Guidance on the use of sustainable drainage systems (SUDS) and an overview of the adoption policy introduced by anglianwater

Easy guide to
Sustainable drainage systems

Contents

Riverside Court Stamford – canal link to River Welland

What's in this guide

- Purpose of the guide
- An introduction to sustainable drainage
- SUDS design concepts and features
- SUDS management and our adoption policy
- Acknowledgements and further information



Purpose of this guide

This guide is intended to help those involved in planning and implementing new development to understand what sustainable drainage systems (SUDS) are, the benefits of using such approaches and to set out some good design practices.

We also set out the principles of our policy on taking on the responsibility for maintaining (or "adopting") SUDS features.

This is an overview document and is complemented by a more technical "SUDS for adoption manual" which can be found on our website. Our adoption manual sets out the design standards we expect for both the integrated system and component features. The manual also sets out the joint engagement process to agree adoption.

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An introduction to sustainable drainage systems

Why do we need sustainable drainage?

Urbanisation reduces the amount of rainfall that can soak away into the ground and means that it has to be managed to prevent flooding. Traditionally this surface water has been combined with the foul sewerage system. More recent developments have separate surface water sewers that discharge direct to local watercourses. Whilst this has advantages to combined sewers, there are environmental risks if misconnections occur between the two systems.

As towns have spread and density of development has increased so too has the volume of the surface water that these piped systems must cope with. Looking forwards, the pressure on urban drainage systems will increase both due to further development to meet the needs of our growing population and also as a result of a changing climate. In the future we expect to see more intense storms in the summer and more prolonged winter storms than we do currently, potentially meaning greater risks of current surface water drainage systems being overwhelmed causing flooding.

We believe that this means that a different approach to surface water management is needed. We see this as a particular priority for the region we serve given the strong growth agenda and its vulnerability to climate change. This view is supported by planning policy makers who specify such approaches in new development.

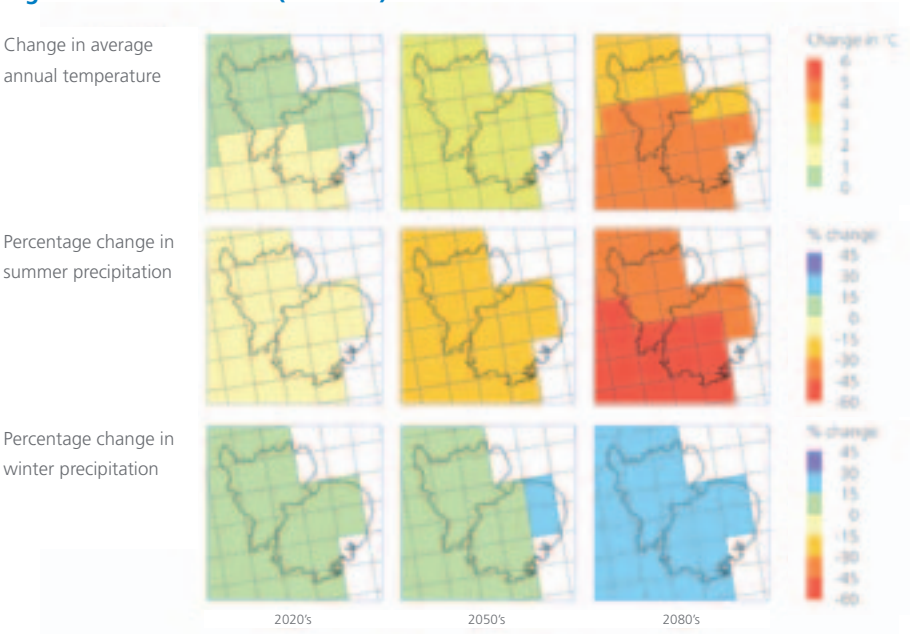
What are sustainable drainage systems or SUDS?

As an alternative to conventional piped means of managing surface water, we promote the use of sustainable drainage systems or SUDS. SUDS aim to mimic within urban areas the way rainfall drains in natural systems.

The prime function of SUDS, as with conventional drainage, is to provide effective surface water drainage, ensuring the greatest degree of flood risk protection over the long term both within and downstream of the development and prevent pollution. However, SUDS approaches can bring wider benefits too;

- Integrating with the landscape design to add amenity for the community as well as bringing biodiversity value
- Providing environmental protection by treating the quality as well as the quantity of surface water run-off

Impacts of climate change: UK Climate Impacts Programme high emissions scenario (UKCIP02)



Source: UKCIP02 Climate Change Scenarios.

Shows the changes forecast by the UK Climate Impacts Programme in temperature and summer and winter rainfall in our region over the period 2080, under it's high emission scenario'.

Riverside Court Stamford – permeable pavement Court

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What prevents the use of SUDS?

