



Jamie Margetts
Clear Environmental Consultants Ltd and WaPUG Vice Chair

URBAN FLOODING

Understanding the challenge of urban flooding in AMP5 and beyond

THE 2007 SUMMER FLOODS raised the profile of urban flooding nationally in the UK, resulting in the Pitt Review (2008) and the Floods and Water Management Act (2010).

This has driven a wide range of multi-stakeholder flood investigation studies, often led by the Environment Agency or Local Authorities. Developing flooding strategies and catchment plans is, though, by no means a new concept to the UK Water and Sewerage Companies (WaSCs), who have all had significant investment programmes to mitigate sewer related urban flooding in earlier AMP periods.

Through this experience, WaSCs are well placed to respond to the challenge of addressing urban flooding, in partnership with other stakeholders, due to the wealth of

technical experience and system understanding built up over the last couple of decades. Whilst the vast WaSC capital programmes often grab the headlines, there is a massive body of data collection, hydraulic modelling and strategic planning work continuously ongoing in the background to better understand both the risk of urban flooding, and the best mitigation measures for customers and stakeholders.

This article will outline how two WaSCs are implementing large strategic planning programmes to formulate robust, cost beneficial catchment improvement strategies to understand and address

flooding, both today and in response to future challenges such as development, urban creep and climate change.

This strategic understanding is pivotal to developing long term programmes of interventions and ultimately the degree of funding required from customers to improve serviceability.

YORKSHIRE WATER DAP PROGRAMME

Yorkshire Water Services (YWS) has, in AMP5, embarked on an ambitious £35m sewer modelling programme, resulting in the construction of urban drainage models covering 37 Drainage Area Plans (DAP), 38 'multi-stakeholder' study catchments, 59 Water Framework Directive zones, and 8 Bathing Beach catchments. The purpose of the DAP models is to predict full catchment serviceability, both for flooding and intermittent discharges

Welcome to the Winter Issue of the FWR Newsletter



The focus of this issue is wastewater in general and urban flooding in particular. We are delighted that Jamie Margetts, Clear Environmental Consultants Ltd and WaPUG Vice Chair, has agreed to write the key article dealing with urban flooding.

In this issue we are also reporting on recent workshops and conferences dealing with wastewater, water supply and WFD issues. On page 7 you will find a report on the latest Defra Water Stakeholder Forum.

As usual, on the last page, Caryl Stephen, FWR Chief Executive, reports on our current activities and The Library section informs about new publications available from the FWR bookshop.

For more information we invite you to have a look at our FWR website (<http://www.euwfd.com>) or (<http://www.fwr.org>). You can also contact us by email or telephone (see details on the last page).

The Editor

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performance, at present and in the future. The long term aim is to identify potential hydraulic deficiencies, through model analysis, before they occur so that pro-active catchment strategies can be implemented; particularly in terms of flooding where areas of surcharge today may develop into flooding in the future.

In order to give a high level of confidence throughout the models, YWS has commissioned a rolling two year programme of short term flow surveys, consisting of up to 1,600 flow monitors at any one time. This is an unprecedented sewer flow monitoring programme not only in the UK but worldwide. In some cases this number will be distributed across a few towns, in others they will be installed in a single batch in the major cities of Hull, Sheffield and Leeds. In order to deliver this massive critical data collection exercise, the traditional concept of a flow survey has been challenged – particularly the need for weekly site visits and sewer entry to check and calibrate monitor performance. State of the art wireless flow monitoring technology is being used to drive efficiencies through reduced man time in site visits and live data assessments through instantaneous uploads to the web. Critical to using this technology is the monitors' innovative capabilities to self diagnose and calibrate, thus removing the need for expensive weekly visits. This approach is also less disruptive to road users and safer for operatives.



