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*Working with water*



## SuDS: Controlling the Flow...

15th October 2013 Bridget Woods Ballard



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# The Problem..

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Evapotranspiration

Surface flow

Interflow

Baseflow

Evapotranspiration

Surface flow

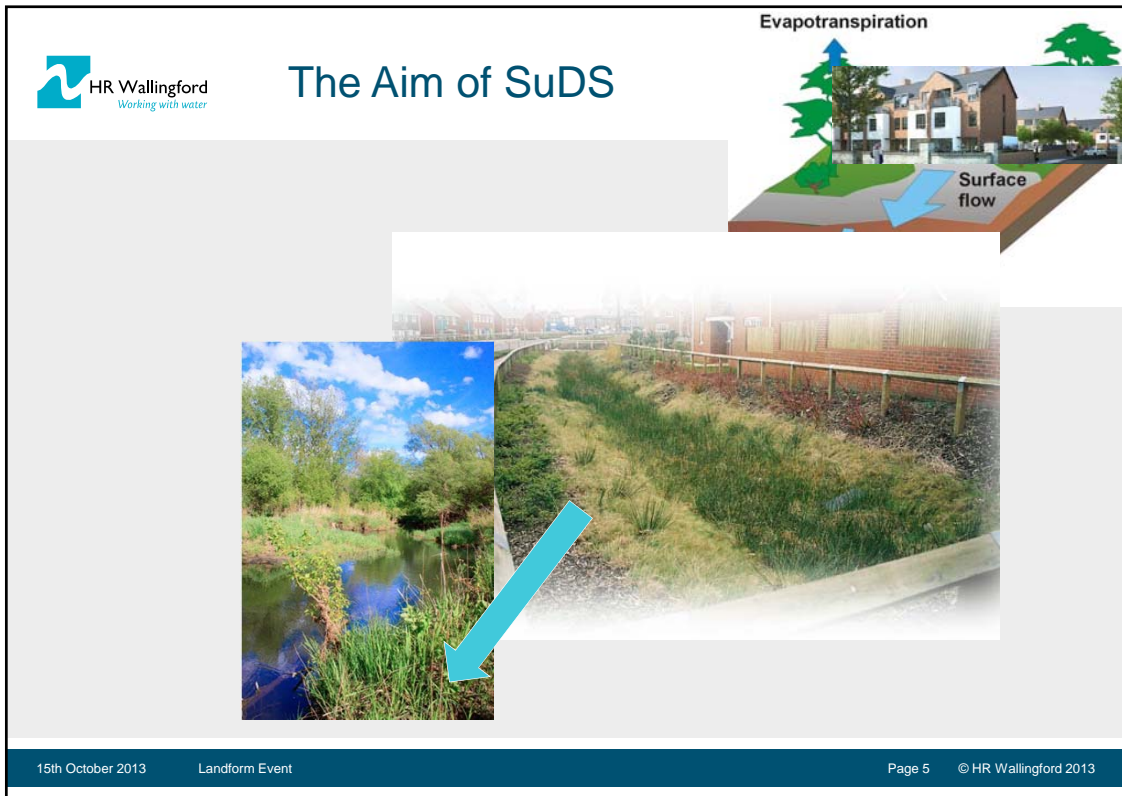
Interflow

Baseflow

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# The Aim of SuDS....

