IAH International Association of Hydrogeologists

NEWSLETTER OF THE AUSTRALIAN NATIONAL CHAPTER

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1 NATIONAL COMMITTEE ACTIVITIES AND ANNOUNCEMENTS

1.1 Introducing the New National Committee

Most members will be aware that the officers of the National Committee retired at the General Meeting held during the Brisbane Conference in May 1986. The new Executive would like to record their appreciation of the work done by the retiring Executive in giving the Australian National Chapter such a tremendous start. Thanks Bill Williamson, Charles Lawrence, Richard Lakey and Andrew Shugg.

Following requests made at the General Meeting each member of the National Committee has provided a pen portrait.

Paul Whincup: President

Paul Whincup was born in Yorkshire a few days after the outbreak of the Second World War. There was no apparent connection between the two events.

After an uneventful childhood during which the seeds of his future career were sown in the caves and potholes of the Yorkshire Dales, he moved north of the border to St. Andrews University, graduating with honours in geology in 1962.

He emigrated to Western Australia in 1963 to take up an appointment with the Geological Survey (GSWA) and to play rugby. This was the time of the great iron ore discoveries in the north of Western Australia, and a period of rapid expansion in GSWA. Unfortunately iron ore related field work in the Pilbara clashed with Paul's rugby union activities and within a few months he transferred to the hydrogeology section where he was assigned to deep exploratory drilling north of Perth. This was a period of his life well remembered for the very thick very monotonous sequences of shale and sandstone, which comprise the Cretaceous and Jurassic sediments of the Central Perth Basin. It was the time that he also learned of the aboriginal word 'up' meaning water and pondered on the significance of it in regard to the aspirations of a Whinc 'up'.

Hydrogeology in Australia in 1963 was in its infancy. The mentor and patriarch of the profession was Eugene (Dris) O'Driscoll who transferred from South Australia to Western Australia in 1963 to organise the newly expanded hydrogeology section of GSWA. It was under Dris' tuition and guidance that Paul came to grips with the practical aspects of groundwater exploration, and came to love the Australian bush as viewed through an upturned glass.

The first groundwater schools in Adelaide in 1965 and 1967 can now be recognised as major technical advances for Australian hydrogeologists; they also went a long way to

developing a camaradie in those young fresh faced up and coming hydrogeologists as they were then. That camaradie still exists today in the original stalwarts, now aged and worn by the passage of time.

The nickel boom of 1969/70 saw a mass exodus from the GSWA as underpaid geologists sought the lucrative salaries being widely touted by private enterprise. Paul was swept along by the enthusiasm of the time and joined a consulting firm, dabbling in mineral exploration for a while, but soon reverting to groundwater as the mineral boom died and the demand for water supply to the mining townships of Western Australia grew.

In 1973 he formed Layton Groundwater Consultants (LGWC) in association with the principals of Layton and Associates and over the next 10 years slowly expanded the practice to the remainder of Australia and overseas. Subsequently Paul became sole proprietor of LGWC and in 1983 changed the name to Groundwater Resource Consultants (GRC). A further change occurred in 1985 when GRC amalgamated with the international consulting group Dames and Moore.

During his 13 years of consulting Paul has seen the role of the hydrogeologist in private practice change from that of a contractor basically locating groundwater supplies, to a specialist consultant dealing with complex groundwater management issues.

He is a firm believer in putting time and effort back into a profession which has offered challenges and enjoyment, and sees the Presidency of IAH as one way of contributing.

Richard Vogwill: Vice-President

Richard Vogwill was born in England in 1944 and left the Motherland at the age of 4 months to become a hydrogeologist in Canada. Unfortunately there was no demand for hydrogeologists in British Columbia in 1944.

After an eventful primary and secondary education in Canada and the U.S. Richard returned to England to complete his last year of schooling. It was during this time that the high point of Richard's sporting career occurred when he kicked a 60 m field goal in a rugby union game near Dover. There is, unfortunately, no plaque to commemorate this occasion.

He returned to Canada and completed a B.Sc in Geology at the University of British Columbia. During the summers, employment was plentiful in mineral exploration and Richard's last job was in the grizzly bear infested Yukon Territory of northern Canada. This experience combined with a continuing fascination with flowing artesian drill holes confirmed that Hydrogeology was the way of the future.

Back across the Atlantic, Richard completed his M.Sc. in Hydrogeology at the University of London in 1968. At this time employment opportunities were limited in Europe and the long trek westwards resulted in pacing the streets of Vancouver looking for work.

Luckily Cominco Ltd were looking for a Hydrogeologist to manage open pit dewatering at the Pine Point Mines. In the middle of winter at -60 degrees F the groundwater work was quite solid, especially when pumps failed.

