

# iah news

Newsletter of the Australian Chapter International Association of Hydrogeologists

# March 2016 to June 2016 Volume 32, No. 2



On the cover:

# Australian National University Research School of Earth Sciences workers collecting groundwater samples from an irrigation bore near Morundah, NSW

Photograph by Kyle Horner.

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# International Association of Hydrogeologists Australian National Chapter

The International Association of Hydrogeologists is a professional association for those within disciplines related to groundwater, its occurrence, utilisation, testing and management. IAH is a scientific an educational organisation that is truly international, and was established to foster closer ties, cooperation and information exchange related to the study of groundwater. IAH is non-government and non-profit and has over 4000 members internationally from around 120 countries. The Association is affiliated with the International Union of Geological Sciences (IUGS), and was founded during the 20<sup>th</sup> International Geological Congress in 1956. By its statutes the IAH is an association of individuals and corporate members, and not a federation of national committees. National groups do, however, organise local meetings and other activities. A proportion of the national committee membership goes to the local organisation to support these activities, the remainder to the international body. The country of the international secretariat is changed every several years. The IAH publishes Hydrogeology Journal, various workshop and conference proceedings and an international newsletter.

The main objectives of the IAH are to promote international and national cooperation between involved scientists and engineers; sponsor international and national technical/management meetings and symposia on hydrogeology; publish hydrogeological reports, papers and maps; establish investigation commissions and working groups to report on special topics; encourage the international application of relevant approaches and techniques for the benefit of the hydrological and human environment.

Our national chapter was founded in 1983 and is one of the most active. Activities tend to be organised locally within each state and territory, but national activities also occur. Each state body has its own meetings, usually monthly. Conferences are held in Australia around every two to three years, and seminars on a more frequent basis.

Membership Requirements: IAH will accept as individual members anyone directly or indirectly engaged in study or research on, or management of water in its various forms related to hydrogeology, if sponsored by two members in good standing. Companies and research organisations can apply for corporate membership. The current membership categories and annual subscriptions for 2015 (see www.iah.org.au) are:

•	Member	\$140
•	Online member	\$120
•	Student	\$55 (full time students)
•	Online Student Member	\$35
•	Corporate member	\$790
•	Partial sponsor	\$155
•	Full sponsor	\$190
•	Retired	\$75

We are pleased to announce that the student membership fees have been reduced by \$20 in 2015 as an added incentive for full-time students to become IAH members. In addition, we have maintained the Member and Online Member fees at their current level, despite a rise in the IAH International fees for these membership categories for 2015.

Membership of this professional association is tax deductible in Australia, and individual members are entitled to use 'MIAH' (Member of the International Association of Hydrogeologists) after their name.

# FROM THE PRESIDENT

Welcome to the IAH Newsletter!

The IAH provides many opportunities to share knowledge.

This year's Darcy Lecturer, **Dr Ty Ferré** will be presenting **Seeing Things Differently: Rethinking the Relationship Between Data, Models, and Decision-Making** around Australia in August this year.

The IAH is also celebrating its 60th Anniversary at the international congress on Montpellier, France in September. The theme is "Groundwater and Society: 60 years of IAH".

In October, **Dr Rebecca Nelson** commences her joint NCGRT/IAH distinguished lecture tour, presenting **Regulating the cumulative impacts of groundwater withdrawals: Australia and further afield.** The Darcy and Distinguished Lecturer series are integrated into the broader set of local seminars offered by many of our state branches.

Looking further afield, dates have been announced for the next IAH/NCGRT Australiasian Groundwater Conference 11–13 July 2017 at the University of NSW in Sydney. The conference theme is **Groundwater Futures: Science to Policy**. This will be a great opportunity to showcase the come together and share our leading thinking in the management of groundwater resources.

The opportunities that seminars, conferences and congresses bring are not just in the knowledge shared, but in the opportunity to discuss issues with your peers. Whether a local branch meeting or an international conference, I encourage all members to get involved!

Have fun planning your "learning and networking" opportunities!

Chris McAuley

President - Australian Chapter, IAH

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# MEMBERSHIP

The 2016 membership year has seen 567 members across the Australian Chapter renew their memberships. Members benefit from being part of a global community of groundwater practitioners and professionals. Networking and linking with a wide range of individuals, organisations and institutions is becoming more important as economic conditions tighten.

Check your state chapter events page on the IAH website to keep up to date with events and meetings. Don't forget if you are an IAH member you will receive a significant discount off the 2017 Australasian Groundwater Conference in Sydney. Keep an eye out for the opening of early bird registrations.



A snapshot of where our Australian members are from:

IAH membership spans a calendar year, please note 2016 Membership renewals will close in October.

Any inquiries regarding the memberships can be emailed to the IAH membership team membership@iah.org.au.

#### **Current/Lapsed Membership Renewal Process**

As a repeat from a previous issue of the newsletter, here's how an inactive member can become active again.

Note that if you were a member in 2015, and <u>did not receive</u> a membership renewal email in January 2016, some common issues are listed below:

- The email was intercepted by your **spam filter**. Check your spam folder or quarantine archive for IAH emails received on or about 15 January 2016, and consider adding the IAH sender details to your safe list.
- Your **email details changed** in the past year (for example, change of employment) and you have not yet updated your email address with IAH. You can update your details at any time through the iah.org.au website, by selecting "My Account" under "Membership", and editing account details.
- **Corporate "firewalls"** at some companies block all suspected incoming spam emails (IAH emails may be classified as "marketing" emails by some systems). Speak with your IT administrator about adding IAH to your corporate safe list, or switch to a personal email account.
- Your membership has **lapsed for more than a year** without renewal, and your details have been removed from our database. You can still use the new membership system to renew your lapsed membership.

Contact membership@iah.org.au with any questions.

Log into <u>your account page</u> on the IAH website (<u>https://www.iah.org.au/membership/my-account/</u>).

