install and run, and unacceptable against new environmental protection standards.

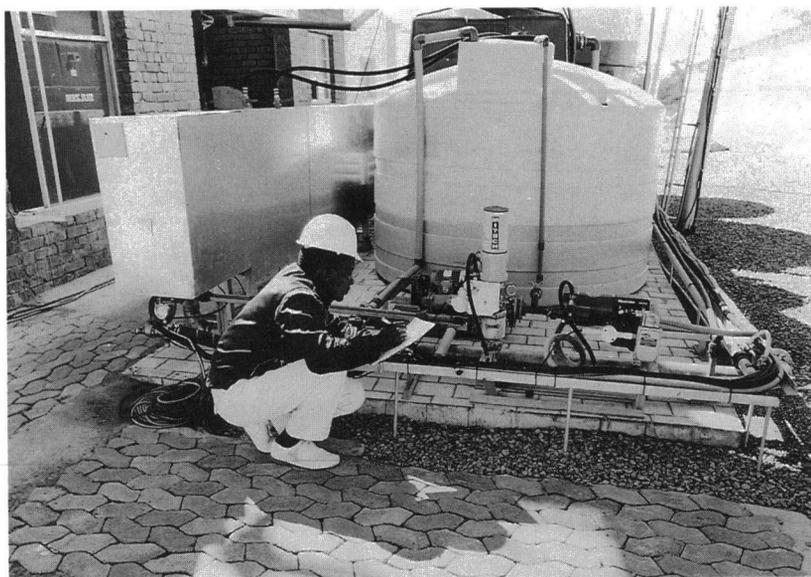
Sewage engineers have long recognised that conventional sewage sludge must be "cleaned up". They also know that nature itself offers the best disposal alternative because only nature completes the natural decomposition cycle of organic matter.

PROCESS

ASP connects in-line to the primary treatment process of a conventional sewage treatment facility and de-waters the sludge to a treatable concentration.

The de-watered concentrate is then pumped through a chemical activator where full pasteurisation takes place within ten minutes at 65 degrees centigrade.

The newly developed process has as its secret a chemical reaction which generates its own heat thereby removing exceptional cost factors required in alternative systems where outside expensive heat sources are required.



The liquid ASP - Active Sewage Pasteurisation process - in which chemicals are added to sewage sludge produce an instantly viable natural organic fertiliser. The plant shown above is capable of handling sludge produced from average-sized towns generating daily inflows of 50 megalitres.

The ASP process is designed for effectiveness and reliability. The plant has very few moving parts ensuring continuous operation and minimising down-time.

ASP offers an effective and relatively simple and inexpensive method of eliminating all odours, pathogenic organisms, parasites and viruses normally associated with raw sewage.

An important aspect to the new development is that the plant becomes an inexpensive addition to existing sewage treatment plant. It makes any plant, regardless of age, more cost efficient because it minimises energy use and achieves detoxification thoroughly in less time and for less cost.

COST

Application of the ASP technology to existing sewage treatment plants can result in annual operational saving of 20 to 30 per cent or more.

The cost of adding the ASP process to an existing facility can be less than the net savings realised on the operation of that facility in one year.

In addition to cost savings, a sewage treatment plant may realise revenue from the production of the high quality organic based fertiliser and is relieved of the economic and environmental burden of having to dispose of ordinary contaminated sludge.

An interesting positive aspect to the new concept is that most sewage sludge currently being disposed of on agricultural land or landfills carries high concentrations of heavy metals such as copper, zinc, cadmium and lead which cannot be prevented from entering a treatment plant. These metals in concentrated form leach into ground water and ultimately reach humans via drinking water and the food chain.

Because the ASP process makes it possible to use sewage waste as a fertiliser rich in nutrients, the spread of the material is thin and, in this instance, the heavy metals can be regarded as trace elements. The fertiliser so enriches the soil with nitrogen, phosphates and organic matter that it may be applied in much smaller quantities than ordinary treated sludges, still achieving the desired fertilising effect. The result—an effective decrease in heavy metals of up to 99 per cent.

FERTILISER

The ASP process which is based on the introduction of nitrogen and phosphate, changes the properties of sewage sludge to the extent that it can no longer be regarded as "sewage". The chemical reaction in the ASP process binds nitrogen and phos-

phate into the organic material resulting in a natural ammonium phosphate slow release, non-leaching fertiliser relatively high nitrogen and phosphate values.

Nitrogen ranges in the 10 to 13 per cent area while phosphates are in the 10 to 15 per cent area. Organic material comprises 40 per cent of the fertiliser.

An interesting aspect of the process is that nitrogen and phosphate values can be adjusted as desired for local or special crop requirements.

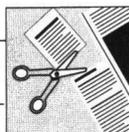
ASP fertiliser also contains micro and trace elements that are absolutely vital for healthy plant growth - calcium, magnesium, sulphur, iron, manganese, copper, zinc, molybdenum and boron.

ASP when used as a liquid fertiliser remains in suspension and can be used in mechanical sprayers and chemigation.

Interested persons can contact Mr A Fourie, tel (012) 98- 5641 for more information.



Dry sludge is fully sterilised in batches by using external heat — an earlier development to ASP (Active Sewage Pasteurisation) yet currently utilised for economy and efficiency in all dry sludge sterilisation.



GRATIS PLAKKAAT

'n Plakkaat om geïntegreerde omgewingsbestuur (GOB) toe te lig is deur die Raad vir die Omgewing uitgegee. Die hele GOB-prosedure word uiteengesit en word treffend met tekenprente deur Tony Grogan geïllustreer.

Die plakkaat, sowel as die geïllustreerde boekie met die naam "GOB - 'n raamwerk vir harmonie tussen ontwikkeling en omgewing" en die meer omvattende dokument "Geïntegreerde Omgewingsbestuur in Suid-Afrika" is nou gratis in Engels of Afrikaans van die Sekretaris van die Raad vir die Omgewing, mnr Brian Egan, te Privaatsak X447, Pretoria, beskikbaar.

ROOT-SHOOT COMMUNICATIONS DURING DROUGHT

*Derrick M Oosterhuis
Professor Of Crop Physiology
University of Arkansas*

Recent evidence indicates that plants can "sense" the water status of the soil directly and that this information can be important in regulating growth and development.

Root-to-shoot communication during drought was one of the main topics discussed at the recent Eighth Annual Symposium on Current Topics in Plant Biochemistry and Physiology held at the University of Missouri, Columbia, Missouri, on April 5 to 7, 1989. The other topics covered in the symposium included cold acclimation and leaf development. A poster session of related topics was also included in the meetings.