Although there are many practical benefits to SUDS there are a number of "administrative" barriers that have caused problems implementing schemes, for example;

- Who takes responsibility for SUDS once they are built?
- How can past practices and regulation be changed to facilitate the use of SUDS?
- Who is checking that SUDS proposals are technically robust?
- How should SUDS be regulated over the lifetime of their operation?

Some of these issues are matters of national policy and work is being done at this level. However we also believe that solutions can be found at a local level through effective joint working between developers, planners, the Environment Agency and other interested parties such as Internal Drainage Boards.

One aim of this guide is to demonstrate Anglian Water's commitment to be an active and positive partner in this process.

Riverside Court Stamford – outfall to River Welland

SUDS design and features

Design considerations and approach

A central design concept is the SUDS "management train" to use a variety of drainage techniques in series to incrementally reduce pollution, flow rates, volumes and frequency of runoff.

The SUDS "management train"

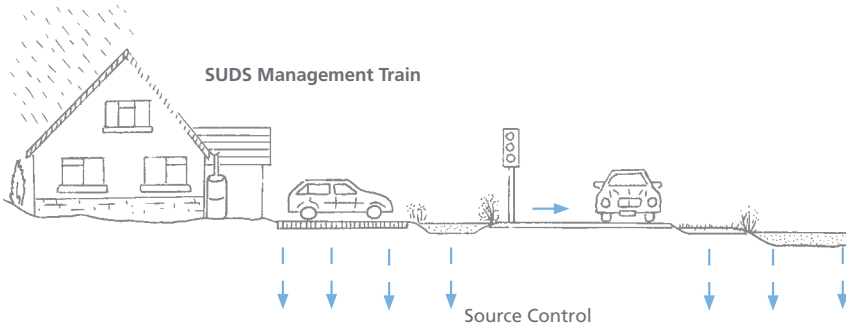
Prevention
good housekeeping measures within development

Source control
managing runoff at or near its source where it falls as rain

Site control
dealing with runoff within or local to the development site

Regional control
control of runoff in amenity space SUDS features before final outfall

Run-off prevention and source control ensures that flows are managed and silt is removed towards the beginning of the drainage system.



As water moves through the site, dividing drainage areas into small sub-catchments makes it easier to intercept pollution and manage storm volumes at source.

A hierarchy of storage and flow management provides opportunities for day-to-day rainfall to be controlled at source, with larger infrequent volumes stored elsewhere in the development or in public open space where necessary or convenient. An important and early part of the drainage strategy for a site will be flow routes at times of extreme events.

It is accepted best practice to develop site level drainage designs through three iterative stages as follows;

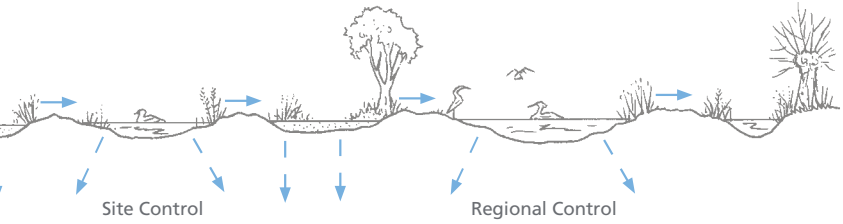
Developing a robust SUDS strategy

Conceptual design
purpose and benefit – this sets out the conceptual drainage strategy and proposed adopting body(ies)

Outline design
purpose and benefit – this stage confirms key design standards and volumes for principal structures, prescribed exceedence routes and sets out adopting body/partnership

Detailed design
purpose and benefit – this should detail the engineering specifications and final design for SUDS features

As well as technical benefits, this staged approach helps to link with key steps within the planning process as well as aiding the agreement of adoption routes. The Environment Agency reviews proposals for developments over 1 Hectare.



Component SUDS features

Within a site design there will be a number of SUDS features to control runoff from development. These can be grouped together based on how they work. The following shows an overview of some commonly used features;

Witney, Oxford – Filter strip and swale

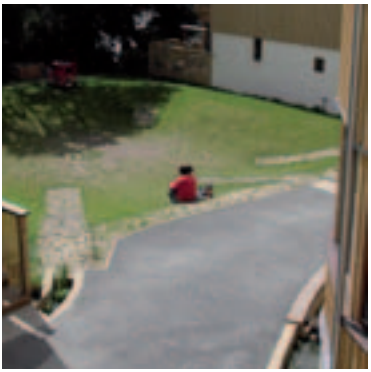
Filter strips and swales drain across vegetated surfaces slowing and filtering runoff. Filter strips are verges that allow sheet flow across the surface. Swales are shallow, flat-bottomed channels that combine conveyance, infiltration, detention and treatment of runoff.

Filter drains and permeable surfaces allow rain to flow directly into a volume of voided material below ground, providing cleaning and storage. Filter drains are linear trenches that drain water laterally from surfaces. Permeable paving intercepts rain where it falls with water passing through the surface to voided stone.

