



### In the Pipe NCWE Chairman's Message

Welcome to Issue 3 of Waterfront. I would firstly like to congratulate the editorial team of Martin Lambert and Alison Miller on both the standard of the newsletter and in getting three issues by the end of 2006 - well done.

The prolonged drought is having a major impact on communities across Australia. River flows in major river systems such as the Murray - Darling have been significantly below historical minimal levels. NSW has announced the suspension of water trading in the NSW Murray and Murrumbidgee valleys due to the on-going dry conditions.

In this context it is timely that the NCWE is highlighting the draft climate variability and change position paper in this issue. It is essential in this time of water shortages that the NCWE provide a balanced and rigorous approach to incorporating difficult issues such as climate change into water resource planning and management.

It is also important that we honour, preserve, and keep alive the outstanding accomplishments and contributions that individuals have made to water resource engineering over the years. I am pleased to see that Professor Crawford Munro has been elected to the Hall of Fame.

There is an excellent program of papers at the 30th Hydrology and Water Resources Symposium in Launceston. If you aren't able to attend I would recommend getting a hold of the papers.

*John Ruprecht*

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### AR&R Update At-Site Flood Frequency Analysis

The estimation of flood risk is one of the fundamental objectives of Australian Rainfall and Runoff (ARR). Flood frequency analysis deals with one aspect of the problem, namely estimating flood risk by fitting probability models to whatever information is available on flood events. Book IV Chapter 2 focuses on fitting probability models using flood information specific to a particular catchment location. This is termed at-site analysis. Though it is typically limited to catchments with gauged data, it underpins the widely used regional flood frequency methods, which are applicable to ungauged catchments.

Recently the technical review of this chapter was completed and it is now available for comment by the profession. Users of ARR familiar with Chapter 10 of ARR (1987) will notice a number of changes. The principal changes are briefly summarized:

- More freedom is given about choice of flood probability model. There is no strong argument in favour of any one probability model. The log-Pearson III model may still be used.
- Bayesian methods are recommended as the primary method for fitting probability models. They offer several major advantages over other methods. They can be used with any probability model and make efficient use of information. More importantly, however, they expand considerably the type of data that can be used in a flood frequency analysis. Apart from the traditional gauged flow data, several other types of information can be used. These include information on pre-gauged floods (such as the number of exceedances over a threshold), information from a regional frequency analysis, and information on rating errors. Bayesian methods are computationally complex. However, as computer software becomes available, users will find they have more capability to exploit the information available on floods.
- The product log-moment method for fitting the log-Pearson III distribution has been abandoned. It performs poorly when not used in conjunction with regional skew methods.
- Sometimes standard three-parameter probability models fail to adequately fit the data. Methods employing LH moments and Bayesian censoring are described to enable standard probability models to provide a good fit to bigger floods.
- In some regions of Australia, there is mounting evidence that flood risk exhibits multi-decadal variability; that is, there can be multi-decadal epochs of enhanced and reduced flood risk. Advice is provided on how to deal with this issue.

Users interested in flood frequency methods are invited to visit the ARR web site [www.arr.org.au](http://www.arr.org.au) and comment on the chapter.

*By Prof George Kuczera*

# Rivers in the Top End

A special interest article on river issues in the Northern Territory

The rivers of tropical Australia constitute a unique set of largely un-impacted systems. However, there is a long history of interest in developing northern Australia and this is currently being influenced by increasing pressure on water supply and river systems in southern Australia. Tropical rivers and groundwater systems are estimated to contain roughly 70% of Australia's fresh water resources, although there is uncertainty surrounding actual water availability because of the quality of information underpinning previous assessments.

