

# Delivering a Vision for an Urban Landscape with SuDS

by Alex Stephenson, Director of Hydro International's UK Stormwater division and chair of the British Water SuDS Group.



Photograph courtesy of Illman Young



Photograph courtesy of Illman Young

Background Photograph courtesy of Illman Young



Elvetham Heath

It is, perhaps, an interesting irony that an old origin of the word 'suds' may have meant silty floodwater, or a marsh or bog. To civil engineers at least, SuDS are now better known as the urban antidote to flooding and poor water quality, as the acronym for Sustainable Drainage Systems.

So, if we are to believe the Oxford English Dictionary's etymology at least, it seems we have already turned a full circle of sorts with SuDS as a solution to controlling the flow, quantity and quality of surface water. It's a play on words, admittedly, but it helps me to set up a historical question: In another 100 years' time can we hope that the word SuDS will be on the tip of the general public's tongue as a humdrum, everyday term for stormwater drainage?

Despite the encouraging progress made in regulation in the UK, we are only just starting out with SuDS. The focus of the Flood and Water Management Act and the Code for Sustainable Homes, for example, is very much on new development or redevelopment. It will be years before the proposed new National Standards for England and Wales have a significant impact on surface water drainage infrastructure.

Great progress has been made in getting SuDS on the statute books in England, Wales and Scotland. It's taken a lot of work for Government and industry to get this far, but it's still just the end of the beginning as far as SuDS is concerned.

The best blueprint we have of SuDS for the future comes from the recently published guidance on Retrofitting for Surface Water Management from CIRIA (Construction Industry Research Industry Association). Among the industry experts who have authored this milestone document, there is a palpable sense of passion and enthusiasm for the transformational potential of SuDS in urban environments.

Their infectious vision helps to paint the best picture we have so far of the opportunity to deliver multiple benefits with SuDS in our urban spaces, creating attractive and useful public landscapes, improved biodiversity

and helping to reconnect a network of ecological green corridors.

SuDS principles aim to mimic natural drainage paths and processes by dealing with rainwater close to the point where it falls. To achieve this means engineering in nature's way with a full 'toolbox' of techniques using both 'hard' engineered and 'soft' natural components, often in combination. SuDS retrofit opportunities cover a broad range of options, from the incremental and prosaic through to more strategic urban planning approaches. The critical point is that no space is useless.

The Guidance's 22 case studies provide some excellent exemplars, including several that use Hydro International's products as part of a sustainable solution. A recent car park retrofit at St Ives in Cornwall used Hydro Stormbloc® and Hydro Stormcell® storage, together with a Hydro-Brake® Flow Control as part of a local retention solution that has solved flooding problems there.

Another case study from Waltham Forest in North London showcases one of the first ever drainage schemes to use vortex flow controls. Back in 1984, the solution used 9 Hydro-Brake® Flow Controls to tackle major flooding problems and was even featured on Tomorrow's World as an exciting new solution to flood risk. It is still doing its job today providing a sustainable, no power solution to managing flood risk.

The concept of Ecosystems Services has provided a means of re-evaluating Sustainable Drainage systems in terms of the multiple value they offer local communities. The Government's Natural Environment White Paper helped to outline a means of giving a monetary value to the benefits derived by people from natural systems. Such approaches help to counter negative perceptions of SuDS as being too expensive, or taking up too much land. These perceptions must not be allowed to dilute the UK's approach to SuDS in the future. In the past, we have treated stormwater as a waste product to be swept away along underground pipes, through combined sewers

and eventually to wastewater treatment works where it has to be expensively treated and discharged. In the same way, many of the urban pockets of green along our streets and highways have often been neglected, or seen as costly liabilities that need to be tidied up.

In future, landscape architects and urban planners will be as important as civil engineers in delivering a multi-agency approach that can harness the potential of SuDS as part of wider urban solutions for our homes, highways, public parks and amenities, helping to build blue and green corridors and contribute to Water Sensitive Urban Design.

Engineering in nature's way means using a mix of 'hard' or proprietary systems and 'soft' or natural features to achieve this. Well-designed SuDS can minimise land take, while still delivering a sustainable solution. For example, using a Hydro-Brake Optimum® can help minimise stormwater storage requirements and reduce the size of a pond or detention basin. Treatment solutions like the advanced hydrodynamic separator (Downstream Defender®) can be enabling, helping to prevent silts, oils and pollutants from entering sensitive ponds and wetlands. Our industry still has much to do in terms of infecting all the necessary agencies with a passion for SuDS and we must continue to demonstrate best practice. Hydro's Engineering Nature's Way website is one such initiative to share knowledge and case studies on SuDS. Visit [www.engineeringnaturesway.co.uk](http://www.engineeringnaturesway.co.uk). You can also download the popular "SuDS in the Urban Landscape" e-guide, authored by myself together with Prof Richard Ashley and Sue Illman of Illman Young landscape architects.

Download a copy of 'SuDS in the Urban Landscape' e-guide below:  
<http://www.engineeringnaturesway.co.uk/download-the-e-guide/>

# Making a *murky issue* crystal clear:

## The Flood and Water Management Act and National Standards for SuDS

It has been a long road, but it seems sustainable drainage systems (SuDS) are finally gaining ground. With the introduction of the UK Flood and Water Management Act (2010), all new developments will be required to implement SuDS. Reducing run-off rates, mitigating flood risk, recharging stressed water tables, and filtering polluted stormwater are all motivating factors for this change in legislation. Crucially, the Act removes the long-referenced road-block to SuDS – an active adoption body. The Act introduces the SuDS Approval Body (SAB), a role to be taken up by county and unitary authorities, who will be responsible for approving and in some cases, adopting and maintaining new SuDS schemes.

