THE NEWSLETTER OF THE BRITISH HYDROLOGICAL SOCIETY

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No. 43 August 1994

Fifth National Hydrology Symposium

Call for papers

Edinburgh — 4th-7th September 1995

River basins: the integration of effects

The Fifth National Hydrology Symposium of the BHS will be hosted by Heriot-Watt University, Edinburgh in September 1995. The title *River Basins: the integration of effects* is intended to draw together the wide range of interests in the hydrological community.

Symposium themes

The title of this fifth Symposium incorporates a wide range of themes for the individual sessions. Within river basins, individual processes are taking place from the source areas in the mountains to the flood plains, each with impacts. These require detailed monitoring from the plot scale to the catchment scale over periods from single storm events to the long term. Downriver integration of flows and the wider impacts, including extreme events, are seen in many different river basins; monitoring and statistical techniques are quantifying problems and assessing their significance. The development of hydrological models, including full river basin models, with the variety of spatial data sets now available, enables water resources managers to carry out assessments of the impacts of changes and plan for the future within the river basins.

Programme

The symposium will run from Monday 4th September to Thursday 7th September 1995. The formal paper presentations will start at 9 a.m. on Tuesday and will finish at 4 p.m. on Thursday. An optional field trip to the Highlands will be arranged on the Wednesday afternoon.

A social programme will be organised, including a buffet reception on the Monday night, social night out in Edinburgh and the Symposium dinner with the hydrological games. Accommodation will be on the University campus where there is the usual full range of facilities.

Participation

Papers

Abstracts, of no more than **500** words, should be submitted by **30th November 1994** to **Dick Johnson** at the Institute of Hydrology, Alpha Centre, Innovation Park, Stirling, FK9 4NF. Tel: 0786 447612; Fax: 0786 447614.

Please indicate whether the paper is intended for oral or poster presentation. Prospective authors will be notified about selection in **January 1995** and completed papers will be required by **31st March 1995.**

Exhibitions

An exhibition of instruments, services and expertise will be mounted throughout the Symposium: enquiries should be addressed to **Bob Sargent**, Forth River Purification Board, Heriot-Watt Research Park, Riccarton, Edinburgh, EH14 4AP. Tel: 031449 7296; Fax: 031 449 7277.

Non-contributors are also welcome to attend as long as they take part in the debates and social programme. Please make sure you indicate your interest in the Symposium to Dick Johnson by **31st March 1995.**

Costs

It is anticipated that the costs will be in the range £275-350 for the full Symposium package, depending on the type of accommodation required.

UCG University College Galway, Ireland

International Postgraduate Hydrology Courses

Contract Appointments

The Department of Hydrology, University College Galway, invites applications for one or two contract appointments in hydrology. Preferred specialisations would include one or more of the following:

(a) The physical and chemical processes in hydrology, including evaporation and flow in the unsaturated zone;

(b) Environmental aspects of water resources development;

(c) Groundwater hydraulics and hydrology;

(d) Hydraulics and sediment transport.

Appointments will be of 2 years' duration, or less if this suits the appointee(s), and will commence as soon as possible.

Salary, commensurate with qualifications and experience, will be in a range from **£15,000** to **£30,000** per annum.

Interested persons may wish to contact Professor C. Cunnane, Head of Department, or Dr K. M. O'Connor, Director, International Postgraduate Hydrology Courses, University College Galway, Ireland.
Tel. 353-91-24411, Ext. 2620 or 2213. **Fax** 353-91-24913.

Application, enclosing a full Curriculum Vitae, should be sent to: **The Personnel Office, University College Galway, Ireland,** by **12th August 1994***.

*For readers of *Circulation*, the closing date is extended to ***26th August 1994***.

UNIVERSITY COLLEGE GALWAY IS AN EQUAL OPPORTUNITIES EMPLOYER

BOOKS

Is it really getting warmer?

Impacts of the mild winters and hot summers in the UK in 1988-1990. Cannell, M.G.R. & Pitcairn, C.E.R. (Eds) 1993. Department of the Environment. HMSO. ISBN 0 11 752642 8.

This book's intention is to form a useful record of the multitudinous amount of data collected and analysed, together with the host of investigations and studies which were carried out into the impacts on the environment of the mild weather over the period 1988 to 1990. This period was remarkable in that there were two successive mild winters and hot summers, with extended drought conditions over much of eastern and central England.

The main driving force, especially of the three DOE commissioned reports which this book summarises, was to gather information which may suggest the type of responses to climatic warming that may deserve attention.

The report is fairly neatly split into three parts, the first two (winters and summers) describing the climatological and hydrological variables and the third section bringing together the impacts on the terrestrial environment, all aspects of agriculture, horticulture and fresh-water ecosystems.

I found it a fascinating account, especially as it contains many anecdotal and personal comments in addition to the large amount of facts and figures. Hydrological aspects are well covered, with a lot of figures, dates, comparisons, periods, etc. to take in, but quite clearly presented. There did seem to be one or two different 'standard' periods, e.g. temperature and potential evaporation over 1961-1980, but rainfall over 1941-1970, which may have some effect on the statistics.

The book presents a good record of the weather, its regional variations and how the trends led to water shortages in certain areas. The period was certainly a time of contrasts, both in distribution around the country and in the marked regional variation in severity of occurrences. An amazing diversity of studies are reported, all having relevance to warmer periods, especially over many months duration, which illustrate the high interdependence of climate and plants and animals.

Water management issues are discussed, indicating the increase in water requirements for may purposes over the period. Questions are raised about the need to provide sufficient water, i.e. irrigated crops do well in higher temperatures, provided that there is adequate water! However, the need to restrict water for various uses is also discussed.

There are many interesting hydrological facts with which to amaze your colleagues: "January to March 1990 was the warmest three-month start to a year in central England since 1659", or "Rainfall over the winter 1989/90 was more than twice that of summer 1990, a ratio not achieved since 1766" (more like a Mediterranean climate!).

Many other eye-catching impacts of the long periods of dry weather are available, such as "yields of honey per bee colony in 1989 and 1990 were the highest for 32 years", or (as if you hadn't noticed!) "Slug populations in spring 1989 were higher than for about 10 years".

Overall the book will be of interest to many disciplines, not just hydrologists, and although it doesn't give definitive answers to whether there is climate change or not, it does give an enormous variety of changes that could occur, and shows the many possible indicators of such change. It clearly shows the value of collection and rigorous quality controls of climate and hydrological data, and the collection of seemingly unconnected happenings which help to explain how climate and the environment are linked.

Anyone wanting to get a broad view of the inter-relationships of climate variables and the environment in all its aspects will find this book of interest.

Mike Knowles
Warrington

Book reviews

I have already received offers from a few members to review books for *Circulation* and I hope to start the review process rolling again soon.

John Griffin

The Maidenhead, Windsor & Eton flood relief scheme

BHS Southern Section Meeting 11 May 1994

Against a backcloth of ministerial decisions, either in the making or awaiting announcement, the Southern Section held its last meeting of the 1993-94 season at Imperial College, London.

Ian Reid (having recently moved to Loughborough University and performing his last task as a member of the Southern Section Committee) was in the chair, and he welcomed **Colin Martin**, Consultant to NRA Thames Region, who put his neck on the block and gave an informative and entertaining account of a scheme that might or might not get the green light in the next few weeks (or months!).

Those of you who are familiar with the controversy surrounding the scheme will know that Colin was talking about what was to come, or what might have been, even as he spoke. As it happened, no bolts of lightning emanated from Whitehall during the course of the meeting — although they might before this report is published. Colin began by giving some of the history of the Scheme and the reasons for its conception. Memories of the 1947 50-year event which had led to extensive flooding of Maidenhead are still fresh in the minds of the local community and incomers have been reminded more recently (and perhaps usefully!) of the folly of flood-plain occupance by events of lesser magnitude such as the 6-year flood of 1990.

Flood alleviation studies had been undertaken for some time within a broader framework of reducing risk and hazard, not only in the non-tidal Thames but also in the tidal section and estuary below Teddington. Along the non-tidal river, Maidenhead had been identified as likely to benefit most from engineering and it had been recognised very early in the planning process that a relief channel would be the most cost-effective method (see Figure 1). Colin was appointed Project Manager in 1989 and the Planning Application was submitted in January 1991.

The public inquiry that ended in December 1992 had been a lively affair, frequently spilling out into the media as the prospective beneficiaries and 'losers' used their various, and not inconsiderable, influences in safeguarding or developing this valuable real estate along the Thames corridor. The sensitivity of what might become the largest river engineering scheme in the UK was amply reflected in the promotional NRA video which Colin then showed to an attentive audience. Kingfishers and great-crested grebes, country riverside walks and canoeing courses were all given prominence against a musical track (that Colin disclaimed!) before the variable dimensions of the 45-metre-wide channel were mentioned as if in passing. The environmental impact assessment was described in detail and the audience were left in no doubt that the most important consultant has been, and will be, the 'resident' archaeologist — the planned channel-alignment already having been altered to avoid one of the few lowland Iron Age encampments found in the British Isles.

