



THE HYDROLOGICAL SOCIETY OF S.A. INC.

C/o Water Resources Branch
Box 1751, Adelaide, S.A. 5001

NEWSLETTER NO 72

MARCH 1993

As members may be aware the Newsletter at present lacks a permanent editor. This is one of the reasons why the Newsletter has not been published on a regular basis recently. Anybody willing to take on the role as editor is invited to contact any member of the Executive Committee of the Society.

The Committee has decided that until another permanent editor is found, a different member of the Committee will be responsible for putting together each issue of the newsletter still with the aim of four newsletters per year. The next newsletter is due to be published in May and the editor for that edition will be Trevor Daniell from the University of Adelaide. All contributions for that edition should be sent to him or handed to one of the members of the Committee.

This newsletter has been a long time in the making. Ross Stevens originally took on the task but had to hand over to Bill Lipp because of commitments overseas. Bill's heavy workload has meant that he also has had difficulty in completing the task. Our thanks to both Ross and Bill.

All members will recall the unusual meteorological conditions with resulting intense rainfall and flooding during the last four months of 1992. The Society held a very successful meeting on the subject on the 11 February with over 80 members and friends attending. With this subject still fresh in our minds it has been decided to make these happenings the theme for this newsletter, the first for 1993.

Paul Harvey, Chairman

Floods in South Australia? Not Likely!!

by Chris Wright

After four years of preparation, my future with the Bureau of Meteorology, Hydrology Section, was beginning to look a little uncertain, since there had been no floods since June 1988. My voice which in the first couple of years had rung out boldly with messages of impending doom, had started to sound a bit shrill. So it was to some extent a relief when I was woken in the early hours of the morning of Sunday 30 August by the sound of the "Beeper", going mad, telling me that there had been heavy rain in the Brown Hill Creek catchment.

On arrival at the office at around 0430, it was necessary to get a grip on the situation very quickly. It was quickly apparent that there would be at least local flooding problems in the Brown Hill Creek system, and advice was

phoned through to the After-hours numbers of each of the seven councils affected, the State Emergency Service and the Police. The response to the phone calls was very interesting. The storm came in from the west and the councils in the west of the city generally knew it was raining anyway, and didn't really want to be told.

Those in the foothills were pleased to get timely warning and were able to carry out emergency procedures satisfactorily, while those just to the east of the ranges looked out of the window, saw there was nothing happening and went back to sleep, to be wakened very suddenly an hour or so later! It was an interesting lesson in the problems with communications during flash floods.

In fact although there were local street drainage problems in the Brown Hill and Glen Osmond creeks, there was no major flooding in this area. The focus of attention quickly changed to the upper Torrens and Onkaparinga rivers.

The "low" was at that stage somewhere over Kangaroo Island, was feeding moist unstable air over the Adelaide region and assisted by orographic lift of the Mount Lofty ranges produced continuous rain over much of the area. However the real damage was caused by a series of intense cells which developed within the air mass and produced torrential rain. In the early hours of Sunday morning, the catchments for which flood warning was possible were:

Flash Flood (flooding within six hours of onset of heavy rain)

- 1 Brown Hill Creek
- 2 Little Para (& Cobblers Creek)
- 3 Hutt River (Clare)

Non-flash Flood

- 1 Gawler River, from Gawler to the west.
- 2 Onkaparinga River, d/s Mt Bold Reservoir.
- 3 River Torrens d/s, Kangaroo Ck Reservoir.

Hourly monitoring of all rainfall and river and reservoir levels was carried out. Part of this work was done automatically by modem-to-modem communication, the remainder of the interrogation was done manually, either from the old Stevens Telemarks (Counting the 'beeps') or from the newer loggers which are equipped with voice synthesisers. In the meantime the volunteer network had been activated and information was coming in from observers on the upper Onkaparinga (Balhannah, Verdun and Mylor), and on the North Para (Stockwell Road, Nuriootpa and Tanunda). At an early stage, and in consultation with the E&WS Department Scientific Services section, it became apparent that despite the high flows in the upper catchments, there was much spare capacity in the reservoirs (less than 50% full), and flooding in the major catchment downstream of the reservoirs was extremely unlikely.