The symposium series, sponsored by the National Science Foundation and the University of Missouri, was initiated to heighten awareness of advances in research and promoting interaction among researchers and graduate students in biochemistry and physiology.

JACOB LEVITT

This year the symposium paid special honour to Dr Jacob Levitt whose distinguished and continuing outstanding career has, to date, spanned more than 50

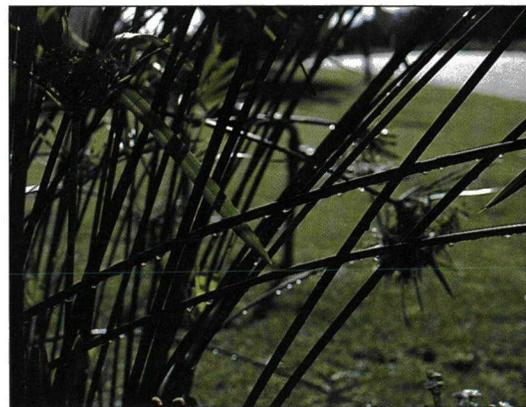
years. Dr Levitt received his Ph D in 1935 from McGill University, was on the faculty at McGill and then at the University of Minnesota prior to joining the University of Missouri in 1947. He has also worked as a senior scientist at the Volcani Center in Israel from 1973 to 1974, a visiting Professor in Minnesota and a visiting fellow at the Carnegie Institute. Dr Levitt has had a profound influence in the field of plant biology and has written 5 books and published over 125 research papers and chapters in the areas of drought resistance, frost hardiness, cell physiology, water relations and ion absorption.

WATER

"Do plants measure the amount of water available in the soil?" This was the title of the opening paper presented by Dr W Davies (University of Lancaster, England) in the root- to-shoot communication section. In the last few years there has been a lot of discussion and substantial change in our understanding of how plant responses to drying soil may be mediated. It was previously accepted that when water is withheld from the soil, its uptake into the plant will be reduced, resulting in reduced leaf turgor which promoted the redistribution and increased synthesis of abscisic acid (ABA) in the leaf and subsequent stomatal closure. Although this sequence of events is commonly observed, there is now mounting evidence that under certain circumstances soil drying can promote closure of stomates before any measurable decrease in leaf turgor takes place. Recent experimental evidence has shown that stomatal conductance can be more closely linked to the water status of the soil than to the bulk water relations of the leaves. Dr Davies maintains that ABA plays a central role in this type of regulation, although other researchers are not convinced.

Dr Wolfram Hartung from the Federal Republic of Germany discussed his research concerning the release of ABA into the mesophyll apoplast and the root xylem sap of stressed plants. Root-shoot interaction in relation to the control of nodulation in soybean was presented by Dr Peter Gresshoff (University of Tennessee). The control and integration of resource acquisition and allocation in plants was discussed by Dr John Cheeseman (University of Illinois), and Dr Mervin Ludlow (CSIRO, Australia) described the influence of root signals resulting from soil dehydration and soil strength on the growth of crop plants.

In the poster section, Dr RE Sharp (University of Missouri) and his colleagues showed that non-hydraulic inhibition of leaf elongation may act to modulate the plant's response to soil drying before the occurrence of shoot water deficits, i.e. inhibition of leaf elongation was not caused by reductions in shoot water status or by reductions in nutrient supply. On the other hand, maize stomata may be more commonly regulated by changes in leaf water status than by signals from the roots. In related work these researchers showed that ABA may be required for continued root growth at low water potentials. Dr BA Smit and co-

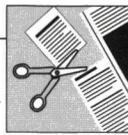


workers (University of Washington) presented data to show that the transport of factors (possibly ABA and cytokinins) in the xylem stream was necessary for the reduced leaf growth response of flooded poplar trees. The results of Drs FC Meinzer and DA Grantz with sugarcane in Hawaii suggest that stomata may respond mechanistically to the ratio of root/shoot hydraulic conductance to the total transpiring leaf area.

In response to the controversy that is developing over root-to-shoot communications, the British Plant Growth Regulator Group has organised a special meeting on "Control of Shoot Growth and Development: The Importance of Root to Shoot Communications in the Response to Environmental Stress". Further information can be obtained from Dr B Davies, Division of Biological Sciences, University of Lancaster, Bailrigg, Lancaster, LA1 4YQ, UK.

Abstracts from the Missouri Symposium (Volume 8), are available at \$14.00 per copy, from:

Dr Douglas D Randall
117 Schweitzer Hall
Department of Biochemistry
University of Missouri
Columbia MO 65211
USA



OPEN CHANNEL FLOWMETER

The FLOWSONIC monitor is a microprocessor-controlled flowmeter, used in conjunction with an ultrasonic sensor. It measures the flow, level, and air temperature of the surrounding area, and totalises the flow volume in each open channel. Measurement of channel flow occurs either directly in the channel, or by means of hydraulic primaries like weirs or Venturis which determine a known relationship between flow-rate and water head. FLOWSONIC can be programmed for measurement on any type of channel or weir, even in partially-filled pipes.

FLOWSONIC outputs can be connected to remote recording instruments or used directly for the control of valves, pumps or samples. It can be programmed to meet different low conditions in existing channels or non-standard weirs. Calibration is carried out by entering the relevant parameters for the flow calculation.

The LCD display indicates all parameters, measured values, and alarm conditions. Flow rate is indicated in the selected engineering units. Using selection keys, indication of level, ambient temperature and volume totals for all programmed parameters, can be requested. An analog 4-20 mA output with galvanic separation is available for connection to remote indicators, telemetry systems, recorders, PCs or PLCs. Two relays and one static contact operate as digital actuators and can be programmed to control external totalisers.

Enquiries: Werner Steffen, Endress + Hauser, Box 783996, Sandton, 2146. Tel (011) 802-5620

NEW FREE-STANDING DAM

A new concept in free-standing dams has been introduced by Isando-based Dam Lining Specialists, AQUATAN, under the name "Aquadam".

Varying in capacity from 1 500 litres to 19 000 litres the Aquadams are unique in that being manufactured of thick "HI-DRILINE" High Density Polyethylene (H.D.P.E.) they require no form of reinforcement - their inherent strength supports the liquid load.

Light, (a 7 000 litre dam weighs 35 kg) the Aquadams have the benefit of being flexible enough to fold in half for transport on

a bakkie and their 2mm thick walls provide for a very tough product that is not easily damaged.

H.D.P.E. is chemically inert, enabling the dams to be used for storing strong chemicals as well as clean water for delicate requirements such as Aquaculture. HI-DRILINE is also very resistant to the effects of weathering and has a 10-year fully exposed history in South Africa, without significant degradation having occurred.

Economical and durable, the Aquadam represents a new option in liquid storage and is proving very popular with contractors for the containment of water for construction purposes.