The video over, Colin then described the 12 km channel, reach by reach. There was something for everyone. The headache of passing under Brunel's Great Western Railway without interrupting traffic, and tunnelling under the 6-lane (or will it be 12?) M4 motorway played to those interested in engineering logistics. 'Softening' the trapezoid of this largely unlined, anthropogenic, anastomose channel (wow!) got the environmental hydrologists sitting up, as did the description of measures to keep out contaminated stormwater. In this context, and allowing for the odd occasion when discharge falls abnormally low, as in 1976, the intake above Boulters Lock, Maidenhead, will (would have?) allow(ed) a trickle flow of up to 10 $m^3 s^{-1}$ through to 'sweeten' the channel water which will (would have) be(en) otherwise groundwater-fed. What is the relief channel intended to do? Colin explained that it would accommodate about 40% of the 65-year recurrence-interval design flood-peak of 515 $m^3 s^{-1}$ and reduce the flood-stage by 0.74 m, leaving the old Thames to cope with its present bankfull capacity of circa 240 $m^3 s^{-1}$ and an enhancement to 300 $m^3 s^{-1}$ through the construction of minor flood banks. But it will also create an amenity in a highly populated area and yield 2 million m^3 of building aggregate! The discussion that followed was lively. **Peter Willie** asked about problems of dewatering during construction, especially in the difficult reach where the channel crosses the

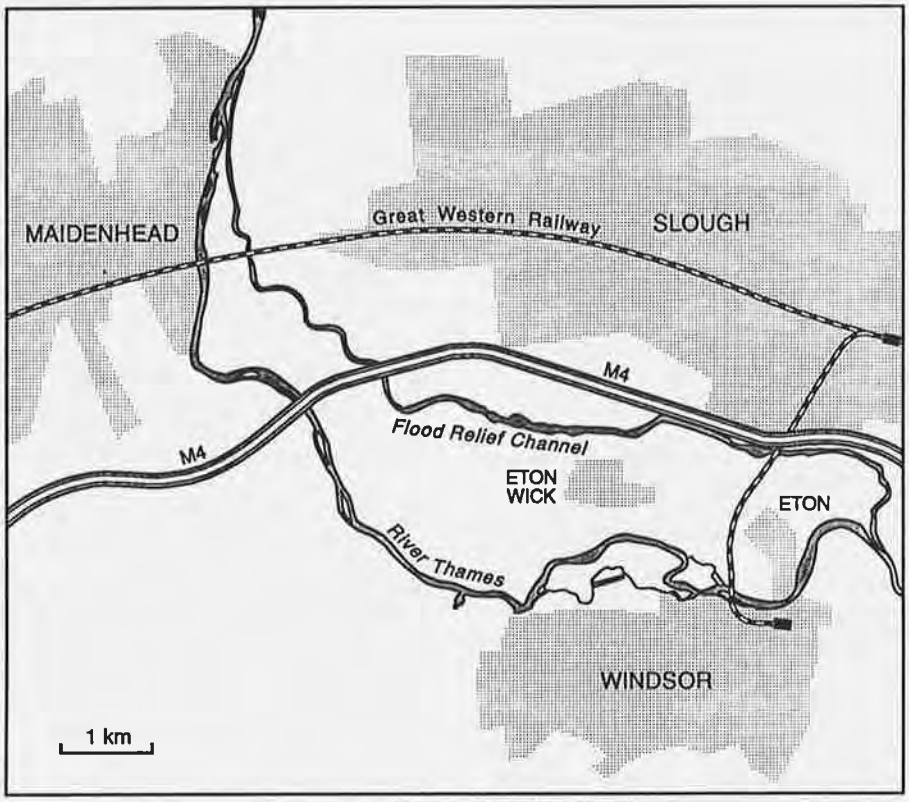


Figure 1 Alignment of the Maidenhead, Windsor & Eton Flood Alleviation Scheme

lines of the railway and the motorway. **Howard Wheater** asked about cost-benefit of the scheme and whether it was sensitive to the return-period of the design-flood. Colin indicated that this was readily assessable, but given that the design-flood had such a long recurrence-interval and that such analyses depended very much on parameterization, the design flood does not have as much impact as lesser, more frequent events.

The calculations made by the NRA give a benefit:cost ratio of 1.2 without intangibles, and 1.4 with. The Treasury have made some changes in the calculation to give a ratio of 0.96 without intangibles, a figure which is still satisfactory. Intangibles are quoted as ranging from 25% to 200% of tangible damage costs. **David Wardle** then pressed as to how benefit had been quantified. **Ben Piper** asked how the NRA were able to benefit from gravel extraction (this will offset the Scheme's £65M cost by about £18M): Colin replied that the compulsory purchase order allowed rights to extract minerals from within the channel boundaries and that the payment of royalties would form part of the purchase price.

David MacDonald wanted to know why the flood problem would not be exacerbated downstream in Datchet. Colin invoked the continuity equation, indicating that the flood-channel storage would fill within less than three hours but that the design-flood peak is flat and would go on for 21 days; water would merely bifurcate in the man-made anastomose, so saving Maidenhead, Bray, etc., and recombine opposite Home Park, Windsor. This would not affect the hydrograph at Datchet. **Warwick Hutchinson** asked if there were any hydraulic purpose behind the relief channel's sinuosity, to which Colin replied that there are no fall problems and land use had been the primary concern in deciding or altering the alignment.

This was a stimulating and enjoyable Meeting, and Southern Section thanked Colin Martin warmly for his presentation. We all now await to hear whether construction of the Maidenhead, Windsor & Eton Flood Alleviation Scheme will join the M4 Motorway Widening, London Heathrow's Fifth Terminal and the Eton College Rowing Lake as ways of making the earth move for residents in this busy neck of the woods!

Signing off from Southern Section,

Ian Reid
Loughborough

The President's piece

In this article I would like to highlight two exciting developments, the first on the International front, the second relating to Education and Training.

In May, I was delighted to accept the invitation of the American Geophysical Union (AGU) to join them for their 75th Anniversary celebrations in Washington DC. They had invited presidents of the various geophysical societies around the world to join them in a Convocation (!!!) of Presidents. This included representatives of various national hydrological societies. We spent a weekend discussing whether there were any benefits to be achieved from greater collaboration between the societies.

The societies represented were vastly different in terms of size, aims, scope of activities and financial status. For example, AGU has a membership of 30,000 and an operating budget of $14 million. BHS, however, was by no means the smallest society represented.

Many of the societies covered technical areas vastly different from ourselves, since societies across the whole breadth of geophysics were represented. Some societies were national societies for one particular specialism, like ourselves. Others were an umbrella organisation for all geophysicists: e.g. the AGU itself, the European Geophysical Society and the European Geophysical Union.

It became clear that collaboration and information exchange between the societies will be of benefit to society members, particularly in academic and research fields. It was interesting that very few of the societies represented at the meeting have members across the spectrum of industry, academia and research institutes in the way that BHS has. Probably the Royal Meteorological Society (UK) and the Japanese Society for Hydrology and Water Resources were the only comparable examples.

It was very clear from the meeting that, whilst there may well be merits in lateral collaboration, the various national societies are not interested in vertical integration, for example to become a national branch of AGU or EGS.

In terms of constructive progress, the meeting produced three notable outcomes:

1. A declaration: all good Convocations produce one of these! This makes clear statements about the importance of collaboration at the global scale. The declaration is reprinted on page 5 of *Circulation*.
2. The setting up of an information exchange network between societies on email.
3. An agreement to meet again in twelve months' time at the IAHS meeting in Boulder, Colorado, to review whether collaboration over the intervening year has been successful and useful, and to decide whether to continue, extend or abandon the process.

The information exchange network will be the prime mechanism for interaction on a Society-to-Society basis. At this stage it is not anticipated that the link will be used by individual members, although this may well come in the future. The first job is to set up the network and test its value. The email system to be used is the INTERNET system, into which the UK academic and research network, JANET, has a gateway. The Institute of Hydrology has very generously offered to act as the UK postbox for this link. We expect to start trials of the network within the next two months. The email address will be: **b.h.s@ua.nwl.ac.uk**.

Initially, the sort of information which will be transferred will relate to a register of the Societies, their addresses and activities in order that Societies and individuals will have a contact point in each country should their members have need to make contact with or visit co-workers in similar fields to themselves. Once the system is proven, it is hoped to extend it to include catalogues of research opportunities which are available, e.g. post-doctoral research fellowships, lists of publications and, ultimately, copies of education and public service documents which societies have produced, which they are happy for other societies to use as a basis for their own publicity material.

All societies, just like BHS, are keen to raise the profile of their technical area in the public domain but, again like BHS, are concerned about the costs associated with this process. By collaboration and exchange in kind, it was felt we might all gain, at minimal cost.

Once the network is set up, reporting to BHS members will take place via *Circulation*, but — who knows — as we move further into the technological age, we may ourselves use email to pass on the information!

One of the by-products of the meeting was to extend bilateral contacts with other societies. I had very positive discussions with **John Harries** of the Royal Met Soc and we look to extend

International Convocation of Geophysical Societies — declaration

Scientists from 18 countries, representing 27 geophysical societies and five international organisations, met in Washington DC on the occasion of the 75th Anniversary of the American Geophysical Union to discuss the state of geophysics and collaboration among geophysical societies worldwide. Three resolutions were passed:

"The International Convocation of Geophysical Societies urges educational institutions, from schools through universities, to strengthen the quality of studies in the geophysical sciences so as to ensure that an adequate supply of the best science students go into the geophysical disciplines. These disciplines are vital for humans to understand to cope with problems of the environment such as global change, natural resources, and natural hazards in a dynamic Earth which are increasingly urgent."

"The International Convocation of Geophysical Societies urges governments to maintain the vigour of the basic sciences. It is only by quantitative understanding of the basic science of the Earth that geophysicists will be able to contribute to the solution of the myriad problems that will face us in the future."

"The International Convocation of Geophysical Societies reaffirms that international co-operation and exchange of scholars are vital aspects of development for all sciences and especially geophysics."

the collaboration we have developed already between BHS and the Royal Met Soc in terms of Education and Training and joint meetings. In particular, we wish to review whether we can develop joint initiatives towards educational and public service literature.

