

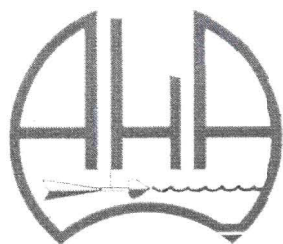
AUSTRALIAN HYDROGRAPHERS ASSOCIATION

Australasian Hydrographer



Men From Mars (Swift Water Boating Training, Tumut NSW)

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February, 2004

The Australasian Hydrographer is the Journal of the Australian Hydrographers' Association Incorporated. ISSN 0812-5090

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EDITORIAL

Welcome everyone to 2004. Big news and events have happened over the last few months, possibly the biggest news that will probably have an impact on all of us is the merger of HYDSTRA with European company Kisters.

Nearly all Australian water authorities are using the HYDSYS or Time Studio data management platform and it seemed not long ago that the merger of these two was to bring about a single 'super' data management package. To date these products are still separate entities, though some connectivity has been achieved with some measure of interoperability between the two platforms.

When HYDSYS and Time Studio merged initially, users were promised input into the new product. Both these products emerged from within the various water authorities around Australia, and the functions and processes in both developed mostly from inputs from people like us, hydrographers and hydrologists.

Now another player has entered the fray, promoting another system and associated data collection hardware to go with it. What this will mean to us (the user) is yet to be seen, but it appears that 'merger' of products is expected to be completed by the end of 2004. HYDSTRA/Kisters have announced a seminar in Sydney in late February (as this issue goes to print) to discuss the merger and product merger pathways, so more will be known shortly. What is important is that we continue to have an input into what we want as customers of these packages.

This year is also our biennial conference year with the 12th AHA conference currently being organised by Queensland. The theme this conference is "*The Science of Hydrography - Looking Forward, Looking Back*". Please lend your support to this years

conference to make it as, if not more, successful than the last.

As always I am after items for the Journal. I would ask that state reps and state groups forward items to me so that we can share our knowledge and experiences with everyone - Australian distance continues to be a tyranny, but communicating through your association is one way of overcoming it.

Mic Clayton

The **Australasian Hydrographer** is the Journal of the **Australian Hydrographers' Association Incorporated**. The Journal is distributed quarterly to Members. **ISSN 0812-5090**

Visit our **Web Site** at: <http://www.aha.net.au> to download a Membership application and to find contact details for your state representative.

Editorial and advertising enquiries should be directed to the association's **Publicity Officer**, Mic Clayton.

e - mail publicist@aha.net.au , or
PO Box 843, COOMA, NSW, 2630.

The views expressed in this publication are those of its contributors and do not necessarily represent those of the Australian Hydrographers Association Inc or its office bearers.

NEWS

Hydstra to merge with Kisters

Source: *HYDSTRA News*, December 2003

Ian Donoghue, General Manager

I am pleased to announce that Hydro Tasmania and Kisters AG of Germany have agreed to merge the Hydstra group of companies and the Kister's Resource Management System Division, with effect from 1st January 2004.

Whilst Kisters AG (www.kisters.de) have a strong base in Europe and Hydstra has a strong base in the southern hemisphere, neither has so far established the global footprint required to fully grow their product and business and provide clients with the benefits derived from worldwide usage. This merger delivers this global footprint and provides a solid foundation to deliver better products to clients.

The Hydstra business will continue to operate as Hydstra Pty Ltd in the southern hemisphere and other key markets. All staff have been offered roles in the merged organisation and while most have accepted Damian Skinner and Tom Riley from the Client Services team in Canberra together with Stuart Allie and Bruce Young from the Product Development team in Hobart have taken this opportunity for a career change. I would like to take this opportunity to acknowledge their contribution to Hydstra and wish them well in their new endeavours.

Given the short timeframe within which this merger has been completed, a substantial amount of detail is still to be finalised. A information pack outlining full details of the merged entity and the future product strategy will be provided to clients early in the new year. Client visits and seminars/workshops will also be held early in 2004 to provide clients with the opportunity to meet the management team of the merged entity.

MEMBERSHIP RENEWALS

Many are now falling due. Application for renewal form can be found inside the back cover as well as at our website at www.aha.net.au. It would be appreciated that renewals are prompt.

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Phone 0064 3 544 3414

The Australian Hydrographers Association's



12TH NATIONAL HYDROGRAPHIC CONFERENCE

"The Science of Hydrography - Looking Forward, Looking Back"

GOLD COAST, Queensland

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Venue: ANA Hotel, Surfers Paradise, Gold Coast, QLD

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The AHA Association invites you to attend the 12th National Hydrographic Conference, 28th - 30th July, 2004.

The conference theme, "The Science of Hydrography - Looking Forward, Looking Back", will provide relevant insight into modern hydrographic technology, while honoring early advances that still influence our work today.

A registration and welcoming function will be held from 4:30pm on the evening of the 27th of July. The Australian Hydrographic Association will hold a meeting following the function, and all members of the AHA are encouraged to attend. Following the presentation of papers, on Friday 30th July you will have the choice of attending the HYDSTRA users group meeting or touring the Hinterland (to see some gauging stations) and points of interest.



To Register, Contact a Conference Convener:

Ray Alford - Ray.Alford@nrm.qld.gov.au
or
Paul Martin - Paul.Martin@nrm.qld.gov.au

Full Registration includes Conference Dinner

AHA member	\$440
Non-member	\$550
Day Rate	\$275

Also Taking Submissions for Papers

Nominations/registrations of abstracts must be received no later than:

COB Friday 27th February, 2004.

Abstracts can be e-mailed to either convener, or may be posted to:

The Conveners
12th Australian Hydrographic Conference, 2004
C/- Natural Resources & Mines Technical Centre
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Ray Alford - Ray.Alford@nrm.qld.gov.au	or Paul Martin - Paul.Martin@nrm.qld.gov.au

Hydrological data: What is available and from where?

Ross James, Bureau of Meteorology, Melbourne.