For further information contact:

Peter Davies - Marketing Director, Aquatan (Pty) Ltd, PO Box 633, Isando, 1600. Tel: (011) 974-5271 Fax: (011) 974-4111 Telex: 7-45607 SA

NON-CONTACT PUMP CONTROL

The new Endress + Hauser PUMPSONIC ultrasonic pump controller is specifically designed for the control of pumps and valves using non-contact level measurement making the device independent of the characteristics of the liquid being measured. The controller is used for applications in control of water basins, river

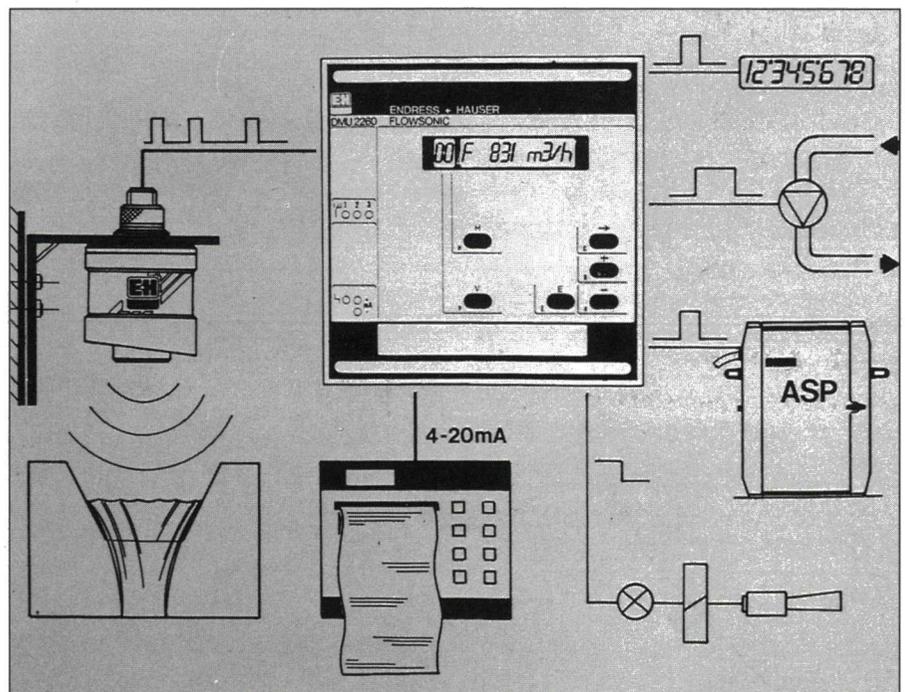
and drinking water control systems, in water pumping stations, and in aqueducts.

Depending on the version used, PUMPSONIC is suitable for the control of up to four pumps, sequential pump control, as protection against a dry run condition, and as a programmable pump and alarm control. The control unit is protected to IP65 and the ultrasonic sensors to IP68 to meet aggressive conditions. Capacitive or pressure sensors can also be used with this controller.

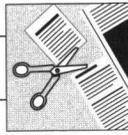
The microprocessor-based control unit calculates and displays the water level and activates and deactivates the connected pumps at two pre-set levels. It can be programmed for up to eight pre-set levels, as set-points for the pump motor relays. A time delay, programmable up to 90 s is available to compensate for oscillation, waves or turbulence. Alternatively, the control unit can be programmed for sequential operation of the pumps, to ensure even wear.

PUMPSONIC is calibrated using three reed switches mounted on the back of the front panel. The switches are activated by placing a magnetic key near the symbol to be selected (replacing push-button control). In this way the controller retains its IP65 integrity, even during calibration.

Enquiries: Werner Steffen, Endress + Hauser, Box 783996, Sandton, 2146. Tel: (011) 802-5620



The FLOWSONIC system



PROFESSOR ROLAND SCHULZE TO SERVE ON INTERNATIONAL BOARD

A new international "Handbook of Hydrology" to replace the 1964 classic by the late Ven Te Chow is to be published in the USA in 1991. Professor Roland Schulze, project leader of the hydrological research group in the Department of Agricultural Engineering at the University of Natal in Pietermaritzburg, has been invited to serve on the International Advisory Board of this very ambitious project involving hydrologists from all six continents. Advisory Board members were selected on the basis of trend-setting research and Professor Schulze is the only member to have been invited from the African continent.



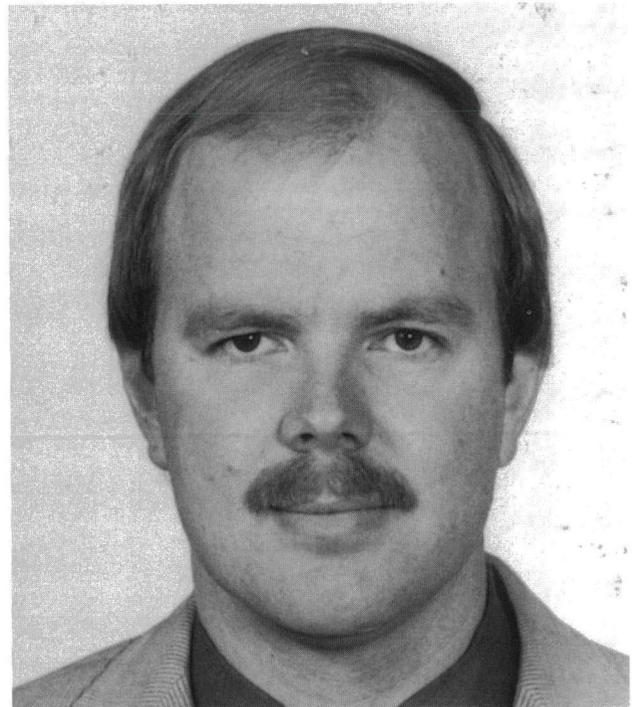
Professor Roland Schulze

VAN VLIET LEI WATERTEK

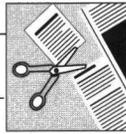
Dr Ben van Vliet is onlangs aangestel as die nuwe direkteur van die WNNR se Divisie vir Watertegnologie. Hy volg dr Daan Toerien op wat nou verantwoordelik is vir die totstandkoming van twee nuwe divisies in die WNNR: die Divisie vir Tekstiëlnavorsing en die Divisie vir Bosbou- en Houtnavorsing.

Ben van Vliet het aan die Afrikaanse Hoër Seunskool in Pretoria gematrikuleer en in 1971 'n BSc-graad in chemiese ingenieurswese aan die Universiteit van Pretoria behaal. In 1973 behaal hy 'n MSc-graad aan dieselfde universiteit en in 1980 'n doktorsgraad in omgewingsingenieurswese aan die Universiteit van Michigan in die VSA.