On the whole, I felt the Convocation of Presidents was much more productive than I had anticipated before I went, or even part-way through the weekend. There do seem to be some very positive steps we can take towards useful collaboration. It will be interesting to see just how far we get in the next 12 months.

The other highlight of the quarter has been the recent change in position regarding Civils and Chartered status for hydrologists. My staff were astonished to find me positively euphoric during one Friday afternoon in May. No, it was not the prospect of a week's holiday in the Scottish Highlands, nor had I won the Water Aid monthly draw. Instead, I had just received a letter from **John Whitwell**, the Director of Education and Training at the ICE, telling me of the recent ICE Council decision that would open the way to hydrologists with first degrees in subjects other than Civil Engineering being able to seek Chartered status without being faced with the prospect of Engineering Council examinations. For those BHS members like myself who have had to face the trauma of sitting exams in subjects such as construction management, soil mechanics and surveying, just to prove their geography or environmental sciences degree as good as a civil engineering degree for a career in hydrology, this is an unbelievable step forward. For the first time, the value of an MSc in subjects such as Water Resources Management and Engineering Hydrology is recognised, as are PhDs in hydrology-related subjects.

Having read the letter several times — just to make sure I wasn't dreaming — I rang **Kevin Tilford**, Chairman of the BHS Education and Training Sub-Committee and asked him to liaise directly with John Whitwell. John had asked that BHS help publicise the changes and work with the Civils to ensure successful implementation of the new regime. Clearly, in the past, BHS members have had a lot of suspicion regarding their treatment by the Civils. It appears that there is now a real sea-change. It is up to BHS members who are interested in Chartered Engineer status to take up the challenge and apply for it through the Civils. It is only by getting successful candidates through the new system that we will prove the system works. I appreciate, from my own experiences, that this will take a lot of trust on the part of BHS members, but I do encourage anyone who is thinking of seeking Chartered status to contact Kevin and make their application. By testing and proving the new route, you will open up the way to BHS members in the future who are not yet at that stage in their careers.

On a personal level, I feel a great sense of satisfaction that this change has come about after many years of discussion with the Civils about the inflexibility and inconsistency with which they treat candidates from backgrounds other than Civil Engineering. Thanks are due to those who have helped over the years — to name but a few — **Frank Farquharson, Howard Wheater, Peter Wolf**. Thanks are due also to those BHS members who have had the stamina, good humour and, in many cases, sheer bloody-mindedness to fight their way to Chartered status through the existing system. The best way of repaying these efforts is to see a stream (!!) of BHS members taking up the new opportunity with enthusiasm, rigour and speed.

[See also Kevin Tilford's article on *Education and Training* on *page 13*.]

Susan Walker
President

New Members

We welcome the following members to the Society:

Carter, R.C. ..... Silsoe College, Cranfield University, Bedfordshire
Dunlop, B.J. ..... Ove Arup & Partners, London
Grew, H.L. ..... Dept of Geography, University of St Andrews
Hamer, A.R. ..... NRA North West Region, Warrington, Cheshire
Lawson, R. ..... Acer Wallace Evans Ltd, Penarth, Glamorgan
Mohamed, A. ..... School of Civil Engineering, University of Birmingham
Purkess, C.H. ..... Cirencester, Gloucestershire
Sherwood, J.M. ..... Dept of Civil Engineering, University of Newcastle upon Tyne
Travers, N.G. ..... Walton, Liverpool
Tye, D.C. ..... Eastbourne, East Sussex

Reaching the parts that other archives don't ...

The National River Flow Archive at the Institute of Hydrology (IH) has recently received flow data from the River Creed on the Isle of Lewis. While maps of the river network of mainland Britain sometimes seem veritably littered with gauging stations, past and present, this is the first step in river flow measurement in the Hebrides. As such, the new gauging station represents an important extension to the spatial coverage of our UK river flow information base.

The station (see photograph) was built in response to rising concern in the 1980s about the reliability of Stornoway's existing supplies. The River Creed (or Greeta River, as it is also known) runs only 2 km from Stornoway and offers the potential for future resource development. Its specification features not only a compound crump weir, but also extras such as a fish counter and mains electricity! Through an informal arrangement with IH, local Western Isles Council staff service the site at regular intervals and forward stage data to the IH office in Stirling for quality control, processing and transmission of flow data to the National Archive in Wallingford.



Creed Bridge gauging station on the Isle of Lewis

Fourteen months' data are now held. Here are some key statistics from the first year's data relating to this gently undulating 45 km^2 catchment of peat and lochans:

Mean flow	1.319 m^3 s^{-1}
Highest peak	8.618 m^3 s^{-1} on 29.1.94
Lowest 10-day mean	0.083 m^3 s^{-1} from 10.9.93

Anyone interested in a quiet winter holiday, with current meters and a bridge, is encouraged to make enquiries.

Andrew Black
IH Stirling

Two session reports from the XIX EGS Assembly in Grenoble

This year's assembly of the European Geophysical Society (EGS) was held in the charming city of Grenoble in late April. Sitting among the French Alps at the meeting of two valleys, Grenoble enjoys spectacular views of the snow-capped mountains, an interesting variety of architecture lining the numerous squares and gardens, and a very efficient tram service. The pride of the French is borne out in the thoughtful decoration of the central avenues and precincts, and in the tidiness and cleanliness all about. If you find yourself in the vicinity, this city is certainly worth the detour.

Session HS2/OA13.2: Stochastic modelling of rainfall in space and time

With the development of distributed and semi-distributed hydrological models, a need has arisen for a parallel development in the modelling of rainfall at small space and time scales. Similarly, to make sense of the outputs from the large grid-squares comprising Global Circulation Models, the rainfall inputs need to be realistically disaggregated to a finer scale. The session was held in recognition of these needs.

Perhaps the most impressive piece of work, matched by an excellent presentation, was that of **Foufoula-Georgiou** and **Kumer**. Their work described a method for disaggregating rainfall fields using wavelet transformations (akin to multifractals). Working at the University of Minnesota, this bright pair have constructed a well-planned study in which applicability carries priority. The 'Maradona of multifractals', **Shaun Lovejoy**, attended some of the session and delivered an epic-length (though, for me, idiosyncratic) overview of multifractals in rainfall. Other interesting presentations with a fractal approach included an attempt by **Olsson** *et al.* to link fractal exponents to climate characteristics, and a propositional speech by **Puente** (an Italian working at the University of California, Davis) which generated an interesting discussion.

The other side of the coin, in terms of mathematical approach, is the development of stochastic models to generate rainfall fields and time series based upon the characterisation of observed rainfall systems. The various statistical techniques proposed were

neatly put into context by **Wilby** (University of Derby) who reminded us that these stochastic models rely upon the subjective classification of weather types. Consequently, whilst the mean rainfall characteristics are adequately reproduced, the extremes may not be, and so the models are somewhat limited in their application.

Ian J Dwyer
IH, Wallingford

Session OA14/HS8: Atmospheric and hydrological processes and models at the soil-vegetation-atmosphere interface: results from recent international experiments

This section covered a wide range of experimental and modelling studies at various time and space scales. One theme which attracted interest throughout the week was below-ground processes.

John Monteith (Institute of Terrestrial Ecology, Edinburgh) has been pleading for years that we should be studying the processes involved in water abstraction by roots, and he gave an example of a simple study of how root growth and soil moisture can be used to derive soil properties. **Jim Wallace**'s talk presented by **John Bromley** (both Institute of Hydrology) also called for more work below the surface. **Pedro Viterbo** (ECMWF, Reading) demonstrated the importance of including soil processes in large scale models. He showed how a more realistic representation of the soil in the ECMWF global forecast model made dramatic improvements to their forecasts of the rain which caused the Mississippi floods in 1992. **Agnès Ducharne** (LMD, Paris) also showed that the run off predicted by the LMD GCM was sensitive to variability in field capacity — but found little effect on evaporation. In a similar study but at a smaller scale **Isabelle Braud** (LTHE, Grenoble) presented a SVAT sensitivity analysis showing that the spatial variability of soil moisture and hydraulic properties would produce biased surface fluxes for bare soil, but not when the soil was covered in dense vegetation. This tends to homogenise the predicted fluxes allowing mean properties to be used. At the same scale **Steve Gaze** (Reading University/IH) showed experimental results from the Sahel which revealed large spatial variation in soil moisture resulting from the microtopography, although he concluded that for the sandy soils of the Sahel this had little effect on evaporation.

The problem is how to reconcile the large scale the modellers need to describe soil processes at the scale of 100s of kilometres, with the well-known variability of soil properties at the scale of metres. **Cathy Holwill** (IH) showed one way forward by demonstrating how micrometeorological techniques could be used to aggregate small-scale variability in soil properties to derive parameters at the 100 m scale. Her data produced the best straight-line fit of the session.

John Gash
IH, Wallingford

More on national strategies

IWEM/NRA meeting
London
20th April 1994

IWEM and the NRA were joint hosts to a conference on Water Resource Development Strategies. This gave the opportunity to expand on components of the NRA's National Strategy published last March, and also to compare it with the current situation in Scotland and Northern Ireland.

In his introduction **Ed Gallagher** emphasised the need to act for sustainability, and to apply the precautionary principle. Value for money was also crucial, and more work was needed to establish methods for enumerating environmental impacts, costs and benefits. The issues raised by the strategy were complex, emotive and political, and presented an "interesting challenge".