Abstract: Rainfall, streamflow and evaporation data are the basic inputs required for a wide range of infrastructure design, resource management and environmental studies. These data are collected by many organizations across the country from networks of independently managed observing stations. This can make determining what data are available and where they can be obtained difficult. Catalogues of station metadata have been published in the past by the Australian Water Resources Council and the Bureau of Meteorology. However, changes brought about by the COAG water reform process and resource constraints within agencies have meant that these traditional catalogues are out of date and difficult to update. The power and rapidly expanding accessibility of the Internet has enabled the introduction of web based catalogues. This paper briefly details the evolution of the catalogues and describes the current development of the Internet based National Water Resources Station Catalogue available at <http://bom.gov.au/hydro/wr/wrsc>.

Keywords: River stations, rainfall station, evaporation stations, station catalogues

1. INTRODUCTION

Rainfall, streamflow and, to a lesser extent, evaporation data are essential inputs to hydrological analyses carried out in support of the design of major infrastructure projects, natural resource management and environmental assessments throughout Australia each year. Historically the major state and territory water agencies have collected streamflow, rainfall and evaporation data from sites within their jurisdictional areas and the Bureau of Meteorology has collected climate data nationally and streamflow data from selected river basins. Each organization managed its own networks, made data from the networks available and published catalogues detailing the data that were available.

A consequence of this involvement of many agencies in data collection across the country is that determining what data are available in any given area of interest can be difficult, requiring inquiries to each agency that may have a responsibility in the area. This difficulty is compounded when the area of interest, such as a river basin, crosses jurisdictional boundaries.

2. EVOLUTION OF NATIONAL STATION CATALOGUES

Attempts have been made to overcome this problem since at least the 1960s with the publication of catalogues of metadata for stations operated by the main state and territory water and agricultural agencies, research institutions and the Bureau of Meteorology. Three examples of these catalogues at the national level are:

- Stream Gauging Information, Australia
Published by the Australian Water Resources Council approximately every five years between the early 1960s and 1990 (AWRC, 1984).
- List of Pluviograph Stations, Australia
Published by the Bureau of Meteorology at irregular intervals between the early 1960s and 1988 (BOM, 1988).
- List of Evaporimeter Stations in Australia
Published by the Bureau of Meteorology in 1970 and 1974 (BOM, 1974).

These catalogues included a range of station metadata. The primary purpose of the catalogues was to identify stations by number and location, detail the period of record and identify the owner of the station so that data could be obtained.

The COAG water reform process during the 1990s saw a number of the large state and territory water and environmental agencies broken up in response to changes in regulatory and management responsibilities and, in some states, the creation of river basin or region based management agencies. These changes, along with the corporatization and privatisation of some water providers, have had an impact on the ownership and management of the observation networks that has increased the difficulty of determining what data are available and where it can be obtained. The changes have also made assembling station metadata for updating the various national catalogues in their traditional formats more difficult.

During 1996 the Bureau of Meteorology presented a proposal to the Surface Water Technical Information Exchange Working Group (SWTIEWG) of the Agriculture and Resource Management Council of Australia and New Zealand, that the publication Stream Gauging Information, Australia be updated. All of the major state and territory water agencies were represented on SWTIEWG. The original intention was to publish the update as hardcopy, in digital format and to also have it available for download from the Internet. As the project progressed, the advantages of utilising Internet technology became apparent and effort was concentrated on the development of a flexible Web tool that would enable a data base of station metadata to be searched using user entered criteria. The major advantage of concentrating on the Internet was that the database could be progressively updated as station metadata was received from the agencies rather than having an infrequent publication of a paper or CD-ROM based catalogue.

After a lengthy gestation period that included project work by computer science students at Swinburne University of Technology and Monash University, Caulfield, the Web based version of Stream Gauging Information, Australia was released in January 2001. The interface allowed users to search the database of station metadata using combinations of the following criteria:

- Drainage Division
- River Basin
- Station number
- Station name
- River name
- User defined rectangular area
- Catchment area
- Length of record
- Station Status (open or closed)
- Availability of water quality data
- Source agency for data

Following the success of the web based version of Stream Gauging Information, Australia a similar catalogue for rainfall stations was developed and released in December 2001. *Rain Gauge Information, Australia* contains metadata for all types of rainfall stations operated by the Bureau of Meteorology and the state and territory water agencies. The rainfall stations in the catalogue are categorised as follows:

- Continuous
Stations equipped with a recording device that provides a continuous record of rainfall intensity data. These stations are commonly referred to as the 'pluviograph network'.

- Daily
Stations for which an observation of the total rainfall for the 24 hours to 9am is available. The majority of these stations are equipped with manually read gauges however increasingly 24 hour observations extracted from operational stations are also being included.
- Synoptic
Stations providing discrete observations of total rainfall at some synoptic hours (eg. 6am, 12am and 3pm) in addition to 9am. The observation may be from either a manually read gauge or a recording gauge. These stations are commonly referred to as the 'synoptic network' and include an increasing number of automatic weather stations (AWS).
- Operational
Stations providing data for operational services such as the flood warning service. The vast majority of these stations are telemetered. Data may be either continuous, a series of discrete observations at regular intervals or a mixture of daily totals with more frequent observations during periods of flooding. These stations are sometimes referred to as the 'flood warning network'.

3. NATIONAL WATER RESOURCES STATION CATALOGUE

The final stage of development was intended to be the development of a third system to present details of evaporation stations. However, the availability of funding from the Natural Heritage Trust in early 2003 presented an opportunity to, not only include evaporation stations, but also to redevelop the existing systems to enhance their capabilities, ensure they were robust and reliable and to streamline the database management and update procedures. The development plan for the National Water Resources Station Catalogue (NWRSC) consists of 2 stages. The first being the development of a text based interface with expanded search criteria, improved database and streamlined database management procedures. Two features of the new system will be the integration of river, rainfall and evaporation stations into a single interface and database and greater flexibility in specifying user-defined areas. The second stage is the development of a map-based interface for the selection of areas of interest and the spatial display of stations meeting the selection criteria.