Your username is the email address the email was sent to (which should be the email address you have registered with IAH). If you have forgotten your password, you can reset it using the "Lost Your Password" link at the bottom of the page using the email address the email was sent to.

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Once logged in, you will see your account Dashboard.

Under the **My Memberships** section, click on the link to sign up for a new subscription. This will direct you to a new page where you can select your desired membership category from the options. Details of each membership type can be found at the bottom of the registration page. Once you have chosen your desired category, follow the prompts to finish your membership renewal.



If you have any questions, please do not hesitate to contact the membership team at <a href="mailto:membership@iah.org.au">membership@iah.org.au</a>.

# IAH AUSTRALIA EXECUTIVE

President	Chris McAuley	drhydronicus@gmail.com
Vice-President	Dr Lange Jorstad	ljorstad@geosyntec.com
Treasurer	Ron Colman	Ron.Colman@royhill.com.au
Secretary	Dr Kyle Horner	Kyle.Horner@epa.nsw.gov.au
Past President	Dr Rick Evans	Richard.Evans2@jacobs.com
Membership Secretary and Web Administration	Fiona Adamson	secretariat@iah.org.au
Newsletter Champion	Dr Ben Rotter	Ben.Rotter@coffey.com

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FINANCE UPDATE

This report of the IAH National Committee finances covers the period 3/11/2015 to 30/06/2016.

Term Deposits as of 30/06/16	\$99,078.02
Cash Account as of 30/06/16	\$70,813.92
Total Cash Balance as of 30/06/16	\$169,891.94

Payment of \$52,599.35 made to IAH UK Head Office for 2016 fees.

Ron Colmon

Signature:

Ron Colman, IAH National Treasurer

Date: 22/07/16

# NATIONAL CONFERENCES AND EVENTS

AUSTRALIA AUSTRALIA	REFOR	Sedimentary basins <ul> <li>Dual overlapping basins</li> <li>Overlapping basins</li> <li>Single basin</li> <li>Geothermal project</li> <li>Brown coal mine</li> <li>Black coal mine</li> <li>Mineral sands or extractive</li> <li>Proven CSG basins</li> <li>High yield aquifers</li> <li>Image: Rawling &amp; Sandiford (2013)</li> </ul>
Date	Location	Register
18 October	Melbourne	NCGRT
20 October	Hobart	NCGRT
26 October	Perth	NCGRT
03 November	Brisbane	NCGRT
10 November	Canberra	NCGRT
10 November	Sydney	NCGRT
30 November	Adelaide	NCGRT
01 December	Darwin	NCGRT

Event dates and registration information for the 2016 IAH/NCGRT Distinguished Lecture can be found on the NCGRT website.

The regulation of groundwater extraction has shifted dramatically through an intense era of intense water reforms spanning three decades. A key outstanding issue is controlling withdrawals with an eye to their cumulative impacts on groundwater resources and dependent systems. Such control is complicated not just by the incremental additive effects of many small withdrawals, but also by interactive and synergistic effects. This complexity is intensified further by data paucity, potentially significant time lags, and simultaneous background changes to natural systems, such as those caused by climate change.

Much of the attention to regulating cumulative impacts has focused on ensuring that traditionally unregulated types of groundwater withdrawals are controlled or at least monitored, and on special-purpose regulation of clusters of withdrawal activities, as in coal seam gas extraction. This talk suggests that a broader view is necessary and possible, inspired by national, state and interstate water law and policy, as well as comparative overseas experience. This broader view would encompass a wide and diverse set of regulatory and non-regulatory mechanisms for dealing with cumulative impacts, where those impacts are understood to include a broad scope of impacting activities and complex, interconnected receptor systems.



Join us for the 2017 biennial Australasian Groundwater Conference.

The theme for the conference program will be **Groundwater Futures: Science to Practice**.

An exciting three-day event is being planned that will enable delegates to examine the multi-dimensional challenges affecting the sustainable development of the regions groundwater resources.

Engaging panels, informative presentations, exhibitions and networking opportunities will engage the over 300 delegates from Australasia's groundwater research, industry, and management and policy organisations.

#### 2017 AGC Abstract themes:

- Emerging Groundwater Initiatives
- Groundwater Science and Future Innovations
- Interdisciplinary Groundwater Problems
- Groundwater Resources and Climate Change
- Energy and Groundwater
- Groundwater Quality and Human Health

#### Abstracts will open November 1 2016 and close March 1 2017.

Keynote, plenary presentations and panel sessions will include climate change and groundwater resource challenges, energy futures, social license to operate and future directions and innovation in groundwater.

#### Stay tuned for the launch of the AGC2017 website.

# **River Modelling for Decision Makers**

IWA World Water Congress Workshop

Modelling is fundamental to achieving sustainable restoration and management of river basins. This workshop is aimed at water resources decision-makers, particularly in policy, technical and management roles. It will address current best practice in river models, problems, solutions. Participants will gain understanding on best use of models especially regarding predictive analyses.

#### **Course Details**

When: Sun 09 Oct 16 - Sun 09 Oct 2016 Where: Brisbane Convention & Exhibition Centre

#### **Course Content**

#### When

- Date: Sunday 9th October 2016
- Time: 9am 3.30pm

What's Included: Workshop Notes, Morning Tea, Lunch.

Where: Brisbane Convention & Exhibition Centre

#### Who should attend?

People working in....