Peter Herbertson and **Geoff Burrows**, in their paper, *Demand Management — NRA perspectives*, emphasised that this component is the key to achieving sustainable development. With the achievement of NRA demand management assumptions, leading to a low growth in water use, there is no need for major strategic developments. However success will only come as water companies and their customers understand that some forms of demand management are cheaper than new sources. Progress will also depend on the availability of better information on water usage and loss.

They contrasted the NRA's 1993 demand forecasts with those published by the Water Resources Board (WRB) in 1973 in the last national water resources strategy. The WRB forecasts depended on extrapolation of past trends in *per capita* consumption, which had until then shown a steady growth. WRB noted that this could not continue indefinitely, but suggested that there were as yet no downward pressures. There was no reference to losses or leakage in the 1973 report, as no data existed at the time to allow reliable estimation of this component. Low growth in industrial demand in the 1970s may be explained by the world recession. In addition, the formation of the regional water authorities in 1974 resulted in rationalisation of supplies and a reduction in local surpluses. A growing awareness of real levels of water unaccounted for was heightened by the 1989-92 drought. The central role of demand management in the 1994 strategy emphasises how far perspectives have changed since 1973.

The paper presented details of the demand forecasting methodology used by the NRA. By breaking demand into components, the impact of different demand management activities can be identified and monitored. For example domestic metering is expensive, but has a significant impact on peak consumption. This is extremely valuable if it allows the development of new sources to be delayed.

The NRA will therefore continue to promote demand management as a central component in its strategy, and is encouraged by the efforts of water companies in this area. Continued performance monitoring and reporting is essential. It was pointed out by a member of the audience that these policies entailed very significant costs which were not considered in the strategy document. However there is ample evidence that there are also worthwhile benefits.

Phillip Wright gave a Scottish perspective on water resources, first summarising the administrative arrangements and overall resource/demand balance in Scotland.

National surveys of existing and future water resources and demands

were published in 1973 and 1984. In the 1984 report demand projections were significantly revised downwards. A third study is in progress, to be reported on in December. It was noted that leakage varies widely, from 18% in Fife to 49% in the Western Isles. However there is no incentive to reduce this latter figure as water is abundant locally, and the cost of transfer is prohibitive. Resource projections also took account of afforestation: yields are reduced by up to 2% for each 10% of the catchment covered by mature forest.

There followed a summary by **Chris Binnie** and **Henry Plester** of water resource development and administration in Northern Ireland. This has been the responsibility of the Water Executive, DOE(NI) since 1973, but systems still often reflect the parochial nature of the original promoters. A major study of water demand and supply was commissioned in 1983, and a new water resource strategy has recently been produced. The concept of leakage control is not new: in 1817 officers of the Belfast Charitable Society were empowered to enter private property to "prevent wastage of water", but serious efforts to monitor and control leakage only began in the 1970s. It was noted that there were particular difficulties in achieving leakage control because of the lack of access at night (for security reasons), controls on investment in the province, and the scattered nature of the rural population. The length of mains per head of population is twice the UK national average. Significant investment was also required to comply with the EC Drinking Water Directive. The resulting strategy includes the promotion of several major sources and transfers, rationalisation of some existing schemes, and an enhanced leakage control strategy in all areas.

John Lawson and **Tim Askew** then described the range of options considered for new resources in developing the strategy for England and Wales. Conventional options can be classified as either strategic transfers or strategic storage. Forecast deficits in the south-east can be supplied either by development of additional storage in the region, thus making more use of winter river flows, or by transfer from wetter regions, possibly supported by additional storage. New sources considered included Craig Goch (to regulate the Severn or the Wye), partial redeployment of Vyrnwy (to regulate the Severn), the use of rising groundwater under Birmingham, and new reservoirs in East Anglia and southwest Oxfordshire. Transfers were also considered from the Severn to the Trent and the Thames, and the possible use of the canal system was also investigated. The paper gave details of these options and presented comparative yield and cost data. It also highlighted the long lead-times associated with major resource developments, and recommended further investigations.

Environmental aspects of the strategy were described by **Hugh Goldsmith** and **Sally Johnson**. An independent high-level environmental assessment of strategic options for water resource development was a key component of the strategy. The aim was to compare options on a consistent basis in order to encourage the promotion of schemes which are technically, environmentally and economically acceptable. A framework for assessment was developed, based on a literature search, review of impacts of existing UK schemes and workshop sessions with NRA specialists. Each component type (e.g. regulated river reach) was assessed separately to establish impacts in various categories, such as recreation, terrestrial ecology and fisheries. The sensitivity, risk of adverse impact and benefit opportunities for each component were assessed on a three-point scale, giving each component equal weighting. There is scope for further enhancing this technique. The potential for adverse environmental impact depends on the sensitivity of the site, the scale and duration of change and the potential for mitigation.

The work highlighted the need for further assessment of the impacts of strategic policies, such as the acceptability of using natural watercourses, as opposed to transfer by pipeline.

In the final paper **Jerry Sherriff** emphasised that the planning process was not easy: there were many uncertainties. These were illustrated by the dramatic differences between resource requirements of the High and Low demand scenarios. Demand management was doubly crucial because of the long lead-time in implementing schemes. The way ahead for the NRA consisted of monitoring consumption, demand management and impacts in order to promote efficiency and economic levels of leakage and metering. Further investigations were required into environmental impacts of schemes, and a number of hydrological studies were needed, both to refine individual elements of the strategy and to provide satisfactory interbasin models.

Speakers from the floor were generally supportive of the strategy, but **Ed Smith** asked us to consider whether the precautionary principle was valid in view of the general absence of evidence of long-term impacts of the recent drought. **Brian Rofe** also considered that the strategy was unnecessarily defensive about justifying the need for additional reservoir storage. There was considerable evidence of the economic benefits of reservoirs.

Clive Swinnerton closed the metting by underlining the need to be flexible, to make decisions and act on them cooperatively. The message was that the strategy is not a once-and-for-all document destined to gather dust on a shelf, but a starting point and a framework for future strategic development.

Hilary Smithers
Warrington

Field practice and instrumentation

BHS Pennines Section meeting
York Museum
18 May 1993

Some fifty delegates attended the Annual General Meeting of the Pennines Section followed by a mini-exhibition and presentation of three papers relating to Field Practice and Instrumentation. At the AGM, two new members were voted onto the Committee: *Hilary Smithers* (NRA North West) replacing *Adrian Saul* (University of Sheffield) and *David Williams* (MRM Partnership) succeeding *David Young* as the IWEM representative on the group.

Graham Leeks presented a paper, co-authored by **Paul Wass** (both Institute of Hydrology) on *Monitoring of river basin fluxes: field research in the Land-Ocean Interaction Study (LOIS)*. This wide-ranging talk described in depth the £30 million, five-year, multi-disciplinary LOIS research programme,

which involves collaboration between researchers from universities and NERC research institutes. LOIS also forms part of the UK contribution to the Land-Ocean Interactions in the Coastal Zone (LOICZ) and International Geosphere-Biosphere (IGBP) programmes. At present very little is known about the flux of materials from British rivers into the sea: LOIS aims to provide better understanding and quantification.

The core study area is the east of England, with 80% of the research effort focusing on the River Humber system and 20% on the River Tweed — two systems with quite different physical, chemical and biological characteristics. With a freshwater catchment area of over 24 000 km^2 the Humber is Britain's largest estuary. Within this system the Yorkshire Ouse is the most intensely studied river. The other principal tributaries are also gauged. As expected in a river system with a multiplicity of rivers, regional water transfers and effluent inputs, river fluxes to the Humber estuary are extremely complex.

A recurrent theme was the importance of high quality instrumentation and data. Graham demonstrated that an assessment of currently available hydrometric data reveals that whilst river flows are gauged in over 1200 locations in the UK (a density of one gauge per 150 km^2), the gauge distribution is far from uniform and the coastline region is poorly gauged. Consequently, additional ultrasonic gauging instrumentation is required at a number of river/estuary interfaces, particularly to support short term, focused research sub-projects. Harmonised data (i.e. data conforming to an international specification) for a range of parameters will be used, in addition to historic data, which are not harmonised.

The primary part of LOIS is concerned with the observation and modelling of river basin (upland to lowland), atmospheric, coastal and estuarine systems (RACS) within a predictive and unifying framework. Amongst other things, this will enable the effects of environmental change (e.g. climatic, land-use, industrial outputs) to be assessed fully across a range of timescales. Graham stressed the difficulties the project faces, not only in the complexity of the natural processes, but also from the additional complications of human influences, such as regional water transfers.

Finally Graham highlighted the importance of 'large events': 95% of sediment is transported from rivers to estuaries in 5% of the time, with 50% occurring in 1% of the time. This dynamic temporal variation further illustrates the enormity of the observation phase of the project.

David Stewart (NRA Northumbria and Yorkshire) asked how useful harmonised data were, given the temporal variation of flow and the frequency of the point samples. Graham conceded that in terms of particulate flux measurement such data were of limited value because of their low temporal resolution.

Jim Hanker (NRA Severn Trent) pointed out that the River Trent is the major tributary of the Humber and wondered whether there were any plans to gauge Trent flows ultrasonically. There were no plans for this within a LOIS framework, although some discussions were being held as part of a specific project on sediment transport in the lower Trent.

David Archer (NRA Northumbria and Yorkshire) commented that each year some 200 million tonnes of sediment were dredged from the Tyne estuary — 50% of the volume of Kielder dam — and within the fluvial river system gravel extraction is also widespread. He wondered whether LOIS had considered the impact of unnatural processes on sediment fluxes. Graham agreed that these important processes affected both sediment and flow dynamics. Estuarine dredging data were to be collected and quantified in association with British Ports.