At the time of writing, the development of the first stage has commenced and is expected to be available for use in mid 2003. The availability of Open Source technologies is being investigated for the

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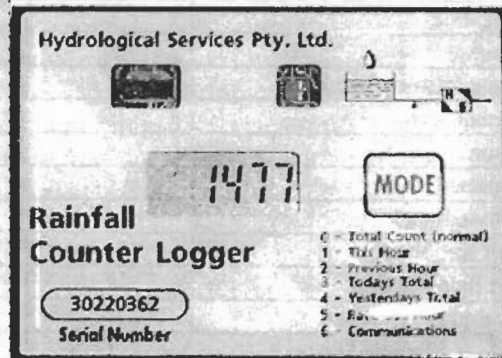
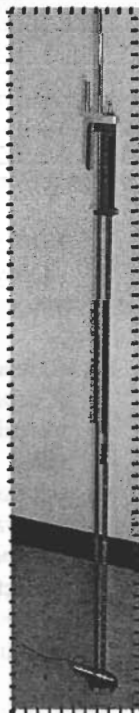
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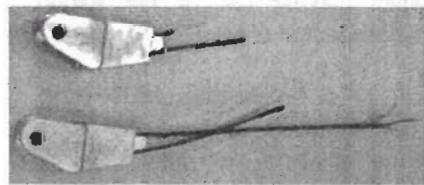
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development of the second stage. If these technologies are found to provide the required capabilities, the map-based interface is expected to be available towards the end of 2003. The integrated catalogues will be available at the URL <http://bom.gov.au/hydro/wr/wrsc>.

The development and operation of the web based Stream Gauging Information, Australia confirmed

that lack of resources and competing priorities in many agencies mean that, if station attributes for the catalogue cannot be automatically generated from existing databases, they will **not** be available for the catalogue. This has prompted the removal of a number of attributes to **simplify the** preparation of station metadata. **The station attributes** included in NWRSC for each **type of station** and the search criteria available to users are detailed in Table 1.

Table 1. NWRSC station attributes and search criteria.

Station Attribute	Station Type			Available as a search criterion
	River	Rainfall	Evaporation	
Drainage Division	✓	✓	✓	✓
Drainage Basin	✓	✓	✓	✓
Rainfall District	✓	✓	✓	✓
Station number	✓	✓	✓	✓
Station name	✓	✓	✓	✓
River name	✓			✓
Location: latitude/longitude	✓	✓	✓	✓
Catchment area	✓			✓
Elevation	✓	✓	✓	✓
Date opened	✓	✓	✓	#
Date closed	✓	✓	✓	#
Rainfall station type		✓	✓	✓
Percent data missing	✓			
National map reference	✓			
Is the river regulated?	✓			
Availability of water quality data	✓			✓
Max gauged stage	✓			
Max observed stage	✓			
Source agency name	✓	✓	✓	✓

Length of record and whether a station is open or closed are search criteria.

Users of NWRSC need to be aware of the following issues/features when making use of the station information returned as search results.

1. Duplicate entries may be encountered for some stations. The duplicate entries may have different station numbers and may only be identifiable as duplicates because of a similar station name and/or the same location. As a result of duplicate entries caution needs to be exercised when determining how many stations actually exist in an area. Some of the reasons for duplicate entries are as follows.
 - (a) A station, while owned by one agency is used by a number of agencies and is therefore included in the list of stations provided by each agency for NWRSC. Data for the station is usually available from each agency however the agency owning the site will probably have the better historical data set. Unfortunately

NWRSC does not clearly identify which agency owns the site and further inquiries will need to be made.

- (b) Rainfall stations will have duplicate entries if data at different observation intervals are available from the site. For example, at some Bureau of Meteorology stations manually read daily totals at 9am and short interval rainfall intensity data from automatic recording equipment are collected. Such stations will have two entries and be categorised as 'Daily' and 'Continuous' respectively.
 1. Some of the stations in NWRSC do not have location (latitude and longitude) information. Therefore these stations will not be included in the results of searches that make use of the station location. They may be included however when the search only includes other criteria such

as length of record, or elevation. When the search criteria include location information, the results will display a message giving the number of stations that do not have location information.

2. Some of the station attributes may not be populated for some stations in NWRSC. This may result when the source of the station metadata provided by an agency is not a comprehensive network database (such as HYDSYS) but a simpler database maintained for other purposes. The station attributes that are often not populated are, elevation, availability of water quality data, percent data missing, extent of river regulation, maximum gauged stage and maximum observed stage.
3. The observed data are not available through NWRSC and must be obtained from the agency operating the site. The agency name and contact details are provided in NWRSC.
4. Station metadata will sometimes be in error. When they are identified, errors will be forwarded to the agency operating the station for correction. The corrections however may not appear in NWRSC until the agency provides the next update of station metadata.
5. NWRSC contains metadata for stations operated by the major state and territory water agencies, some large urban water authorities, some regional or river basin water authorities and the Bureau of Meteorology. A number of other

agencies/organisations/companies are known to operate networks of river, rainfall and possibly evaporation stations. Efforts will be made to have these stations included in NWRSC. Any assistance from users of NWRSC to either identify these agencies/organisations/companies or to convince them that they should contribute station metadata will be appreciated. Instructions on how to contribute to NWRSC are included on the web site.

6. CONCLUSION

NWRSC (<http://bom.gov.au/hydro/wr/wrsc>) is being developed to provide a national view of the networks of river, rainfall and evaporation stations operated by individual river basin, regional, state, territory and national agencies. It utilises the power and ever expanding reach of the Internet to provide users of hydrological data with a flexible and powerful tool to answer the question: *What hydrological data are available for use in my project/design/study and where can I obtain it?*

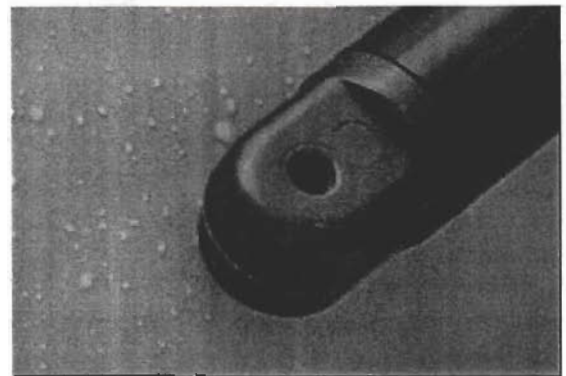
7. REFERENCES

- AWRC, *Stream Gauging Information, Australia*. Australian Water Resources Council, Water Resources Series No 2, Australian Government Publishing Service, Canberra 1984.
- BOM, *List of Pluviograph Stations, Australia*. Bureau of Meteorology, Melbourne, February 1988.
- BOM, *List of evaporimeter stations in Australia*. Bureau of Meteorology, Melbourne, 1974

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Hydrological data: What is available and from where?