Efficient and high quality management of the flow survey programme is essential to the delivery of the whole DAP programme, particularly issues which prevent or delay monitor installation, including the Traffic Management Act or access to critical YWS assets. In Sheffield and Leeds, over 1600 flow monitors will require installing in the space of a month, many of which will require manhole access on main roads or busy city centre streets. An unprecedented level of engagement between YWS, the flow survey contractor, consultants and the Local Authorities will be required to ensure this massive number of flow monitors can be installed in such a short period of time. Likewise, upfront planning and identification of flow monitoring sites will be essential to ensure monitors can be moved from catchment to catchment in a timely manner.

The models built and verified against these flow surveys will follow the updated YWS Sewer Modelling Specification, which has evolved to produce robust models over the last few AMP cycles. One significant change is the requirement to model all surface water and S24 sewers in addition to the normal foul and combined public sewers, again with the aim of fully understanding the mechanisms and locations of current and future flooding – in effect, full serviceability. Many WaSC models only include S24 sewers at confirmed current flooding locations when developing an intervention or a scheme. This full S24 coverage approach will more than double the size of many models and pose a number of software, hardware, technology and data processing challenges – one which the sewer modelling software providers are addressing through the release of new software products at a rapid rate, taking advantages of hardware advances and cloud computing to improve simulation times and processor utilisation.

By heavily investing in this flow monitoring technology, and setting challenging goals in AMP5, YWS will have a library of thoroughly verified full catchment urban drainage models which will allow confident predictions on serviceability to be made across the whole catchment and not just focus on addressing known catchment deficiencies. This will be vital to understanding, planning and implementing future investment strategies to address flooding deficiencies and responding to change in these catchments. A higher level of confidence will be placed in the targeting of flood prevention strategies and capital and operational investment in future AMPs, ensuring value to the customer.

SEVERN TRENT SMP PROGRAMME

Sewerage Management Plans (SMPs) are Severn Trent's approach to catchment planning in AMP5, following extensive DAP programmes in AMP3 and AMP4. SMPs build on an extensive existing model stock to include the consideration of risk in the system performance analysis and outputs, in contrast to the traditional approaches of predicting flooding which identify only the likelihood or frequency of a volume of flooding at a certain point. The risk based process is aligned to WRC's Sewerage Risk Management (SRM) Principles, considering consequence, severity and frequency in the assessment of flooding, and the confidence that can be used in the data underpinning the analysis. This involves considering factors such as land use criticality, flood depth, threshold overtopping, overland flow, and damage costs in addition to traditional urban drainage model outputs showing simply the location and volume of flooding for any manhole. The outputs contain a flood risk score applied to each surface landuse, allowing prioritisation for mitigation or intervention development purposes and producing very different outputs for the communication of flood extents and risk compared to traditional modelling (Fig 1).

The SMP process is 'live', with models being maintained to reflect constant changes in the catchment (development and sewer upgrades), data sets being re-analysed as these are updated over time by the respective internal owners and external partners, and model analyses being repeated on a regular basis to reflect these changes. This leads to not only 'live' models but a living plan, which is constantly reviewed and updated to reflect changing risks, regulation and the priorities of Severn Trent and its stakeholders. This will allow Severn Trent to meet regulators needs on rolling timescales, up to 25 years, and base decisions on the most up to date data available.

Whilst much of the focus of these plans is to understand and mitigate flood risk (given this is a key funded regulatory driver) the interventions and strategies (Figure 2) developed consider all elements of risk, whether these be hydraulic incapacity, operational or maintenance, pollution, health and safety, data quality or confidence, and



Figure 1. Model outputs – Traditional model output (left) and risk based output (above).

structural or asset condition. These strategies are aimed at providing models and solutions as part of the capital programme, assisting with operational and maintenance regimes, and providing robust inputs for future flood mitigation funding as part of the Price Review process.