Keith Beven (University of Lancaster) commented on the importance of the influence of man and large events in land-ocean fluxes and wondered whether the LOIS community was ready for a large event, should it occur in the next five years. Graham agreed that large events are crucially important and this illustrated the need for automated observation systems.

David Izatt (Howard Humphreys and Partners Ltd) and **Stephanie Peay** (Cobham Resource Consultants) presented a paper entitled *Methods of environmental survey of the Yorkshire Ouse, a large lowland river*. David began by describing an environmental appraisal of a primarily fluvial reach of the Yorkshire Ouse. The results of the survey, conducted on behalf of Yorkshire Water, will accompany a licence application to increase surface water abstraction from the river, together with a lowering of prescribed flow. The survey was designed to address gaps in the available data and specifically to cover aspects potentially affected by a change in the flow regime (i.e. lower flows): water quality, wastewater discharges, algae, other plants, aquatic macro invertebrates and fish.

The 30 km section of the river surveyed extends from the confluence of the Ouse and River Nidd, downstream through York, Naburn and the confluence with the River Wharfe to Cawood. The study was conducted through the summer of 1993 in the hope that there would be a period of low flows. Unfortunately, from July to November it was extremely wet, and the river flow only fell below the prescribed level on three brief occasions.

The survey techniques used during the study were described, including static monitoring (conducted at all inputs to the river), boat surveys and spot sampling (17 sites visited on a weekly basis). Each observed a range of parameters including temperature, dissolved oxygen, conductivity, pH and ammonia. Particular emphasis was attached to storm sewer overflows (SSOs), pumping stations and sewage treatment works. Part of the study focused on algal populations and the relation of these to flow rates — important since planktonic algae can block treatment filters. As with the LOIS presentation, the importance of automatic data recording was a recurrent theme.

Stephanie introduced a further aspects of the study. The physical characteristics of river channel flora and fauna were recorded at 500 m intervals for the whole study reach whilst electro-fishing and hydro-acoustics were used to assess the fish stocks. The hydro-acoustic technique used a side scanning dual beam sonar - the strength of returned signals being proportional to the number and size of fish present. The data collected were presented as a chart of fish density along the river. A striking feature of this was the large variation along the river with notable 'highs' in York itself and downstream of sewage treatment works. Electro-fishing relies on a low electrical current to temporarily stun fish so that they float to the surface where they can be netted, examined and returned. Stephanie explained that the technique, limited to a water depth of 2 m, provides detailed information about the fish population, such as species, age, health and size. The survey observed fifteen fish species: three species accounted for 85% of the fish population. A comparison of the fish stocks and growth rates with other rivers showed the Ouse to be supporting a healthy fishery.

Stephanie concluded that environmental assessment was a process requiring considerable planning and entailing extensive consultation and liaison with local interest groups, planning authorities, etc., as well as the more obvious fieldwork, data collection and analysis.

David Williams (Rust Environmental) expressed surprise at the observation that SSOs did not cause quality problems in the receiving water and requested additional comments. David Izatt responded by stating that the conclusion should be taken in a local context: the length of the Ouse studied is ponded behind a navigational weir. Despite this, neither SSOs nor storm overflows from sewage treatment works were seen to pose a quality.

Neil Osborne (NRA Anglian Region) wondered whether retention

time was the crucial parameter rather than the concentration or velocity of water. David replied that the biological diversity ties in well with the chemical water quality. NRA surveys at a number of sites have shown biological quality gradually (not abruptly) shifting through York.

Paul Towlson (NRA Northumbria and Yorkshire) commented that the surveys were conducted at a time which was unrepresentative of low flows in the River Ouse and questioned whether SSOs arising from high intensity rainfall (thunderstorms) during low flows would more significantly influence downstream water quality. David replied that, when observed during the survey period, SSOs had a negligible impact on water quality during low flows. The increased retention time could provide more opportunity for a breakdown in BOD loading.

The final paper, presented jointly by **David Steward** and **David Archer** (NRA Northumbria and Yorkshire), was entitled *The installation and use of a snow pillow to monitor snow water equivalent*. David Archer introduced the subject by explaining that regional snow measurements were required to support a range of water resource management tasks, including runoff modelling, yield assessment, flood warning and flood alleviation design. He then quoted a number of damaging historic flood events with significant snow-melt components including floods in 1947, 1963, 1982, and 1991 on the River Tees and in 1955 on the River Tyne — the largest flood of the century for the Tyne.

Whilst the water equivalent of a snowfall can be measured by a heated raingauge and snow depth can be directly measured with a ruler or core sampler, none can provide objective, automatic measurements of meltwater volume and timing in real-time. Furthermore the problem of 'reduced catch' arising from wind vortices around raingauges is even more severe for snow than rainfall, even with the use of shields. The use of remotely-sensed satellite data for assessing snow cover has been explored, but the absence (because of cloud cover) of visible data when it was most needed (i.e. when the air and snow temperature were greater than 0°C) was found to be prohibiting. The search for a reliable surface method has resulted in deployment of a snow pillow, a device which has been used in North America for over twenty years.

The snow pillow installed alongside Cow Green reservoir in upper Teesdale in February 1993 was described by David Stewart. The pillow is a large flexible butyl rubber container filled with an antifreeze solution and retained within a rigid sub-surface tank. The weight of snow on the pillow displaces its water equivalent in a stilling well which can be automatically measured via a shaft encoder. The siting factors considered included altitude (snow frequency), access, cost of telemetry, local site conditions (exposure) and planning/landowner permission. David also discussed some of the operational problems encountered. These included snow failing to settle on the pillow, pillow heat retention causing premature snowmelt and wind effects.

David Archer assessed the results obtained to date (100 days of snow cover) in terms of how well the pillow represented snow at the site and over the catchment, as well as by the operational usefulness of the information. The audience were shown rainfall, snowmelt rate and runoff data for two small local catchments for two high-flow events. In both cases the initial floodpeaks were directly attributable to snowmelt, fast melt resulting from rapid increases in air temperature.

David concluded that the pillow was no good for light snow cover (<5 mm water equivalent), where water equivalents are underestimated; though the data have provided a good guide to snow cover at two manual sites, snow melts from the pillow in advance (this can usefully provide a short-term snowmelt forecast!) The snow pillow was regarded as a useful development in the regional instrumentation capability, possessing considerable potential.

Laura Baird (Halcrow) asked how representative the measurements were in terms of aspect. It was stated that logistical considerations meant that few locations were available, but aspect was not as important in Britain as in North America, where snow lies all season and is melted radiatively: here altitude is the dominant consideration.

Andrew Black (IH) wondered whether further pillows were planned, perhaps at different altitudes. Four more were planned in the region, although logistical considerations could impose severe limitations. Further research work was desirable, e.g. in the Scottish Highlands.

Rod Hawnt (Hydrologic) asked how much the snow pillow cost and invited comments on the cost-effectiveness of the device. David Stewart answered that the capital cost of the snow pillow was $1000 (from the Canadian manufacturers), but installation costs, including labour charges and installation of telemetry, raised the total cost to £10 000. The initial trials had demonstrated the potential of the pillow for making representative snowmelt measurements for a number of catchments — particularly when complemented by a manual network of soil water equivalent measurements.

Stephanie Peay (Cobham Resource Consultants) noticed that the site was unfenced. Was there a possibility that sheep walking on the pillow could cause spurious variations in the recorded data? David Archer responded by saying that a sheep was not heavy enough and the load had to be evenly distributed.

The meeting concluded with a vote of thanks to all the speakers for three very informative and stimulating presentations.

List of Exhibitors:
Technology Ltd, Grant Instruments Ltd, Valeport Marine Scientific Ltd, ELE International Ltd, Scan Group Ltd, Casella London Ltd, Logica Industry Ltd, Hydrologic Ltd, Didcot Instruments Company Ltd.

Kevin Tilford
Salford

Workbook coordinator needed

Ron Manley has had to withdraw from pursuing his initiative for a new *Workbook for Travelling Hydrologists*, to be published as a BHS Occasional Paper.

A volunteer coordinator is therefore being sought by the Committee to bring to fruition the work Ron has done. This job will not require writing any new material, but just bringing together existing valued material, coordinating a group of providers of material, and some editing.

Please contact the President (0925 653999) or the Hon. Secretary (0793 812479) if you may be able to take on this important role for the Society.

Travel grants

Grants in the range £75-£100 are available to help members with the cost of attending meetings (see *Circulation 38*). The scheme is open to anyone, but is intended mainly to help students or younger members whose travelling expenses are not met by an employer.

Please apply to the Hon. Secretary (**Richard Harpin**), including details of the meeting, whether a paper or discussion is to be presented, the total costs and benefits of attendance, brief details of your financial situation, your background and your aspirations in hydrology. A brief supporting letter from a supervisor is also required.

Successful applicants are expected to produce a short report of their experiences in attending the meeting.

The hydrological significance of Birmingham's canals

BHS Midlands Section Meeting
The University of Birmingham
6 July 1994

Twenty members attended this presentation and site visit, organised by the Midlands Section in conjunction with British Waterways. *Rob Arrowsmith*, Senior Hydrologist from the British Waterways Watford Office, described the configuration, development and operation of the canal system around Birmingham, followed by a visit to two of the feeder reservoirs.

The Birmingham Canal Navigations (BCN)

The complexity of the canal network around Birmingham and the Black Country, dominated by the system of the Birmingham Canal Navigations (BCN), was well illustrated by Rob using two slides. A plan view of the system reflected the achievements of the engineers in creating an intricate network to satisfy the demands of coal mines and factories across country which was far from easy for canal building.