Ross James, Bureau of Meteorology, Melbourne

National Water Resources Station Catalogue www.bom.gov.au/hydro/wrsc

The purpose of this catalogue is to identify the existence and location of rainfall, river and evaporation stations throughout Australia.

Steps to Use:

1. Define the area of interest
2. Select station type(s) and/or names
3. Optionally enter additional criteria
4. Press 'search' button

Station metadata has been provided by the following organisations.

- | | | |
|--|-----|---|
| Bureau of Meteorology | Qld | Department of Natural Resources and Mines |
| ACT Environment/ACT | SA | Department of Water, Land & Biodiversity Conservation |
| NSW Department of Infrastructure, Planning and Natural Resources | SA | SR Water |
| NSW Manly Hydraulics Laboratory | TAS | Hydro Tasmania |
| NSW Snowy Hydro | TAS | Department of Primary Industries, Water and Environment |
| NSW Sydney Water | VIC | Melbourne Water |
| NT Department of Infrastructure, Planning and Environment | VIC | Department of Sustainability and Environment |
| Qld Brisbane City Council | WA | Water and Rivers Commission |

Are there any other organisations willing to contribute station metadata?

The catalogue will be updated as new or updated station metadata are made available. Instructions are available at: the menu link 'provide station updates' near the top of the catalogue web page. Comments and queries should be forwarded to r.james@bom.gov.au

(Developed under a Natural Heritage Trust grant)

AHA Conference, 2004.

Update from Ray Alford - Organiser

Planning for the 12th National Hydrographic Conference is now well advanced.

There has been a good response by companies who wish to exhibit this year with two stepping forward so far with offers of "gold" sponsorship. Thank you Hydrological Services and Underwater Video Systems.

There has also been a number of delegates booking early into our venue, the ANA hotel Surfers Paradise. The conference has block booked a number of rooms for the duration of the conference. These are available to anyone associated with the conference on a first come/first served basis. The negotiated rate for these rooms is \$145, which is very good value for quality accommodation on the Gold Coast. If you want to extend your stay to relax (or recover) the hotel has agreed to extend this offer to 3 days before or after the event. Why not bring your family? They can visit the theme parks and other attractions while you are busy working on conference activities. Don't forget to mention the conference when you book.

Because ADCP measurement is rapidly surpassing conventional means for gauging large flows, the organisers have decided to incorporate an ADCP workshop along with the normal presentation of papers. This session will allow users to compare notes and discuss issues with fellow hydrographers and also allow discussions concerning the development of standards for doppler measurement. Suppliers of doppler equipment will be attendance to answer questions and offer advice.

There are still places for those who wish to deliver a paper at the conference. The theme "Science of Hydrography, Looking forward, looking back" allows ample scope for those not on the cutting edge of technology to participate. The organisers have extended the deadline for abstracts until the end of March to cater for the late comers.

This conference is your best opportunity to meet with fellow hydrographers from across Australia or around the corner. Please support it.

Ray Alford

Update- TAFE NSW OTEN 3573 Hydrography Certificate IV

Further enrolments in the TAFE NSW OTEN Hydrography Certificate IV are desperately sought to maintain the viability of this course. To date (24th February) only 15 students have enrolled or re-enrolled for 2004. This is way down from a peak of 55 at the end of 2003 and is very disappointing for OTEN staff and industry sponsors. A sharp increase in TAFE fees has been cited by some students as the cause of their tardiness in re-enrolling.

On a positive note, the period for re-enrolment has been extended indefinitely to allow students to re-enrol. OTEN has introduced payment of TAFE fees in two instalments.

Lobbying by the "Water Industry" was cited as one factor in OTEN retaining its status as a registered training organisation in a major restructure of the NSW Department of Education and Training. The support of the Australian Hydrographers Association is greatly appreciated. OTEN delivery is to be maintained from its current site in Strathfield, NSW.

The industry-funded project for the development of seven distance education learning resources is

proceeding apace. Resources have been developed for modules

8004R Atmospheric Physics and Hydrology A

8004S Atmospheric Physics and Hydrology B

8004G Water Industry Basic Instrumentation B

Development is near-complete for

8004X Hydrography A

8004AA Project

Projects remaining (estimated completion June 2004) are:

8004Y Hydrography B

8004L Water Quality Laboratory and Field Techniques

The support of the industry through direct funding, writing, reviewing, technical advice and making resources available has produced great resources.

The related course 8046 "Hydrology and Environmental Management Training Program Statement of Attainment" has had its accreditation extended, allowing enrolments until August 2004.

There are currently eight students enrolled in this course, again well down on the twelve enrolled at the end of 2003.

For further information please contact

Neil Harper

Teacher of Environmental Science, OTEN

1300 360 087 or 02 9715 8485

email neil.harper@tafensw.edu.au

web <http://www.oten.edu.au>

Scott Technical Instruments (Advertisement)

(Letter received march 2003)

Re: Glogger Repairs SN# 030165

Dear Owen,

Enclosed is the Moree Hydro Data team's Gauging Logger (Gavin). The black electrical terminal was broken in the line of duty whilst conducting a boat gauging.

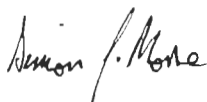
The unit still appears to be functioning correctly, but is definitely no longer a sealed unit any more.

With the Glogger we have consistently cut down our work times in the field.