In 1971 the first move to Perth occurred and Richard worked with the Geological Survey of W.A. From Pine Point to the Great Sandy Desert was a shock and after working with a private consultant, Richard returned to Canada to take up a position with the Alberta Research Council. Under Joe Toth the ARC Groundwater Division was a hot house of hydrogeology and the work was most enjoyable. Involvement in hydrogeological mapping, groundwater exploration, underground coal gasification, and a scientific mission to India made the ARC a most interesting place to work.

Tiring of the climate of Edmonton, Richard moved back to Perth in 1982 and has worked with the GSWA and in private consulting.

Richard has been Chairman of the W.A. Branch since its formation in December 1983. He feels that the IAH provides a means of establishing Hydrogeology as a unique applied science related to both geology and civil engineering.

Alan Deeney: Secretary

Alan Deeney was born in Glasgow some years after the President and the Vice-President. He deserted the land of his forefathers at an early age however, this did not prevent him from developing a taste for pure malt whisky, bagpipe music and the sort of legs which should never be seen in a kilt. Most of his formative years were spent in Bristol where his main interests were rugby football and rowing. He entered London University, initially to study chemistry, but after realising the error of his ways, graduated with honours in geology in 1975.

Employment as a mud logger in the North Sea did not appeal and he chose the less lucrative offer of employment with Severn-Trent Water Authority in the English Midlands. He spent four years at Severn-Trent and was involved in a wide range of projects in the areas of resource assessment, licensing of groundwater abstraction and waste disposal.

After an exhausting but rewarding year at Birmingham University he gained an MSc in hydrogeology in 1980. His next stop was Botswana where he worked for a short time as

an independent consultant concerned mainly with the location of water supplies for villages, mines and road construction.

Since the beginning of 1982 he has been employed by the Geological Survey of Western Australia. He has been involved principally with investigations of the groundwater resources of the Perth Basin and with the development of a computerised storage and retrieval system for groundwater data. Away from work, he enjoys sailing, fishing and watching rugby football.

Alan has been secretary of the W.A. Branch of IAH since its formation in December 1983. He feels that, through IAH, members have formed an association which will influence the development of hydrogeology in Australia and can usefully contribute to policy decisions concerning groundwater related matters.

Philip Commander: Treasurer

Philip Commander is another migrant from the UK, a Londoner by birth, attracted to the wide open spaces of the Australian bush. He owes his career in hydrogeology to a timely graduation at the height of the nickel boom and the associated exodus from the Geological Survey of Western Australia, together with a background including physics and maths. His most memorable period in GSWA was 3 years in the Pilbara Regional Office, which gave him the opportunity for getting to see the real Australian Northwest. Now safely behind a desk he oversees the activities of the resources assessment subsection.

A member of IAH since 1976, hydrogeological maps and the hydrogeology of sedimentary basins are his main professional interests. He is well known for extended overseas trips, especially when there's a conference on, and taking as much leave as possible. Outside the profession house building is a major hobby, and with the third child on the way fatherhood assumes an increasing role.

Rien Habermehl: State Liaison Member (ACT)

Dr M.A. (Rien) Habermehl obtained his Candidaats Examen (B.Sc - Hons) in Geology from Leiden University, The Netherlands in 1966, and his Doctoraal Examen Geology (MSc. degree) in Sedimentology and Hydrogeology from Leiden University in 1970, following postgraduate research on Devonian sediments in the Spanish Pyrenees, and on a carbonate-rock groundwater basin in the Celtiberic Mountains, central Spain. He completed his Doctor Wiskunde en Natuurwetenschappen - Ph.D (Geology) at Leiden University in 1970 on research in sedimentary geology on a shallow marine Devonian sequence in the central Pyrenees, Spain. He joined the Australian Bureau of Mineral Resources, Geology and Geophysics, Canberra, in 1971, and

has since studied the geology and hydrogeology of the Great Artesian Basin, Australia. He participated in the Review and Assessment of Australia's Groundwater Resources to the Year 2000 for the Australian Government Department of National Development and Energy in 1982, and prepared and presented reports and scientific papers on Australia's national groundwater resources.

A feasibility study of hydrogeological aspects of soil salinity in the Khorat Basin, Thailand was undertaken for the Australian Development Assistance Bureau in 1978.

He currently holds the positon of Research Scientist in BMR's Division of Continental Geology, and is Leader of the Hydrogeology Research Group in the Division. He was the Hon. Secretary of the Commonwealth Territories Division of the Geological Society of Australia Inc. from 1979 to 1981, and a Committee Member of the Hydrological Society of Canberra Inc. He is a Member of several Sub-Committees of the Australian Water Resources Council.

He is a Member of the Australian Committee of UNESCO-IGCP Project 184 - Neogene and Quaternary palaeohydrology of low-latitude deserts. He is a Member of the Royal Geological and Mining Society of the Netherlands, a Member of the Geological Society of Australia Inc., and a Member of the International Association of Hydrogeologists.