The second slide was a sectional view of the network, showing the five main "Levels" into which it is divided. The highest, the Titford Level (511 ft/ 156 m a.s.l), is of limited extent and little known to canal enthusiasts. Once you have reached this level, there aren't many places to go! Next down is the Wolverhampton Level (473 ft/144 m) which sweeps in a great curve from Smethwick to Wolverhampton and northeastward towards Cannock. The Birmingham Level (453 ft/138 m) is the best known and includes the recent Gas Street Basin Development in the centre of Birmingham as well as Telford's great cutting at Smethwick. The Walsall (408 ft/124 m) and Erdington (301 ft/ 92 m) Levels are on lower ground to the northeast of the main Birmingham to Wolverhampton axis. There are numerous interactions between the different levels, the operation of which Rob likened to a game of three dimensional chess.

Rob then covered the current hydrology of the BCN, with the canal pounds acting as "linear reservoirs". Navigation remains the principal drain on canal water resources, through lock use by boats. There are also leakages at locks and channel losses due to seepage and evaporation. Power stations have made large gross demands upon the canal system, although these have declined markedly in recent years in response to changes in the power generation industry. Agricultural users are licensed to abstract in some parts of the network.

Rob stressed two major changes which had occurred since the system was built. The first was that many riparian areas and catchments of feeder reservoirs have become heavily urbanised. An almost inevitable consequence of this has been the diversion of some sewer systems into the canal network, with the provision of flood storage potential. Although there are quality implications, the large available storage clearly provides a valuable complement to the more normal components of urban flood alleviation schemes.

The second change was in the distribution of lock movements (lockage) through the year. Although total annual lockage had changed little from 1925 to 1990, in the days of commercial freight there was an even distribution through the year. The current dominance of recreational traffic, however, results in a high summer peak with limited lockage in winter months. This pattern clearly exerts a demand on the water resources of the system at a time when they are most under pressure, providing the BCN canal managers with plenty of challenges.

Looking to the future, Rob considered that canals would play an increasingly important role in national water resources planning, as evidenced by the recent study carried out by Binnie and Partners for British Waterways. This demonstrated the feasibility of transferring relatively large volumes of water along canals, with only limited civil works to provide for bank raising, channel widening and back pumping at key locations. Further changes may include the increased importance of groundwater abstraction, especially in the light of rising groundwater levels in the Birmingham area.

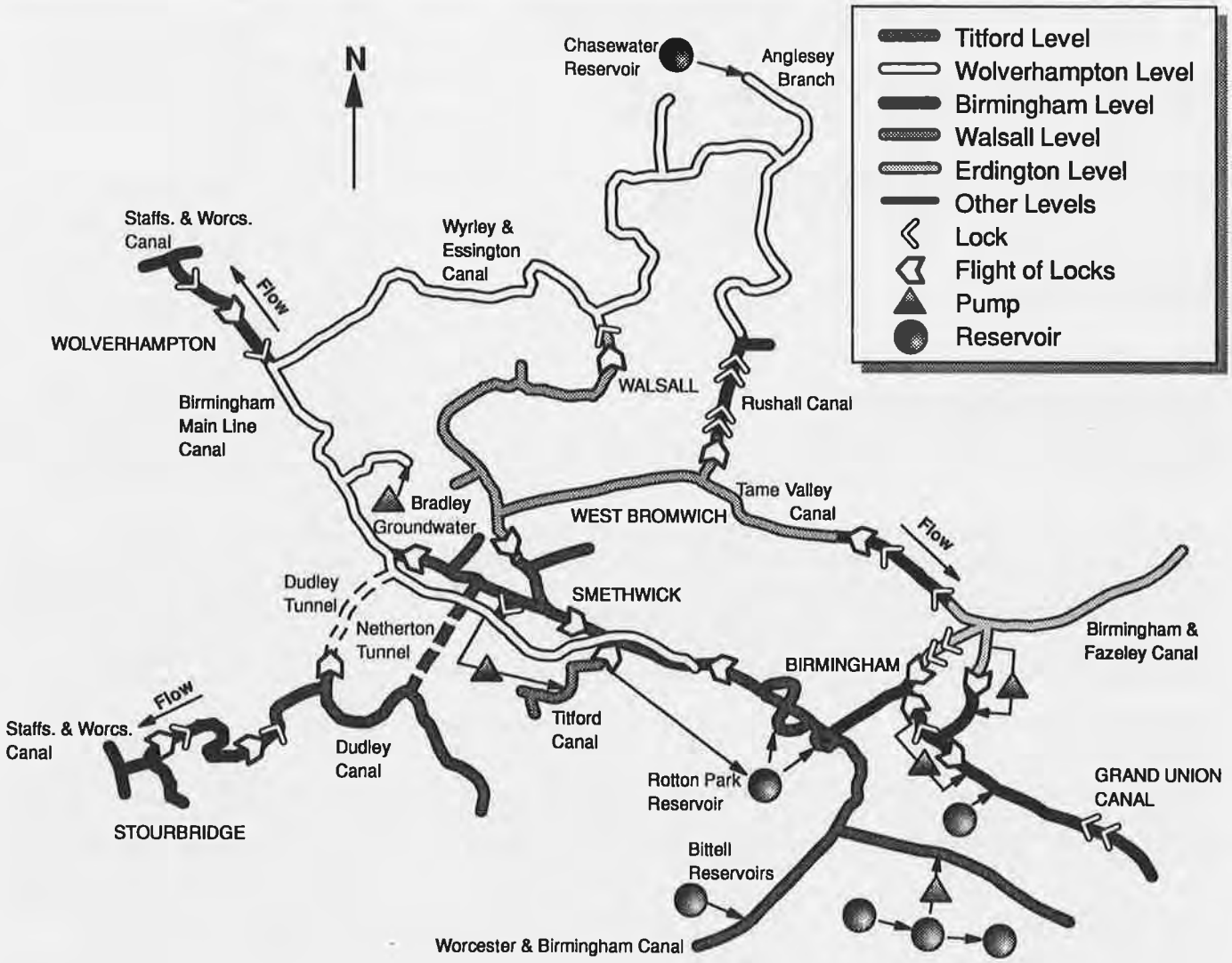
After a lively question session, and in spite of the rain, the party then boarded the mini-bus transport to visit two sites on the network: the Rotton Park and Lower Bittel Reservoirs.

Rotton Park (Edgbaston) Reservoir

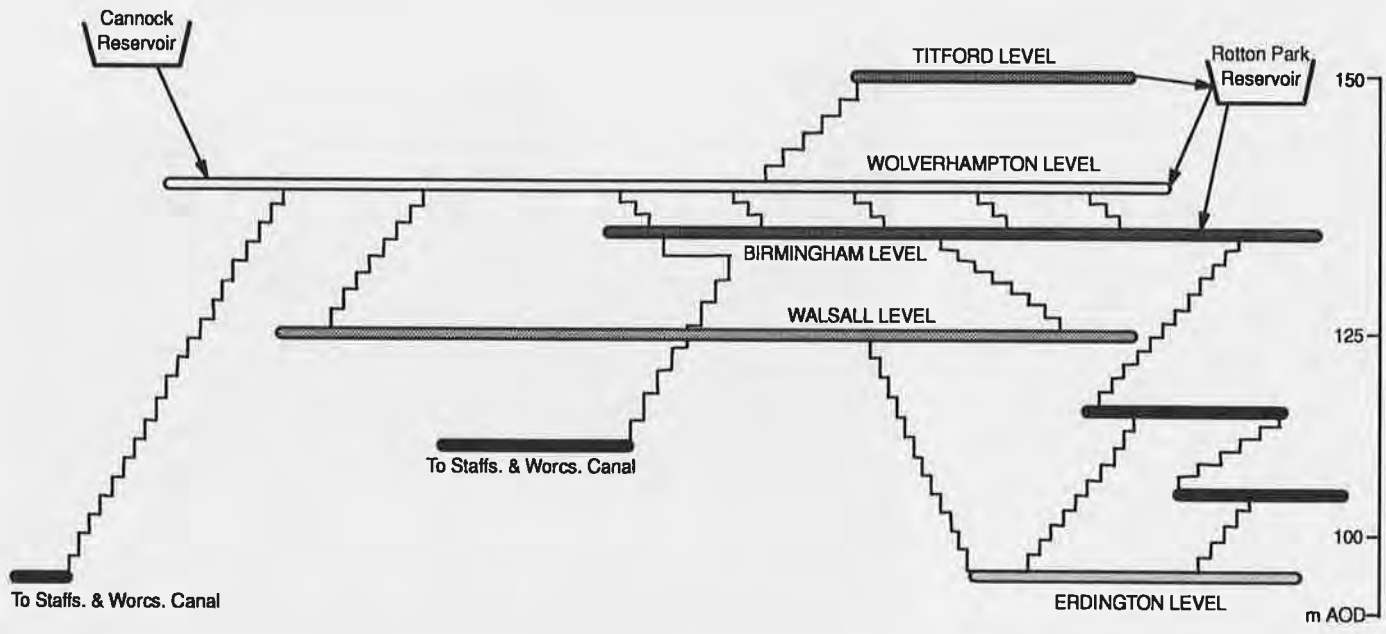
This reservoir is well-known to past students of the University of Birmingham, who may have sailed,



Members looking for children in the culvert to the spillway at Rotton Park reservoir



A plan of the Birmingham and Black Country canal network, showing the main levels and water supply



The Birmingham and Black Country canal network in cross-section, showing the relationships between the main levels



Lower Bittel reservoir: the embankment, the Birmingham & Worcester canal and the valley of the River Arrow beyond

rowed or even swum in its waters. It was completed in 1826 under Thomas Telford, whose drawings of the Rotton Park sluices appeared in a recent exhibition at the Institution of Civil Engineers. Designed as a feeder to the Birmingham Level, the direct catchment is of only 1.5 km^2, but this is supplemented by transfer from the Titford system, giving access to an indirect catchment of 8km^2. Amongst many Inspection Engineers over the years, a certain William Halcrow noted that children could enter the culvert and block the spillway! He did not clarify whether the blockage would be direct or indirect, but no children were in evidence on the spillway during the visit. Although the primary function of the reservoir is clearly as a canal feeder, the needs of the BCN can engender conflict with those who sail and row, especially the latter, who are currently seeking to establish a 200 m course.