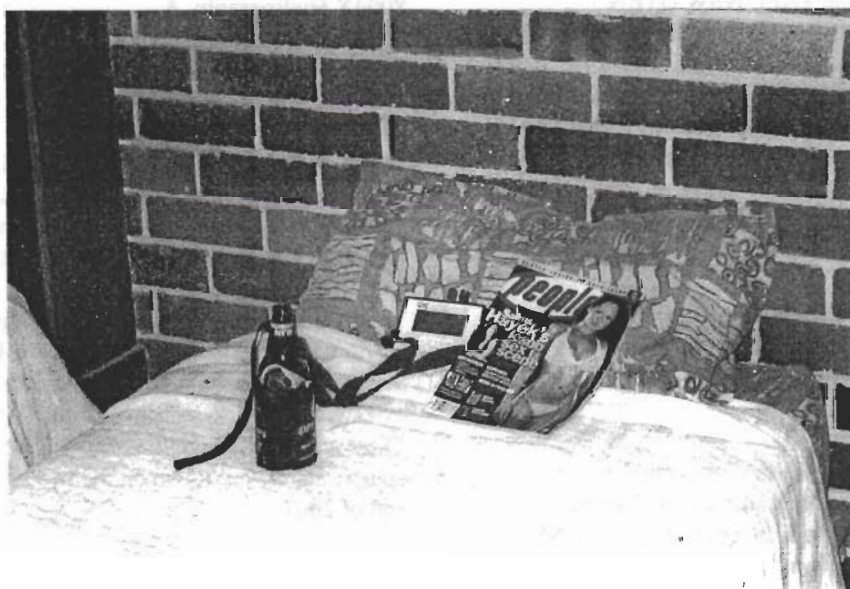
We hope that the necessary repairs do not take too long, as Gav now an invaluable third member of our team (see enclosed photo). We are finding it very hard to adjust to manually booking gaugings again after becoming used to the ease of using the glogger.

Please do repairs then fax me an invoice and I will send a purchase order over for that amount.

Yours sincerely



Simon Morse
Hydrographic Assistant,
Resource Information Unit
NSW Department of Land and Water Conservation



Gav resting after a hard day
in the field. Mungindi Hotel/Motel.

For Glogger info:
www.scottech.net

SURFACE WATER MONITORING IN SOUTH AFRICA

Part Two

CHRISTOFF LE GRANGE

*Department of Water Affairs and Forestry,
Directorate: Hydrology, Pretoria, SOUTH AFRICA*

GAUGING STRUCTURES

7.1 Gauging structure network:

The present network of flow gauging stations in South Africa has grown from isolated observations on an *ad*

hoc basis to an extensive network of stations across the country. Standardised gauging stations to suit local conditions, which include purposely-designed compound weirs, have been developed.

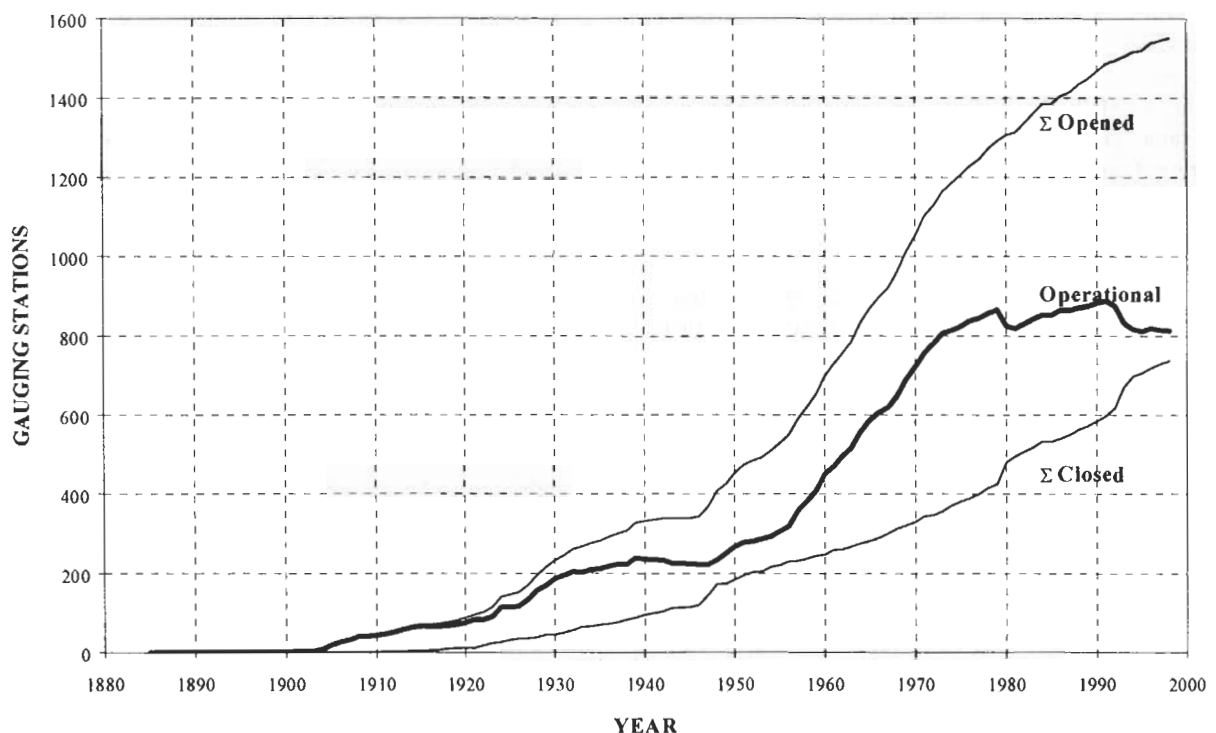


Figure 3: Growth of the flow gauging network in South Africa since 1885

The first gauging structures constructed specifically to measure flow in South African rivers were completed in 1904 in the former province of Transvaal. New structures were constructed until 1916 when a lack of funds, due to the First World War, brought a temporary halt to the expansion of the gauging network. At the time there were at least seventeen compound gauging weirs established in the Transvaal, where stage were gauged continuously using mechanical recorders. The Rand Water Board (supplying bulk water to the Johannesburg - Witwatersrand area) established several gauging stations during 1915. By this time at least eight compound gauging weirs had been established in the former Cape Province and three gauging weirs in the Orange Free State province.