SuDS have the potential to become an integral part of the urban landscape. But they come with a health warning; if they aren't given the care of design and maintenance that we would expect for any other part of the public realm, they won't deliver the benefits. It seems obvious, but good design that successfully integrates water management with the urban world still seems to be a challenge.

Draft National Standards for Sustainable Drainage Systems were released in December 2011 and outline how Defra expects SuDS to be designed and adopted. No doubt the draft proposals will be finessed to provide consistent expectations and guidance for



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design, but crucially the National Standards remain focussed on functionality and leave the broader design considerations surrounding place-making, design quality, ecological value, and contextual response to be set out through local plans. This leaves the SAB and local authorities with a challenge – if they want to approve and adopt SuDS that respond to the local agenda and maximise value to communities, they need to embed that vision through local standards and skills.

### Embracing a changing landscape

As with the introduction of many new policies, the draft National Standards and the proposed approval and adoption processes raise as many questions as they answer. Many

authorities taking on the SAB role are uncertain how it will dovetail with existing processes and roles and are raising a number of questions: How will the SAB interact with the Local Planning Authority to ensure applications are assessed efficiently? Who will be included in the SAB, and when will it start operating? Where will funding for the SAB and SuDS maintenance be sourced in the long-term? How will all the various people involved in the process be trained in time? As it stands, the SuDS approval and adoption requirements could come into place as soon as October 2012, though Defra is considering an extension into 2013. Whatever the date, the coordination required means that both county and local authorities and their partners need to start testing local issues now while Defra refines the national guidance.

Cambridgeshire County Council has been one of the early movers, deciding that a pro-active approach is the only option. Cambridgeshire believes it can make the journey considerably easier by having the awareness, coordination and a clear vision established locally in advance.

"Given the uncertain timescales of the SAB commencement and the level of development that's planned in Cambridgeshire, the County Council decided to take a proactive approach to SuDS. Working in partnership with key stakeholders including the Environment Agency and District Councils, the County Council is developing a handbook to promote the use of SuDS in new developments, and to provide support to local planning authorities before the SAB commencement.

# embracing SuDS in Cambridgeshire

This handbook will be used as the local standards for SuDS in the county supported by the National Standards. In addition to detailing the local standards for SuDS in Cambridgeshire, the process of developing the handbook also helped raise awareness of the SAB duties, the associated implications, and reinforced on-going partnership working in flood risk management." Sass Pledger, Flood and Water Manager, Cambridgeshire County Council

## Development of Cambridgeshire's SuDS handbook

Recognising the opportunity to proactively establish clear local standards, build relationships, and define internal processes early on, Cambridgeshire County commissioned AECOM to develop a SuDS handbook. Cambridgeshire receives the lowest rainfall in the UK, and water resources are limited, but conversely water is ever-present on the county's surface as it has a generally flat topography, a high water table, and predominantly claysoil that makes it difficult for water to infiltrate. It is therefore unsurprising that the county has a long history of innovation in surface water management. In recent years, the area has continued to push the boundaries with the development of Cambridge City's award-winning SuDS Design and Adoption Guide. Now, Cambridgeshire County's handbook builds further on the knowledge developed in the area, and brings together local guidance on how stakeholders will work together and on how the SAB will

expect SuDS design to respond to local expectations.

It was clear while developing the handbook that including Cambridgeshire-specific standards would be essential to make the National Standards meaningful locally. As part of the process, 20 local SuDS standards were created and refined. These clearly communicate the local design considerations developers need to address when working in the county. Not only does this enshrine good design into local policy, but it also makes development in the county more attractive to developers, as it removes ambiguity regarding the types of acceptable drainage.

### Solving problems together

While the National Standards and the handbook will provide crucial guidance and examples of good practice, Cambridgeshire also realised that half the challenge comes in communication and coordination. In developing the contents of the handbook, a series of workshops was held to raise awareness, establish local priorities and secure agreement on how the approval and adoption process will be handled. Establishing understanding and support from the local authorities in the county has been crucial, not only because of their role as the intermediary in handling and enforcing SuDS requirements alongside planning approvals, but in the local knowledge and expertise their staff can bring to the process. Sharing staff expertise in

drainage, maintenance, ecology and urban design will be crucial to delivering quality SuDS.

"Successful SuDS are dependent on many disciplines in different organisations coming together; communication and joint working are key to this. This promotes consistency, and opportunities can be realised from perceived constraints leading to more efficient, cost-effective processes and better places for people to live and work." Simon Bunn, Sustainable Drainage Engineer, Cambridge City Council

Through stakeholder collaboration, checklists were created for the handbook that the SAB will use at various stages of approval and adoption. Four checklists outline the documentation and evidence the SAB will be seeking for design approval, construction verification, maintenance specifications, and asset transfer. While the checklists have been created for the SAB, they will benefit other stakeholders looking for insight into SuDS criteria the SAB is looking for.

In the age of localism, it is unlikely national policy will provide all the answers, and it will be crucial for county and local authorities to outline their own priorities and ensure they can be delivered locally. Cambridgeshire hopes to capitalise on the benefits SuDS can bring to the area, seeing this as both a challenge and an opportunity.