Fundamental to understanding flood risk through the SMPs is the need to interact with internal and external stakeholders (Figure 3) to provide business as usual data and assisting with Severn Trent's obligation to input into inter-agency studies with the Environment Agency, Local Authorities and DEFRA. Outputs from the models have been used to assist in EA flood defence projects, preliminary and strategic flood risk assessments and Surface Water Management Plans (SWMPs). As part of this stakeholder engagement and strategy development, there is a strong emphasis on using the model to understand the impact on flood risk of 'what-if' scenarios, covering intervention analysis, emergency planning, operational maintenance issues and asset failure both in the short term and for long term planning purposes.



Figure 3. Interactions with internal and external stakeholders.

and streams, and regulatory requirements. The management of these stakeholders is an article in itself, but critical to the process is the development of integrated models to accurately represent the complex mechanisms of flooding due to interaction between these different facets of the urban drainage system.

Historically, there has been little standardisation in terms of approaches, techniques and guidance between the different modelling disciplines covering sewers, rivers and overland flows. The delivery of SWMPs, Water Cycle Studies and other inter-agency investigations has meant a need for modelling guidance to cross some of these bridges.

INTEGRATED URBAN DRAINAGE TO UNDERSTAND URBAN DRAINAGE FLOOD RISK

The 2007 Summer Floods and the implementation of the Pitt Report through the Floods and Water Management Act (2010) instigated a step change in the way urban drainage flooding issues are approached, particularly in terms of stakeholder engagement. The sewers, highway drains, culverts, watercourses, rivers and even overland flow routes in the urban drainage environment are owned by different bodies, each with different funding cycles

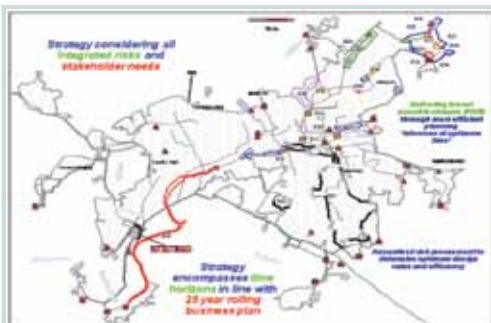


Figure 2. (above) – Strategy considering all integrated risk and stakeholder needs.

Figure 4. (below) – Modelling Process (WaPUG UID Guide, 2009).

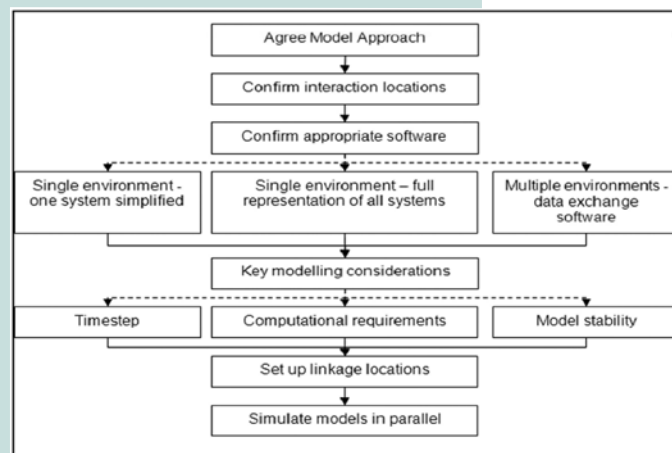
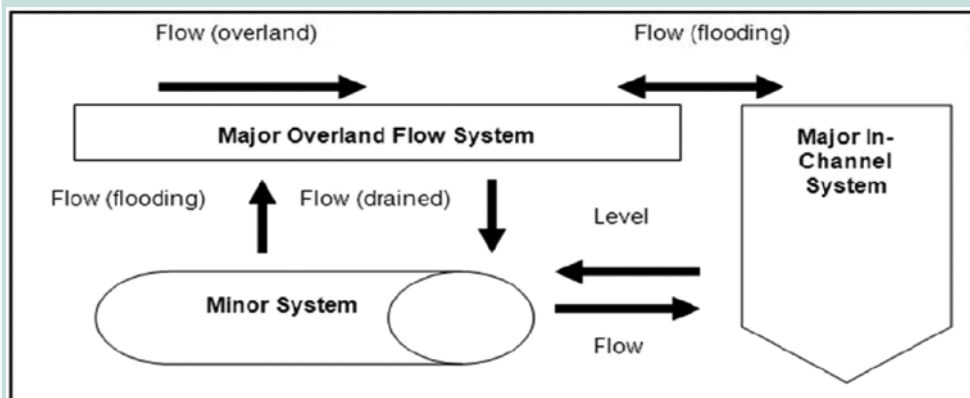