The growth in the number of gauging stations in South African rivers since 1885 is shown in figure 3 above. The influence of both world wars on the growth of the network is evident from this graph. After World War II the number of operational flow gauging stations grew rapidly until the early 70's. Due to the approach of a near optimal number of gauging stations across the country, the start of a network planning program and financial constraints, the number of operational flow gauging stations remained between 800 and 900 since the beginning of 1975. Discharge is gauged by means of purpose-designed compound gauging structures at virtually all these stations. Discharge is gauged at 900 different geographical positions in South African

rivers. Of these stations, approximately 55% include components with sharp-crested weirs and 35% with Crump weir crests. Flow records at these stations are compiled from roughly 3400 continuous recordings of stage, gate openings, meter readings, rainfall and evaporation readings at dams.

7.2 Reasons for gauging structures:

Flow in South African rivers varies considerably in space and time and therefore it has been a policy in the Directorate of Hydrology to build measuring structures. The biggest advantage of a permanent structure is that it can be pre-calibrated, but it is also relatively expensive to build. The idea behind a measuring or gauging structure is to create an artificial control in the river with a known relation between stage and discharge. Methods such as velocity measurements, backwater calculations and slope-area are used to calibrate these stations for high flows. There are also a number of natural river sections calibrated specifically to measure floods.

Sections rated by velocity-area methods have not been used extensively in the past for the following practical reasons:

- vast distances to the respective sites and generally short runoff periods make it logistically difficult to fully rate sections within acceptable time limits,
- a lack of real-time rainfall and runoff data adversely affects reaction times to perform the necessary gaugings,
- high rainfall intensity, making access to sites hazardous and
- a lack of skilled manpower to undertake the required velocity-area gaugings.

8. TYPE OF STRUCTURES IN SOUTH AFRICA

Mainly two types of weirs are used to gauge discharge in South Africa, namely sharp-crested and long-base weirs. The difference between long-base weirs and sharp-crested weirs is the length of the structure in the direction of flow. It is also possible to distinguish between different types of long-base weirs; namely broad-crested, triangular profile weirs and nappe-

profile or ogee spillways. Of the various long-base weirs, only the Crump type triangular profile weirs have been used widely to gauge discharge in South African rivers.

Almost without exception all gauging structures built in South African rivers until the 1980's were compound sharp-crested weirs. The first compound Crump weir was built in the Great Fish River in the Eastern Cape and came into operation during October 1977. South African rivers are subject to large and sudden variations in discharge. Compound gauging weirs are used in an attempt to ensure accurate gauging and sensitivity over a wide range of discharges in streams. A compound gauging weir consists of a conglomerate of individual weir types, with the crest of each weir at a different level, across the width of a stream. Normally low discharges in a river flow only over the lowest crest of a compound weir (also called the low notch). As discharge increases more of the higher weir crests start to function. This ensures that discharge can be gauged accurately over a wide range of flows without causing an excessive increase in the water levels upstream of a weir.

8.1 Broad-Crest Weir:

The broad-crested weir is not used very often as a measuring structure itself because of difficulties in calibrating it accurately. The broad-crest will only act as a broad-crest for low flows and above a certain height it starts to act as a sharp-crested weir.

8.2 Sharp-Crest Weir:

The sharp-crested weir is one of the most popular types of structures. Under ideal conditions it can be calibrated very accurately. This type of structure is very sensitive to submergence. It can be calibrated accurately up to a submergence factor of 85%, but must be designed to handle only up to 50% submergence. Sharp-crested weirs should not be used in sediment-laden rivers. Sediment is deposited in the upstream pool, which will change the conditions at the station and impacts on the accuracy of flow observations.

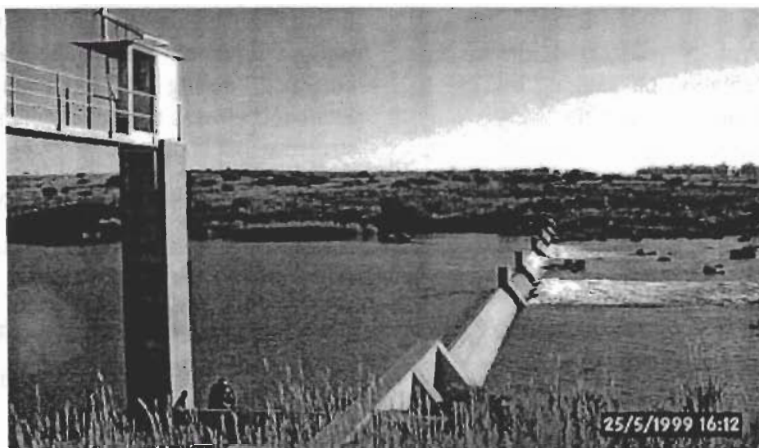


Figure 4: Sharp-crest gauging weir

8.3 Triangular Profile Weirs: (Crump):

The Crump weir is currently the most popular type of triangular weir world-wide. E.S. Crump published a paper during 1952 in England in which he described a new type of triangular profile weir. The upstream and downstream slopes of this triangular profile weir are 1:2 and 1:5 respectively. There are two types of Crump weirs used for flow measurement in natural streams, namely the horizontal or rectangular Crump weir and the V-shape Crump weir. In South Africa, the side slopes of the V-Crump are presently standardised at 1 vertical to 10 horizontal. The Crump weir is relatively easy to construct. It is a robust structure, and is insensitive to minor damage to the triangular profile of the crest.