**AECOM**

## Polypipe unveils new concept in rainwater harvesting systems with optional built-in anti-microbial technology

Polypipe, the UK's leading manufacturer of plastic sustainable drainage and water management products, is responding to the growing need for sustainable rainwater re-use systems through the launch of its Rainstream RXL.

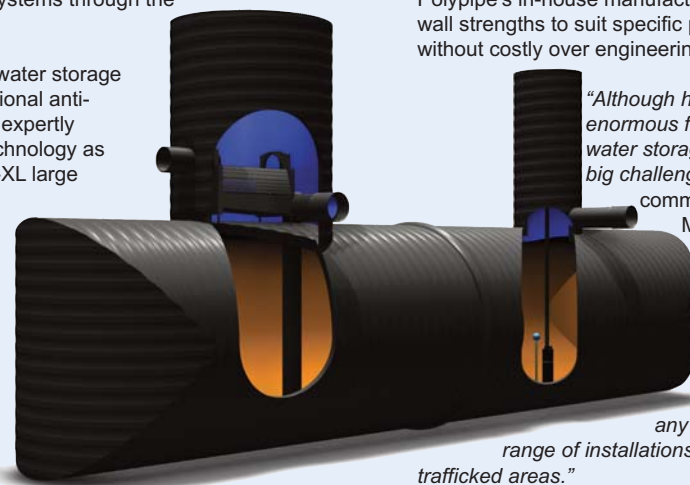
Rainstream RXL high volume water storage tanks are available with an optional anti-bacterial lining and have been expertly engineered using the same technology as Polypipe's popular Ridgidorm-XL large diameter pipes.

The Rainstream RXL tank's modular design allows any storage capacity to be created and features an integral pre-storage filter - eliminating the need to make connections between the chamber and the tank.

Exceptionally strong, Rainstream RXL offers all the functionality of large-scale GRP sub surface tanking and in most cases can be installed using a single sized granular backfill, as opposed to a more costly concrete support structure. And with no need to fill the tanks

with water during installation, tens of thousands of litres of water can be saved.

Polypipe's in-house manufacturing facilities can produce bespoke tank wall strengths to suit specific project requirements and burial depths, without costly over engineering.



*"Although high volume below ground tanks offer enormous flexibility in the planning and provision of water storage for large scale projects, they present big challenges in transport and installation"*

comments Darren Crane, National Sales Manager Rainwater Harvesting at Polypipe.

*"Rainstream RXL has been designed and developed to help specifiers, engineers and contractors overcome these challenges and achieve significant cost and environmental savings too. The fact we are able to manufacture the tank to any stiffness classification allows for a broad*

*range of installations, be it below the water table or in heavily trafficked areas."*

The modular construction of the Rainstream RXL allows for easier on-site handling, off-loading and positioning. While assembly is straight forward with Polypipe's unique Electro-Fusion jointing technology.



Rainstream RXL also comes with optional Biomaster® Protection within its polymer lining. Biomaster is a safe, effective, silver based anti-microbial additive which is proven to reduce the growth of harmful, pathogenic bacteria such as Legionella, Listeria, Campylobacter, MRSA, E.coli and Pseudomonas on the inner surface of the tank by up to 99.9%. The Biomaster Protected parts of the Rainstream RXL have been tested to ISO 22196:2011 standards.

More information on the Rainstream RXL storage tank can be found at <http://www.polypipe.com/wms/products/rainstream>

### SURFACE WATER DRAINAGE

## NEW RIDGIDRAIN

THE PERFECT BLEND OF TECHNOLOGY & SUSTAINABILITY



### PERFORMANCE, INTEGRITY AND SUSTAINABILITY

At Polypipe, we invest heavily in research and new production technology that allows us to pursue high quality standards, more precise performance specifications and even greater reliability.

NEW RIDGIDRAIN is the latest in a long line of innovations and our most efficient surface water drainage system yet, offering specifiers a proven structured wall product to meet the demanding criteria of today's Civils and Infrastructure projects.

When we evolve as a company so do our products  
[www.polypipe.com/ridgidrain](http://www.polypipe.com/ridgidrain)

**Polypipe**



## Surface Water Management Conference 2012

By Lauren Goozee, Events Officer, CIWEM

### *“Delivering a Different Future Vision and Practice”*

#### PRESENTERS

Better surface water management  
Paul Shaffer, CIRIA

Climate change and surface water flooding: risk and adaptation  
Stephen Merrett, Environment Agency

Flood Risk Management An overview of current and developing policy  
Linda Aucott, Defra

Urban Diffuse Pollution  
Richard Martin, Environment Agency

Making surface water management 'business as usual'  
Peter Jordan, Ofwat

Surface Water Elimination and Reduction (SWEAR) Strategy  
Jeremy Jones, Welsh Water

The role of the water companies in Surface Water Management  
Briony Tuthill, Anglian Water

Surface water early action: outcomes and next steps  
Jonathan Hunter, Environment Agency

SuDS - Urban retrofitting – a highway perspective  
Owen Davies, Lambeth Council

Surface Water Flooding - Community Engagement  
Paul Cobbing, National Flood Forum

SuDS Approval and Adoption Bodies  
Simon Bunn, Cambridge City Council

Testing change: What are the key elements of the new Paradigm?  
Chris Digman, MWH

Sustainable Drainage The American Way: Paradigm in Portland  
David Schofield, Hydro Consultancy