Northern Australia offers a unique opportunity to productively develop land and water resources while protecting downstream users and rivers of high conservation value. Specific issues concern the Alligator Rivers, the Daly, the McArthur, and the Ord and Fitzroy in Western Australia. All of these would benefit from a better understanding of their geomorphic stability and their geometric sensitivity to changes in catchment management and hydrologic changes which may be occurring due to climate change. In addition, the Environment Centre Northern Territory has expressed concerns about the proposed water management system and the realignment of the McArthur River and Barney Creek. It is claimed that it will take 50 years or more for the realigned channel hydraulic roughness to become similar to the existing channel and that there will also be a higher sediment load in the new channel during the low flow period (20-100 m<sup>3</sup>/s). This is viewed as an unwarranted permanent alteration of the hydrology and geomorphology of the river. This position should be tested.

The Daly River is the focus of a study that is now beginning. The Northern Territory Government plans to convert pastoral leases in the Daly River region to agriculture. Prior to this development it is important to understand the sediment dynamics of the system and the potential impacts on the river of water abstraction for irrigation. The Daly River is one of the iconic river systems of northern Australia. There is considerable debate about the effects that potential development of the river basin may have on the river channel. Evidence suggests that there has been considerable siltation in the estuary since 1880, and recent observations of the channel indicate that there are instabilities in the channel platform. The question as to whether these instabilities are driven by hydrological or anthropogenic influences is crucial to the decision on future development and how it should be managed.

Work is underway at Charles Darwin University to explore the possibility of applying rational regime methods based on sediment transport concepts to this problem. A model of the hydrodynamics and morphology of the Daly River is being constructed to help determine if the channel dimensions are in equilibrium or are being subjected to a change from a previous equilibrium state. This will include the application of rational regime techniques to self-similar reaches. Considerable work has been carried out in idealised laboratory free-form channels to investigate and test rational regime approaches. However, much less has been done to apply these methods to field conditions. There are several reasons for this. For example, the argument about the so-called channel-forming discharge, the scepticism that such systems may yield to a pseudo-deterministic approach, and the fact that to solve the equations which describe the system, an extremal hypothesis has to be applied with little theoretical justification. These are issues of great interest in river mechanics.

Channels where there is strong interest in assessing future stability are the Magela and Gulungul Creeks which are close to the Ranger mine located in the Kakadu National Park. Other projects underway include an ecohydraulics model study of low flows in the Katherine River in collaboration with fish ecologists to determine suitable habitats in the dry season.

*By Prof Eric Valentine*

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## Water Down Under 2008

Incorporating the 31st Hydrology and Water Resources Symposium and the 4th International Conference on Water Resources and Environment Research in **Adelaide**, South Australia **15-17 April 2008**. This conference will be held at the Adelaide Convention Centre, which is in the centre of the city and adjacent to Adelaide's Theatre and restaurant districts. A three-day scientific program, pre-conference workshops and field trips are planned in association with a trade exhibition, a comprehensive partner program and opportunities for all delegates to enjoy pre and post conference tours to some of Australia's major attractions.

Invited speakers for the conference include: Professor Peter Loucks from Cornell University, USA; Professor Ezio Todini from the University of Bologna, Italy; Emeritus Professor Ghislain de Marsily from University Paris VI, France and Mr John Scanlon, the Independent Commissioner on the Murray Darling Basin Commission, Australia.

Abstract submissions are now being accepted for Water Down Under 2008. Abstracts of no more than 300 words should be submitted by 29 June 2007. Please refer to the web site for submission details and format requirements.

For more information please visit: <http://www.waterdownunder2008.com/>

# Water Engineering Hall of Fame

The Water Engineering Hall of Fame honours individuals who have made outstanding and lasting contributions to the water engineering profession in Australia. These individuals have shaped the theory and practice of water engineering. The Hall of Fame not only seeks to acknowledge their contributions but also seeks to document their legacy to develop a sense of tradition and appreciation of the history of the profession.

## Crawford Hugh Munro

Professor Crawford Munro played a key role in the development of engineering hydrology and water resources in Australia from 1950 until his death in 1976, and his influence has continued for many years after. He was a man of tremendous vision, energy and enthusiasm – a big man in more ways than mere physical size. By nature he was a crusader, and his achievements encompassed many areas of activity.