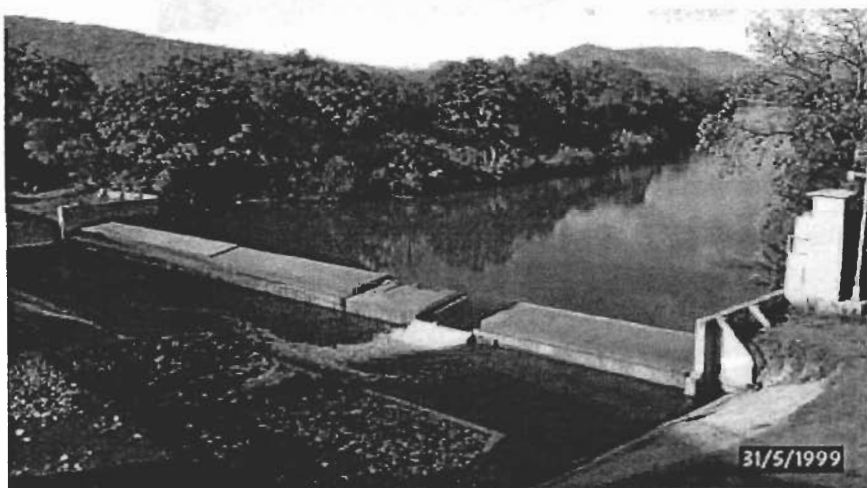


Figure 5: Crump gauging weir

8.4 Ogee Crest:

The Ogee is used mostly where higher flows occur and in particular as dam spillways or storage and diversion weirs.

Like the Crump-structures, the Parshall is not sensitive to high flows. The Parshall can only be calibrated accurately for flows within its structure limit.

8.5 Parshall Flume:

8.6 Hydro Flume:

One of the most serious problems to overcome in the gauging

8.7 Sluicing Flume:

The Directorate of Hydrology addressed the negative impacts of sedimentation on gauging by dredging the pools upstream of gauging weir structures when required and flushing inlet systems when blocked. This is very time consuming and expensive and it often happens that a pool fills up again with sediment with the first flood runoff after such a cleaning operation.

The need for the development of a gauging structure that can overcome the sediment problem in upstream pools of gauging weirs was quite apparent. At the request of Directorate Hydrology, the Water Research Commission (WRC) made

funds available for a research project to develop a new gauging structure for use in sediment-laden streams in South Africa. The aim of the project launched during 1992 at the University of Stellenbosch was the development of a flume type structure that is able to:

- operate as the lowest crest in a compound weir;
- work in combination with existing weirs where sedimentation problems exist;
- allow the free passage of sediment;
- lower the deposit level of sediment in upstream pools;
- provide accurate gauging of flow over a wide range of discharges.

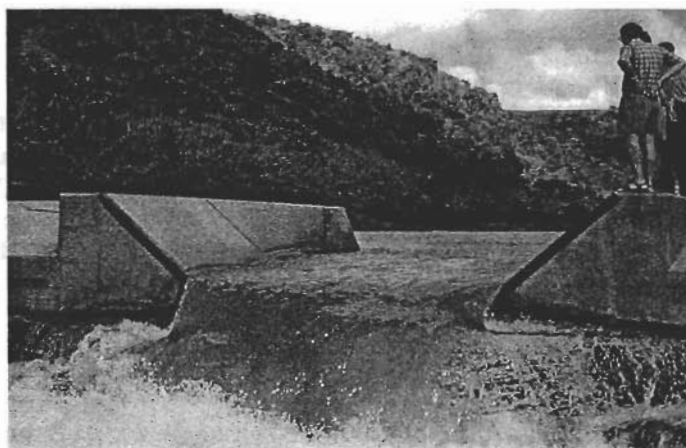


Figure 6: Sluicing flume (downstream)

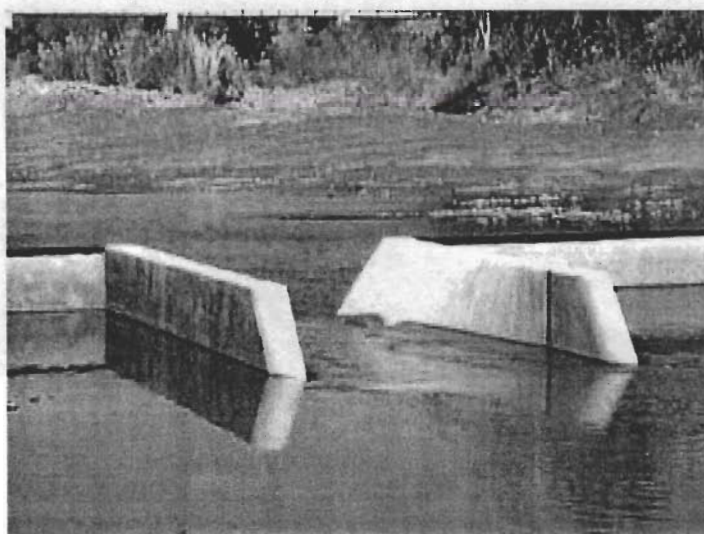


Figure 7: Sluicing flume (upstream)

6. STAGE MEASUREMENT AND INSTRUMENTATION:

The first long term documented daily flow record in South Africa was initiated in July 1885 at the pumping station of the Kimberley Water Works Company at Riverton on the Vaal River. The first continuous stage record started on 1 February 1900 in the Vaal River at Rietfontein, Vereeniging using the Kent (USA) vertical axle recorder. The type of water level recorder most commonly used by Hydrology is the OTT type X horizontal axle water level recorder (Since 1956). The company OTT MESSTECHNIK in Germany manufactures this recorder. Currently there are more than 1 500 Type X recorders in the field, most of which are currently used as back-ups for electronic instrumentation.

6.1 Electronic data loggers:

The first electronic instruments were installed in 1990. Currently 85% of all functional gauging stations are equipped with electronic instruments. The shaft encoder that is used extensively by the Department for the last two years, is the German OTT THALIMEDES shaft encoder. It is a single channel dedicated logger, making use of an absolute encoder, with a float and counterweight. These instruments are suited for stilling wells, as an attachment to a Type-X water level recorder, R20 strip chart water level recorder or stand alone application. The Swiss STS Pressure Transmitter with single channel data logger is also used in the Directorate. It is a compact, robust, stainless steel instrument using the piezoresistive measuring element and was introduced into the network during 1999.