Figure 5. (below) – Multidirectional Interactions (WaPUG UID Guide, 2009).



In the summer of 2009, WaPUG, CIWEMs Urban Drainage Group produced the Integrated Urban Drainage Modelling Guide in response to these needs.

The guide provides a framework of using and integrating different models, with particular emphasis on the challenges linking models developed in different software (Figure 4) and following different procedures. Emphasis is given to the representation of linkage points, such as outfalls, gullies, culvert inlets and out of bank spill points, as these drive the influence of interactions between different systems, such as high watercourse levels causing backing up in a surface water system and flooding from manholes a significant distance upstream (Figure 5). Now that robust guidance is emerging the modelling of all urban drainage environments, an increasing number of studies are successfully underway confirming localised flood risk and the range of mitigation measures being put in place to manage this risk. This was evident at the WaPUG 2010 Autumn conference in Blackpool, with papers relating to flood risk management in London (Arthur and Graham, 2010) and Glasgow (Flemming and Williams, 2010).

So, moving forward, flooding is a challenge that needs to be faced by a number of stakeholders and by using a multitude of modelling and planning disciplines in an integrated manner. The UK WaSCs are well positioned to input into the process as a key stakeholder, and help plan and develop optimised flood mitigation measures,

using the large programmes of modelling and strategic planning work already in place. There is a high degree of modelling technology and skills already in place, making the WaSCs and their suppliers industry leaders in urban flooding analysis. This is built on established best practice aligned with pushing the boundaries through embracing modelling and monitoring innovation, and dissemination

of experience through groups such as WaPUG and the wider CIWEM community.

REFERENCES

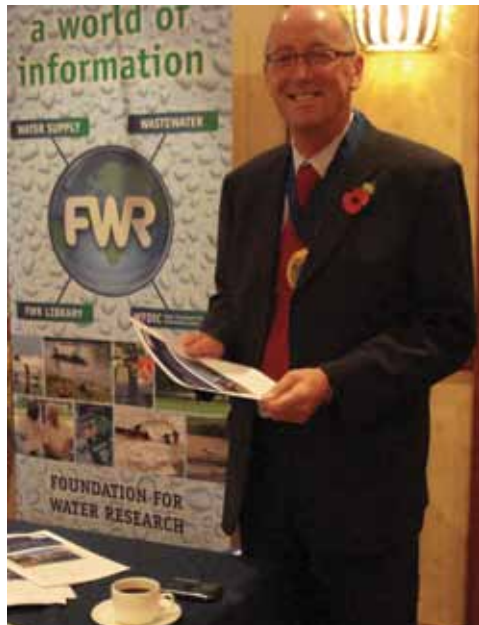
CIWEM / WaPUG (2009), Integrated Urban Drainage Modelling Guide, (<http://www.ciwem.org/knowledge-networks/groups/wapug/publications/modelling-guides.aspx>).

Arthur, M and Graham, M (2010), Drain London – A summary of challenges and solutions for delivering 33 surface water management plans, WaPUG Autumn Conference 2010, Blackpool.

Flemming, R and Williams, M (2010) Using ISM modelling to fully understand the problem, WaPUG Autumn Conference 2010, Blackpool.

WaPUG The autumn Wastewater and Urban Drainage Conference

Blackpool, 10 - 12 November 2010



Gerais Morris, Environment Agency, President of CIWEM, visiting FWR.