Dr Van Vliet was van Junie 1973 tot Augustus 1977 aan die WNNR verbonde waarna hy sy studies in Amerika voortgesit het. Sedert Januarie 1981 is hy terug by Watertegnologie waar hy aanvanklik aan die hoof van prosestegnologie en later aan die hoof van die skeidingstegnologieprogram van WATERTEK gestaan het.



Dr Ben van Vliet



INGENIEURS BEKROON

Twee ingenieurs van die Departement van Waterwese is onlangs vir hulle buitengewone werkprestasie met die Alfred Dale Lewis-medalje bekroon.

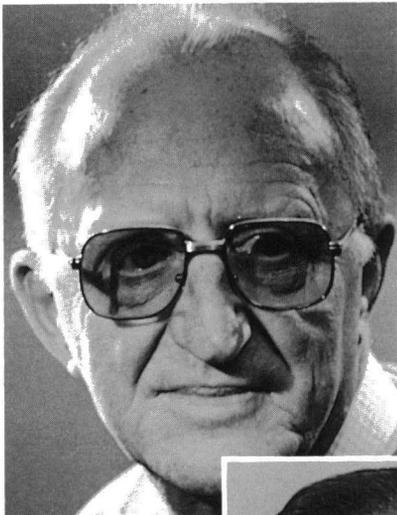
Mnr Frank Hollingworth, hoofingenieur (spesialis) beton-damme en mnr Alan Conley, hoofingenieur: strategiese beplanning, het tydens 'n plegtigheid by die Roodeplaat-opleidingsentrum dié toekenning van die Minister van Omgewingsake en van Waterwese, mnr Gert Kotzé, ontvang.

Mnr Conley is vereer vir sy publikasie: "Bestuur van die Waterhulpbronne van die RSA" en mnr Hollingworth vir die revolusie wat hy in dambou teweeggebring het met die toepassing van die rolbetontegniek op boogdamme.

Die wêreld se eerste swaartekrag-boogdam waar die rolbetontegniek gebruik is, die Knellpoortdam, is in 1988 onder mnr Hollingworth se leiding in die Vrystaat voltooi.

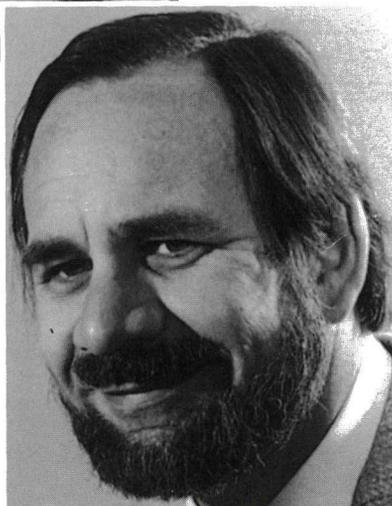
Hierdie baanbrekerswerk van mnr Hollingworth is aangebied as 'n referaat by die Internasionale Kommissie op Groot Damme se San Fransisco-kongres in 1988.

Die medalje is vernoem na dr Alfred Dale Lewis, die man wat die grondslag vir wateringenieurswese in Suid-Afrika gelê het. Hy was hoof van die Departement van Besproeiing van 1921 tot 1941 en het gehelp met die totstandkoming van 'n aantal besproeiingskemas soos Vaalharts, Loskop, Vioolsdrif en Boegoeberg. Die eerste reeks topografiese kaarte van die Unie van Suid-Afrika op 'n 1:50 000-skaal is ook onder sy leiding uitgegee.



*Mnr Frank
Hollingworth*

*Mnr Alan
Conley*



UNIVERSITY OF NATAL DEPARTMENT OF CHEMICAL ENGINEERING

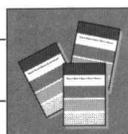


POLLUTION RESEARCH GROUP GRADUATE PROGRAMME IN INNOVATIVE WATER AND EFFLUENT TREATMENT SYSTEMS

The Pollution Research Group interacts with funding organisations, executive bodies and industry in undertaking investigations centred on the closed recycle treatment of industrial effluents and innovative water treatment systems.

A Masters project will be initiated in 1990 to develop processes for the recovery and reuse of regenerant chemicals from ion exchange resin plants. This project will be sponsored by the Water Research Commission and will be undertaken in close co-operation with Eskom. Graduates interested in this field are invited to join the project. It will be necessary to spend a certain amount of time at a power station and to interact with the Analytical Chemistry Section of Eskom's Engineering Investigation Division.

For further information contact: Prof CA Buckley (031) 816-3375, Fax (031) 816-3131.



ATMOSPHERIC POLLUTION AND ITS IMPLICATIONS IN THE EASTERN TRANSVAAL HIGHVELD

by PD Tyson,
FJ Kruger and CW Louw

This report reflects the current knowledge regarding atmospheric pollution and its effects on inhabitants and the environment of the Eastern Transvaal Highveld (ETH) and adjacent regions.

It is based on information obtained from research that was initiated by CSIR (contracted by Department of Constitutional

Development and Planning) and Eskom (1979 to 1983) and followed by a co-operative effort (1984 to 1987) that had been directed and managed by a Steering Committee under the auspices of the National Programme for Weather, Climate and Atmosphere Research. Several organizations participated in this effort, including CSIR, universities, Atomic Energy Corporation, SASOL, Eskom as well as research institutions of various government departments.

The report has been prepared to provide a state-of-the-art publication that will inform and be of use to the scientific community, the authorities involved with the control and abatement of atmospheric pollution and for all those anxious to see that the ETH and adjacent environments are not despoiled by man's activities.

FINDINGS

Atmospheric pollution climate

The ETH atmosphere is highly unfavourable for dispersion of atmospheric pollutants. Indeed, the ETH has an atmospheric pollution climate among the most adverse anywhere in the hemisphere, let alone in South Africa. This fact needs to be accepted and taken into account in future atmospheric pollution management strategies for the region.

Emissions and sources of atmospheric pollutants.

Substantial amounts of pollutants are re-released into the ETH atmosphere. Inventories of overall emissions (tons per annum) in the ETH for 1984 has been as follows:

Particulates	374 692
Sulphur dioxide	1 038 556
Nitrogen oxides	355 246
Carbon monoxide	339 574
Hydrocarbons	276 503

Most of the pollution results from power stations but substantial contributions also arise from various smaller industries, smouldering discard coal dumps, domestic combustion and motor vehicles.

Controls are applied at most of the sources within the ETH area. Significant progress has already been made in improving the situation, but the atmospheric pollution problem has, for practical reasons, not as yet been fully addressed.