A permeable surface

Green roofs and bio-retention areas combine vegetation with permeable surfaces. Water filters through vegetation to a drainage layer below the surface providing cleaning and storage for run-off from both green roofs and bioretention features.

A bio-retention area



A Detention basin

A Retention pond

Underground storage

Infiltration structures drain water directly into the ground. They include soakaways and infiltration trenches as well as many other SUDS features.

Basins, ponds and wetlands are depressions in the ground that store water: Basins store runoff but are empty during dry weather. Ponds and wetlands contain water all the time and hold more water when it rains.

Underground storage can help manage surface water volumes, but they do not provide treatment of polluted runoff. It is important that they are designed correctly to avoid problems in the future (e.g Siltation).

SUDS features also require **inlets, outlets** and **control structures** to manage the flow of water. Due to the nature of SUDS features and the need to manage flows throughout the management train, SUDS systems usually require a number of small, robust, cost-effective control structures. These structures are critical to the performance and maintenance of the system as a whole. In addition SUDS use low-flow channels, weirs, overflow structures and exceedance flood routes to augment SUDS techniques. Water is eventually released naturally into the ground wherever possible, to watercourses where the land is impermeable or as a last resort to the surface water sewer network.

Springhall Housing, Stroud – Rills and underground storage.

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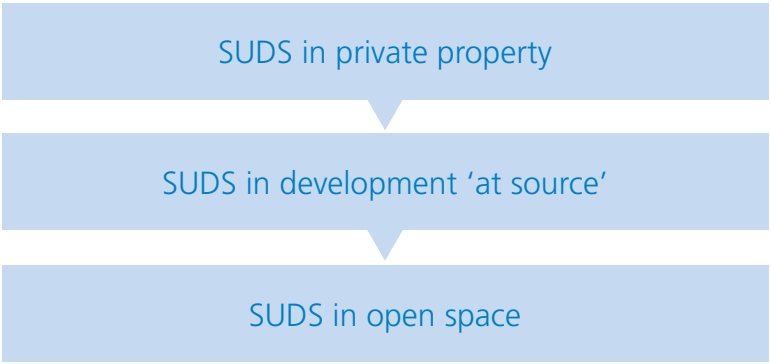
Management of SUDS

As described previously, SUDS features are generally either of an open landscape nature (such as filter strips, swales and ponds) or shallow underground structures (such as permeable pavements) that are easily accessible for maintenance. They can therefore usually be managed using normal, everyday landscape maintenance techniques. Indeed operational and maintenance ease should be a integral part of the design philosophy. In the case of soakaway structures, easy maintenance is not always possible.

However SUDS management also requires a clear understanding of who is responsible for maintenance, particularly in private housing development. There are distinct areas of SUDS maintenance:

Areas of SUDS maintenance



Maintenance of the first category of feature (for example green roofs, water butts and permeable driveways) is the responsibility of the land or property owner. Maintenance of the second category (for example permeable pavements, bio-retention areas and some collector swales) depends on the type of development and ownership pattern. The third category (for example basins, ponds and wetlands with linking swales and control structures) links to the care of open space.

Anglian Water's SUDS adoption policy

There is an accepted framework for the adoption of "conventional" systems – the "sewers for adoption" manual. However, whilst this manual covers the principles for SUDS, adoption routes are not prescribed.

We have therefore produced our own "SUDS for adoption" manual which can be found on our website. This expands on the themes within this guide on devising effective drainage strategies and key design standards for component features. The manual also sets out the joint engagement process to agree adoption. This more technical document is intended for the practitioner for example a developer or planner.

In general terms we will adopt **features in open space** with **effective upstream 'source control' measures that have an effective outfall** i.e. to ground, watercourse or surface water sewer. Open space features includes basins, ponds, wetlands and open swales or low flow connection channels. Adequate 'source control' measures are required to protect the environment.

Our adoption mechanism gives some flexibility on the structures we will consider subject to schemes meeting the prescribed design and construction criteria.

Overall our intent is to provide technical input into the planning process to ensure that SUDS solutions are robust and have clear, enforceable maintenance regimes in place so that they provide effective flood protection for the long term.

SUDS for adoption manual

For more information you can contact us …

By email at: **developerservices@anglianwater.co.uk**

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Acknowledgements and further information

We hope this guide has provided a useful overview. We have been supported in its development by Robert Bray Associates. We would also like to recognise the assistance of the Environment Agency (Anglian region) and the Bedford Group of Drainage Boards.

There is also considerable amounts of wider information that is available. A few key reference documents are listed below.

- The SUDS Manual 2007 CIRIA 697 (including the handbook for the construction of SUDS: CIRIA C698)
- The Interim Code of Practice for SUDS: National SUDS Working Group – CIRIA at www.ciria.org/SUDS
- Planning Policy Statement 25 – Development and Flood Risk together with A Practice Guide Companion to PPS25 'Living Draft', A summary of responses June 2008.

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