At that stage reports of the flooding at Cudlee Creek were coming in. Assessments had also

been made of the Flash Flood catchments, however the intense rainfall bursts had moved very rapidly to the east and were no longer a cause for concern for Adelaide. In the North Para catchment there was a strong possibility of flooding, with very high river levels reported at Stockwell Road bridge. To confuse matters further, reports from the upper Onkaparinga indicated that flows were so high that the ratings had been exceeded at Balhannah, and that the movement of large debris had caused the gauge at Mylor to be useless for further measurement.

By about 0930, analysis of flows in the North Para indicated that flooding would occur and at 1030 on Sunday 30 August, the first ever official Bureau of Meteorology flood warning for South Australia was issued. The warning was for Moderate flooding. (Flood categories are **Major, Moderate or Minor**) By 1600hrs on that Sunday, we issued the final flood warning. However the next few days proved to be just as challenging, with a succession of low pressure systems and fronts giving rise to concern. In many situations the major task was to issue "No flood" warnings, because with the heightened appreciation of flood dangers, and with the reservoirs all full and spilling, people were expecting more floods by the hour and there was a general atmosphere of panic, not helped by a few wild stories put around by the media.

One of the striking features of this, our first flood warning session, was the speed with which the flood developed and dissipated. In the months that followed, there have been five more flood events. However with the benefit of experience, we have been able to cope with the situation much better and to make more use of the predictive models that have been developed. The warnings have generally been issued in good time and been reasonably accurate, although we have had trouble on the Gawler catchment estimating when the flood peak would reach Gawler. In most of these floods, the simplest flood prediction models have given the greatest value. Peak height relationships, which are simply comparisons of past floods at various points down the catchment, are very quick to use during times of stress. Unit Hydrographs had been developed for the Gawler catchment for predicting flows at Penrice and Yaldara.

These were used for the last of the events and were quite useful for early predictions of the flood, later confirmed by actual water level data. From an operational point of view, use of Unit Hydrographs or other more sophisticated models will no doubt become easier for real-time flood forecasting. Taking account of the extremely demanding and stressful situations which are part and parcel of flood warning, such models need to be capable of being set up automatically, obtaining and using data directly without requiring manual intervention.

Generally speaking the last few months have given the Hydrology Section the chance to try out the procedures for catchment monitoring, flood assessment, prediction and warning. In most cases the results have been good, although it was fortunate that the greatest need for flood warning occurred on the Gawler, where the system for catchment monitoring is best developed.

For the future, the Bureau will be working on the improvement of the monitoring networks, with emphasis on joint development of systems for flash and non-flash flood warning with State and local government, using radio telemetry and telephone telemetry according to location and use. The use of radar for storm monitoring will improve as soon as the new Weather Watch radar is installed at Sellicks Hill. This will overcome the gap in rainfall display which occurs four times a day when the existing radar at Adelaide Airport is being used for weather balloon tracking.

At any rate after that baptism experience, the Hydrology section can say with renewed confidence:

"Watch out! Every day brings us closer to the next big flood!!"

Records in the Records

by Mark Harvey

With 170 hydrometric stations throughout the state, the majority of which are in the Mount Lofty Ranges, and with 25 of these stations telemetered for flood warning and operational purposes the E&WS Department's Hydrographic Section was kept busy not only ensuring the continued operation of the network but recording some of the exceptional flows that occurred.

Historical data from all hydrometric stations are archived by the Hydrographic Section. The period of record from some locations extends back for many years. For example the record at Gorge Weir on the River Torrens commenced in 1884 with digital data available back to 1937. Interest in the recent events has been high with many requests for flow and rainfall data being received.

It has been interesting to note that record flows were recorded at some stations in terms of the existing digital records. As a bonus, several record physical discharge measurements were obtained by hydrographers in the field, including 330 cumecs at Houlgraves on the Onkaparinga River. Such record measurements allow the stage - discharge relationship (the rating curve) for the station to be extended or reviewed. Reliable gauging station rating curves (at high stages) are essential if full value is to be obtained from stations for flood estimation purposes. The table on the next page compares some of these record flows with previous high flows.