The current tall-stack policy of atmospheric pollution control has apparently been successful in avoiding unacceptably high ambient atmospheric pollution concentrations at ground-level. This, however, has been achieved at the cost of pollution accumulating in an elevated layer over the ETH. Some of this pollution is subsequently deposited by wet and dry processes with possible deleterious environmental consequences in and beyond the region in question. It seems that the present policy may have to be revised and supplemented with more stringent controls in future in order to safeguard the ETH and adjacent regions from detrimental medium- and long-term effects on the environment.

1988: 144 pages
ISBN 0 7988 4134 6

Available from the Foundation for Research Development, CSIR, PO Box 395, Pretoria 0001.

Atmospheric pollution and its implications in the Eastern Transvaal Highveld

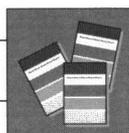


P D Tyson, F J Kruger and C W Louw

SOUTH AFRICAN NATIONAL SCIENTIFIC PROGRAMMES REPORT NO

150

APRIL 1988



RIVER INTAKES AND DIVERSION DAMS

by E Razvan,
TAHAL Consulting Engineers
Tel-Aviv, Israel

The main purpose of this book is to contribute towards an understanding of the specifics of river diversion and to stimulate creativity, when tackling new projects. Many years of activity in hydraulic engineering has taught that the implementation of man-made constructions in natural river valleys should be approached with precision and constraint.

Contents: **1. Water Demands and Water Sources.** Water uses. Water sources. **2. A Summary of River Hydraulics.** River systems. River flow. Sediment load. River channel. **3. General Design Criteria. Definitions.** Functions of the diversion works. Intake hydraulics. Channel

morphology changes following a river diversion. Classification of river diversion. The hydraulic design of river diversions. General design criteria. **4. The Environmental Approach to River Diversion Projects.** Definitions. Evaluation of the environmental impact. Environmental impact of river projects. **5. The Diversion of Mountain Streams.** Specific operating conditions. Intakes with bottom racks. Pier intakes. **6. The layout of River Diversions.** General. River diversions without dams. Small river diversions. Common river diversions. Very large river diversions. **7. The Intake Structure. Intake block design.** Intake components. Examples. **8. Diversion Dams. Gated weirs. Spillways.** **9. Elements of the Hydraulic Design of Diversion Dams.** The discharge capacity of the dam outlets.

Energy dissipation. Underground contour. **10. Elements of the Structural Design.** General Diversion dam structure. Retaining walls. Aspects of concrete technology. **11. Earthfill Embankments.** General problems. Typical solutions. Foundation treatment. Embankment design. Some constructional problems. Examples. **12. Maintenance and Operation of River Diversion Works.** Preparatory measures. Maintenance activities. Operational activities. Appendix A: Hydraulic design data. Appendix B: Soil mechanics data. Appendix C: Concrete in diversion structures.

1989: XIV + 508 pages

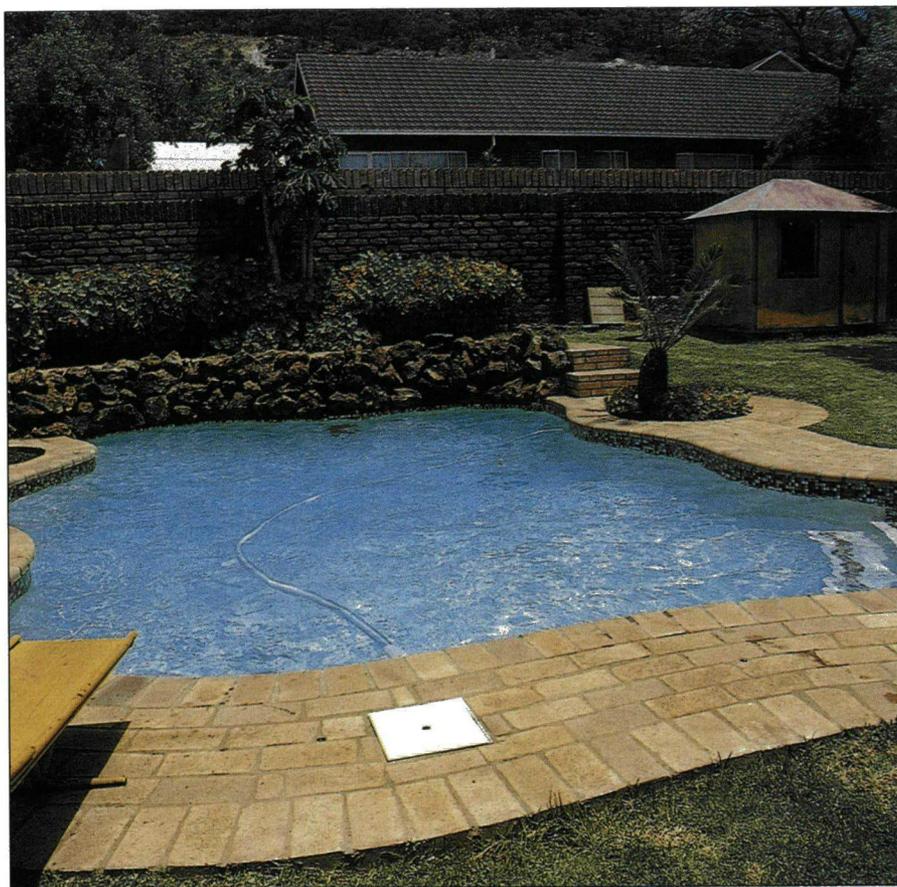
Price \$150

ISBN 0 444 87315 5

Available from Elsevier Science Publishers, PO Box 211, 1000 AE Amsterdam, the Netherlands.

CHEMISTRY OF CHLORINATED SWIMMING POOLS

by KJ Hartley



Plenty of information has been published on the basics of pool operation but until now there has been no text providing the

more detailed understanding of pool behaviour required for purposes of design and optimisation of operation.

This new book describes the fundamentals of pool chemistry in sufficient detail for rational design and operation of a pool's chemical system. Beginning with a review of well-known material on the chemistry of chlorination, the book progresses to items such as:

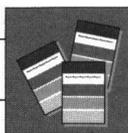
- Photochemical decomposition of chlorine, including recent field measurements made at a large Australian aquatic centre.
- Chlorine stabilisation. An analysis of cyanuric acid chemistry including distribution of chlorinated species with pH.
- pH and alkalinity control. For all commonly used combinations of chemicals, derivation of equations and illustrative graphs for chemical doses needed to maintain pH and alkalinity at desired values. With these equations, for example, it can be shown that carbon dioxide is cheaper than hydrochloric acid for pH control of large pools when using hypochlorite as a disinfectant.
- Redox potential. A full explanation of redox potential and its application to control of pool chlorination, including the effects of chlorine residual and pH.