Community engagement – a case study from Portland, Oregon, USA  
By David Schofield, Hydro Consultancy

Transitioning to a Water Sensitive Urban Design approach in the UK  
Peter Robinson, AECOM

Australian thinking - the value of rainwater  
James Berryman, Micro Drainage Ltd

With the month of June seeing parts of the UK flooded at the same time as hosepipe bans and drought, the CIWEM conference on Surface Water Management was very timely as how we manage water, whether it be too much or too little, is high up on the agenda. We have now been told that June was the wettest since records began, with double the average rain falling during the month. The weekend of 23/24th June saw extraordinary levels of rainfall in parts of Northern England, with 5 – 10cm in some places, causing surface water and fluvial flooding. With the threat of climate change and the predictions that rainfall intensity will increase by up to 30 per cent by 2115, and the extra pressure being placed on existing drainage infrastructure with new housing developments planned across many parts of the UK, it is more important than ever that we manage surface water sustainably.

Over 140 delegates from a wide range of organisations including central Government, regulators, academia, NGOs, local Government, consultancies and research bodies attended CIWEM's annual event. The conference focused on how surface water management fits into the broader context of water in the urban environment and demonstrated the practical delivery of projects from a wide range of perspectives in these current challenging times.

The conference programme consisted of presentations from 15 speakers plus ample time for panel discussions and Q&A with the audience. After an introduction and scene setting from **Elliot Gill, CIWEM Urban Drainage Group Committee member and Associate Director at Halcrow**, we were treated to an overview of the current situation including a Government Policy Update from **Linda Aucott, Head of Engineering, FCRM, Defra**. At the event Linda officially launched the new Defra and LGA Flood Portal, a one stop shop for all information on flood and coastal risk management including guidance, legislation and research. This is part of the Defra Capacity Building campaign; a response to the recognition that Lead Local Flood Authorities (County Councils and Unitary Authorities) need to build up their skills and knowledge base to be able to carry out their new role in Flood Risk Management. Linda also announced that by 2013 there will

be publicly available surface water maps, news greatly received by many.

The conference then moved on to looking at making surface water management 'business as usual' from the water company perspective, followed by a session on community practice and engagement, finishing with a look at some international case studies from Australia and the USA.

Throughout the event a number of themes were repeatedly referred to by speakers and delegates alike. These are outlined as follows:

#### Multiple benefits

Traditionally the benefits of SUDs have been cited as mainly flood risk management and improving water quality however the move of thinking towards green infrastructure delivery and integrating surface water management into urban design has led to additional benefits being realised. These benefits range from water supply, thermal comfort, reductions in energy use, and recreational and quality of life/health benefits.

#### Multiple solutions

It was recognised that not one solution fits all and often projects include a range of solutions appropriate to the local situation – this might include a mix of disconnection of roof drainage, disconnection of highway drainage, permeable pavements, water butts, alongside educating and engaging with the public.

#### Partnership working

It was apparent that partnership working will be key to managing surface water in the future in terms of planning, delivery and funding.

#### Community Engagement

The National Flood Forum noted that a community that is prepared for flooding suffers much less. In addition to this local knowledge is invaluable to sustainable water management. It was recommended that early engagement with the local community should be sort before decisions have been made, rather than informing communities once a projected has been decided.

#### Holistic/integrated approach

integration is one of the powerful principles of sustainability and it is clear that the way forward is to take a

holistic approach to water management. There is a lot to learn from our international colleagues particularly in Australia and the USA on Water Sensitive Urban Design (WSUD), the process of integrating water cycle management into urban planning and design. We still have a way to go before we see a transition in the UK to a WSUD approach. It was evident from the conference that if we are to effectively address the issues presented by climate change, urban creep, energy and carbon, the Water Industry will require new and smarter ways of managing surface water management. This can only be achieved through a long term integrated approach involving partnership working and early community engagement.

The conference took place on 27th June 2012 at SOAS, University of London. Outputs from the event including speaker presentations are freely available on the CIWEM websites. CIWEM has also published briefing reports on Integrated Water Management and Multi-Functional Urban Green Infrastructure

Working for the public benefit for a clean, green and sustainable world, CIWEM (The Chartered Institution of Water and Environmental Management) is the only independent, chartered professional body and registered charity with an integrated approach to environmental, social and cultural issues. To find out more about the institution visit [www.ciwem.org](http://www.ciwem.org)

CIWEM organises a multitude of conferences and events bringing together a diverse audience of environmental professionals, regulators, academics, researchers, local authorities, NGOs, civil servants and others to debate, share knowledge, hear from and engage with key figures in the environment sector, and network. These events support CIWEM's policy work and inform key initiatives such as the CIWEM manifesto, briefing reports, policy statements, lobbying and other work. See the CIWEM Events Calendar for a list of future events.

#### LINKS:

**Defra & LGA Flood Portal:**  
[www.local.gov.uk/floodportal](http://www.local.gov.uk/floodportal)

**CIWEM Conference Presentations:**  
[www.ciwem.org/events/conference-outputs.aspx](http://www.ciwem.org/events/conference-outputs.aspx)

**Integrated Water Management link**  
<http://bit.ly/Lktx3r>

**Multi-Functional Urban Green Infrastructure**  
<http://bit.ly/Lvpz3s>

**CIWEM Events Calendar**  
[www.ciwem.org/events/events-calendar.aspx](http://www.ciwem.org/events/events-calendar.aspx)

## Manage Storm and surface water with **ISIS FAST**



ISIS FAST is an innovative flood inundation modelling tool designed to allow quick assessment of flooding using simplified hydraulics. It provides the functionality to carry out surface water modelling at strategic, intermediate and detailed levels and provides results in seconds or minutes as opposed to hours or days, which is up to 1,000 times faster than traditional two-dimensional models.