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The Aim of SuDS

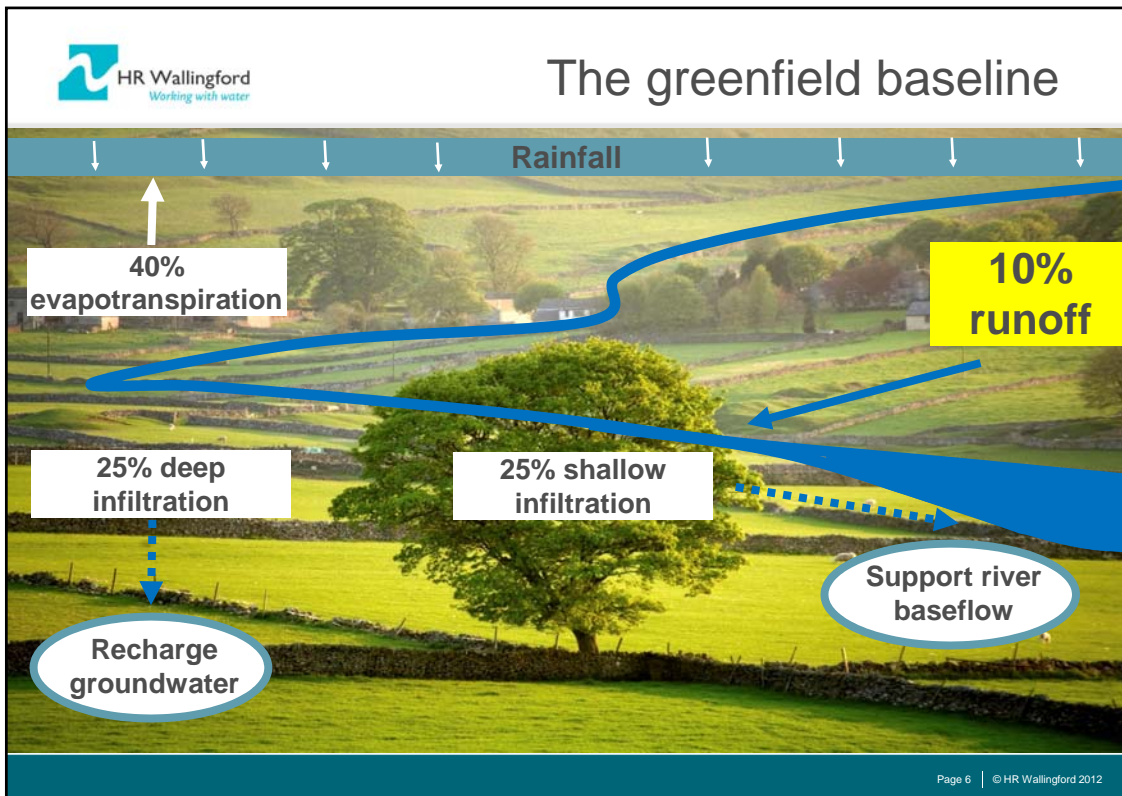
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Evapotranspiration

Surface flow

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This slide features the HR Wallingford logo and the title 'The Aim of SuDS'. It includes a 3D diagram of a residential area showing 'Evapotranspiration' (upward arrow) and 'Surface flow' (downward arrow). A large photograph shows a landscaped SuDS area with a concrete channel, grass, and trees. A smaller inset photo shows a natural stream with reeds. A large blue arrow points from the SuDS area towards the natural stream.