Tim Evans, FWR and Gary Lane, Environment Agency.

WaPUG, NOW CIWEM's URBAN DRAINAGE GROUP, organises technical conferences and specialist workshops for the urban drainage community.

Both Dr Tim Evans and Neil Tytler attended the conference where FWR was one of the conference sponsors and had a stand in the conference exhibition area. The objectives of the meeting was to explore the key challenges facing the water industry over the next 5 years, and explore how urban drainage practitioners will meet these, particularly in the context of modelling and system management. Over 160 delegates attended the conference from a wide range of local authorities and water related organisations. The conference, similar to last year, was split into five sessions plus four workshops over

the two and a half days covering topics looking at the future five years, implementing new legislation, operations management, water quality modelling and integrated solutions, looking at the WFD and flooding.

A large number of people visited our stand and took away the literature particularly the reports on previous WaPUG workshops since 2002.

For further information and to view the presentations visit the CMS, the conference organisers' website:

(<http://www.coastms.co.uk/conferences/439/show>).

Local Authorities and SUDs capacity building

FOLLOWING ON FROM A DEFRA WORKSHOP where Local Authorities identified training in SUDs as a top priority, Middlesex University, the University of Abertay Dundee and consultants MWH co-hosted a facilitated workshop to assess the current level of SUDs-awareness within LAs, identify the types of training required and preferred training delivery mechanisms.

The event attracted delegates from 16 Local Authorities, with representatives from national government, several consultancies, SUDs manufacturers and a water company also in attendance. Through the course of discussions, it was identified that whilst all participants were involved in SUDs activities, few delegates had undertaken any formal training. Attendees referred to a range of guidance manuals and websites (7 and 3, respectively) as key sources of information currently.

A lack of consistency between different guidance/manuals, the potential for existing guidance to be inappropriate at specific sites and the costs associated with accessing guidance were all cited as major concerns. In relation to the provision of training, delegates were keen for training to be sector-specific (e.g. to meet the needs of urban planners and highway engineers) whilst also recognising the need for integration between disciplines. Delivery mechanisms favoured include on-line training, videos/DVDs and teleconferencing as options that limit time away from office, short formal training courses, site visits and 'on the job' training. Websites were seen as 'self-help' tools with strong support for a central web-based portal, with key training concerns identified as cost, time involvement and 'information overload'. The use of incentives and pre-accreditation of prior learning were put forward as opportunities to partially address concerns over budgetary and time constraints.

Key recommendations emerging from the discussions include the development of nationally consistent SUDs guidelines for Local Authorities in a form which is easily accessible and regularly updated with best practice, the development of generic training with sector-specific components, the identification of case study sites with programmes of guided visits and the provision of on-line and short course training co-developed by practitioners and academics.

Prepared by:
G MacKay (MWH),
B D'Arcy (Abertay Dundee),
L Corr (Middlesex University),
L Lundy (Middlesex University),
R Wade (Abertay Dundee).

FWR Wastewater Research and Industry Support Forum

THE LAST, 42ND, MEETING OF THE WASTEWATER FORUM, on 24 November 2010, was an opportunity for exchange of information about Forum members' research. There were also three technical presentations:

Neil McIntyre 'The impact of upland land management on flood generation', Howard Wood 'CO₂ Sequestration in landscapes' and Nigel Horan presented a critical summary of the 15th European Biosolids & Organic Resources Conference in Leeds, 15-17 November 2010.

An extensive Note on the Meeting and the presentations will be available on our website www.fwr.org, Wastewater Section/Meeting Notes. The next meeting of the Forum will be on 8 March 2011.

For further information contact Dr Tim Evans (tim@timevansenvironment.com).

4th European Water and Wastewater Management Conference

Leeds, 27-28th September 2010.

INSTITUTE OF WATER winter seminar

FWR attended and had a stand at the Institute of Water's Eastern Area's two-day winter seminar at Wyboston Lakes Conference Centre, St Neots on the 24th-25th November 2010.