Record rainfall totals were measured for the same period at numerous locations. The Bureau of Meteorology publication "Monthly Weather Review" provides details of records achieved at their recording locations.

It was certainly an interesting four months for hydrographers with multiple flow records being set at some locations:

- At Gumeracha Weir (Torrens R) two of the five highest peaks on the digital record occurred in 1992.
- At Gawler Junction (Gawler R) three of the five highest peaks on the digital record occurred in 1992.
- At Houlgraves (Onkaparinga R) two of the five highest peaks on the digital record occurred in 1992.

Because of the vast amount of flood related data collected, data processing for some locations is still being carried out. Flood damage at some hydrometric stations makes processing of the data more difficult.

A COMPARISON OF NEW AND PREVIOUS PEAK FLOW RATES

STATION	PREVIOUS MAXIMUM FLOW (ML)	DATE	NEW MAXIMUM FLOW (ML)	DATE
R Torrens (Mt Pleasant)	25	3/10/74	67	30/08/92
R Torrens (Gumeracha)	173	29/08/71	280	30/08/92
R Onkaparinga (Houlgrave)	277	26/06/81	432	30/08/92
Echunga Creek	29	24/06/87	40	30/08/92
South Para R (Warren Res)	70	8/09/83	150	30/08/92
South Para R (SE Gawler)	71	29/08/71	108	9/10/92
Gawler R (Gawler Junction)	209	3/03/83	290	9/10/92
Mt Barker Creek	53	24/06/87	> 60	19/12/92
Dawesley Creek	48	3/07/81	> 50	19/12/92
Bremer R (Hartley)	112	3/10/74	300	19/12/92

Full details of available flows and rainfall data on the E&WS Department archive can be obtained from Mark Harvey on (08) 226 2511 or Robin Leaney on (08) 226 2524.

Performance of Flood Plain Mapping and Flood Mitigation Works during the 1992 Floods.

by David Kemp

The 1992 floods in South Australia have given a good opportunity to examine the performance of flood plain mapping and flood mitigation works during flood conditions that approached those for which the mapping exercises and works had been carried out.

The experience has shown that flood plain mapping is invaluable, both for flood plain

management purposes and during flood events. The Gawler River flood plain map that I took to Two Wells during the October flood was kept at the Emergency Services headquarters for the rest of the flood, where it became an essential tool in the response to the floods.

The map had already served its purpose in preventing further land division on the flood plain. If these controls had not been in place the number of people and properties affected would have been substantially greater.

Flood mitigation works proved effective. They reduced damages, but in some ways more importantly they reduced the trauma associated with flooding. It was good to see that the effectiveness of the levee work at Balhannah was covered in the media.

Another observation from last year is the apparent persistence of floods. History shows that when a large flood occurs there seems to be a reasonable chance that another flood will occur. As Mark Harvey has shown on both the Gawler, Torrens and Onkaparinga Rivers the separate floods that occurred last year were each quite important in their own right in terms of the historical

record. The storms and floods from last year also raise several queries:

- Are the current Intensity / Duration / Frequency curves for design rainfall correct for short duration storms?
- What are the effects of the E&WS changes in rating curves?
- How do these floods affect the current flood frequencies derived before the events?
- What are the implications on current flood management?

and the final comment is that we should act quickly to address the above while the memory of flooding is fresh.

Gawler River Flood Management

by David Kemp

Following the flooding that occurred in the Gawler River in October 1992 a task group consisting of State Government, Local Government and community representation has been formed to oversee the production of a flood management plan for the Gawler River.

B.C. Tonkin and Associates have now been engaged to produce the plan. Tasks to be undertaken will include:

- A review of the flood frequencies having regard to the 1992 floods.
- An evaluation of the role and effectiveness of various management strategies including flood mitigation works, selective land acquisitions, planning controls, flood warning, emergency services, local community and personal preparedness plans.
- The consideration of the effects of and future management of the artificial levees along the lower portions of the river.
- An examination of the need for a controlling authority for the management of the catchment.