The greenfield baseline

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Rainfall

40% evapotranspiration

25% deep infiltration

25% shallow infiltration

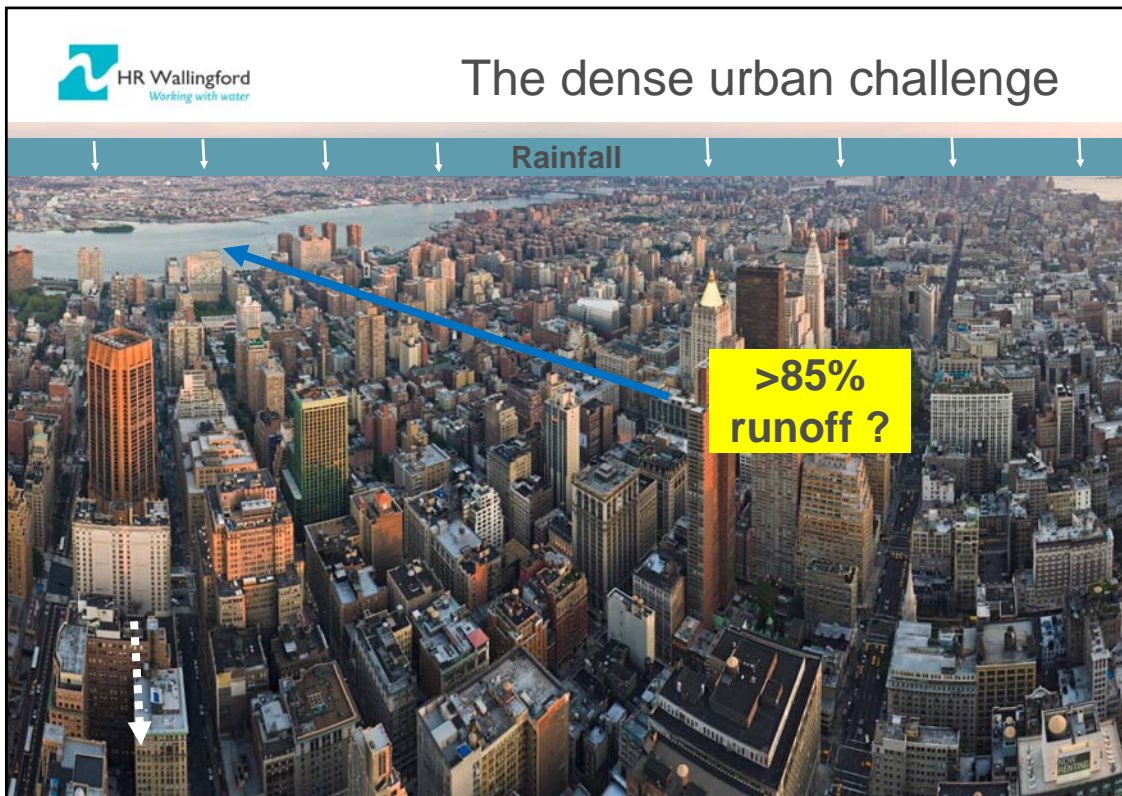
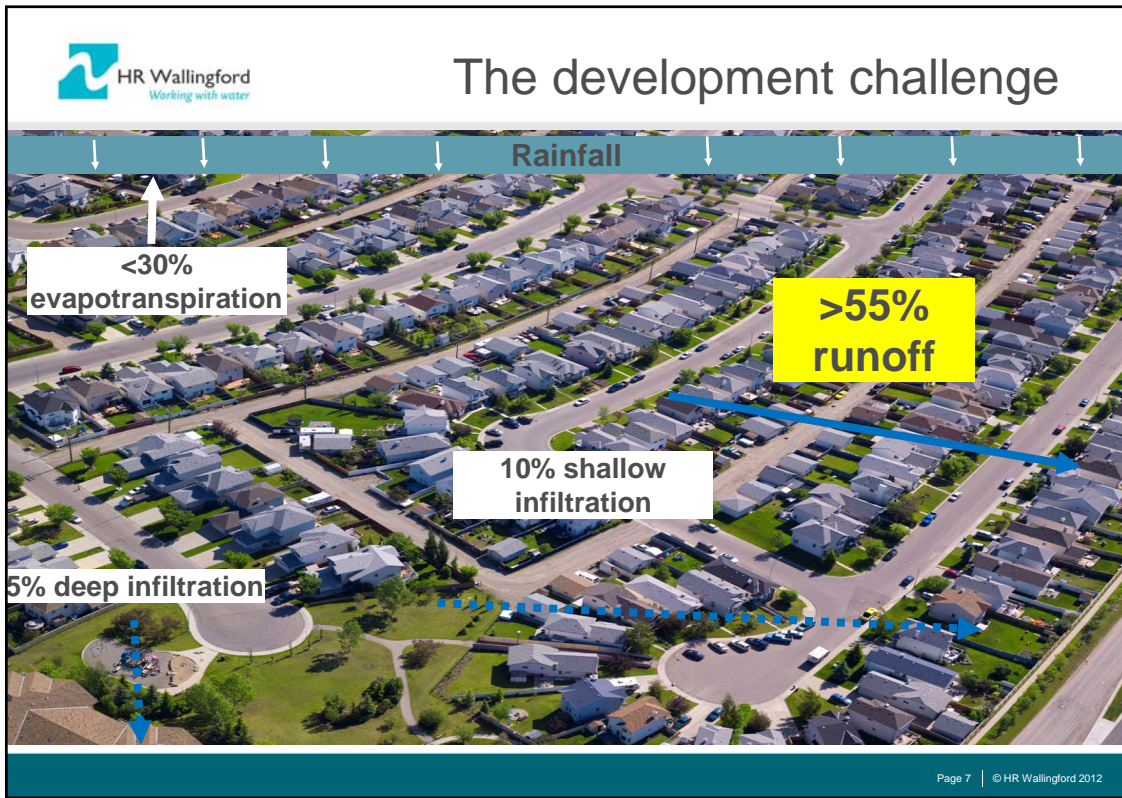
10% runoff