Crawford Munro was a Professor of Civil Engineering at the University of New South Wales for 16 years. He was a member of the University Council for eight years, chairman of the Faculty of Engineering for three years, and was involved in many extra-curricular activities. In recognition of his contribution to the university, the title of Emeritus Professor was conferred on him by the University Council on his retirement in 1969. After his retirement, he held an appointment as Visiting Professor and Acting Head of Engineering, Faculty of Military Studies of The University of New South Wales at Duntroon.

Crawford Munro also served the Institution with distinction. He was a member of the Stormwater Standards Committee of the Institution which produced the first version of "Australian Rainfall and Runoff", and Chairman of the National Committee on Hydrology for 6 years.

The many symposia organised by these committees owed a lot to Crawford Munro, both for his organisational drive and for his many vigorous and often memorable contributions from the floor of the conference hall. It is appropriate that we recognise Crawford's contribution in the upcoming Launceston conference as he played a very significant role in the development of the Launceston flood scheme.

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## Rainwater and Urban Design 2007

Combining the 13th International Rainwater Catchment Systems and 5th International Water Sensitive Urban Design Conferences. The joint conferences will be held on **21 - 23 August 2007** at the Sheraton on the Park in **Sydney** and is hosted by the International Rainwater Catchment Systems Association (IRCSA), Engineers Australia, WSUD in the Sydney Region, The Stormwater Industry Association (SIA) and Bluescope Water.

In the context of ongoing droughts, climate change and population growth with subsequent water shortages, this joint conference is timely. Rainwater harvesting is a sole source of water for about 3 million rural Australians and, increasingly, an important supplement to mains water supplies in urban areas. In a drying climate, the efficiency of urban roof catchments in our coastal cities in comparison to the diminishing efficiency of inland water supply catchments for harvesting rainwater is an important consideration. Although most Australian cities are subject to water use restrictions and impending water shortages, more rainwater, stormwater and wastewater is discharged unused from those cities than their total water usage. Importation of this water to our cities from often distant catchments and the discharge of stormwater and wastewater from our cities to environments have profound economic and ecological implications.

In response to water shortages, there is an emerging interest in the science, safety and governance of rainwater harvesting and alternative water sources. Similarly, water sensitive urban design is emerging as a successful strategy to mitigate the environmental impacts of rural and urban developments. Nevertheless, there is also a need to counter uncertainty about the design, economics, maintenance and application of water sensitive strategies with new science, experience and continuing innovation.

These approaches are a major departure from conventional water management practices that requires development of new governance, economic and infrastructure provision regimes that may incorporate competitive business structures and distributed solutions rather than conventional centralised monopoly processes. Importantly these new approaches recognise that a single preferred source of water may no longer guarantee the security of urban water supplies into the future. Successful water supply strategies will include rainwater harvesting and other sources of water that require an understanding of the synergistic benefits of multiple water resource strategies.

Water is essential for life. This conference will provide opportunities for exchange of ideas, experiences and innovation with international delegates on the use of rainwater catchment systems and water sensitive urban design methods to supplement available water resources and protect ecosystems.

For more information visit: [www.rainwater2007.com](http://www.rainwater2007.com)

# ARQ Update Chapter 6: Urban Water Harvesting and Reuse by Associate Professor

Peter Coombes from University of Newcastle and Dr. Grace Mitchell from Monash University addresses the use of roofwater and stormwater, and reuse of wastewater in urban areas.

Australia is a generally dry continent that experiences highly variable rainfall and strong population growth in coastal cities. The traditional approach to urban water supply is the development of water sources increasingly remote from urban areas with centralised treatment and distribution across large distances to end users. In contrast, it is often the case that more locally available rainwater, stormwater and wastewater are discharged, unused or used once, from our urban areas than the total volume of water imported, at considerable expense, from drying inland catchments into our cities. Given that most Australian cities are subject to water use restrictions and impending water shortages utilisation of these locally available water resources is important.