Surface water management plans outline preferred surface water management strategies for a Lead Local Flood Authority (LLFA) area, and are undertaken with key local partners, led by the local authority. ISIS FAST can help partners to map surface water flooding, understand its impact, and visually communicate the risk to stakeholders.



ISIS FAST is fully integrated with ISIS suite and links with other modelling and analysis tools to deliver a powerful but easy to use surface water mapping system. ISIS FAST is a new way of mapping flood

risk quickly, while still representing the most important topographic affects that control patterns of flooding. ISIS FAST combines ground elevation data with rainfall amounts to model water depths in topographic depressions, as well as the pathways between them. ISIS FAST captures the most important features of flooding, without the need for time consuming model setup, long run times or as much modelling expertise when compared to building traditional 1D and 2D models.

#### Why use ISIS FAST for surface water management plans?

ISIS FAST provides a cost effective way of rapidly delivering flood information for all levels of analysis, from strategic to detailed. It has been extensively benchmarked against full two-dimensional (2D) models to ensure it captures the key behaviour of surface water flooding. It is used throughout the world as a key analysis tool for surface water management. ISIS FAST uses a two stage approach: first, topographic analysis is used to extract surface water catchments and pathways; and second, a "wet" method is used to route water between these catchments. ISIS FAST is therefore even faster when multiple scenarios (storm probability, runoff hydrology, sewer capacity and climate change) are to be run. Using a "wet" method means ISIS FAST outputs are more realistic and informative than other approaches like the "rolling ball" method, and allow the effect of different rainfall and runoff hydrology scenarios to be investigated.

#### Key Features

- ISIS FAST is fully integrated with the ISIS suite, allowing users to easily switch between the FAST and full two-dimensional hydrodynamic solvers
- it produces results up to 1,000 times faster than full two-dimensional modelling methods
- links with ISIS Mapper (a free GIS tool) and other software developed by Halcrow for easy mapping and analysis functions
- rapid model development – from digital terrain model (DTM) to outputs in only five minutes
- outputs grids of flood extent and depths, with ISIS Mapper functionality to produce vector flood extents
- even quicker to run multiple effective rainfall scenarios once topographic analysis is done
- pathway flooding represented with user control over depths and extents
- used in conjunction with more detailed modelling software, such as ISIS Professional and ISIS 2D
- reduces the cost of subsequent detailed modelling by identifying the flood risk hot spots where detailed analysis is needed
- can test solutions that protect people, property, critical infrastructure and the urban environment

By Vijay Jain,  
Halcrow

#### National pluvial flood map for Scotland

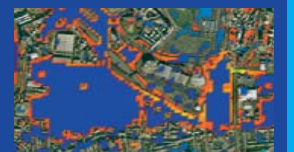
ISIS FAST has been used to map surface water flooding across the whole of Scotland, covering an area of 78,000 km<sup>2</sup> split into 4,000 models. Using ISIS FAST, the whole of Scotland could be modelled in 48 hours per rainfall scenario. Flooding in Loch Achray St, Glasgow.



ISIS FAST outputs were validated using historical records of flooding in Glasgow in 2002, and outputs from detailed level integrated surface-sewer model developed for the Glasgow surface water management plan. The validation results confirmed that ISIS FAST produced useful, credible results at national and regional scale.

#### Surface water flood mapping, London

ISIS FAST has been used to map surface water flooding in East London. Compared with results delivered by an ISIS 2D (full hydraulics) model for the same area, ISIS FAST was able to reproduce flood extents and depths to within 10cm, but 1,000 times more quickly.



ISIS FAST's computational efficiency allows users to generate a Monte Carlo ensemble of thousands of simulations. Modellers can use this to explore the uncertainty arising from key hydrological parameters in a fully probabilistic framework.

## The 2012 National SuDS Conference

# "Getting on with SuDS"

By Chris Hodson

The SuDSsource, 2012 National SuDS Conference, was held on 20th and 21st June in Oxfordshire and themed 'Getting on with SuDS'. Architect and consultant to both SuDSsource and the trade association Interpave Chris Hodson was there and reports on the event.

### SPEAKERS

**Bridget Woods-Ballard, HR Wallingford**

Paper 1: Where we are now (issues and opportunities)?

**Aydin Zorlutuna, Principal Landscape Architect - Urban Designer, Hyder Consulting (UK) Ltd.**

Paper 2: NW Bicester Eco Development

**Roger Nowell, Landscape Architect – Green Infrastructure and Flood Risk Manager, Sheffield City Council**

Paper 3: A day in Hannover  
– Stormwater management in Kronsberg

**Nicola Keen, Senior Landscape Architect, Allen Pyke Associates**

Paper 4: Great Western Park Didcot

**Chris Patmore, Director, RSK**

Paper 4: Great Western Park Didcot

**Bob Bray, Robert Bray Associates – SuDS Consultant and Landscape Architect**

Paper 5: Amenity and Biodiversity in SuDS

**Simon Bunn – Drainage Engineer, Cambridge City Council.**

Paper 6: SAB Overview and Seminar introduction

**Anthony McCloy – McCloy Consulting**

Paper 7: Flows and Volumes  
– a Practical Approach to the Standards

**Nathan Davies, Team Leader (Leisure Safety), RoSPA**

Paper 8: Designing for Health and Safety

**Steve Wilson, Technical Director, EPG**

Paper 9: SuDS Guidance – an Author's View

**Chris Digman, MWH**

Paper 10: SuDS Retrofit  
– a Review of the The CIRIA Guide

**Richard Stevens, River and Coastal Scientist – Water Management UK, Haskoning UK Ltd.**

Paper 11: The FLOWS  
– monitoring SuDS at Lamb Drove, Cambourne.