He is the author of more than 100 published and unpublished scientific research papers, reports and conference papers. He has been an Invited Keynote Speaker at International Groundwater Conferences in Australia and Europe.

Michael Knight: State Liaison Member (NSW)

Michael Knight graduated BSc. PhD from the Geology Department University of Melbourne in 1972. He worked for 3 years in the Public Service of Papua New Guinea (Agriculture and Geological Survey). The work included village water supply surveys, groundwater for irrigation farming, water-waste-pollution studies and Engineering Geology of Hydroelectric Power Schemes and slope stability problems. Since 1974, Michael has been Lecturer and Senior Lecturer in Engineering Geology at the Department of Applied Geology, School of Mines, University of New South Wales. He has active research interests in ground-water contamination and especially the modelling of hydraulic and hydrochemical processes in waste landfills. Michael also supervises post-graduate research students and lectures in Hydrogeology. He directs a Master of Applied Science Degree program in Hydrogeology, Environmental Geology and Engineering Geology. During 1986 Michael co-founded a Centre for Waste Management at UNSW and currently he is Deputy Director. The aims of the Centre are to foster research and training in the field of Waste Management including groundwater aspects. In his

spare time Mike consults to Industry and Government on waste disposal, groundwater contamination and engineering geology.

John Milne: State Liaison Member (NT)

John Milne commenced professional work as an hydrogeologist with the Queensland Water Resources Commission. He then spent several years as an exploration geologist before working as an hydrologist on mining related problems in Papua New Guinea under the supervision of Berkley University. On returning to Australia he was involved in a number of projects for the Australian Water Resources Council concerning catchment hydrology, flood plain management and groundwater resources. He was associated with the AWRC Groundwater Committee as Secretary, Commonwealth member and Northern Territory member over a period of 10 years. He joined the Water Division in Darwin as Principal Groundwater Engineer and more recently was appointed Chief Environment Protection Engineer.

John is currently forming the Northern Territory Branch of IAH.

Bruce Pearce: State Liaison Member (QLD)

Bruce Pearce holds a Bachelor of Science Degree with a major in Geology obtained through the University of Queensland in 1966. Since graduation he has spent his career with the Queensland Water Resources Commission. Seven of these years were spent stationed in Rockhampton working in the Central Queensland Region while the remainder have been spent in Brisbane.

During this period he has had extensive involvement in a number of groundwater investigations undertaken throughout Queensland, and for a number of years was responsible for administration of the Commission's Groundwater Advisory Service to private landholders. Bruce currently holds the position of Senior Hydrologist in Groundwater Group, Water Resources Division of the Commission. He is involved principally with the investigation of dryland salinity problems, and remote sensing interpretation and processing relating to groundwater investigation.

Steve Barnett: State Liaison Member (SA)

Steve Barnett graduated in Geology from Adelaide University in 1974 having never heard of groundwater. He commenced employment in the Hydrogeology Section of the Dept of Mines and Energy, South Australia in the same year and is still there and still learning.

Steve is a Class 3 (Senior) Geologist and has worked in most areas of South Australia from the very wet Southeast to the very dry Northwest Aboriginal Reserve. He is

currently completing a five year investigation of the Murray Basin and doing battle with a three layer computer model of part of the aforesaid basin.

His likes include general hedonism, miscellaneous sports and flying. Anyone requiring further information is asked to contact ASIO or his solicitors.

Richard Lakey: State Liaison Member (VIC)

Richard Lakey is an hydrogeologist and is currently Head of the Salinity and Pollution Section of the Groundwater Branch at the Geological Survey of Victoria (DITR).

He was founding Secretary of the Australian National Chapter.

He is also very reticent about giving professional details.

Bob McGowan: State Liaison Member (WA)

Bob McGowan was born in 1959 in Dover, Kent in the land of decent beer and 'continuous recharge'. A 'down-to-earth' secondary education at assorted schools led to B.Sc (Hons.) Geology at Leicester University. Subsequent offers of slave labour with assorted oil service companies were resisted in favour of yet more education. Careful assessment of market trends indicated that the market price of groundwater (next to nothing) was not subject to huge fluctuations and that a career in hydrogeology might have a stable base. He then completed an intensive year of study in the M.Sc. Hydrogeology course at University College London, following in the footsteps of many far-flung fellow professionals.

Bob moved to Perth and the Geological Survey of W.A. in 1982 - during one of those 'boom' periods when government employment was unfashionable. A variety of work to date has included major projects in the Ord Irrigation Area (Kununurra), salinity research in the W.A. Wheatbelt, drought relief drilling in the Kimberley and a large number of town and country water supply investigations.