- Private, public and consulting agencies
- Local, state and commonwealth Government agencies
- Engineering, environment, agriculture, farming, irrigation, education, research and mining sectors
- Water authorities and power utilities

#### What will we learn?

- Understand the range of contemporary river models available
- Appreciate the strengths and limitations of river models
- Find out how much you really need to know
- Learn how to get the model you really need
- Work out what you need e.g. specialist staff, data, consultants
- Learn how to assess model results

#### What will be covered?

- Why are river models needed for river management?
- Which are the principal river model applications?
- What do managers need to know about models?
- Best practice river modelling
- Scenario planning
- Case studies the Manager's model for the River Murray
- How to select a fit-for-purpose model
- How to get a model running in your organisation
- What data is needed
- How to interpret model results
- Modelling teams vs external consultants
- Flood damage reduction planning & analysis
- Stochastic streamflow generation program
- Watershed hydrology
- River hydraulics

#### Presenters

Tony Weber will lead this Workshop. Tony is the National Leader, Water Modelling, at Alluvium. Joining Tony are:

#### Tony Weber, <u>Alluvium</u>

Tony is one of Australia's leading practitioners in the catchment modelling and water quality field. Prior to joining Alluvium he worked at BMT WBM for 13 years where he led the water quality discipline across their Australian operations. Tony has over 27 years' experience in the water industry delivering a range of catchment modelling, water sensitive urban design, integrated water management, water quality and stormwater management projects. Tony was also a member of the MUSIC urban stormwater model development team, and is a leading proponent of the Source modelling framework in Australia. Tony was awarded the 2012 Fellowship for the Modelling and Simulation Society of Aust and NZ. In 2009, Tony was invited to become a Visiting Fellow at the iCAM unit, part of the Fenner School in ANU and is a member of the Urban Water and Catchment Source Scientific Expert Panels for Healthy Waterways. He was also nominated as one of the top 10 Water Leaders in Australia by WME Magazine in 2013.

#### Geoff Podger, CSIRO

Geoff Podger: Senior River Modeller and Principal Research Scientist at CSIRO Geoff has significant experience in hydraulic and hydrologic modelling. With 22 years experience in hydraulic and hydrologic modelling, Geoff also has nine years experience in coastal engineering and 13 years experience in river basin management and planning. Geoff has been involved in the implementation and development of numerous hydraulic and hydrologic computer models and is the principal author for the Integrated Quantity and Quality Model (IQQM). Geoff was responsible for the implementation of the Mekong river basin model from Chiang Saen to the Mekong Delta. This project is part of the Mekong River Commission's Water Utilisation Program Part A (WUPA) funded by World Bank. Geoff Podger coordinated the modification of around 70 different river models, many developed by Queensland, New South Wales, Victoria and South Australia, for integration into a dynamic model of the entire Murray-Darling Basin. Geoff plays a significant part in developing the next generation of Australian hydrological models

#### Michel Raymond, Seqwater

Michel is the Operations Engineer at Seqwater. Michel has an extensive career in a wide range of water engineering roles including: Senior Principal Engineer: URS Corporation, Senior Water Engineer: Kinhill Engineers, Water Engineer: CMPS&F Engineers, Water Engineer: Cameron McNamara.

#### Pradeep Sharma, MDBA

Pradeep is Senior Director Water Resources with MDBA and has over 30 years experience in water resources planning and management in Australia and India. The key area of interest is application of systems engineering techniques to water resources issues. He has played a significant role in modelling studies for various policy developments and implementation of a number of key initiatives in the Murray Darling Basin such as Salinity and Drainage Strategy, Basin Salinity Management Strategy, setting up of Murray models for Cap implementation, The Living Murray and development of the Basin Plan. Prior to joining the MDBA he was project manager for the IQQM software development and its implementation to the river systems of NSW. In India, he was involved for more than 10 years in projects for application of optimisation and simulation methods for Decision Support Systems development, reservoir operations, river basin planning and environmental impact assessment of water resources projects.

# **FROM THE BRANCHES**

# **NEW SOUTH WALES**

#### IAH NEW SOUTH WALES BRANCH

2016 Committee:

Chair	Katarina David	(UNSW)
Presentations Secretary and External Communications	Graham Hawkes	(AECOM)
Treasurer	Tingting Liu	(Hydrosimulations)
Secretary	Sean Cassidy	(EMM)
Student and Young Professional Coordinator	Dr Anna Greve	(Eco Logical Australia)
Meeting Facilitator and Internal Communications	Sean Daykin	(WSP Parsons Brinkerhoff)
Newsletter Champion	Dr Ben Rotter	(Coffey)
NSW Sponsorship Champion	Jason Carr	(Jacobs)
Web Champion	Doug Anderson	(Water Research Laboratory, UNSW)
International Sponsorship Champion	Dr Jay Punthakey	(Ecoseal)
University Liaison	Dr Bill Milne-Home	(UTS)
Members Champion	Ellen Kwantes	(WSP Parsons Brinkerhoff)
National Vice President	Dr Lange Jorstad	(Geosyntec)
International Vice President - Australasia	Dr Wendy Timms	(UNSW)
Committee Support	Mark Peterson	(ANSTO)

# Local News

Our regular branch meetings continue to be held at the office of WSP Parsons Brinckerhoff (WSP) located in the Sydney CBD. Thank you to WSP for supplying the convenient central venue, first class facilities, and food and drinks.

IAH NSW branch provides events that span all stages of a career in hydrogeology. Our Student Night event provides a platform for students, and our Young Professional Award recognises young professionals. For mid to late career hydrogeologists, a forum is provided for technical presentations. Highly experienced professionals join our panel during Elders Night, with esteemed NSW hydrogeologists recognised by the receiving of the Woolley Award at or near retirement.

# **NSW Sponsors**

IAH NSW gratefully acknowledges the contributions of its 2015/16 sponsors. Details of sponsors can be found on the website at <u>http://www.iah.org.au/about/new-south-wales/nsw/-branch-sponsors</u>.

Our Gold Sponsors are AECOM, Earth Science Information Systems, EMGA Mitchell McLennan, Geosyntec, Jacobs, NSW Environment Protection Authority, Parsons Brinckerhoff, WSP, and University of NSW Water Research Laboratory.



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Our Silver Sponsors are Douglas Partners, C. M. Jewell & Associates, Kalf and Associates, and Hydrosimulations.









# **Recent Events**

# 20 June 2016 – The hydro-geomorphic Structure and Function of Temperate Highland Peat Swamps on Sandstone – Kirsten Cowley

Kirsten Cowley is a PhD candidate based in the Department of Environmental Science at Macquarie University, NSW.