**Stephen Wielebski, Divisional Development Director, Miller Homes Limited.**

Paper 12: A Housing Developer's Perspective on SuDS

**Bob Bray, Robert Bray Associates – SuDS Consultant and Landscape Architect**

Paper 13: Taking SuDS Forward

**SuDSsource**



With the prospect of Sustainable Drainage Systems (SuDS) becoming mandatory under the 2010 Flood and Water Management Act, the debate about their wider impact on new developments continues and there is a clear need for practical information and consensus. The SuDSsource conference set out to meet this need, in response to calls from experienced practitioners.

SuDS have been in use for decades and much experience has been gained, both through practice and research, over the years which the SuDSsource conference pulled together. Although intended as a forum for debate, not just a series of presentations, the conference also provided support for the new 'SuDS Approving Bodies' (SABs), local planning authorities, designers, practitioners, developers and their consultants in dealing with implementation of the 2010 Flood and Water Management Act and draft National Standards.

The two-day, packed programme was split into four distinct, themed sessions:

### Masterplanning with SuDS SuDS Law and Standards SuDS on Site SuDS in Practice



### Masterplanning with SuDS

In the Masterplanning session, landscape architects and engineers described a fascinating diversity of projects. At first-phase design stage, the NW Bicester Eco Development seeks to fully integrate urban and landscape design with SuDS on this 5,000 home Ecotown. Also in Oxfordshire, at Great Western Park Didcot – another major development – a drainage strategy has been developed to keep discharge from site to an absolute minimum, with phased implementation linked to landscape design.

An intriguing virtual tour through Kronsberg in Hannover demonstrated a pioneering and inspirational approach to management of rainwater in the landscape. Back in the UK, Robert Bray Associates showed how SuDS can contribute to the quality of the landscape experience if integrated early in the design process, with examples at schools, housing and retrofit projects (read case study SuDS for Amenity). These two presentations highlighted the low-key nature of effective SuDS techniques and the challenge of applying them to meet engineering criteria to substantial new developments such as Bicester and Didcot. The session also provided a reminder of the importance of integrating engineering and landscape design from the start.

### SuDS Law and Standards

Individual papers and group seminars explored a wide range of issues facing all those involved with the development process in interpreting and implementing National Standards for SuDS – once they are finalized – based on the current draft. How should county councils, unitary authorities and other organizations set up SuDS Approving Bodies (SABs)? How can engineering designs be evaluated by SABs? The design of SuDS at or near the surface, and particularly the use of open water, requires us to consider the issue of Health and Safety: what is a realistic approach to this? How can SuDS be retrofitted to existing developments? All these issues were debated enthusiastically and it became clear that there is a real need for more detailed guidance – and this is unlikely to be forthcoming from government.

### SuDS on Site

An essential part of this Conference, which focused on the practical issues surrounding SuDS, was inspection of two contrasting schemes in Oxfordshire. Oxfordshire County Council has taken a positive and pragmatic approach to adopting SuDS – notably concrete block permeable paving – for some 15 years



now (read case study - Adopting SuDS). Over this period, extensive experience has been gained and lessons learnt.

Firstly, delegates visited a high-density urban housing development in Abingdon with permeable paving still working well without problems after several years with no maintenance. Then they moved on to Great Western Park Didcot (discussed earlier) where the first phases of this massive development are taking shape. Here, various SuDS features are being employed across the whole project. But now water is also considered as an asset, not just a problem, as on other recent Oxfordshire sites.

### SuDS in Practice

This approach is also demonstrated by the The Lamb Drove SuDS Monitoring project in Cambourne, Cambridgeshire, discussed in the final session. Despite the modest size of the site, it demonstrates the use of as many SuDS techniques as possible, including concrete block permeable paving, used in combination to form an effective management train and fully integrated with landscaping – proving to be both popular with residents and effective. Most importantly, project monitoring demonstrates that SuDS work and should cost less than conventional piped drainage in terms of initial, maintenance and whole-life costs (read case study on page 26).

The last session also aired concerns from housing developers about the lack of direction and guidance on implementation of SuDS by government and the potential impact on cost. Adoption and maintenance issues were discussed by several existing SuDS practitioners from local authorities, with a clear consensus developing that the full engagement of all stakeholders from the start of a project was key to its successful implementation. The 2012 SuDSsource Conference ended with a tour of exemplary projects, clearly demonstrating the simplicity and robustness of SuDS, and its importance in the fight against flooding, as well as providing new design opportunities and a better environment for us all.



## Case Study - SuDS for Amenity

As a most versatile sustainable drainage system (SuDS) technique, concrete block permeable paving is particularly useful as a source control at the head of the SuDS management train. It reduces peak rate, total volume and frequency of rainwater runoff, and is also particularly effective at removing water-borne pollution. But it also offers the important – and often missed – opportunity of a gradual supply of treated water, something that Bob Bray of Robert Bray Associates exploits for amenity, harvesting and habitat enhancement in recent projects.