Importation of water to our cities from often distant catchments and the discharge of stormwater and wastewater from our cities to environments without utilisation of locally available water sources has profound economic, ecological and water security implications for Australian water futures. Chapter 6: Urban Water Harvesting and Reuse in Australian Runoff Quality provides essential advice on integrated water cycle management.

Chapter 6 discusses the traditional urban water cycle and presents alternative urban water cycle management strategies. It provides an overview of roofwater, stormwater and wastewater reuse techniques. The Chapter presents water quality aspects of roofwater, stormwater, wastewater and greywater, and, in a fit for purpose framework, highlights opportunities to utilise these local water sources.

The Chapter also provides guidance on selecting water reuse or harvesting techniques for a given site including financial and economic considerations. This includes matching water demands with available resources, analysis of public acceptance and social impacts. Chapter 6 also explores the impact of utilising locally available water resources on the provision and operation traditional infrastructure.

An overview of relevant guidelines and regulations that influence water harvesting and reuse strategies is also provided. This discussion includes current advice from health authorities, water utilities, local government and Australian Standards. The authors also acknowledge the contributions from Dr. Peter Breen, Professor George Kuczera, Tony McAlister, Bob Shipton, Claire Diaper and the other authors of Australian Runoff Quality.

*By Associate Professor Peter Coombes  
University of Newcastle*

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## Position Paper Climate Variability and Change

The Australian climate is noted for its marked variability of extremes. The possibility of rapidly occurring climate change due to both natural and anthropogenic factors necessitates the acknowledgement of the uncertainty of future climate and the development of contingency planning for adaptation to a changing climate. This paper aims to provide an Australian context to the current global concern over climate change. This paper also attempts to provide a more rational approach to managing water resources and hydrological issues given the historical variability of the Australian climate and the uncertainty of its future climate.

Marked climate variability is an intrinsic aspect of the climate in Australia. The probability of future climate variability and change represent key threats to many Australians. Current predictive insight into the future Australian climate is, at best, limited due to the complexity of climate processes. A common insurance industry practice is to define risk as the probability of occurrence multiplied by the consequence of that occurrence. If the scientific community cannot provide reliable predictions of future climate (and in particular climate extremities), then the focus must turn to reducing the consequences of possible changes in climate. In this light, engineers can best contribute by acknowledging the uncertainty of future climate and by incorporating known climate variability into current practices for drought and flood prone designs. Increasing climate tolerance should be an intuitively appealing response to predictive uncertainty.

The potential impacts of climate variability and change on Australia are wide-ranging and rigorous risk analysis of these threats requires analyses that cross traditional disciplinary boundaries. It is believed that a truly multi-disciplinary approach is needed to evaluate these threats. To this aim, mechanisms are required that integrate knowledge and provide a suitable forum for a more holistic approach to climate impacts. This may be best served by the organisation of specific conferences and workshops devoted to these aims, but with broad representation from relevant stakeholders. The Institution of Engineers, Australia, is ideally suited for coordinating such a role, as a key institutional body responsible for practical adaptive solutions to climate impacts. (See [http://www.arq.org.au/pos\\_papers/cvandc.html](http://www.arq.org.au/pos_papers/cvandc.html))

## Call for Papers AJWR

The Australian Journal of Water Resources provides a forum for Australian & International researchers and practitioners to publish high quality articles on issues related to and affecting the hydrology & water resources in Australia. Topics covered range from rainfall & rainfall modelling, climatic variability & change, assessment & management of water resources, catchment hydrology, environmental flows and hydraulics, open channel flow and hydraulic structures. Instructions for prospective authors can be found at:

[http://www.engaustr.com.au/transactions/pub\\_info1.asp](http://www.engaustr.com.au/transactions/pub_info1.asp)