The multi-channel data loggers used by the Directorate are also manufactured by OTT. The multi channel, modular data logger, has a variety of applications. These units are operated from 12v power supply, and can be powered by battery, solar power, or mains transformer. Unfortunately vandalism is a major problem in the rural areas and solar panels or any other

7.1 Real time data acquisition:

Real time flow data are received from more than 100 satellite and radio telemetry stations countrywide. Hydrology is responsible for the management of floods in South Africa. The Vaal- and Orange Rivers flood warning system is done via real time information. Daily flows and dam levels in the Vaal- and Orange River system are available as well as dam levels and

equipment that is not protected is removed or vandalised. These loggers are ideally suited where more than one parameter is to be recorded, with the capability of connection to data transmission systems. It is normally installed in some enclosure, eg. mild steel, brick or concrete. The OTT-LOG multi-channel data logger has different input cards for each defined parameter to be measured. The instrument can be set up using a laptop with KHydras II software or BG II (portable or built-in). The latest model, the OTT LOGOSENS is a "plug and play" model. The software of the data logger only needs to be configured via laptop or PC. The pressure sensor currently used is the STS transmitter for water level measurement. The sensor is exactly the same as the sensor used with the single channel data logger. The sensor has almost the same function as the ODS-4, except that for measuring sensor, which is a Piezoresistive measuring element.

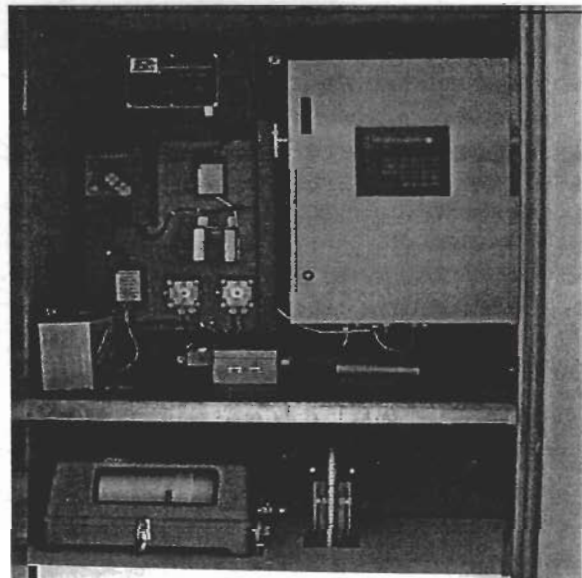


Figure 9: Recorder hut & instrumentation

volumes, calculated on a weekly basis. The radio telemetry system can almost be classified as an "old method" of receiving data in real time, however flows in the Vaal Dam catchment are monitored using a land-based radio telemetry system. Transceivers are erected at gauging stations in the catchment area with the information first being transmitted to repeater stations, then to a receiver at Vaal Dam and lastly sent via telephone line to the flood control room in Pretoria.

protecting hydrological installations and replacing vandalised equipment.

7.2 SADC-HYCOS project

Hydrology is also involved in this project and plays a leading role in the establishment of a hydrological gauging network in Southern Africa (Figure 10). This project covers 11 countries of the Southern African Development Community (SADC). The Directorate of Hydrology in Pretoria, South Africa hosts the Pilot Regional Centre (PRC). Fifty DCP's have been ordered and experts of Hydrology South Africa and WMO in the supplier's premises conducted acceptance tests of the equipment. The installation of the regional network of DCP's started in October 1998. Most of the DCP's are operational, but vandalism and security problems would not allow for the installation teams to access some of the proposed sites. The server, which handles all the data from the SADC-HYCOS DCP's as well as the additional historical time series provided by the countries directly or through other regional initiatives in the water sector, is operating in the PRC located in Pretoria.

7. FUTURE CHALLENGES FOR HYDROLOGY IN SOUTH AFRICA

The new water related legislation in South Africa as well as changing requirements called for an adequate monitoring network that will focus on all components within the hydrological cycle. The success and sustainable development of the country's limited water resources will depend on an optimum hydrological network. Effective water resource management will only be possible if:

- Collection of hydrological data is done in a cost effective and integrated manner, ensuring that the data being collected meets the identified and changing needs of the user environment.
- Planning and management of water resources has access to all hydrological information and data from a specific stream, river basin or region.
- The present mix of separate hydrological systems (HIS) must be replaced with an integrated, highly accessible single system. Ensuring that this system supports the decentralisation of functions to small business units, like the proposed 19 Catchment management areas.
- Network planning and evaluation of the current hydrological monitoring networks fulfil the demand and needs of integrated water resource management.

- Monitoring techniques, procedures and standards (in areas where it is lacking) through field testing and experimentation are developed and implemented.
- The availability of hydrological data exists on a real/near real time basis and also on the World Wide Web.
- Vandalism is minimised and reduced at hydrological installations.
- Line functions relevant to the processing, editing, quality control and dissemination of hydrological data are moved to regional offices and eventually to the future 19 CMA's.
- Capacity building programs are set up to ensure that knowledgeable technical people and hydrologists will be available for hydrological data dissemination in all regions and CMA's.
- Forums and workgroups are initiated with all hydrology stakeholders national and international to facilitate, promote and exchange ideas on hydrological data needs and developments.



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Contributions to the Journal and Newsletter

Member contributions to the Journal and newsletters are most welcome. You are the Association and hence it is helpful if you provide input into it.

At present the Editor is limited to steam driven Word 6.0 so if you have a contribution could you please submit in that format.

Advertisers could also assist by providing TIF, GIF or JPG images or similar of their ads - while PDF format is handy it means cut and paste has to be done - literally!

I look forward to getting summaries of papers from the conference from those who have indicated that they are willing to provide them. Summaries of the summaries are also welcome as I can use them as a precursor in the newsletters for items appearing in the next Quarterly Journal.

Photographs are also welcome for the cover of the newsletter - final use of a submitted photo will depend on how well the image transposes onto the cover of the Journal, so the clearer the better.

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