1989: 59 pages

ISBN 0 9590012 2 0

Price 17.00 US dollars

Available from Gutteridge Haskins & Davey (Pty) Ltd, GPO Box 668, Brisbane QLD 4001, Australia.



WATER-WELL DESIGN AND CONSTRUCTION

by RL Harlan,
KE Kolm and
ED Gutentag.

(Developments in Geotechnical Engineering, 60)

The practice of geohydrology has, over the past few decades, become increasingly sophisticated, requiring a degree of specialisation that was not needed five or ten years ago. In response to this increase in level of sophistication, many universities have developed programs in geohydrology. In practice, however, this has resulted in a lack of awareness in graduates of practical applications and the limitations of many theoretical approaches. While many universities offer good programs in "theoretical geohydrology", practical application courses are rarely available. The purpose of this book is to provide a reference for addressing many of the practical hydrogeological problems. Although it deals largely with the design and construction of water wells, it also broadly addresses the practice of geohydrology.

Contents: **1. Introduction.** Purpose and scope. Hydrologic cycle. Ground-water occurrence. Definitions. **2. Subsurface Evaluation.** Preliminary considerations. Drilling and coring. Site observations. Geophysics. **3. Well Hydraulics.** Concept of head. Darcy's law. Aquifer properties. Radial-flow equations. **4. Principles of Well Design.** Purpose of proper well design. Water-quality considerations. Materials selection: casing and screen. Dimensional considerations. Well screens. Gravel and filter packs. **5. Well Construction, Development, and Maintenance.** Well construction. Well development, rehabilitation and maintenance. Water-supply systems. Well closure and abandonment. **6. Aquifer Evaluation.** Aquifer (pumping) test design. Procedures for conducting aquifer tests in single wells. Packer tests. Laboratory tests. **7. Special Applications.** Ground-water monitoring. Dewatering and depressurization. Infiltration galleries/horizontal collectors. (All chapters include references). **8. Glossary. Index.**

1989: xii + 205 pages
US\$ 84.25/Dfl. 160.00
ISBN 0-444-87480-1

Available from Elsevier Science Publishers, PO Box 211, 1000 AE Amsterdam, The Netherlands.

PIPELINE DESIGN FOR WATER ENGINEERS

Third Revised and Updated Edition

by D Stephenson, Department of Civil Engineering, University of the Witwatersrand, Johannesburg, South Africa.

(Developments in Water Science, 40)

"...the book is at its best in the design and analysis sections and could stand on these alone as a well-stocked handbook with copious references for further study," commented the Journal of the National Water Council after publication of an earlier edition of Pipeline Design for Water Engineers.

This classic monograph has been revised and updated to take account of new developments in the field. Recent research in cavitation and flow control has prompted additional sections to be added. There are also new sections on supports to exposed pipes and secondary stress. Additional references and a new layout make up this edition. Some sections appearing in previous editions, notably on pipe network systems analysis and optimization have been omitted as they were considered more appropriate in the author's parallel book "Pipeflow Analysis" (Developments in Water Science, 19).

Contents: **1. Economic Planning.** Introduction. Pipeline economics. Basics of economics. Balancing storage. **2. Hydraulics.** The fundamental equations of fluid flow. Flow head loss relationships. Minor losses. Pressure and flow control in pipes. Types of valves. Cavitation in control valves. **3. Pipeline System Analysis and Design.** Network analysis. Optimization of pipeline systems. **4. Water Hammer and Surge.** Rigid water column surge theory. Mechanics of water hammer. Elastic water hammer theory. Protection of pumping lines. **5. Air in Pipelines.** Introduction. Problems of air entrainment. Air intake at pump sumps. Air absorption at free surfaces. Hydraulic removal of air. Air valves. Head losses in pipelines. Water hammer. **6. External Loads.** Soil loads. Superimposed loads. **7. Concrete Pipes.** The effect of bedding. Prestressed concrete pipes. **8. Steel and Flexible Pipe.** Internal pressures. Tension rings to resist internal pressures. Deformation of circular pipes under external load. Stress due to circumferential bending. Stiffening rings to resist buckling with no side support. **9. Secondary Stresses.** Stresses at branches. Stresses at bends. The pipe as a beam. Temperature stresses. **10. Pipes, Fittings and Appurtenances.** Pipe materials. Lien valves. Air valves. Thrust blocks. Forces induced by supports. Flow measurement. Telemetry.

11. Laying and Protection. Selecting a route. Laying and trenching. Thrust bores. Pipe bridges. Underwater pipelines. Joints and flanges. Coatings. Linings. Cathodic Protection. Thermal insulation. **12. Pumping Installations.** Influence of pumps in pipeline design. Types of pumps. Terms and definitions. Impeller dynamics. Pump characteristic curves. Motors. Pumpstations. **General References and Standards.** Books for Further Reading. **Appendix.** Symbols for the pipe fittings. Properties of pipe shapes. Properties of water. Properties of pipe materials. Conversion factors. **Author Index. Subject Index.**

1989: xiv + 264 pages

US\$ 92.00/Dfl. 175.00

ISBN 0-444-87373-2

Available from Elsevier Science Publishers, PO Box 211, 1000 AE Amsterdam, The Netherlands.

GROUNDWATER ECONOMICS

Selected Papers from a United Nations Symposium held in Barcelona, Spain

Edited by E Custodio, and A Gurgui.
(Developments in Water Science, 39)

This book contains a selection of papers presented at the Symposium and Workshop on Groundwater Economics, held in Barcelona, Spain, 19-23 October 1987. The editors' aim was to produce a publication with useful contributions, containing basic concepts, general formulations, relevant specific studies usable as reference cases, and issues of interest for developing areas and countries.

Contents: (in broad outline)

Basic Concepts on Economy and Groundwater Economy.

Section I. Economic Aspects of Groundwater Exploration and Exploitation.]

Section II. Economic Aspects of Groundwater Use and Conservation.

Section III. Economic Aspects of Groundwater Management.

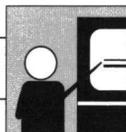
Section IV. Economic Aspects of Groundwater Relevant to Developing Areas and Countries. Groundwater Economics Workshop Conclusions.

1989 xii + 626 pages

US\$ 115.75/Dfl. 220.00

ISBN 0-444-87296-5

Available from Elsevier Science Publishers, PO Box 211, 1000 AE Amsterdam, The Netherlands.



SOUTHERN AFRICA

ANALYTICA '90

The first national symposium on analytical science - Analytica 90 - will be held from 18 to 23 March 1990 in Pretoria. The theme will be: Analytical technology in a developing South Africa.