Kirsten presented on Temperate Highland Peat Swamps on Sandstone, which are listed as endangered ecological ecosystems under both State and Commonwealth legislation due to their restricted distribution, and threats posed to them from mining and urbanisation.

These swamps are sediment accumulation zones, high in organic matter. They function as water and carbon storage systems and are thought to make important contributions to the base flows of lower catchment watercourses. The high carbon content of swamp sediments also makes them important carbon sequestration systems.

Preliminary isotope results indicate that many of these swamps maintain some connectivity with the underlying fractured sandstone aquifers, making these systems important conduits for groundwater-surface water exchange. This has significant implications for proposed long wall mining and coal seam gas activities, particularly within drinking water catchments where groundwater, as well as swamp waters, have the capacity to contribute significant volumes of water to drinking water supplies.

### 10 May 2016 – Elders Night

The annual Elders Night saw Fabio Carosone, Ray Hatley and Dr Len Drury, senior members from our local groundwater profession, offer their collective wisdom in a panel forum. Questions such as early influences, embarrassing moments and inspirations along their career paths were fielded.

These senior professionals shared memorable experiences from their careers with the audience, provided insight into lessons learnt and challenges overcome, and discussed the changes they had seen in the industry and the future of hydrogeology and groundwater engineering. The night was chaired by Graham Hawkes and Tingting Liu.

In particular, Fabio told of his early influences in Italy and the challenges of sampling groundwater in the Dolomites in a karst environment. Len explained the many advantages and disadvantages of working internationally and developing lifesaving infrastructure for developing nations while balancing family life. Ray reminded us of the importance of taking the time to publish important project findings which adds to the profession and is also personally satisfying.

At the beginning of the night Fabbio Carosone was awarded this this year's recipient of the Woolley Award. The Woolley Award is presented annually to a well-recognised, prominent NSW hydrogeologist that is at or near retirement and has made significant contributions to the promotion of hydrogeology in NSW. Frank Mohen, a former colleague of Fabio's introduced Fabio and provided a short summary of his career. Frank told many stories of Fabio's various hydrogeological investigations from Indonesia to the Australian outback describing him throughout as a true gentleman who managed to wear an ironed shirt in the field.



The 2016 Elders Panel (left to right): Len Drury, Fabio Carosone and Ray Hatley Fabio Carosone receives the Woolley Award from Frank Mohen and Graham Hawkes

# **Upcoming Events**

### 9 August 2016 – Seeing Things Differently: Rethinking the Relationship Between Data, Models, and Decision-Making - Dr. Ty Ferré, University of Arizona

Practicing hydrogeologists construct detailed numerical models to predict the responses of hydrologic systems to natural and applied stresses. These predictions form the basis for decisions that must balance optimal use of resources and ecosystem support. These decisions typically involve multiple interested parties with strongly differing priorities for water allocation. Despite the importance that stakeholders place on water resources, budgets for hydrogeologic studies are often limited. As a result, the hydrologic models used for decision support are severely data limited. This requires improved methods to identify the optimal set of observations to collect and to use modelpredictions to support robust decision-making under considerable uncertainty.

Dr. Ferré will build from the basic concepts of decision science to present concepts and recent developments in optimal design of hydrogeologic monitoring networks. He will also discuss how hydrogeologic models can be used for decision support under uncertainty. Finally, he will show that focusing hydrologic analysis on the specific, practical problems of interest can guide optimal measurement selection, advance hydrologic science, and improve the integration of science into economic and policy decisions.

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# 12 July 2016 – Hydrogeochemical and ecological processes in the hyporheic zone and the response to groundwater drawdown – Dr Helen Rutlidge

Dr Helen Rutlidge is a Post Doctoral Fellow working in The Connected Waters Initiative (CWI) Research Centre, a joint initiative between University of NSW (UNSW) School of Civil and Environmental Engineering and UNSW School of Biological Earth and Environmental Sciences.

Dr Rutlidge will present research carried out as part of a larger project, which focusses on addressing ecohydrological research questions in relation to coal seam gas extraction and coal mining for the Federal Department of Environment, Office of Water Science.

One aspect of this project is hyporheic exchange and biogeochemical processes, which includes organic carbon cycling, nutrient cycling, redox biogeochemical and microbial processes and the effect on ecological conditions for hyporheos and stygofauna.

This presentation will focus on one of the study sites at Maules Creek, NSW, and the organic matter content and redox chemistry in the hyporheic zone of this groundwater fed stream. Perennial hyporheic flow is supported by localised inputs of regional groundwater, which is oxygenated and low in organic matter. Inputs of oxygenated groundwater influence the redox chemistry and organic matter processing in upwelling hyporheic zones, which in turn influences stream ecology including the habitat for hyporheic fauna. Thus, activities causing drawdown in groundwater fed streams may impact redox chemistry, organic matter processing and stream ecology.

# **Other News**

#### Student Sponsorship

NSW IAH is jointly sponsoring two MSc students from Nepal, **Jinita Shakya** and **Rasila Koirala**, with National IAH for the duration of their MSc theses.

The students are based in the Central Department of Geology at Tribhuvan University, Kirtipur, Kathmandu, Nepal.

**Jinita**'s study is focussed on the groundwater quality, recharge and discharge in the Sankhu area. Groundwater conditions vary according to the topography and soil type of the area. In the Sankhu area, a single groundwater well typically provides a potable water source for four or five families. Groundwater quality is therefore of importance to human health.

Janita is also interested in the recharge and discharge mechanisms of the Salinadi River, a famous river of the Sankhu area. Due to poor historical management, the river has depleted as a water resource. Janita intends to work with the local community to improve the maintenance of the river.