## PAPERS in Australian Journal of Water Resources, 10/3, November 2006

### Invited lead paper

Water sensitive urban design – The journey thus far  
*THF Wong*

### Technical papers

Triple-bottom-line assessment of water sensitive design options in a greenfield residential area  
*AC Taylor and TD Fletcher*

Building the capacity of local government and industry professionals in sustainable urban water management  
*N Keath and J White*

Melbourne Water's stormwater quality offsets  
*S RossRakesh, M Francey and C Chesterfield*

Designing for sustainable water and nutrient outcomes in urban developments in Melbourne  
*A Grant, A Sharma, VG Mitchell, T Grant and F Pamminger*

Understanding the factors that influence domestic water consumption within Melbourne  
*JM Clarke and RR Brown*

Optimisation of mains trickle topup supply to rainwater tanks in an urban setting  
*ME Barry and PJ Coombes*

Research study into access to recycled water: impediments to recycled water investment  
*MR Martin and J Hill*

Energy and water use at a WSUD subdivision in Brisbane, Australia  
*EA Gardner, GE Millar, C Christiansen, AM Vieritz and H Chapman*

Baseflow water quality behaviour: implications for wetland performance monitoring  
*GD Taylor, TD Fletcher, THF Wong and HP Duncan*

An investigation of the potential to use street trees and their root zone soils to remove nitrogen from urban stormwater  
*L Denman, PF Breen and PB May*

Towards a general model of the impact of urban development on vegetation communities in wetlands  
*DM Blackham, PF Breen and RG Barrett*

Delivering the final product – establishing vegetated water sensitive urban design systems  
*S Leinster*

## Upcoming Events

### Rainwater and Urban Design 2007

Combining the 13th International Rainwater Catchment Systems and 5th International Water Sensitive Urban Design Conferences. The joint conferences will be held on **21 - 23 August 2007** at the Sheraton on the Park in **Sydney** and is hosted by the International Rainwater Catchment Systems Association (IRCSA), Engineers Australia, WSUD in the Sydney Region, The Stormwater Industry Association (SIA) and Bluescope Water.

For more information visit: [www.rainwater2007.com](http://www.rainwater2007.com)

### Water Down Under 2008

The Organising Committee of Water Down Under 2008 invites all professionals with an interest in hydrology, water resources and the environment to join colleagues in Adelaide, South Australia **15-18 April 2008**.

The proposed Conference themes and sub-themes are:

- Climate, Rainfall and Surface Water Variability
- Hydrological Modelling, Data and Forecasting
- Water Management and Sustainability
- National and International Water Issues and Case Studies
- Groundwater Systems

The Conference will be held at the Adelaide Convention Centre. For more information visit:

<http://www.waterdownunder2008.com>

### Environmental & Water Resources Congress 2007

**May 15-19, 2007**, Tampa, Florida

This ASCE/EWRI Congress has become an important annual opportunity for the best minds at work in water and environmental fields to convene and focus on topics of the day. For more information see

<http://content.asce.org/conferences/ewri2007/index.html>

**18<sup>th</sup> – 21<sup>st</sup> December 2006**: Australian Workshop on Fluid Mechanics – A complex Dynamical system. Held at the University of Melbourne, see:

<http://ltrac.eng.monash.edu.au/AWFM-06>

**10<sup>th</sup> – 12<sup>th</sup> September 2007**: 2007 Hydraulic Measurements and Experimental Methods Conference. Held at Lake Placid, NY, USA. See:

<http://www.asce.org/conferences/HMEM07/>

Sydney Division Water Panel:

<http://www.sydneywaterpanel.org.au/>

Queensland Division Water Panel:

<http://qld.ieaust.org.au/jetspeed/?group=water>

West Australian Division Water Panel:

<http://www.wa.engineersaustralia.org.au/groups/hydrology.html>

Victorian Water Engineering Branch:

<http://www.vic.ieaust.org.au/groups/branches08.html>

Hydrological Society of South Australia:

<http://www.hydsoc.org/>

## Links