Enquiries: The Chairman, Analytica '90, Department of Chemistry, University of Pretoria, Pretoria 0002, RSA. Tel. (012) 4202515.

WASTEWATER SEMINARS

Three concurrent seminars on wastewater treatment will be held at a country hotel near Pretoria and Johannesburg from 2 April to 4 April 1990. The seminars are entitled: Nutrient removal from wastewater streams, Design and operation of biological treatment plants and Industrial and hazardous waste treatment.

Enquiries: Conference Co-ordinators C 126, CSIR, PO Box 395, Pretoria 0001.

WATER SUPPLY

A seminar on water supply and sanitation will be held in Transkei from 26 to 27 June 1990.

Enquiries: The Conference Co-ordinators C 126, CSIR, PO Box 395, Pretoria 0001.

IRRIGATION

A South African Irrigation Symposium will be held from 4 to 6 June 1991, at the Elangeni Hotel in Durban.

Enquiries: The organising Committee: Irrigation Symposium, PO Box 824, Pretoria 0001.

Keep us posted

SA Waterbulletin welcomes news and information of relevant conferences and symposia for inclusion in this regular feature page. Please send details of such events to:

The Editor, SA Waterbulletin
PO Box 824, PRETORIA,
0001

OVERSEAS

EFFLUENT TREATMENT

A conference on effluent treatment and waste disposal will be held in Leeds, England, from 3 to 5 April 1990.

Enquiries: Conference Section, Institution of Chemical Engineers, 165-171 Railway Terrace, Rugby CV21 3HQ, England.

HYDRAULICS

The third international conference on hydraulic engineering software — Hydrosoft '90 - will be held in Boston, USA from 3 to 5 April 1990.

Enquiries: Liz Newman, Computational Mechanics Institute, Ashurst Lodge, Ashurst, Southampton SO4 2 AA, UK.

WATER TREATMENT

The first joint IAWPRC/IWSA conference will be held in Jönköping, Sweden from 24 to 26 April 1990. The theme will be: coagulation, flocculation, filtration, sedimentation and flotation in water and wastewater treatment.

Enquiries: Joint Specialist Group, International Water Supply Association, 1 Queen Anne's Gate, London SW1H 9BT, UK.

WASTEWATER

An international conference and exhibition concentrating on water and wastewater technology will be held in Barcelona, Spain, from 24 to 27 April 1990.

Enquiries: The organisers: Water and Wastewater '90, PO Box 125, Scotch Plains, NJ 07076, USA.

IRRIGATION

The 14th International Congress on Irrigation and Drainage will be held from 29 April to 4 May 1990 in Rio de Janeiro, Brazil.

Enquiries: The Secretary, International Commission on Irrigation and Drainage (ICID) 48 Nyaya Marg, Chana Kyapuri, New Delhi 110 021, India.

WATER DEVELOPMENT

An international symposium on the development of small scale water resources in rural areas will be held in Khon Kaen, Thailand, from 21 to 25 May 1990.

Enquiries: SITRA CO, LTD, 158 Emmanuel Building, Rachdapisek Road, Bangkok 10310, Thailand.

WASTE DISPOSAL

The IFAT 90-International Trade Fair for Waste Disposal will be held in Munich, FRG, from 22 to 26 May 1990.

Enquiries: Munchener Messe- und Ausstellungsgesellschaft, mbH, Messeglade, Postfach 12 10 09, D-8000 Munchen 12, FRG.

WATER RESOURCES

The 8th international conference on computational methods in water resources will be held in Venice, Italy, from 11 to 15 June 1990.

Call for papers on modelling of groundwater, surface water dynamics, water quality, sedimentation, resource optimisation and computers.

Enquiries: Prof G Gamlolati, Dipartimento di Metodi e Modelli Matematici, Università degli Studi, Via Belzoni 7, 35 131 Padova, Italy.

WATER RESOURCE SYSTEMS

A symposium on water resource systems application will be held in Winnipeg, Canada, from 12 to 15 June 1990.

Enquiries: International Symposium on Water Resources Application, Civil Engineering Department, University of Manitoba, Winnipeg, Manitoba R3T 2N2, Canada.

IAWPRC

The IAWPRC's Biennial '90 international conference and exhibition on water pollution control will be held in Kyoto, Japan, from 29 July to 3 August 1990.

Enquiries: IAWPRC Biennial '90, 1 Queen Anne's Gate, London SW 1H 9 BT, England.

GROUNDWATER MODELLING

An international conference on calibration and reliability in groundwater modelling will be held in the Netherlands from 3 to 6 September 1990.

Enquiries: Modelcare 90, P O Box 30424, 2500 GK, The Hague, the Netherlands.

AQUATECH '90

An international trade-exhibition together with a range of related topical conferences on the water supply industry, Aquatech '90, will be held from 10 to 14 September 1990 in Amsterdam, Holland.

Enquiries: Aquatech '90, RAI Gebouw bv, Industrial Presentations (Europe) B.V., 1078 GZ Amsterdam, Holland.



ONE WEEK SHORT COURSE ON THE DESIGN OF WATER QUALITY MONITORING SYSTEMS

OBJECTIVES

The course will introduce the systems approach to water quality monitoring. The system components are:

- determination of the information expectations,
- the monitoring network,
- analysis of the data accumulated, and
- reporting the information in a format suitable to meet
- information expectations.

This short course was offered in 1988. It has been revised and, by popular demand, will be offered again in 1990. The short course will present detailed procedures for designing water quality monitoring systems which have as their objectives the determination of water's fitness for use, assessment of trends, determination of pollutant loads, and monitoring compliance to standards. Design procedures apply to both fixed station and special monitoring studies. This wide variety of monitoring situations can be covered in one week by focusing on basic, common components of all water quality monitoring programmes. Most illustrations of the design procedures use effluent, stream, and ground

water quality monitoring examples. The course will begin with an overview of the entire monitoring system, including the role of statistics in water quality monitoring. This will be followed by discussions of the principles involved in selecting water quality variables to be measured, locating sampling sites, and calculating sampling frequency. Demonstrations of computer software that can be used in solving water quality monitoring problems will provide practical guidance. The course will concentrate on the basic principles of monitoring, therefore it will be valuable not only to persons involved in the study and management of freshwater systems, but also those responsible for information on terrestrial, marine, and atmospheric systems.

PARTICIPANTS

The short course is aimed at those persons actively involved with the design, operation and/or management of monitoring programmes, with emphasis on quality of surface and ground water, and those that use the information produced by monitoring programmes in decision-making. The course assumes that attendees will have little or no background in statistics. A text book on the design of water quality monitoring systems will be furnished at the course. Attendees should bring a calculator as it will be needed during the problem solving sessions.