**Rasila** has a keen interest in rainwater recharge potential in the northern Kathmandu area.

The Kathmandu Valley is located on the sediments of a lake that once filled the valley. These sediments serve as relatively productive aquifers. The upper, unconfined section of the aquifer, although it has become increasingly polluted in some locations, serves as a primary source of water for many local shallow wells. This water is used mostly for nonconsumptive uses such as bathing, washing and gardening. The water in nearly all wells shows high counts of faecal coliform bacteria, especially during the monsoon season. The city's leaky sewer system combined with the presence of numerous areas that are not served by any sewer system and the absence of effective treatment plants contributes to the pollution.

Rainfall is a principal source of groundwater recharge - shallow, unconfined aquifers are recharged every monsoon, although deeper aquifers are not. To develop groundwater resources for the long term, the relative rate of recharge for different aquifers needs to be understood.

The goal of Rasila's work is to better understand these aquifer systems, and the potential for them to provide sustainable and clean water supply.

# AUSTRALIAN CAPITAL TERRITORY

### IAH AUSTRALIAN CAPITAL TERRITORY BRANCH

2016 Committee:

Chair	Lucy Lytton	(Geoscience Australia)
Vice-Chair / Secretary	Scott Lawson	(Department of the Environment)
Treasurer	Anne Reisz	(Department of the Environment)
Events Committee	Tim Evans	
	Tim Ransley	(Geoscience Australia)
	Chris Harris-Pascal	
	Peter Hyde	
Communications	Stephen Hostetler	(Murray Darling Basin Authority) (Geoscience Australia)
Membership Champion	Tim Evans	(Geoscience Australia)

# Local News

# Water Management in the Western US – An Australian perspective Dr Tony Mcleod, 22 June 2016

Dr Tony McLeod (MDBA) presented on the historical connections between water management laws in Australia and the western US (and Mexico) dating from the 1885 tour of the Victorian Royal Commission on Water Supply headed by Alfred Deakin. He also discussed the current challenges facing the Colorado River Basin, and the way Indigenous water rights are addressed in the US. Tony presentation was based on his 2014 visit to the US after he was awarded a Fulbright Fellowship. He spent 4 months at the University of Colorado Boulder on researching water management issues in the western United States with particular reference to the comparisons with the Murray-Darling Basin. The presentation was very well received with the attendees asking many questions about water management in the US.

# The Broken Hill Managed Aquifer Recharge (BHMAR) project: approaches taken and lessons learnt - Dr Ross Brodie, Principal Hydrogeologist, Geoscience Australia, Tuesday 3 May 2016

Joint event with the Canberra Hydrological Society at the Fenner School of Environment and Society, ANU.

As part of a broader water savings strategy for the Murray-Darling Basin, Geoscience Australia was tasked, through the Broken Hill Managed Aquifer Recharge (BHMAR) project, to identify and assess aquifer storage and groundwater extraction options in the

Darling River floodplain of western New South Wales. Due to the lack of pre-existing information, the project involved significant data acquisition. This included approaches not routinely used in Australian hydrogeological investigations, such as airborne electromagnetics (AEM), sonic coring, pore fluid analysis, downhole nuclear magnetic resonance (NMR) logging and river bathymetry/sediment surveys. It was the interpretation, integration and re-evaluation of these cross-disciplinary datasets during project phases that drove fundamental shifts in the conceptual understanding of groundwater processes in the study area. This talk provided an overview of the approaches taken, of the challenges and opportunities in integrating these datasets and of the important increment in understanding of the groundwater system provided by each additional dataset.

# VICTORIA IAH VICTORIA BRANCH

Alan Wade	(Aquade)
Ben Hall	(Eartheon)
Tara Smith	(Jacobs)
Anthony Brinkley	(Jacobs)
Katy Kijek	(Port of Melbourne Authority)
Heath Pawley	(Golder Associates)
Alexis Valenza	(Valenza Engineering)
Matt Currell	RMIT
Anne Northway	EPA
Riki Gresswell	CDM Smith
Ben Moore	CFA
Lynton Bourne	Noel Arnold & Associates
Mike Hoban	DELWP
	Alan Wade Ben Hall Tara Smith Anthony Brinkley Katy Kijek Heath Pawley Alexis Valenza Matt Currell Anne Northway Riki Gresswell Ben Moore Lynton Bourne

# Local News

Our regular branch meetings continue to be held alternatively at the Melbourne RMIT City Campus and at Jacobs Melbourne Branch. Thank you to RMIT and Jacobs for supplying the convenient central venues and first class facilities.

# Committee Meeting

The next VIC Chapter IAH committee meeting will be held on the 28<sup>th</sup> July 2016 at the Melbourne RMIT City Campus.

# Talks

We have a pretty full year ahead with several talks covering a large range of topics. A few highlights below.

# 19 April 2016, AECOM, Melbourne. Meeting Melbourne's Future Demand for Water Using Aquifer Storage and Recovery – developing an Integrated Water Cycle Management (IWCM) Strategy which includes development of ASR schemes to store recycled water and storm water

The talk was presented by Matt Hudson, Senior Hydrogeologist at City West Water. City West Water is one of three Victorian Government owned retail water businesses in metropolitan Melbourne, providing drinking water, sewerage, trade

waste and recycled water services to customers in Melbourne's central business district, inner and western suburbs.

City West Water (CWW) is investigating the viability of alternative water storage through managed aquifer recharge (MAR) to assist in long term planning options supporting alternative water supply.



10 May 2016, RMIT University Melbourne Campus. Vegetation and Groundwater Interaction

The talk was presented by Dr. John Webb from Latrobe University. John Webb holds a PhD from the University of Queensland (1982). He has worked at La Trobe University since 1986, teaching first sedimentology, then environmental geology, including groundwater (hydrogeochemistry and hydrogeology, climate and landscape change, and remote sensing. He undertakes research on a variety of topics, including groundwater resources and chemistry, with current research projects on the influence of climate and land-use change on groundwater funded through the Victorian Department of Primary Industries and the National Centre for Groundwater Research and Training. Other research projects focus on improving treatment procedures for acid mine drainage and understanding the formation of acid sulphate soils. His geomorphological interests center on karst, as well as tectonic geomorphology and the interaction between landscape evolution and human settlement, and he has worked on the geomorphology of archaeological sites in Australia, China, Papua New Guinea and New Caledonia. He has published over 100 papers on these topics, as well as supervising 31 PhD students, 4 MSc students and 102 Honours students. He has acted as a consultant on groundwater, contaminated site management and geomorphology of archaeological sites, including as an expert witness.