At a high-density town-centre housing scheme in Stamford, most public areas between buildings are concrete block permeable paving which also accepts runoff from other hard areas and roofs. Stored, treated water then passes from the paving directly into planted rills and canals, which add interest and much-needed greenery to the courtyard environment, before passing into the nearby river. This principle is expanded on a hillside Co-housing scheme in Stroud. Here, treated, stored water from concrete block permeable paved car parking feeds a 'waterfall' onto a planted swale, then via planted rills into a wildlife pond and existing stream.



At a pioneering school in Milton Keynes, a terraced sequence of permeable paving car parks removes pollutants, substantially improving the quality of water serving two ponds intended to encourage long-term population by wildlife – notably the 'protected' great crested newts indigenous to the site. Other sections of concrete block permeable paving at the school – on level areas used for play – collect and store rainwater for toilet flushing in the school buildings.

Bob Bray continues to explore the sustainable amenity potential for water treated and stored within concrete block permeable paving on various projects, including schools – many covered by an Interpave case study on Robert Bray Associates, via [www.paving.org.uk](http://www.paving.org.uk).

## Case Study – Adopting SuDS Experience

Oxfordshire County Council has taken a positive and pragmatic approach to adopting SuDS and concrete block permeable paving for some 15 years now. At Oxfordshire, SuDS is considered an essential component of any development and concrete block permeable paving as mainstream technology. Highways Adoption Officer Barry West explained: "With hundreds of permeable paved schemes around the County now, we have developed real confidence in the technology and how it performs. We have had no problems with any permeable pavements – even during the 2007 summer floods."



Once the new Flood and Water Management Act takes effect – following implementation of recently published draft National Standards – 'SuDS Approving Bodies' (SABs) will be formed to both approve and adopt SuDS schemes. Again, Oxfordshire have taken a lead, as Barry West explained: "We have been using Section 38 agreements to adopt concrete block permeable paving for a decade or so – and it works well, particularly when all parties are involved from the very start of the planning process."

"We have already put in place what is needed to operate as an SAB, so that when the new Act does take effect, it will simply be business as usual." Oxfordshire's example and this case study will help to reassure and inform other authorities, including the new SABs, and demonstrate the long-term successful application of concrete block permeable paving as an essential SuDS technique. The case study and a wide range of other information on permeable paving and SuDS can be downloaded via: [www.paving.org.uk](http://www.paving.org.uk).

# The Lamb Drove SuDS Monitoring Programme

## - Quantifying the benefits



Richard Stevens, Royal HaskoningDHV



The multiple benefits of SuDS are widely recognised; however quantification of these benefits is rarely undertaken. The Lamb Drove Sustainable Drainage Systems monitoring programme has done just that and is providing a vital contribution to the SuDS evidence base.

The Lamb Drove site was completed in 2006 and comprises a one hectare residential development with 35 properties in Cambourne, Cambridgeshire. The site was selected to showcase SuDS as part of the FLOWS (Living with Flood Risk in a Changing Climate) programme funded by the European Regional Development Fund (ERDF) through the INTERREG IIB North Sea Region programme. Royal HaskoningDHV, working with Robert Bray Associates, were commissioned by Cambridgeshire County Council to retrofit SuDS and property flood-proofing measures into the design of the Lamb Drove development site. The design followed three guiding principles of simplicity, visibility and easy maintainability.

Through an integrated system of sustainable drainage features, the site brings environmental, ecological and social benefits to residents. The SuDS management train at this site includes the use of 'source control' measures including a green roof, permeable pavements, under-drained swales and water butts, 'site control' measures including bio-retention swales, detention basins and wetlands,

and a final 'regional control' retention pond. The ground conditions on the site offer little potential for infiltration so the system operates through attenuation of flows through the network of features.

Royal HaskoningDHV was commissioned to undertake monitoring of the performance and benefits of the implemented SuDS over a period of two years which began in October 2008. This was extended until the end of 2011 with the final report published in 2012. Flows are monitored across the site as they move along the treatment train. A control site of similar size and development density, but with traditional drainage, is also monitored. Water quality samples were collected on a quarterly basis at both the SuDS site and the control site. The environmental benefits of the scheme were assessed through habitat surveys and the local residents were surveyed to assess their views on the scheme. The results from the Lamb Drove site were compared to results from the control site.

The SuDS system has attenuated surface water flows; significantly reduced peak flows have been observed when compared to the Control Site (Figure 1). The monitoring programme has clearly shown the successive attenuation and reduction of both flow and volume through each stage of the SuDS management train.