INSTRUCTORS

Dr **ROBERT CWARD**, Associate Dean and Professor, Department of Agricultural and Chemical Engineering, Colorado State University, Fort Collins, Colorado, USA.

Dr **THOMAS G SANDERS**, Associate Professor, Department of Civil Engineering, Colorado State University, Fort Collins, Colorado, USA.

Dr **DC GROBLER**, Deputy Director, Water Quality Management, Department of Water Affairs.

Dr **JANE HARRIS**, Senior Engineer, Division of Water Technology, CSIR.

GUEST LECTURERS

A number of experts in water quality monitoring and related fields will participate as guest lecturers.

WHERE: Conference Centre,
CSIR, Pretoria.

WHEN: 13 - 17 August 1990.

ADDRESS ALL CORRESPONDENCE TO

Ms Helene Joubert
Water Research Commission
PO Box 824
PRETORIA
0001
Tel: (012) 330-0340

Please register for this short course by filling out and returning the postcard. If the card is unavailable, please contact Ms Joubert at the address above. Include your name, address, and company affiliation.

Avoid disappointment by registering as soon as possible because the facilities can accommodate a maximum of 50 people. The positions will be allocated on a first come, first served basis. DO NOT send money now. You will be notified later if your application has been accepted.

FEE

The course fee is estimated at R700 which includes tuition, all class materials, text book, daily refreshments, lunch, and two evening functions.

ACCOMMODATION

There are a number of hotels in close proximity to the CSIR, we will be happy to furnish a list upon request.

COURSE OUTLINE

Monday

- Introduction
- Water quality management in the RSA
- Systems approach to water quality monitoring
- Water quality variables as stochastic processes
- Basic concepts of probability and statistics
- Evening social

Tuesday

- Estimating means and confidence intervals
- Hypothesis testing
- Distribution-free tests
- Exploratory data analysis
- Compliance monitoring
- Establishing a data base for compliance monitoring

Wednesday

- Sampling site location
- Sampling frequency
- Effects of data characteristics on sampling frequency
- Regression analysis for trend detection
- Problem session

Thursday

- Water quality variable selection
- Analytical laboratory as part of a monitoring system
- Quality control in a water analysis laboratory
- National Water Quality Monitoring System
- Software demonstration
- Evening social

Friday

- Reporting water quality with an index
- Comparison of components of water quality monitoring for different objectives
- Practical implications of environmental monitoring

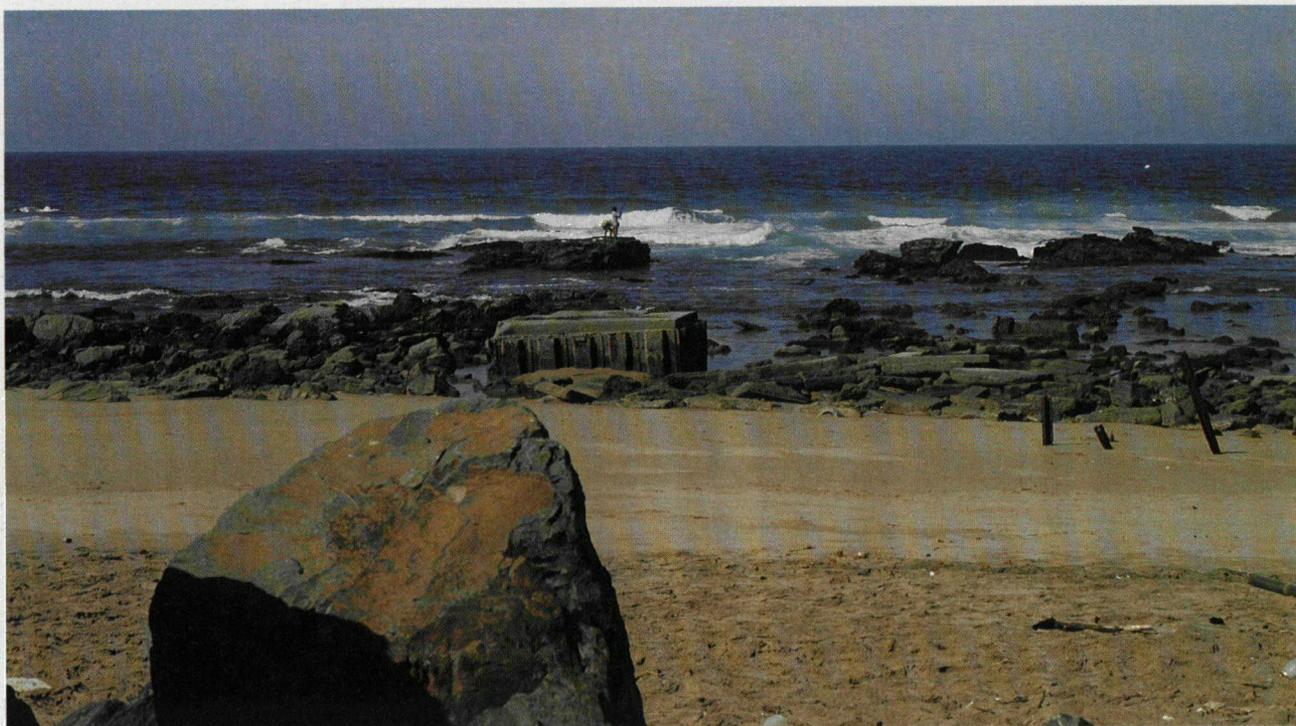
OCEANS '90

7TH NATIONAL OCEANOGRAPHIC CONFERENCE

25 to 29 June 1990

San Lameer

Port Edward, Natal, RSA



OCEANOGRAPHY PAST, PRESENT AND FUTURE

The conference will be an interactive working conference based primarily on workshops which are poster orientated. Oceans '90 is the 7th triennial national oceanographic conference. It is traditional that scientists report on the research they have undertaken over the past three years. Much of this research was sponsored and guided by SANCOR. The conference will also provide, therefore, an opportunity to evaluate SANCOR's achievements.

VENUE:

San Lameer, near Port Edward on the Natal South-Coast. This is an attractive coastal resort.

COSTS:

Accommodation (all meals included): R600 per person for five nights and four days.

Registration:

R200, to cover invited guests, documentation and other conference costs.

Subsidies:

Efforts are being made to generate support to subsidise the attendance of students. The formula for awarding subsidies will be made known at a later date.

FORM OF CONFERENCE:

The conference will be a mixture of plenary sessions and workshops. The latter will be held on each afternoon and, if necessary, extend into the early evening. Plenary sessions will include selected overviews/reviews and oral papers, and a report back of proceedings of workshops which took place the previous afternoon.

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