#### Abstract

Plants suck up soil water and release it as water vapour to the atmosphere, and in so doing, they reduce the amount of recharge infiltrating through the soil and change its composition. Our studies on groundwater in western Victoria have shown that transpiration removes much more infiltration than evaporation. Furthermore, the preferential plant uptake of particular species (K, S, C, Ca) is largely responsible for changing the composition of infiltrating rainfall to that of groundwater (which has ion/chloride ratios typical of seawater). The species extracted by plants are not recycled by decay of organic matter, and are probably removed largely by fire. Rock-water interaction in silicate aquifers has minimal impact on groundwater composition.

The blue gum plantations in western Victoria have reduced groundwater recharge, as expected from the replacement of shallow-rooted pasture with deeprooted trees. However, in some instances there has been no decrease in stream flow, where down-slope orientation of the tree rows increases surface runoff.

# Coming Talks

The following talks will be given over the 3<sup>rd</sup> Quarter 2016. Stay tune on the IAH VIC portal <u>https://www.iah.org.au/events/victoria/</u>

Seeing things differently: rethinking the relationship between Data and Models

By Dr Ty Ferre, from the Department of Hydrology and Water Resources, University of Arizona (Monday 15 August, 5:30 for a 6pm start Darcy Lecture, Golder Associates, Wurundjeri Room, Level 4, Building 7, Botannica Corporate Park, 570 – 588 Swan Street, Richmond)

Student Presentations

Students, RMIT City Campus, September (date TBC)

# WESTERN AUSTRALIA

#### IAH WESTERN AUSTRALIA BRANCH

Ian Brandes de Roos
Mal McGivern
Carsten Kraut
Peter de Broekert
Geoff Pettifer
Grant Bolton
Pauline Amez-Droz
Rachel Hamilton
Mariajose Romero-Segura
John Enkelmann
Alex Renz
Adriaan Haasbroek
Ryan Vogwill

# Local News

A reminder for our WA members: the 2016 technical talk series is now held at Spacecubed, a new shared-work facility at 45 St Georges Terrace. These events are kindly sponsored by **Boart Longyear** and have proved to be a popular bar, meeting place and technical forum. They're on the 4<sup>th</sup> Wednesday of the month (except August) from 5.30.



# Venue for the 2016 IAH WA technical talk series - Spacecubed

# Recent meetings

Date	Description
	Water Resource Management at Roy Hill Mine – from Planning to Reality – <b>Ron Colman</b>
24-Feb	Ron kicked off the 2016 program with a presentation that covered all aspects of water resource management planning for Western Australia's Roy Hill project. It's been one of our best attended events to date.
	Depressurising 15 km of Coal Mine Low Wall in Kalimantan, Indonesia – John Waterhouse
23-Mar	John's presentation encompassed his long association with the Tutupan Coal Mine in south east Kalimantan. It's the second largest coal mine in Indonesia and has experienced rapid and accelerating development. John outlined the challenging geotechnical issues he faced and the solutions he implemented.
27-Apr	Groundwater development in the humanitarian and developmental context – <b>Jay Matta</b> In one of our best received presentations, Jay outlined his work with the Red Cross and associated organisations. Remote-community water supply projects can be rewarding and challenging and Jay outlined how practitioners need to combine hydrogeology skills with a community's unique social and environmental setting. He addressed some of the common issues and challenges faced when developing groundwater resources through examples from Somalia, Nepal, Bangladesh, Philippines, Myanmar, DPRK and the Pacific.
25-May	What do you do when things go pear-shaped at a large petrochemical facility? – a case study from Saudi Arabia – <b>Jan Vermaak</b> Jan's presentation outlined that contaminant hydrogeology is usually reactive – a spill occurs, a remediation programme is implemented. Jan presented an active approach whereby a numerical modelling assessment was undertaken to assess of hypothetical hydrocarbon spills, subsurface transport, fates and emergency remediation measures on a reclaimed island surrounded by the Persian Gulf. The investigation identified appropriate remediation measures to prevent rapid-spreading LNAPL and developed priority-timeframes for longer-acting groundwater and soil contamination issues.

	Beenyup Stage 1 Groundwater Replenishment Scheme – Simon Higginson
22-Jun	Simon gave a well-received presentation outlining the Beenyup replenishment trial and future projects. The Water Corporation's three- year groundwater replenishment (GWR) trial at a metropolitan wastewater treatment plant assessed the technical, social and regulatory feasibility of GWR. Simon gave an overview of the advanced water treatment processes and management systems, borefield designs and aquifer characterisation processes.

# Upcoming events

Date	Description
	Aquifer Storage and Recovery for groundwater control at low-lying urban areas on the Swan Coastal Plain – Carl Davies
	There are two primary water related issues facing urban developers on the Swan Coastal Plain. The first is the significant volume and cost of fill required in shallow watertable areas; the second is the requirement for irrigation water supply in over-allocated areas. Field investigations have been undertaken at two urban developments on the Swan Coastal Plain to monitor groundwater level responses between subsoil drainage lines, the results of which can be used to inform fill requirements. Subsoil drain outflow volumes and quality are also being monitored to assess the viability of utilising subsurface drainage water as an alternative water supply.
27-Jul	Groundwater level monitoring over two annual peaks has shown mounding of ~0.5 to 0.9m above the road reserve subsoil drain levels, with a rapid groundwater rise and fall in response to rainfall. Subsoil drains have been flowing throughout the year at both sites, which shows the promise of using subsoil flow for irrigation in the drier months, without the requirement of wet season storage and dry season re-use. The water is generally suitable for direct irrigation except for elevated iron and the presence of a visible iron floc which will require treatment prior to use. Subsoil flow in the wetter months is expected to provide a feasible supply via Aquifer Storage and Recovery (ASR) due to volumes that significantly exceed annual irrigation demand. The cost for implementing the ASR system will be considerably higher than the direct irrigation option, both in terms of capital outlay and ongoing maintenance; however ASR provides more surety in terms of ongoing water supply. Excess water supply could potentially be on-sold to nearby users to offset the costs of the ASR system, which is expected to include both installation and treatment to minimise clogging and ensure the water does not compromise the environmental and human health values of the target aquifer.
31-Aug	Darcy Lecture, Ty Ferré