Out-of-hours Bob's main interest is motorised madness behind the wheel of a rally car and associated organisational activity. When time permits, fishing, squash and cycling are high on the agenda.

Bob sees I.A.H. as having a vital role in promoting the use and importance of groundwater in Australia. He is Meetings Secretary for the W.A. Branch of I.A.H. and is keen to promote the inter-disciplinary nature of hydrogeological investigations.

1.2 New Members

The following new members are welcomed

Mr A.J. Brinkley
Hydrogeologist
(Geol. Surv. Vic.)
40, Bourke Street
MENTONE, VIC 3194.

Dr G.B. Davis
Research Scientist
CSIRO, Div. Groundwater Res.
Private Bag,
P.O. WEMBLEY, WA 6014.

Ms S T Hamilton
Hydrogeologist
Water Res. Comm.
P O Box 952
NTH SYDNEY, NSW 2060

Mr R.J. Paul
Hydrogeologist
(Groundwater Res. Consultants)
35 Howlett Street
NORTH PERTH, WA 6006

Mr K J Robinson
Acting Head
Dept. Geol & Geol Eng
RMIT, GPO Box 2476V
MELBOURNE, VIC 3000

Dr L.R. Townley
Lecturer
Centre of Water Res.
Univ. Western Australia
NEDLANDS, W.A. 6009

Mr W.D. Weeks
Hydrologist
(Qld Water Res. Comm.)
7 Carawatha Street
EVERTON PARK QLD 4053

1.3 Membership Subscriptions

1986 Subscriptions:

Because of the recent decline in the value of the Australian dollar relative to the German Mark, the $30 membership subscription became insufficient to cover the 40DM fee during July 1986. The Executive Committee has resolved to levy an additional $10, to be added to the 1987 subscription, from members whose subscriptions were received after 30th June 1986.

1987 Subscriptions:

The Executive committee resolved to set the 1987 Subscription at $40, with a late fee of $10 to be levied after 1st March 1987. Accounts will be sent out with December 1986 Newsletter.

Unfinancial Members:

Members who have not paid their 1985 subscriptions are reminded that their membership will lapse at the end of the year. Unfinancial members may not receive 1986 publications. For the reasons outlined above unpaid 1985 subscriptions have been increased from $20 to $30.

1.4 Federal Water Resources Assistance Program (FWRAP) 1986-87

The National Committee understands that payments to States and Territories for water resources assessment under FWRAP have been cut this year and is obtaining further details. When these are available, a submission will be made to the Minister for Water Resources.

1.5 IAH Publications

In order to minimise costs, the International Committee generally orders only enough copies of particular Memoires to provide one copy for each individual/organisation registered as a member at the date of publication. Consequently members will usually receive only those Memoires published during the years following the one in which they joined.

Members who have not received some or all of the publications to which they are entitled are asked to inform the National Secretary who will take the matter up with the International Committee. To assist members in this, the Memoires and other documents published in 1985 are listed below. Items 1-3 were distributed earlier this year and Items 4-6 will be sent out later this year.

(1) Hydrogeology of Rocks of Low Permeability. Memoires, Vol. XVll, Pt. 1 and 2 (Tucson Congress).

(2) Hydrogeology in the Service of Man. Memoires, Vol. XVlll, Pt. 1-4 (Cambridge Congress).

(3) International Contributions to Hydrogeology, Vol. 6. UNESCO/IAH/IUGS (Groundwater Protection Zones).

(4) International Contributions to Hydrogeology, Vols 2, 5 and 7 UNESCO/IAH/IUGS.

(5) Bulletin d'Information.

(6) Membership List and Supplement No 1.

1.6 Education Sub-committee

Richard Lakey has been asked to chair an education sub-committee. Members who are interested in contributing to it are asked to contact the National Secretary.

1.7 Australia Based IAH Commission

The National Committee is planning to put a proposal to the International Committee for an Australia based commission. Suggestions concerning a suitable theme would be welcomed. Dryland Salinity has been suggested.

1.8 Australian Geoscience Council (AGC) Annual Reports

Members are invited to submit articles concerning significant new developments in hydrogeology to the National Committee for inclusion in AGC Annual Reports. These articles will replace the 'Groundwater Status Report' which will be produced on a triennial basis in future. Articles must be submitted before 31 March in the year of intended publication.

1.9 Visiting Hydrogeologists

Members are asked to advise the National Secretary of forthcoming visits by hydrogeologists travelling interstate or from overseas. This would allow the Secretary to give advance notice to the State Branches who might wish to invite the visitors to address their meetings.

1.10 Logo for the Australian National Chapter

The National Committee would welcome ideas from members on the design of a logo.

1.11 December Issue of the Newsletter

The National Committee plans to circulate the next issue of the Newsletter in December. Articles in a form suitable for direct inclusion would be welcomed and should reach the National Secretary by 1 December 1986.