The theme of the seminar was "The Customer Experience" and featured presentations from Ofwat, CC Water, UK Water, Anglian Water, Veolia Water, HomeServe and Halcrow amongst others.

All the presentations were very informative but one in particular that stood out was by Rob King a Customer Services Technician for Veolia Water who regaled the audience with many amusing anecdotes of his dealings with the public face to face.

Two interactive workshops were held, the first on training needs for those in the customer service area and the second looking at the future for the water industry under a range of future climate change scenarios. This second workshop provoked a lively amount of discussion and banter between the various teams as they allowed their imaginations free rein in considering the possible industry outcomes of their climate change scenario.

The Institute of Water is solely concerned with the UK water industry. They support and develop careers by providing a learning, developing and networking framework. For more information and to view the presentations (Members only) visit the Institute of Water website:

(<http://www.instituteofwater.org.uk/index.php>).



Speakers Day 1: (L to R) Keith Edwards (Independent consultant), Richard Brimble (Veolia Water), Caroline Hardwicke (Harding and Yorke), Andrew Kluth (Halcrow), Sue Cox (OFWAT).



Forum for the Future, Interactive Session Day 2.



Nick Ellins, Consumer Council for Water and Vice President of the Institute of Water.

(Photographs courtesy of the Institute of Water)



Ken Shapland, immediate past President of CIWEM, at the FWR stand.

TO PUBLICISE ITS WORK FWR took two delegate places and exhibition space at the conference.

The theme of the Conference was "Reducing the Environmental Footprint of the Water Industry". The format of the conference was as for previous years with a plenary session on the first day on Legislation, and the second day on Regulation.

Each day had three parallel sessions covering topics on Carbon & Energy, Instrumentation & Equipment, Sustainable Water, Innovation, Resource Recovery, and Improving Water Management. There were also workshops on the Sewerage Network and panel discussions on Rainwater Harvesting.

Approximately 200 delegates were registered representing the whole spectrum of the water industry. We were very pleased in the amount of interest shown in the work of FWR, in particular with students who did not know of the Foundation and the library of research papers and water information we provide.



Proceedings from the conference are available from the organiser (£80):

(http://www.aquaenviro.com/index.php?option=com_virtuemart&page=shop.browse&category_id=83&Itemid=152).

Brian D'Arcy, Environment Consultant.

EUROPE-INBO 2010 On the Implementation of the WFD

Megeve, France, 22-24 September 2010

AT THE INVITATION OF THE FRENCH WATER AGENCIES 177 participants from 42 countries took part at the 8th European Conference of the International Network of Basin Organisations (INBO).

The conference was organised within the 3rd International Conference on New Water Governance in Mountains is Needed to Face Climate Change! and attended by more than 600 participants.

The EUROPE-INBO supports exchanges of practical experience in the implementation of the WFD within the Member States as well as with non-EU countries interested in WFD concepts

The conference in Megeve was organised around six Workshops:

1. Progress made in the preparation of the WFD Management Plans
2. Programs of Measures 2010 - 2015
3. Co-ordinated implementation of the WFD with the Groundwater, Floods and Marine Strategy Directives
4. Strategies for the prevention of droughts
5. Adaptation of water management to climate change
6. Cooperation with neighbouring countries

As the conference was simultaneously translated into French and English it was particularly interesting to hear delegates from diverse countries, including Hungary, Bulgaria, Belarus, Ukraine, Algeria, Libya, Israel, China, Colombia and Chile, talking about their approach to river basin management and dealing with water shortages and floods.

At the end of the conference Pierre Roussel, Inter-ministerial Coordinator of the French National Organising Committee for the World Water Forum 2012, outlined proposals for the regional European process for the 6th World Water Forum that will take place in Marseilles in March 2012.

The next meeting of the EUROPE-INBO will take place in Oporto, Portugal in the Autumn of 2011.