The production of the plan is expected to take of the order of six months.

Urban Water Resources Centre (University of SA)

by Bill Lipp

A number of agencies and researchers in South Australia are collaborating on innovative, novel projects in the areas of stormwater quality issues and the potential of stormwater as a renewable resource. However, their separate projects are not coordinated, compete for limited research funds, are limited in their dissemination of results and risk duplication of effort.

Due to its School of Civil Engineering's ongoing program of research and development into on-site stormwater retention and the Australian Centre for Water Quality Research (which includes the Schools of Civil Engineering and Chemical Technology) playing a key role to establish the stormwater quantity and quality monitoring network at Glenelg, the University of South Australia recently decided to establish a Urban Water Resources Centre. This Centre will provide a focal point for the development of a coordinated suite of projects and to become a national facility transferring technology and disseminating information.

The centre will work closely with state government departments, local government and the private sector in the development of its research, development and education programs. It will also provide *ad hoc* specialist consulting services and testing services to the water industry.

It has been projected that following initial establishment with the assistance of grants in the first year, sufficient commercial opportunities exist in this field to enable the Centre to operate at a profit thereafter.

The Subsidy Drainage Scheme Advisory Committee recently agreed to grant \$50,000 to the Centre as part of the start up grants for the first year.

Glenelg QQ Project - Ilsax Modelling

by David Kemp

Two students from the University of South Australia spent part of the summer vacations working at the Department of Road Transport modelling part of the Glenelg catchment using the ILSAX model.

Data gathered previously by students "working" for John Argue on the way each house drained was used to determine the total area directly connected to the street drainage system, grassed area and roof area drained on to the block, and not to the street.

The directly connected area percentage of 27% was less than many people would currently use for design purposes, and had to be reduced by a further 10% to approximately 24% to achieve a good fit with the recorded storms.

Data from seven storms in the second half of 1992 was obtained from the E&WS Department. This included rainfall from two pluviometers and one gauging station at Frederick Street, Glengowrie.

Two storms were large enough to produce runoff from the grassed areas within the catchment.

The ILSAX model produced very acceptable results for the storms examined, which is very heartening to those that are using the model in South Australia. Further work is required to determine which values of antecedent moisture condition and percentage directly connected should be used for design purposes.

It is intended that a full presentation of the project results will be given at an ILSAX users group meeting, at a date to be determined.

It's Hypothetical - Impressions

by David Kernich

On 18 November 1992, the Society meeting included a debate on a hypothetical scenario, wherein the River Murray would no longer be fit to supply Adelaide's domestic and industrial needs.

Lawyer and environmental consultant David Cole and a panel of experts from a wide range of backgrounds entertained a near-capacity crowd at the Charles Hawker Conference Centre.

Everyone was most interested in the far ranging topic, probably to see how their own area of expertise fitted into the very big picture painted by the panel. Technicalities were juxtaposed with politics. Harsh economics were contrasted with green idealism. Some barrows were pushed.

All speakers performed well but the impression was that not all the seven veils were removed. The topic was discussed in a somewhat guarded manner, with some using carefully chosen words that could be construed in a number of ways depending on the listener's predisposition. The debate was therefore a bit "sanitised" compared with what it may have been if all the speakers had provocatively used their expert knowledge.

Again, it was disappointing that time constraints (or deliberate policy ?) prevented an open forum at the end of the debate. A few probes from zealots in the audience would have been a welcome high on which to conclude the night.

These reservations aside, the hypothetical was well received and the "Hydsoc" deserves congratulations for a good night out.

Hydrogeological Maps

by Steve Barnett

The first of a series of hydrogeological maps that will assist many future natural resources management decisions in the Murray Basin in South Australia has recently been released. The maps show the depth to the water table, structure contours of Tertiary units and pre-Tertiary basement, hydrogeological cross-sections and hydrographs from representative observation bores. Because the maps are computer-generated, the information presented on them can be easily updated and reproduced at any scale.