2 BRANCH NEWS

2.1 Northern Territory

John Milne intends to call a meeting during September to establish a N.T. Branch. Currently, there are 9 members in Darwin and 4 in Alice Springs.

2.2 Victoria

Mr A P Lane was elected Chairman and Ms R Clark was elected Secretary of the Victorian Branch at a meeting held on 20 May 1986. Prior to the elections, Dr D K Todd gave an informative and entertaining talk on his experiences as a groundwater consultant and in particular his work on groundwater contamination and the development of groundwater supply systems.

2.3 Western Australia

There are now 49 I A H members in W.A. representing a wide range of affiliations. The Branch has maintained an active meetings calendar with attendances usually of about 25.

Meetings held in 1986 to date:

1.	28 January	"An overview of the Hydrogeology of Israel." Prof. Arnon Arad, Israel.
2.	4 March	"The use and design of Multiport Piezometers," M.W. Martin (Geol. Survey.) Meeting included AGM.
3.	22 May	"Managing Groundwater with Artificial Recharge." Dr D.K. Todd, U.S.A.*
4.	3 June	"Natural Isotopes and Chemical Parameters for determining Groundwater Quality and Quantity." Prof. E. Mazor, Weizman Inst., Israel.*
5.	14 July	"Modelling aspects of the Perth Urban Water Balance Study." G. Boughton (Water Authority) and L. Townley (U.W.A.)*
6.	7 October	"Groundwater Management Areas in W.A." R.E. Green and H.B. Ventriss (Water Authority.)

The final meeting in 1986 will be:

2 December "Groundwater in the Middle East."

* Joint meetings with the Institution of Engineers.

The Branch were fortunate to hear from two visiting Israeli speakers. Professor Arad was on sabbatical in Perth working with the C.S.I.R.O. Divison of Groundwater Research on stable isotopes in groundwater in salinised agricultural areas. Professor Mazor and also Dr Todd were in Australia for the IAH/AWRC Brisbane conference and their visits to Perth were funded by contributions from C.S.I.R.O, Geological Survey and the Water Authority. The talks from our overseas visitors were very well received.

3 GROUNDWATER NEWS

3.1 CSIRO Forms New Division of Water Resources Reseach

CSIRO will set up a new Division of Water Resources Research with major Laboratories in Canberra and Perth. The new Division will be formed from elements of the existing Divisions of Groundwater Research, Water and Land Resources and the Hydrology Group of the Division of Soils. About 200 staff are involved in the reorganisation.

The objectives of the new Division will be to develop new or improved practices for the management of Australia's water resources including the maintenance of the quantity and quality of water supplies and the disposal of waste water.

A series of meetings is to be held throughout Australia with water authorities and other agencies with responsibilities in water and related land management. The objectives of the meetings are to define current and emergent water resources problems that CSIRO might tackle and to consider arrangements for more effective research in CSIRO for the benefit of Australia's water industry.

Dr Alan Reid, Director of CSIRO's Institute of Energy and Earth Resources, will be responsible for the initial development of the new Division and the existing Divisions will continue until the Chief of the new Division is appointed.

3.2 Churchill Fellowship awarded to Stephen Hancock

Stephen Hancock, principal consultant with Australian Groundwater Consultants Pty Ltd, has been awarded a Churchill Fellowship in 1987 to study a new technique for stablised clay grouting. He will travel to the USSR to visit the Institute which developed the new technique and will also visit mining and civil engineering projects in the USSR before travelling to Poland, Hungary, Spain and Britain.

The stablised clay grouting technique uses clay or any other fine particle size material as a filler in the grout. The grout is mixed under close control with a chemical formulation to form a slurry which is pumped as a fluid. Set-up commences as shear stress from pumping declines below certain levels. The grout swells on set-up and is reported to become progressively harder with time, and with vibrations such as those that derive from blasting. As a result it is claimed to represent a much more effective and reliable grout than cement.

Important aspects of the new technique are that the formulations can be varied to match the geological environment, the grout is claimed to be a low cost mixture which requires little special equipment and it can generally be introduced in large volumes from the surface in advance of mining.

Grout observed filling in a three metre diameter opening in karst limestone in an underground coal mine in Hungary had the consistency of a very hard putty but it showed no evidence of plastic creep despite being under 200m of water head. This type of grout has the potential for wide application in Australia for groundwater control in mining and civil engineering.