The Bittel Reservoir System

The Bittel Reservoirs are located near Alvechurch, about 10 miles from the centre of Birmingham, and were built to feed the Worcester and Birmingham Canal. In contrast to the urban landscape around Rotton Park, these reservoirs are in a most attractive rural environment. The upper two of the three reservoirs feed the canal, which at Bittel is on the Birmingham Level (453 ft/138 m), the same level as fed from Rotton Park. The lowest reservoir was originally built to provide compensation flows for millers along the River Arrow, which flows in a southeasterly direction from the site. It still provides compensation flows, but is also popular with fishermen. An interesting feature is that the canal bank forms part of the reservoir embankment — Reservoir Inspection Engineers beware! A drop shaft, complete with BCN paddle gear, allows for releases through the embankment and under the canal.

As storm clouds gathered over Birmingham, the meeting thanked Rob Arrowsmith and British Waterways for an excellent afternoon before returning to the University for welcome refreshments.

Paul Webster, Birmingham
Henry Gunston, Wallingford

Education and training news: developments in academic assessment for CEng

The multidisciplinary nature of hydrology means that specialist hydrologists have a wide range of academic backgrounds. This has often caused problems for those seeking a professional qualification. Most notable is the prestigious Chartered Engineer (CEng) qualification, whose rigid assessment of Academic formation is really geared to 'Civil Engineers' and has proved a near-insurmountable hurdle for those not holding a first degree accredited by the Engineering Council.

However, in a recent committee reorganisation, this assessment is now to be done at the Institution level (e.g. by the ICE) rather than by the Engineering Council, and the ICE plans to adjust the guidelines so that Academic formation is extended to cover related MSc degrees as well — indeed the Institution wishes to encourage candidates who fall into this category. So, for example, a hydrologist with a BSc in Geography and an MSc in Water Resources may now be able to satisfy the requirements of the Academic Qualifications Panel of the ICE and thus progress further along the accreditation road.

This significant change in policy will present a number of BHS members with a real opportunity to seek CEng status — perhaps for the first time. The BHS E&T sub-committee are currently liaising with the ICE, and have been asked to advise them on the academic qualifications held by hydrologists, in particular typical first/postgraduate degree combinations. To assist them in the forthcoming discussions the sub-committee are appealing to all BHS members who work as hydrologists and have (or may have in future) an interest in attaining CEng status to give us details of their first degree and postgraduate qualifications (name of degree course and institution).

Information may be sent to **Kevin Tilford**, Department of Civil Engineering, University of Salford, Salford, M5 4WT by post, email (k.a.tilford@civils.salford.ac.uk), fax (061 745 5060) or telephone (061 745 5000 ext. 3458).

Developments in the new procedure for specialist Civil Engineers will be reported in the next *Circulation*.

Kevin Tilford
Salford

Inter-society links

We are receiving material from other hydrological societies on a reciprocal basis. So that members know where to look, the Institute of Hydrology is holding the newsletters received in its library. If you are keen to read *Current* (New Zealand) or *AIH Bulletin* (USA) as a change from *Circulation*, make an appointment to visit the IH library (01491 838800) or arrange to borrow the newsletter of a Society which interests you.

Striving for a safer world in the 21st Century

Yokohama was the setting for the World Conference on Natural Disaster Reduction which marked the mid-point of the International Decade for Natural Disaster Reduction (IDNDR). This week-long conference attracted several thousand participants from nearly 150 countries to discuss natural disaster reduction. WMO and UNESCO were among the 18 UN bodies present. A 12-point agenda terminated with the adoption of the conference report and the Yokohama Strategy for a Safer World. As well as the ten principles shown in the box below, the Strategy also contains a plan of action involving actions at levels from the sub-regional to the international.

Most of the so-called IDNDR demonstration projects were displayed in a poster session organised by UNESCO. There was an exhibition containing more general material from a wide range of disaster-oriented organisations, as well as a display of children's paintings of disasters. A large number of national reports on responses to disasters were available to the participants, there were several study tours and an IDNDR Scientific and Technical Committee meeting chaired by **Dr Jim Bruce** from Canada.

Hydrologists were among the many delegates brought together in Yokohama: hydrology featured in Technical Session F on Warning Systems (organised by WMO), as well as in the poster session and exhibition. The crucial problem of funding was not addressed however: the governments present avoided any discussion of increased funds for disaster preparedness in general. Nevertheless, the feeling was of a successful conference and a more meaningful programme for the rest of the Decade and even in to the 21st Century.

John Rodda
Geneva

PRINCIPLES OF THE YOKOHAMA STRATEGY FOR A SAFER WORLD

1. Risk assessment is a required step for the adoption of adequate and successful disaster reduction policies and measures.
2. Disaster prevention and preparedness are of primary importance in reducing the need for disaster relief.
3. Disaster prevention and preparedness should be considered integral aspects of development policy and planning at national, regional, bilateral, multilateral and international levels.
4. The development and strengthening of capacities to prevent, reduce and mitigate disasters is a top priority area to be addressed during the Decade so as to provide a strong basis for follow-up activities to the Decade.
5. Early warnings of impending disasters and their effective dissemination using telecommunications, including broadcast services, are key factors to successful disaster prevention and preparedness.
6. Preventive measures are most effective when they involve participation at all levels, from the local community through the national government to the regional and international level.
7. Vulnerability can be reduced by the application of proper design and patterns of development focused on target groups, by appropriate education and training of the whole community.
8. The international community accepts the need to share the necessary technology to prevent, reduce and mitigate disaster; this should be made freely available and in a timely manner as an integral part of technical cooperation.
9. Environmental protection as a component of sustainable development consistent with poverty alleviation is imperative in the prevention and mitigation of natural disasters.
10. Each country bears the primary responsibility for protecting its people, infrastructure, and other national assets from the impact of natural disasters. The international community should demonstrate strong political determination required to mobilize adequate and make efficient use of existing resources, including financial, scientific and technological means, in the field of natural disaster reduction, bearing in mind the needs of the developing countries, particularly the least developed countries.

Recent IAHS Publications

The IAHS Press has recently published *Snow and Glacier Hydrology*, edited by G. J. Young (*IAHS Publ. No. 218*, $60), the proceedings of the International Symposium at Kathmandu in 1992.

The 36 papers cover a range of topics: cooperation in snow and glacier hydrology projects, application of databases to water resources planning, effects of climate change, processes & models, floods & avalanches and glacio-chemical studies. The inaugural speeches and the recommendations made are included.

Another symposium volume just published is *Hydrological, Chemical and Biological Processes of Transformation and Transport of Contaminants in Aquatic Environments*, edited by N. E. Peters *et al.* (*IAHS Publ. No. 219*, $75).

As well as an overview on global and national monitoring by R. Helmer, there are sections on the fate and transport of contaminants, hydrochemical modelling and additional techniques & water quality assessments.

Forthcoming publications include *Groundwater Quality Management* (*No. 220*), the proceedings of the 2nd FRIEND conference (Braunschweig) (No. 221), and also *A Methodology for the Assessment of Surface Resistance and Soil Water Storage Variability at Meso-scale Based on Remote Sensing Measurements: a case study with HAPEX-EFEDA data* (*IAHS Spec. Publ. No. 2*).

Groundwater maps

As part of its responsibility to protect water resources, the NRA is launching a series of groundwater vulnerability maps to cover England and Wales.

The maps will help planners, developers, consultants and regulatory bodies to ensure that developments conform to the NRA's recently published *Policy and Practice for the Protection of Groundwater*. There will be 53 maps at a scale of 1:100 000, to be published between now and 1996. Four sheets have already been issued: 47 (east Kent), 13 (Humber), 39 (west of London, including Reading) and 16 (centred on Chester). Six more (mainly eastern England) are due later this year. Flat maps are obtainable from the NRA National Groundwater Centre, 550 Streetsbrook Road, Solihull, B91 1QT (£9.95 + £2.55 p&p); folded ones may be bought for £9.95 from HMSO bookshops and agents (fax orders 071 873 8200).

News from Members

Scottish Group news

The Secretary of the Scottish Hydrological Group of the ICE is now **Andrew Black** (Institute of Hydrology, Alpha Centre, Innovation Park, Stirling, FK9 4NF: Tel: 0786 447612; Fax: 0786 447614). **Paul Jowitt** (Heriot-Watt University) is the Chairman, and there are ten committee members: **Bayo Adeloye** (Heriot-Watt University), **Dick Collar** (Strathclyde University), **James Curran** (Clyde RPB), **Graham Herbertson** (Glasgow University), **Dick Johnson** (Institute of Hydrology, Stirling), **Alistair Moir** (Scottish Office Environment Dept), **John Townson** (Strathclyde University), **Steve Wallis** (Heriot-Watt University), **Robin Wardlaw** (Edinburgh University) and **Robert Walker** (Babtie Shaw & Morton, Glasgow).