Recharge groundwater

Support river baseflow

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This slide features the HR Wallingford logo and the title 'The greenfield baseline'. It shows a landscape with a blue bar at the top representing 'Rainfall'. A large blue arrow indicates the flow of water, which is split into '40% evapotranspiration' (upward arrow), '25% deep infiltration' (dashed arrow to 'Recharge groundwater'), and '25% shallow infiltration' (dashed arrow to 'Support river baseflow'). A yellow box indicates '10% runoff'.






# The National Standards

**Objective 1: Prioritise Infiltration... in order to:**

- Support flood risk management
- Control water pollution
- Protect water resources and river baseflows

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## Runoff destination

Infiltration as a priority, unless:

- Low permeability
- Risk of geohazards

Surface water body, unless:

- Risk of groundwater contamination
- Not practicable
- Risk of surface water contamination
- Pumping required
- Hydraulic connectivity with combined sewer


Surface water sewer, highway drain unless:

- Not practicable

Combined sewer

~~Foul sewer~~

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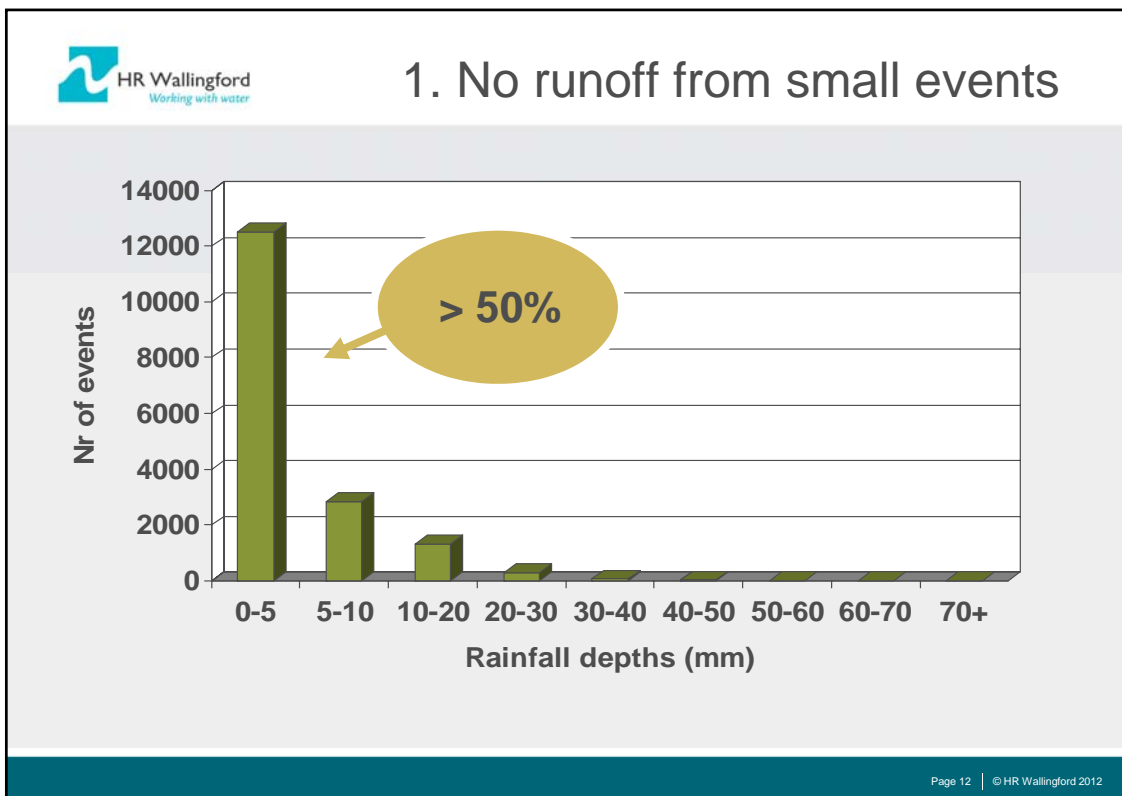


## The National Standards

**Objective 2: Mimic greenfield response characteristics... in order to:**

- **Protect the ecology and morphology of the receiving waterbody**
- **Minimise the impact of the development on flood risk associated with the receiving waterbody**

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## Why ?