3.3 Groundwater Events in N.S.W.

Of major significance in New South Wales in recent times has been the renaming and restructuring of the Water Resources Commission, now known as The Department of Water. The Hydrogeological Section is intact and still viewed as being very important. An important program currently in progress is the joint BMR-Department of Water drilling program in the Western Murray Basin. This involves 11 holes of which 4 are to be fully cored. The purpose is to establish more precisely the regional groundwater system and evaluate its implications for salinity. A strong group of hydrogeologists from N.S.W. attended the International Conference; Groundwater under stress held in Brisbane in May. We really appreciated the excellent work by Col Hazel, Uniquest and the team in organizing and running the program.

Three very useful technical meetings have been held with attendances averaging 30. The topics covered the Hydrogeology of the Amadeus Basin (Dr. J W Lloyd), application of isotope studies to groundwater problems (Professor E Mazor) and Water harvesting in California for groundwater recharge (Dr. D K Todd).

A research program for verifying a linked finite element and process model to describe the hydraulic behaviour of leachate in a landfill continues in the Department of Geology, School of Mines, University of N.S.W. This work is following on from the analytical model described at the 1985 International Conference, Groundwater and Man.

4 REPORTS

4.1 Australian Water Resources Council Groundwater Committee - State Debriefing Meetings.

The AWRC Groundwater Committee (GC) has recognized that the limitation of having only one representative from each state makes it difficult for that person to adequately collect and convey all matters of importance for that State. As a result, the GC has decided that each State Representative will form a subcommittee to help him keep abreast of all developments in the State.

The GC meets twice a year and each State Subcommittee will meet before and after each GC meeting to aid the State Representative in recognizing and disseminating matters of importance.

In W.A. the first debriefing meeting took place at the Water Authority on May 29, 1986.

Harry Ventriss, the W.A. Representative chaired the meeting and personnel from the Geological Survey of Western Australia (Allen, Bestow), CSIRO (Peck) and IAH (Vogwill) were present to form the subcommittee. It is felt that the size of the subcommittee can expand and contract as necessary.

The agenda of the meeting closely followed that of the last GC meeting at the recent Brisbane Conference. That agenda and the resulting points of discussion are outlined in summarized form below.

Groundwater School 1987:

The next Groundwater School will be held in Adelaide in August 1987. This two week course is given every three years and is generally of interest to recent graduates. During the first part of the course participants take common subjects which provide an introduction to all aspects of hydrogeology. During the second part of the course participants can choose either the Mining Stream or the Water Management and Land Use Stream.

Further details on this course can be obtained from your State Groundwater Committee Representative.

Groundwater Education/Training:

The GC feels that the present courses in groundwater at Tertiary Institutions in Australia at both undergraduate and graduate level are inadequate.

It was felt that the subcommittee meetings provided a good opportunity for associations such as IAH, AWRC, CSIRO etc to put together a suitable submission on tertiary education in hydrogeology.

Hydrogeological Maps:

A guide for the preparation of maps in Australia is being prepared by the subcommittee on hydrogeological maps.

Consultants have completed an Australia-wide study of data collection, data availability and presentation techniques. Consultants are also preparing five map sheets and the cost is expected to be $100,000/sheet. The Ballarat sheet is the most advanced in preparation,.

A draft version of an hydrogeology map of Australia has been prepared by G. Jacobson et al. This map has been sent to various State agencies for comment.

Great Artesian Basin:

In the GAB a large number of bores are flowing to waste. The GC has studied this problem and has submitted a report to the AWRC Standing Committee. An important finding of this report is that for $235/installation 1 ML/YR/bore of groundwater could be conserved.

Groundwater Pollution:

A subcommittee was formed in 1985 to compile an inventory of pollution events in Australia. This has proved difficult because frequently, pollution events are not reported.

The debriefing subcommittee considered that such an inventory should perhaps be compiled by each State.

Future Conferences:

The Murray-Darling Conference on salinity will be held in Adelaide or Melbourne in June 1988.

The theme of the next AWRC sponsored conference is Groundwater in Large Sedimentary Basins and Perth has been suggested as a suitable venue. The Conference is scheduled for 1989 and it is hoped that it will attract an international audience. Financial support for these conferences is being solicited and the IAH will be actively involved in the Perth Conference.

4.1 South Australian Department of Mines and Energy.

Arid Areas Water Supplies:

Observation well networks have been established at two remote towns in the far north of S.A. Both Glendambo (a new town on the re-aligned Stuart Highway between Woomera and Coober Pedy) and Mintabie (opal mining setttlement 130 km south of NT border) will have water levels and conductivity readings monitored by local progress associations with monthly samples being collected for nitrate analysis. The Mintabie supply has a TDS of 1000 mg/L of which 130 mg/L is nitrate!

Some 50 drilling sites were pegged in the Pitjantjatjara Homelands area (NW corner of S.A.) and an inspection was made within the Maralinga Lands area for possible drill sites.