28-Sep	IAH social night
	Stay tuned for more information regarding this exciting event
26-Oct	Distinguished lecturer, Rebecca Nelson
23-Nov	AGM & student night

# **SOUTH AUSTRALIA**

### IAH SOUTH AUSTRALIA BRANCH

2016 Committee:

President	Steve Barnett
Vice President	Neil Power
Membership champion	Tavis Kleinig
Committee member	Russel Martin
Web master/mistress	Fiona Adamson
Modelling Forum	Juliet Wood

# **Recent Events**

# 12 May 2016 - Symposium on "Groundwater : supporting the Adelaide Region towards 2100"

A symposium on the topic, Groundwater supporting the Adelaide Region towards 2100, was hosted by the International Association of Hydrogeologists (SA) and the Hydrological Society of SA, at Flinders University on 12 May 2016.

The symposium was attended by more than 40 representatives from a range of research institutes and government agencies, including DEWNR, Goyder Institute, EPA, CSIRO and the NCGRT.

DEWNR hydrogeologists and water policy officers presented an overview of the current condition of the groundwater resources beneath the Adelaide Region, and provided the latest information about the Central Adelaide water allocation planning process.

The facilitated discussion among representatives focused on the possibility of meeting Adelaide's water needs in a drier future climate, by:

- Increasing the proportion of groundwater resources used to meet Adelaide's water needs, and
- Determining the capacity of the confined aquifers (better water quality than unconfined) to receive injection of significant volumes during winter to balance the larger extractions that would occur during summer.

Issues identified that would need serious consideration include:

- Cost of infrastructure and treatment for supplying groundwater into the existing reticulation network.
- Injection of significant volumes of water into the Tertiary aquifers will create artesian conditions which may require extensive changes to well headworks not designed for such conditions.

# 20 May 2016 – Modellers' Forum on "Uncertainty in Groundwater Modelling"

This was a joint event involving IAH and NCGRT, with about 50 attendees. Six speakers spoke on the focus topic of "Uncertainty in Groundwater Modelling", including;

**Prof Craig Simmons** (NCGRT) introducing the forum, setting the context of the importance of methods to measure, conceptualise, understand, reduce and communicate uncertainty in hydrogeology as well as modelling.

**John Doherty** (Watermark Numerical Computing) delivered a skype presentation that concentrated on the philosophy of PEST methods, explaining why and how models cannot tell us (exactly) what will happen but they can tell us (with low uncertainty) what can't happen (or what is highly unlikely).

**Hugh Middlemis** (HydroGeoLogic) explored how structural uncertainty issues (or alternative conceptualisations) usually carry greater uncertainty than parameter or calibration uncertainties, and described several case studies (2005-2010) where more than one conceptualisation was investigated in practical projects with limited budgets.

**Luk Peeters** (CSIRO) described methods that have been applied to Bioregional Assessments, using qualitative uncertainty analysis to explore the 'so what?' question via a focus on stresses and predictions rather than the model and data (although it does use soft and hard data to constrain prior estimates of hydrological response variables).

**Anthony Knapton** (CloudGMS) de-mystified the process of applying PEST methods on practical projects to examine parameter uncertainty and provide confidence in the model outputs and ultimately the decisions based on them.

**Steve Barnett** (DEWNR) described how model results are best used by groundwater managers, and despite uncertainties in the modelling process, perhaps even greater uncertainties lie in the estimates of future stresses (e.g. climate variability, pumping regimes) that are required for prediction scenarios.

The ensuing Q and A panel discussion reiterated the traditional workflow as outlined in the Modelling Guidelines is not always the best approach and that uncertainty issues need to be considered up front with the client so that an appropriate study methodology is devised. All studies should explore alternative conceptualisations, along with PEST methods to show what is not uncertain. Above all, closer collaboration should be encouraged between hydrogeologists, groundwater modellers, resources management and policy 'wallahs' when designing the study methodology in order to avoid misconceptions about what a model can achieve.

# IAH submission to the SA Minister for Sustainability, Environment and Conservation (Ian Hunter)

Following on from the SA Groundwater Forum (reported in the last newsletter), the SA Branch reviewed the presentations and held discussions which identified some impediments to groundwater–related economic development. These are mostly the result of outdated and inflexible statutory plans and guidelines which need review and revision, specifically in Water Allocation Plans (WAPs) and the governance of Managed Aquifer recharge (MAR).

In summary, the key priorities are;

- Lifting of the Moratorium on 'backyard bores' in the Adelaide area
- Dealing with inappropriate trigger levels in Water Allocation Plans
- Governance of Managed Aquifer Recharge
- Implement a mid term review of the Lower Limestone Coast WAP
- Improved management of areas of deep watertables in the Upper South East

SA IAH proposed solutions to removing these impediments through actions achievable in the short to medium term. Whilst not 'silver bullets' to immediately generate development, they are important in getting the settings right to facilitate such development in the future. Some longer term opportunities for further economic gain were also discussed in the submission.

The Minister subsequently took up the IAH offer to discuss these options at a meeting which was held on March 16<sup>th</sup> with IAH representatives Stuart Richardson, Glenn Harrington and Russell Martin, together with DEWNR officers. There was general agreement that more flexibility was required in the planning process and that some of the recommendations were already underway. It was also recognised there must be smaller transactional costs for both the groundwater users and the government in any new initiatives.