The hydrologic functions of streams change with as little as 5–10% imperviousness and they change profoundly when imperviousness approaches 25%.  
Johnston, et al., 2006

Eroded/incised channel

Non functional floodplain

Pollution

Sedimentation

Depressed water table, dry riparian soils


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## How do we do that ?

- > Infiltration systems
- > Rainwater harvesting systems (provided regular demand)
- > Green roofs
- > Permeable pavements
- > Swales, filter strips, trenches
- > Detention basins

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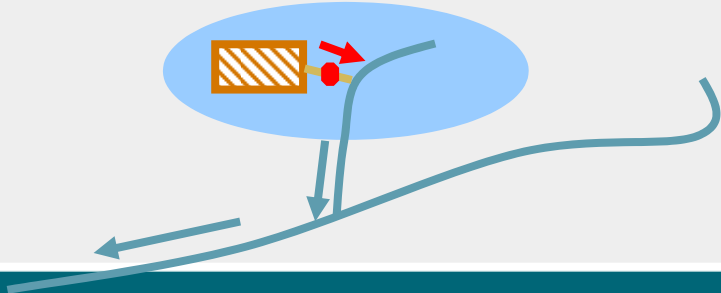
## 2. Control peak flow rates

**Control 1 in 1 year to greenfield equivalent**

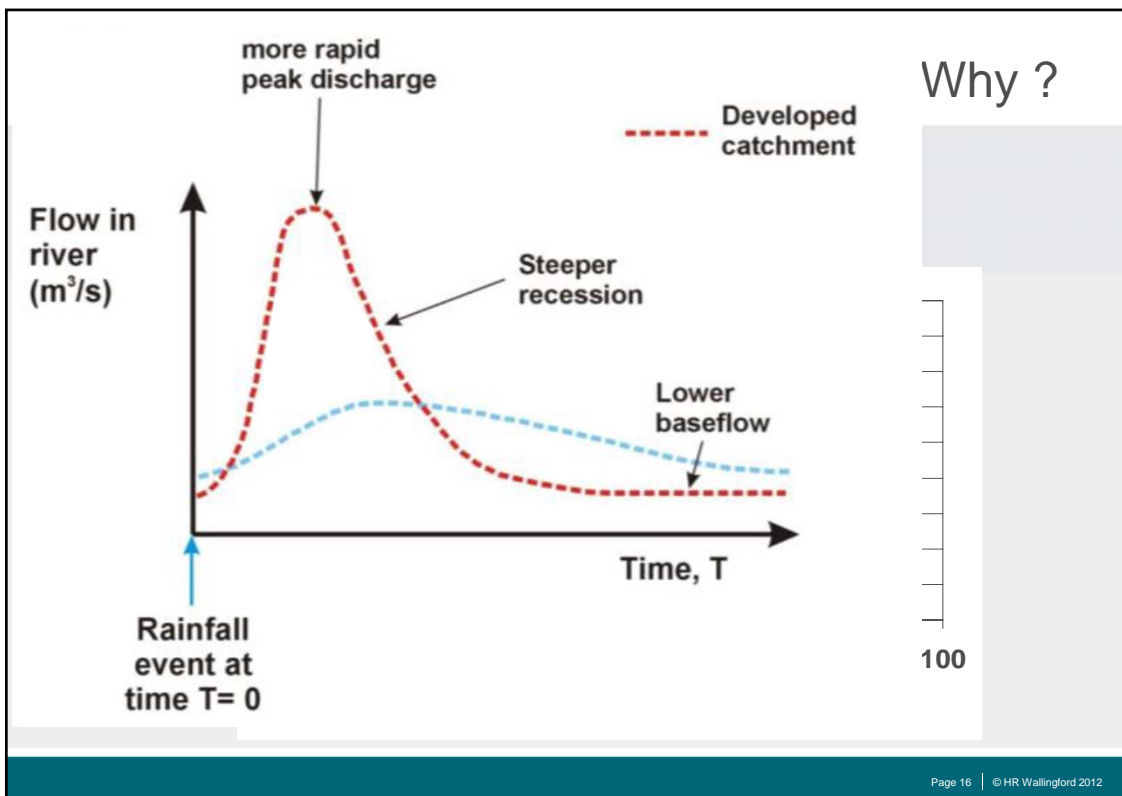
- > 1 in 1 year event = approximately bank full (morphological control)

**Control 1 in 100 year to greenfield equivalent**

- > 1 in 100 year event = extreme flood flow rate



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## How do we do that ?