S.A. - Victoria Border Groundwater Sharing Agreement:

Recent legislation passed by both the South Australian and Victorian Governments seeks to manage groundwater resources within a 20 km strip each side of the common border extending from the Murray River to the Southern Ocean. South Australia has proclaimed its area under the Water Resources Act.

In order to quantify the groundwater resource within this strip estimates were made of various parameters including groundwater in storage, the proportion of through-flow available, recharge, current groundwater usage (irrigation, municipal, industrial, stock and domestic, etc.) and the resource available for development.

Values for the parameters will be upgraded as knowledge increases. One of the components, current irrigation development, was found to be significantly under-estimated in the original data gathering based on information from Australian Bureau of Statistics. Discrepencies were revealed by analysis of aerial (colour) photography of March 1985.

Murray Basin:

A three layer model is being run of the Mallee region in conjunction with the Department of Engineering and Water Supply. Clearing of the natural vegetation will lead to rising water tables and increased groundwater inflows to the River Murray. Increases of up to 5 times will occur in some reaches over a 500 year time frame. Effects on river salinity are being calculated.

4.3 CSIRO Division of Soils

Recharge in the Murray Mallee:

Recharge through the unsaturated zone in the Murray Mallee has been estimated at 15 sites under native vegetation and found to be less than 0.1 mm per year. These estimates have been made by sampling the soil from the surface to the water table and measuring the chloride concentration of the soil water. The very low rates of annual recharge have been confirmed by a study of the carbon 14 concentration of groundwater.

Sampling at 10 sites, which have been cleared for 50 to 80 years, has provided estimates of recharge varying between 4 and 15 mm per year. It is likely that the effect of this increased recharge has not reached the water table which is generally deeper than 30 m in South Australia. When it does, inflow of saline groundwater to the River Murray will increase. CSIRO is attempting, with the South Australian Departments of Engineering and Water Supply and Mines and Energy, to estimate the time rate of change of this groundwater inflow (see section 4.2).

The work is continuing with further sampling to establish the variability of this increased recharge and to attempt to locate sources of recharge under both cleared and uncleared land. Regional surveying using electro-magnetic techniques is being undertaken to establish the importance of point source recharge.

Solute Movement in Dual Porosity Media:

Recent attempts to describe solute movement in structured soils and fractured aquifers have considered the system to consist of a convective transport region and a stagnant diffusion-controlled source/sink region. In many cases this is a simplification, as convection occurs in both regions with different characteristic velocities.

The Division of Soils is currently undertaking experimental and theoretical work to characterise this phenomenon. The results may have broad application in the field of groundwater contamination and prediction of fertiliser leaching.

Studies of the Stable Isoptopes, ^{2}H and ^{18}O in the Unsaturated Zone:

CSIRO Divison of Soils have developed techniques for evaluating diffuse groundwater discharge in arid areas based on interpretation of depth profiles of ^{2}H and ^{18}O concentration in soil water. The technique has been used with success to estimate groundwater discharge from Lake Prome. At present, joint studies with the Universite de Paris Sud are underway to estimate evaporation from the water table beneath the Sahara. Early work suggests that this is about 2 mm per year when the water table is at 10 m. While this is small, the areas involved are large and diffuse discharge from large areas of relatively deep water table may be an important component of the water budget.

In parallel with this work further theoretical and laboratory studies are underway to see if further useful hydrologic information can be obtained from ^{18}O and ^{2}H concentrations in soil water.

4.4 Water Resources Branch - South Australian Department of Engineering and Water Supply:

Groundwater modelling for management purposes is proceeding in the Angas Bremer area, the Murray Basin and the Tatiara region as joint exercises with the South Australian Department of Mines and Energy (SADME).

The Angas-Bremer irrigation area adjacent to Lake Alexandrina is facing salinity problems due to the formation of a large cone of depression during the irrigation season. A three layer model is being prepared as part of a management study to test previous water balance and salinity predictions and to examine the likely effects of alternative management strategies.

The Tatiara Proclaimed Region is an intensive irrigation area in the Upper Southeast (Keith - Bordertown area). In some areas, groundwater salinities are rising by up to 140 mg/L year due to the recycling of irrigation waters. A computer model is being prepared as part of a water resources management study with SADME and the Agriculture Dept.

4.5 Queensland-New South Wales Border Rivers Groundwater Investigation.

Between 1958 and 1960, 50 bores were drilled in a joint groundwater investigation by the Queensland and New South Wales Governments, of the alluvial deposits of the Dumaresq River. Supplies of up to 25 l/sec were obtained from shallow aquifers (less than 12 m below ground level), but the few deeper aquifers which were encountered, down to 70 m, produced only small supplies.

The groundwater supplies in this area have been utilized to a very small extent. Some shallow wells have been dug but overall use is very little. Surface water supplies have been supplemented by a major storage, the Glenlyon Dam, and it is only since all surface supplies have been allocated that thoughts have returned to groundwater supplies.