# **NORTHERN TERRITORY**

#### IAH NORTHERN TERRITORY BRANCH

2016 Committee: Chair	Melissa Woltmann
Vice-Chair	Joanna Ellis
Secretary	Steve Tickell
Treasurer	Quinton Bruwer

# Recent Events

#### **Technical Talk March**

"Groundwater Resource Assessment for Larrimah, Daly Basin" by Quinton Bruwer (DLRM).

Quinton presented on the published findings of his work in assessing and quantifying the groundwater resources in the southern part of the Daly Basin in Larrimah as part of the NT Governments Land and Water Suitability Program.

#### **Technical Talk July**

"Near surface baseline characteristics of the Beetaloo basin – a jointly funded project between CSIRO, Origin and Santos" by Allison Hortel (CSIRO)

"A review of prospectivity of unconventional gas in the Beetaloo Basin with an outline of Origin's approach to obtaining baseline hydrogeological data prior to any potential ramp-ups in activity" by David Close (Origin Energy)

Allison and David presented to a group of 16 including IAH and non -IAH members at the Charles Darwin University venue. These presentations will be made publicly available on the IAH NT web page.

# Upcoming Events

#### Mataranka Field Trip 15 – 17 July

Steve Tickell will be leading a field trip to examine the various springs and tufa deposits in the Mataranka area.

#### **Darcy Lecture and Seminar 29 August**

4pm at Charles Darwin University Blue Building Room 2A

In addition to the Darcy lecture local speakers will be presenting on groundwater projects currently being undertaken in the NT. More information on the speakers and presentation titles will be available from the IAH NT page shortly.



No update available in this edition.

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# QUEENSLAND

#### IAH QUEENSLAND BRANCH

2016 Committee:

President Vice President	Lucy Reading Paul Smith	(Queensland University of Technology (QUT)) (Pacific Environment)
Treasurer	Dawit Berhane	(Department of Science, Information Technology and Innovation (DSITI))
Technical Representative	Jim Underschultz	(University of Queensland, Centre for Coal Seam Gas)
Director of Communications	Adam King	(Pacific Environment)
Committee Member	Shaun Davidge	(BHP Billiton)
Committee Member	Lindsay Furness	(Freelance consulting)

# Local News Sponsors

We are pleased to announce that the Queensland branch now has three corporate sponsors: AGE, Douglas Partners and Pacific Environment. Their generous donations will help to support our meetings and provide the funds to support our monthly events.



If you or your company would like to sponsor the Queensland branch, please contact the committee!

# Applications are now open for QUT PhD scholarships

Opportunities are currently available for groundwater research projects QUT in the fields of:

- Groundwater chemistry
- Groundwater modelling
- Groundwater management

There are a limited number of PhD scholarships available through the "annual scholarship round" at QUT – applications for this close in September each year. If you would like to know more about current groundwater research opportunities at QUT and/or how to apply for a PhD scholarship, you can email Lucy Reading – Lucy.Reading@qut.edu.au

#### **Recent Meetings**

#### 22 April 2016:

**Keith Phillipson** presented the findings of the new Underground Water Impact Report (UWIR) by the Office of Groundwater Impact Assessment. The UWIR reports on the impacts of coal seam gas activities in the Surat Basin Cumulative Management Area (CMA).

#### 20 May 2016:

**Des Owen** of NRRA (research start-up) presented on the use of methane and associated isotopes to understand gas migration between aquifers. This work formed part of his PhD, which he recently submitted at QUT.

#### 17 June 2016:

**Ross Carruthers** shared his experiences in engaging with the community to promote improved CSG / groundwater knowledge. Ross took on the role of Principal Project Officer (Groundwater Investigation and Assessment Team) - CSG Compliance Unit in 2013. His presentation focused on the development and implementation of exciting new projects, including: 'Renewing our CSG GW Monitoring Arrangements' with CSG Online (continuous monitoring of at least 60 strategically located bores); and CSG Net (empowering landholders to monitor their own bores).

#### 15 July 2016:

**Tina Girard** from Queensland Rail shared her experiences relating to groundwater monitoring and groundwater protection in the US under the EPA Superfund sites program. This program is responsible for cleaning up some of the US's most contaminated land and responding to environmental emergencies, oil spills and natural disasters.

# **Upcoming Events**

# 23 August 2016 NGWA Darcy Lecture - Ty Ferre

Seeing Things Differently: Rethinking the relationship between data, models, and decision-making

From the NGWA website: "Dr. Ferré will build from the basic concepts of decision science to present concepts and recent developments in optimal design of hydrogeologic monitoring networks. He will also discuss how hydrogeologic models can be used for decision support under uncertainty. Finally, he will show that focusing hydrologic analysis on the specific, practical problems of interest can guide optimal measurement selection, advance hydrologic science, and improve the integration of science into economic and policy decisions."

For more information on the upcoming Darcy Lecture, go to:

http://www.ngwa.org/Foundation/darcy/Pages/Current-Darcy-Lecturer.aspx

# 16 September 2016

Elders night: John Hillier (formerly a consulting hydrogeologist), Iain Hair (Douglas Partners), Colin Hazel (formerly a consulting hydrogeologist) and Errol Briese (AGE) will discuss their career highlights and anecdotes.





For upcoming courses, see http://www.groundwater.com.au/events/training

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# IAH PUBLICATIONS

Discounted IAH publications in the 'International Contributions to Hydrogeology' and the 'Selected Papers' series can be ordered by Australian IAH members directly from Macmillan Publishers Australia in Victoria.

customer.service@macmillan.com.au or orders@macmillan.com.au

Remember to quote your IAH Membership Number, which entitles you to a substantial discount. If you don't know your IAH membership number contact the Secretariat at: joel-p@groundwater.com.au