A report on the conference 'Declaration of Megeve', the presentations, photographs and other related documents are available for download on the INBO website: (<http://www.inbo-news.org/spip.php?article1709>)



Stephen Midgley, OIEau (left) updated on the IWRM European FP6 project, and Jean-François Donzier, Permanent Technical Secretary of INBO reviewed the objectives and actions of EUROPE-INBO



Adolfo Merida (left) talked about drought management in Spain and Mme Danielle Mitterand, President of the France Libertés Association, was launching the 'Water Carriers' campaign



The new and the retiring Presidents of the EURO-INBO, Laurent Fayein (France) on the left and Bjorn Sjoberg (Sweden)



Fourth Workshop - Nikola Marjanovic (Serbia), Jason Alexandra (Australia), Yehuda Shevah (Israel) and Prof Hadi Mgarbi (Lybia)



Aziza Akhmouch (OECD) presenting 'Fostering better governance to overcome obstacles in the implementation of the WFD



Facilitator Serge Délémontex discussing the outcome of the third Workshop with Laszlo Perger (Hungary)



Defra's Water Stakeholder Forum for England

THE LATEST MEETING was held in London on 24 September 2010. These consultation meetings continue to be fully booked. The last meeting was attended by 70 participants from a wide range of sectors, including the Environment Agency, Ofwat and CCWater, Local Authorities, environmental NGOs, agriculture, ports and navigation, energy and other industry.

DEFRA UPDATE

Chris Ryder presented a paper updating current Defra activities (Flood and Water Management Act, SUDS, diffuse pollution, EU Common Implementation Strategy, and others) and Stuart Kirk discussed the Defra's Evidence Investment Strategy: 2010 - 2013 and beyond (<http://www.defra.gov.uk/evidence/science/how/strategy.htm>) in relation to the WFD.

ENVIRONMENT AGENCY UPDATE

Geoff Bateman, Environment Agency, reported that all regions are now making progress with programming and undertaking investigations following on from the RBMPs and updated the stakeholders on other current developments including the EQS Directive, Revised Bathing Water Directive and diffuse pollution.

DEMONSTRATION TEST CATCHMENTS (DTCs)

Professor Bob Harris presented further information on DTCs - building our capacity for catchment management (see also FWR Newsletter, Issue 2, 2010). These catchments will be the UK input into an EU Pilot River Basin Network, which aim to share experiences and ideas.

The main focus of this meeting were the two important White Papers, the Natural Environment White Paper and the Water White Paper, which are to be published early next year. The White Papers were discussed in parallel in breakout sessions.

NATURAL ENVIRONMENT WHITE PAPER

Matthew Sabourin, Policy Advisor, Defra, gave an overview of the White Paper. It will be a statement of the Government's ambitious vision for the natural environment, covering our marine environment, our air, water, soil and landscapes. It aims to reflect the role of farming, food, waste, land use and planning and to look at England's footprint on the natural environment overseas. It considers new ways of enabling local authorities and local communities to protect and enhance the natural environment.

The Agenda, Minutes of the Meeting, presentations and other documents from the Defra Stakeholder meetings is available to download on our website: (http://www.euwfd.com/html/england_and_the_wfd.html)



WATER WHITE PAPER

Tony Ripley & Julie Dickason, Defra, prepared a background paper.

The White Paper will focus on future challenges facing the water industry. Key topics will include:

- Securing sustainable water supplies
- Increasing choice and delivering better value to customers
- Modernising the current regulatory system
- Ensuring fair and affordable water charges
- Incentivising water conservation

It will reflect the conclusions of the Ofwat review which was announced on 26 August. It will also set out the Government's conclusions on Martin Cave's Review of Competition and Innovation in Water Markets and Anna Walker's Review of Charging for Household Water and Sewerage Services. It will be developed in close conjunction with the Natural Environment White Paper.