The map series is a joint venture between the member Governments of the Murray Basin and the Commonwealth and in South Australia represents the fruition of a ten year investigation which has included a \$700 000 drilling program carried out by the Department of Mines and Energy to complete 180 observation wells.

The first South Australian map to be completed (the RENMARK 1:250 000 sheet) includes the

Riverland and highlights the importance of saline underground water and its impact on River Murray salinity. Subsequent sheets in preparation (PINNAROO and NARACOORTE) outline large areas of low salinity underground water suitable for irrigation and also low-lying areas susceptible to the increasing land degradation problem of dryland salinity.

Plans of the subsurface geology which are included on the maps contain useful information for the search for lignite and heavy mineral sands.

The hydrogeological maps are due to be completed by mid - 1994 and will be available from the Department of Mines and Energy, 191 Greenhill Road, Parkside for \$20 each.

Water Down Under 1994

21 - 25 November 1994
Adelaide, South Australia



Combining the:

- **25th Congress of the International Association of Hydrogeologists**
"Management to Sustain Shallow Groundwater Systems"

with the

- **International Hydrology and Water Resources Symposium of IEA**
"The Hydrologic Cycle: Integrating the Professions"

These symposia were planned separately for 1994 and the two organising committees sensibly decided to join forces to present what will hopefully be one of the largest and most successful "water" conferences ever held in Australia. It is anticipated that there could be as many as 500 delegates attending 5 concurrent sessions - 2 hydrology, 2 hydrogeology and a combined session.

A joint Organising Committee for the combined event has been established and program frameworks have been prepared and sub-committees for all the major activities are up and running.

The Conference logo has been designed - a simple but striking design with interpretation being left up to the beholder.

A promotional video (in VHS format) has recently been edited to incorporate the Institution of Engineers symposium content of the conference. The video outlines the conference format as well as giving some background to groundwater (and some surface water) issues. Any individual or group interested in screening the video at general meetings, conferences, symposia etc please contact:-

Peter Smith
C/- SA Department of Mines and Energy
PO Box 151
EASTWOOD SA 5063

Regular updates will appear in the Newsletter - watch this space.

The Science and Engineering Association - Port Lincoln

This Association is looking for speakers. Any member who may be in Port Lincoln on business and is willing to present a talk to this Association please contact its Secretary:-

C. Forbes
P.O. Box 1274
PORT LINCOLN SA 5606

AWRC 12th Groundwater School

The 12th Groundwater School of the Australian Water Resources Council will be held in Adelaide from the 12 - 23 July. It is comprised of one weeks intensive tuition to enable scientific, engineering and technical personnel to gain a very broad groundwater education. This will be followed by three short courses and a optional groundwater excursion.

Further information can be obtained from:-

Peter Dillon
 Centre for Groundwater Studies
 CSIRO Division of Water Resources
 Private Bag 2
 GLEN OSMOND SA 5064

Meeting Program for 1993

The program for the remainder of 1993

29 April	Bremer-Barker Catchment Group - A community ICM Group
17 June	Upper South East Dry Land Salinity
19 August	AGM + Algal Management in the Murray Darling Basin
21 October	Northern Adelaide Plains Stormwater Strategy
?? December	Chile Hydrogeology ?

1993 Hydrological Society Committee

Paul Harvey (Ch)	226 2502	E&WS Department
Ross Stevens (VCh)	267 3177	ACER Hosking Oborn
Chris Purton (Sec)	223 5583	BC Tonkin & Associates
Bill Lipp (Treas)	343 2508	Department of Road Transport
Steve Barnett	274 7583	Department of Mines & Energy
Santo Ragusa	274 9392	Centre for Groundwater Studies
Stuart Richardson	226 0498	Department of Primary Industries
Trevor Daniell	228 5454	University of Adelaide
Glen Walker	274 9385	Centre for Groundwater Studies
Steve Pugh	274 7696	Department of Mines & Energy

Subscription Reminder

All members are reminded that subscriptions for the 1992/93 are well and truly due. The Treasurer would appreciate a remittance from those members who have yet to pay.

Membership Number. 77

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