BHS South West Section reincarnated

Following a recent meeting organised by **Peter Sims** and **Alan Weston**, an embryonic Committee has been formed. The main objective is to show that the BHS South West Section is alive and well by organising seminars, lectures and field visits.

As a result of circumstances, the committee is dominated by NRA staff, but this should change following the December AGM.

The committee comprises Peter Sims (University of Plymouth, Chairman), **Graeme Boyce** (Secretary), **Andy Wall** (Treasurer), **Bryony Howlett** (Membership), **Paul Sadler** (Events), **Steve Taylor** (Publicity), **Andy Gardiner** and Alan Weston.

Anyone interested in getting involved in any events or in helping to run the BHS South West Section should contact Graeme Boyce, NRA South Western Region, Manley House, Exeter, EX2 7LQ.

FORTHCOMING EVENTS

Members on the move

Dr Sue White will be leaving the Civil Engineering Department at Newcastle University in September to take up a two-year EC HCM Fellowship in Spain, but she will maintain close contacts with **Enda O'Connell**'s group in Newcastle. Sue will be based at the Instituto Pirenaico de Ecología in Zaragoza, part of CSIC, the Spanish National Research Council. Her work will concern hydrological modelling of basins in the Pyrenees, particularly relating to land abandonment and reforestation, and their impact on soil erosion and sedimentation.

Retirement of Norman Tyler

Norman Tyler retired from the ICE Secretariat on 24th July. Norman will be well known to many BHS members for the support he has given BHS over the years. In the early days, Norman was instrumental in the administrative development of BHS and significantly contributed to the positive relationship between ICE and BHS. On behalf of the Committee and members of BHS, I wrote to Norman wishing him a long, happy and healthy retirement. BHS also contributed to his retirement gift and was represented at his retirement presentation by **Peter Wolf**.

Susan Walker

BHS South West Section's outline programme:

October 1994	Field visit to Dawlish Warren looking at sand dune hydrology;
December 1994	AGM and half-day seminar on practical computer modelling in hydrology;
Feb./Mar. 1995	Evening lecture/discussion on flooding and flood warning, possibly based on Polperro;
June 1995	Field visit to Wheal Jane mine or Wimbleball pumped storage scheme;
Autumn 1995	Seminar based around water charges.

Meetings

International Conference on METEOROLOGICAL AND HYDROLOGICAL TECHNOLOGY AND ITS MANAGEMENT
Geneva
22-26 May 1995

WMO is convening this conference, METEOHYTEC 21, for high-level decision-makers from ministries, meteorological and hydrological services, academia and industry to address new technologies and issues of systems management.

The themes will include training in modern technology, impact of high-tech. applications on meteorological and hydrological services, management and use of modern technology with modest resources, data management. The languages are English, French, Spanish and Russian, with simultaneous interpretation. Experts wishing to present papers were asked to submit an abstract (<500 words) by **1 August**, but this deadline may well be extended.

Further details may be obtained from WMO World Weather Watch, Case postale 2300, CH-1211 Geneva, Switzerland (Tel.: +41 22 730 82 44, Fax: +41 22 734 23 26).

Canadian Conference on MOUNTAIN HYDROLOGY: PEAKS AND VALLEYS IN RESEARCH AND APPLICATIONS
Vancouver, British Columbia
17-19 May 1995

This is a conference on current research and applications in mountain hydrology, an increasingly important area with the increasing pressures on mountain environments: hydroelectric power, mining, water supply, forestry, residential development.

Themes include snow hydrology, glaciology, urban hydrology on steep slopes, instrumentation, runoff forecasting, precipitation distribution and modelling, amongst others.

Two-page extended abstracts were expected by **30 June** and final papers are expected by the end of 1994.

For further information about attending, please contact C. David Sellars, c/o Klohn-Crippen Consultants Ltd, 10200 Shellbridge Way, Richmond, British Columbia, Canada, V6X 2W7. Tel.: (604) 279 4322, Fax: (604) 279 4300.

Diary

7th September 1994
BHS Annual General Meeting
"Environmental impact and the hydrological cycle"
Venue: ICE, 1-7 Great George St, London
Time: 10.30 (coffee from 10.00) to 16.45
Contact: Dr Richard Harpin, Halcrow, Burderop Park, Swindon, Wiltshire *(Tel: 0793 812479)*

29th September 1994
British Soil-Water Physics Group
"Scaling problems in soil-water physics"
Venue: ADAS, Cambridge
Contact: Dr A C Armstrong, ADAS Soil & Water Research Centre, Anstey Hall, Maris Lane, Trumpington, Cambridge, CB2 2LF

13th-16th September 1994
BHS/IH/HR/IAHR/ODA Conference
"Integrated river basin development"
Venue: HR Wallingford & IH
Contact: Jacqueline Watts, HR Wallingford Ltd, Howbery Park, Crowmarsh Gifford, Wallingford, Oxon, OX10 8BA (Fax: 0491 832233)

16th September 1994
Welsh Hydrological Group AGM
Contact: Linda Aucott, NRA South Western Region, Rivers House, East Quay, Bridgwater, Somerset *(Tel: 0278 457333, Fax: 0278 662153)*

4th October 1994
Hazards Forum / BHS
"Contingency plans for UK droughts"
Venue: ICE, 1 Great George St, London
Contact: Frank Law, Institute of Hydrology, Wallingford *(Tel: 0491 838800)*

5th October 1994
BHS Pennines Section
Site visit to the Tees Barrage
Time: 2.00 p.m.
Contact: Elizabeth Kaar, NRA North West, P.O. Box 12, Knutsford Road, Warrington, Cheshire *(Tel.: 0925 53999)*

14th October 1994
Scottish Hydrological Group
"Land-use/climate impact on river flows"
Venue: City Mills Hotel, Perth
Time: 2.00 p.m. (half-day) *£4 registration*
Contact: Dr Andrew Black, Institute of Hydrology, Alpha Centre, Innovation Park, Stirling, FK9 4NF *(Tel: 0786 447612; Fax: 0786 447614)*

19th October 1994
BHS Southern Section
"Urban hydrology and water quality management"
Venue: Civil Eng. Dept, Imperial College
Time: 5.30 p.m. (tea at 5 p.m.)
Contact: Prof Howard Wheater, Dept. of Civil Engineering, Imperial College, London SW7 2BU *(Tel: 071 589 5111 ext 4736/4720. Fax: 071 823 8525)*

2nd November 1994
BHS Pennines Section
"Low flow management"
Venue: University of Huddersfield
Time: 2.00 p.m.
Contact: Elizabeth Kaar (*address above*)

16th November 1994
BHS National Meeting
"Analytical techniques for the development and operations planning of water resource and supply systems"
Venue: University of Newcastle
Time: 10.30 - 16.50
Contact: Tim Wyatt, Power & Water Systems Ltd, Henley on Thames, Oxon *(Tel: 0491 578860, Fax: 0491 410780).*

7th December 1994
BHS Southern Section
"Groundwater flooding – a time to run?"
Venue: Civil Eng. Dept, Imperial College
Time: 5.30 p.m. (tea at 5 p.m.)
Contact: Howard Wheater (*see above*)

8th December 1994
Scottish Hydrological Group / Scottish Hydraulics Study Group
"Coastal flooding in the Clyde estuary" — Dr John Townson, Dick Collar (Strathclyde University); Dr Yusuf Kaya (Babtie, Shaw & Morton)
Venue: Rankine Bldg, Univ. of Glasgow
Time: 6.30 p.m. (tea at 6 p.m.)
Contact: Andrew Black (*address above*)

9th January 1995
BHS National Meeting / NERC
"Weather radar and its application"
Venue: ICE, 1 Great George St, London
Contact: Dr Kevin Tilford, Dept of Civil Engineering, University of Salford *(Tel: 061 745 5000)*

18th January 1995
BHS Southern Section
"Aquifer protection: how is it working?"
Venue: Civil Eng. Dept, Imperial College
Time: 5.30 p.m. (tea at 5 p.m.)
Contact: Howard Wheater (*see above*)

19th January 1995
Scottish Hydrological Group
"Environmental impact assessment of river engineering works" — Amanda Chisholm (Babtie, Shaw & Morton)
Venue: Royal Society of Edinburgh
Time: 6.30 p.m. (tea at 6 p.m.)
Contact: Andrew Black (*address above*)

22nd February 1995
BHS Pennines Section
"Flood prediction and warning"
Venue: University of Salford
Time: 2.00 p.m.
Contact: Elizabeth Kaar (*address above*)

8th March 1995
BHS Southern Section
"Water in the Middle East"
Venue: Civil Eng. Dept, Imperial College
Time: 5.30 p.m. (tea at 5 p.m.)
Contact: Howard Wheater (*see above*)

9th March 1995
Scottish Hydrological Group
"Overseas hydrology: a world of engineering possibilities" — Robert Walker (Babtie, Shaw & Morton); Robin Wardlaw (Edinburgh University)
Venue: Royal Society of Edinburgh
Time: 6.30 p.m. (tea at 6 p.m.)
Contact: Andrew Black (*address above*)

28th March 1995
BHS National Meeting / Geol. Soc.
"Modelling river/aquifer interactions"
Venue: Burlington House, London
Contact: Dr Paul Younger, Dept of Civil Engineering, University of Newcastle upon Tyne, NE 1 7RU *(Tel: 091 222 7942)*

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