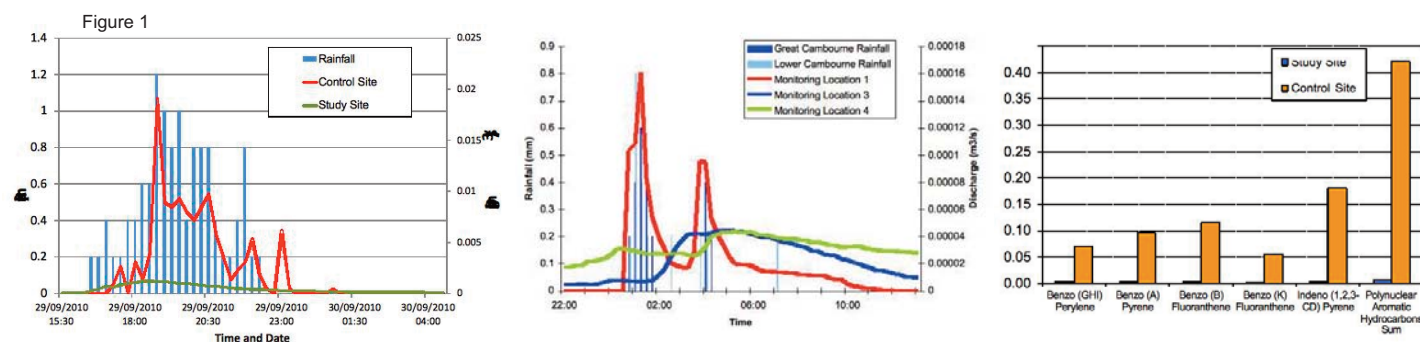
The SuDS system has improved the quality of water discharged from the Study

Site when compared to the Control Site. Results have shown that the Study Site has observed reductions in concentrations of a variety of pollutants and other water quality indicators including hydrocarbons, heavy metals and suspended solids.

In addition the Study Site has shown a higher number and diversity of species present over the three habitat surveys than the Control Site, demonstrating that the Study Site represents a more natural management regime.

The resident surveys found that they regard the open space around their homes more aesthetically pleasing when compared to other parts of Cambourne. It is apparent that the residents of Study Site have a high regard for the aesthetics and visual appearance of the open spaces within the SuDS scheme. This agrees favourably with findings from some other SuDS sites, where the positive impact on the immediate areas had transformed into locally higher property values.

These results are already being used at the national level to promote the benefits of SuDS and overcome the lack of confidence on their actual performance. By providing significant evidence base on the performance of SuDS compared to conventional systems, this study takes the industry a long way in providing scientific information on the performance of SuDS systems.



More information about this SuDS project can be accessed at <http://www.cambridgeshire.gov.uk/environment/planning/drainagesystems/monitoring.htm> or by contacting [richard.stevens@rhdhv.com](mailto:richard.stevens@rhdhv.com).

# A SuDS Retrofit provides the solution for car Park flooding

Behind the steep, tourist-beloved streets around the cliffs and beaches of St Ives, Cornwall, lies the infrastructure that the town's residents use all year round. Here a retrofit SuDS scheme, based on Hydro International's stormwater storage and infiltration technologies and Hydro-Brake® Flow Controls has alleviated flooding problems at a busy town car park, caused by the frequent heavy rainfall.

The scheme is highlighted as an exemplar of tackling surface water flood risk in a retrofit context in CIRIA's new Guidance on Retrofitting to Manage Surface Water.

"We needed a surface water attenuation solution for Trenwith Car Park which would be highly effective within the site's existing footprint, and would not badly disrupt the users of the car park during construction," comments Nigel Higgins, project leader, Highways, for Cornwall Council. "Since its installation in 2010, we have had no more complaints about the car park flooding, despite poor weather."

The Trenwith car park provides connection with the town buses, as well as serving the well-used leisure centre, local businesses and residents. With a hectare of paved surface, heavy downpours used to cause frequent local

flooding, especially down the lower path descending towards the part-culverted stream at the bottom of the slope.

"We also installed speed humps to divert the water flowing in from the grassed overflow car park areas to run along the base of existing Cornish hedges," adds Nigel. "However that was only marginally better."

"With the Environment Agency, we decided that the best answer would be to combine these diversions with a SuDS installation along the bottom of the car park slope. The SuDS scheme would provide both underground infiltration and storage attenuation as a two stage process to protect the properties and the watercourse further down the slope."



"Using Hydro's Stormcell® and Stormbloc® modular load bearing geocellular blocks enabled a simple shallow (approx. 1.5 m deep) excavation, which could easily be paved over and landscaped. It is an excellent example of a retrofit urban scheme."



The primary protective installation comprises a drainage channel along approximately 100 m across the slope, interconnecting a series of infiltration pits where Stormbloc® is installed. The outflow of the channel is connected to the second line of defence, an attenuation storage tank, comprising nearly 140 cu.m. of Stormcell® with a Hydro-Brake® Flow Control device at the outlet.

This secondary protective tank is designed to provide surface water storage when the infiltration channel design is exceeded. It controls the maximum discharge into the water course. Stormcell® is designed to minimise silting of the storage volume in order to maximise availability and the whole installation meets one in 100 year event requirements.

According to the CIRIA case study, the scheme reduces the rate and amount of surface water entering the Park Avenue and

Stennack areas of the town below the car park. An earlier CCTV survey of the Park Avenue sewers revealed a problem with both the condition and alignment of a section of pipe and manhole factors that had evidently contributed to the backing up and surcharging of surface water at this location.

Since completion of the scheme, Cornwall Council's Emergency Management Service received more than six notices of 'flash warning of heavy rain for Cornwall' issued by the Met Office. The local highway team have confirmed that there have been several incidents of intense rain events in St Ives. Events similar to those have caused problems in the past, however, they did not receive any reports of flooding in the Park Avenue or Stennack Area.

For more information about Hydro's Stormwater management products please call 01275 337977, email [enquiries@hydro-international.co.uk](mailto:enquiries@hydro-international.co.uk) or visit [www.hydro-int.com](http://www.hydro-int.com).



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