Useful links:

Programme of investigations for river basin management planning: (<http://environment-agency.gov.uk/research/planning/33106.aspx>)

Water Framework Directive (WFD) Mitigation Measures Online Manual: (<http://evidence.environment-agency.gov.uk/FCERM/en/SC060065.aspx>)

Natural Environment White Paper: (<http://ww2.defra.gov.uk/environment/natural/whitepaper/>)

Water White Paper: (<http://ww2.defra.gov.uk/environment/quality/water/whitepaper/>)

The Eden DTC in Cumbria: (<http://www.edendtc.org.uk/>)

The Wensum DTC in Norfolk: (<http://www.wensumalliance.org.uk/index.html>)



An update on the activities of the FWR



Caryl Stephen

Chief Executive of the Foundation for Water Research

Well, as promised in the previous Newsletter, this issue is focussing on urban flooding and the work of our Wastewater Section. It has been a busy time for this Section culminating in November with a Forum meeting and the WaPUG – Wastewater and Urban Drainage Autumn Conference in Blackpool. On the Water Supply side, as you will see, FWR has

continued to also be active and it is hoped to appoint a replacement co-ordinator for Tony Lloyd early in the New Year.

WFDIC has continued to monitor European activities and, as already detailed, the FWR Library has published a new Guide and updated a further Guide and a ROCK. Work is continuing on updating the ROCKS on Endocrine Disrupters and Desalination for Water Supply. Our next Newsletter will focus on urban diffuse pollution and work has already started on this.

Meantime, I should like to thank all those who have contributed to this years' Newsletters and to wish all our readers a very merry Christmas and a happy New Year.

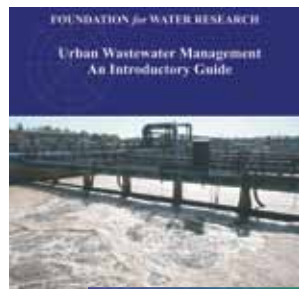


Library

the information centre for water, wastewater and related environmental issues



New publications from FWR, Rocks & Guides

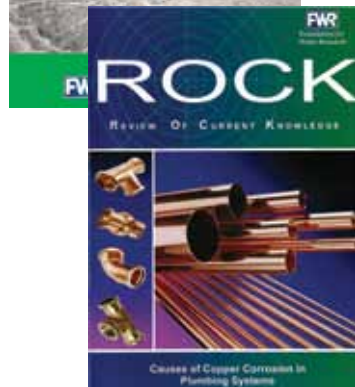


Just Published:

- **Updated FWR Guide FR/G0001:** The EC Water Framework Directive - An Introductory Guide
- **Updated FWR ROCK FR/R0007:** Causes of Copper Corrosion in Plumbing Systems
- **A new FWR Guide FR/G0008:** Urban Wastewater Management

Future Publications:

- **FWR Rock FR/R003:** Endocrine Disrupters in the Environment
- **FWR ROCK FR/R0013:** Desalination of Water Supply.



SNIFFER Reports:

- SNIFFER, the Scotland and Northern Ireland Forum for Environmental Research, manages and publishes research addressing knowledge gaps relating to environmental issues.

The reports are available in pdf format on the SNIFFER website (<http://www.sniffer.org.uk>). Printed copies or CDs (**£20+VAT**) can be ordered from our FWR website (<http://www.fwr.org>) or by e-mail: office@fwr.org.uk. The following new report is now available from FWR:

- **UKCC13** - Communicating Understanding of Contaminated Land Risks Guidance (**£25**)

A summary, or the complete documents (Adobe Acrobat pdf file) may be viewed via the appropriate link. our FWR/Library website from the Bookshop section: (<http://www.fwr.org>).

Copies of the Guides are obtainable from the Foundation, price **£15.00, less 20%** for FWR Members. Purchase these Guides through our Secure Online Purchasing system. All ROCKs are available as A5 size printed booklets, priced at **£15.00, less 20%** to FWR Members.

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