A detailed examination of the old investigation results was carried out. It was concluded that the deeper gravels were probably of Tertiary origin and could be much more extensive than previously thought, and it was also considered that modern drilling techniques may be more successful in extracting larger supplies.

The Queensland Water Resources Commission has recently drilled 25 bores along the Queensland side of the Dumaresq and MacIntyre Rivers downstream to Goondiwindi using both rotary and percussion drilling rigs. Supplies in excess of 50 l/sec were obtained from Tertiary sediments which were found to exist at depths down to 112 metres. Problems were encountered in drilling through loose boulders which occur near the surface and drilling techniques had to be modified to overcome these problems. Generally large diameter holes were drilled using drilling mud and the holes geophysically logged to select the intervals at which screens were inserted. Gravel packing techniques were used.

Although reasonable supplies of water were encountered, the water quality varies. Total dissolved solids are generally less than 1,000 mg/l, but in the Tertiary sediments the water is generally a sodium bicarbonate water. The Residual Alkali Hazard is moderate to high, making the water unsuitable for prolonged irrigation on some soil types. The R.A.H. generally increases downstream, and the water becomes less suitable.

The results of this investigation show that work previously carried out often needs to be reviewed. A better understanding of the geology and hydrology of the area and the use of different drilling techniques has resulted in a further groundwater reserve being identified.

5 CONFERENCE REPORTS

5.1 Groundwater Systems Under Stress-Brisbane 1986

A very successful International Conference, "Groundwater Systems Under Stress", was held at the Queensland University, Brisbane, from May 12 to May 16, 1986, under the auspices of the Australian Water Resources Council (AWRC).

The Conference was convened by the Groundwater Committee of the AWRC and attended by some 160 delegates; more than half of the professionals working in the Groundwater

field in Australia today. It provided the opportunity to display the new Hydrogeological Map of Australia and to distribute an Inventory of Numerical Groundwater Models, both of which came about as a result of Groundwater Committee initiatives.

Eleven countries were represented and an excellent coverage of groundwater hydrology, particularly as it applies in Australia, was given in the 56 papers presented.

A feature of the Conference was the allocation of time for discussion. While centering on the papers presented, these discussion periods allowed the participants to discuss many and varied topics and helped to foster the spirit of friendliness which pervaded throughout.

The Conference was opened by the Honourable Martin Tenni, M.L.A. Queensland Minister for Water Resources and Maritime Services who challenged the participants to communicate at three levels; with the user, with themselves and finally with the political decision makers, and to communicate effectively so that the message was clear.

The keynote address was given by Professor Mazor, of the Weizmann Institute of Science, Israel, who gave an enthusiastic presentation which highlighted the need to collect and use our basic data.

Dr David Todd attended, and in closing the Conference said that we in Australia were about 60 years behind California in our state of groundwater development. He encouraged us to study what California had done but not to make the same mistakes.

The Conference included a trip to the Lockyer Valley, and a visit to Surescreen Pty Ltd as well as a barbecue and Conference Dinner.

Some participants took the opportunity of going on a post Conference tour from Brisbane to Townsville and visited many interesting groundwater projects during the six days.

In all, the Conference was a resounding success and all of the participants are eagerly looking forward to the next one.

5.2 Catchment Salinity Symposium - Perth 1986

A Symposium on Catchment Salinity was held in Perth from April 16 to 18 and followed by an informal field visit to experimental sites in the Collie area. This meeting was organised by CSIRO Division of Groundwater Research and the Water Authority of WA to mark the completion of the long-term collaborative research project in the Collie

River basin. In fact, observations and data analysis are continuing, but less intensively than in the past. Participants at this meeting totalled 75 including 5 visitors from Thailand, one from the USA and 15 from Territories and States other than WA.

The meeting was opened by Mr Bob Hillman, Chairman of the Water Authority Board. He referred to the magnitude of salinity problems in Australia, and particularly those in WA which were recognised in the late 1960's and prompted the research which is the topic of the present Symposium. A considerable achievement has been that the research substantially realised its objectives through an era of rapid change in CSIRO and the water industry.

6 CONFERENCES, SYMPOSIA AND MEETINGS

25-27 November 1986 Hydrology and Water Resources Symposium, Brisbane. Contact: Conference Manager Institution of Engineers Australia, 11 National Circuit, Barton ACT 2600

22-26 June 1987 Groundwater and the environment, Kuala Lumpur. Contact: Secretary, Groundwater Conference 1987, C/o Department of Geology, Faculty of Physical and Applied Science, University of Kebangsaan, Malaysia, 43600 Bangi Selangor Malaysia.

23-28 October 1988 International Mine Water Conference, Melbourne. Sponsors: AIMM, Australian Groundwater Consultants.

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