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## Where can we do that ?



	PERMEABLE PAVING		MAIN FLOW		CONTROL POINTS
	BOX STORAGE TANKS		PIPE FLOW		OVERFLOW
	RETAINING STRUCTURES		WET RILL FLOW		GABIONS
	RILL UNDER BUILDING		ROOF WATER		SURFACE FLOW

Sustainable Drainage - Uplands Housing, Stroud

**Robert Bray Associates**  
Sustainable Drainage Consultants  
Fairfield, Corporation Road, Rodborough, Stroud, Gloucestershire, GL5 3SB  
Tel: 01453 764885 Fax: 01453 765545  
Email: bob@robertbrayassociates.co.uk www.sustainable-drainage.co.uk

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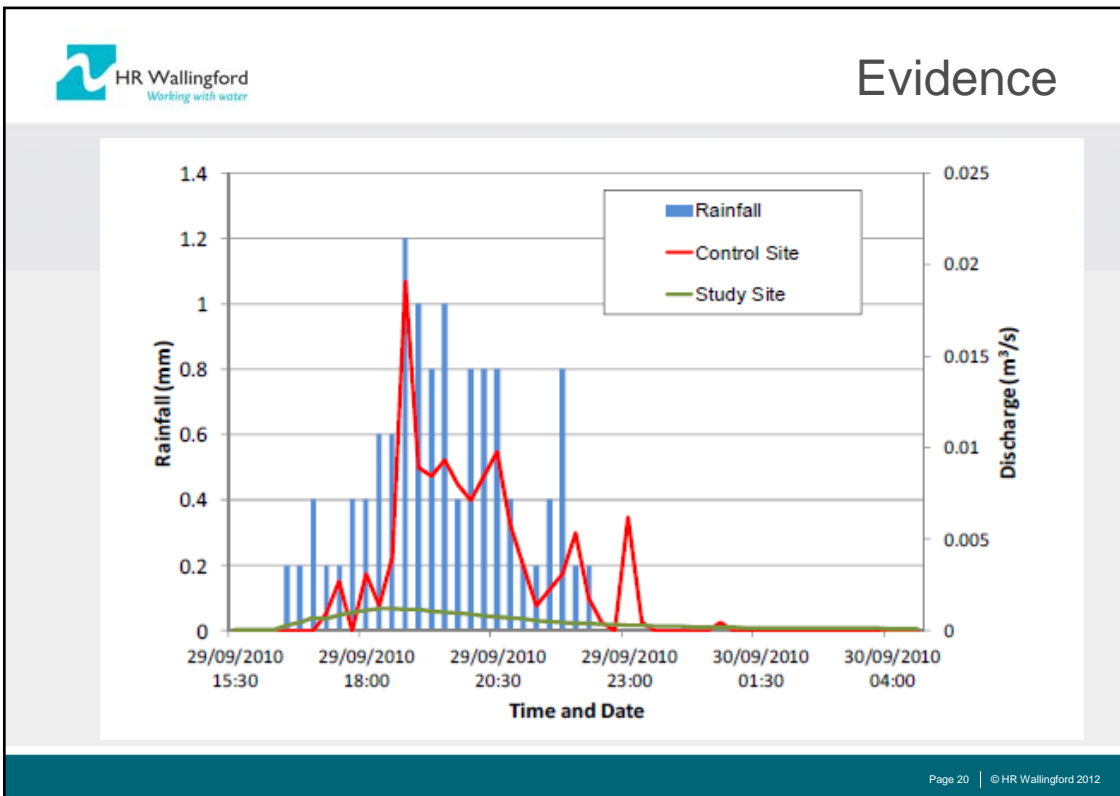



## Where can you put storage ?





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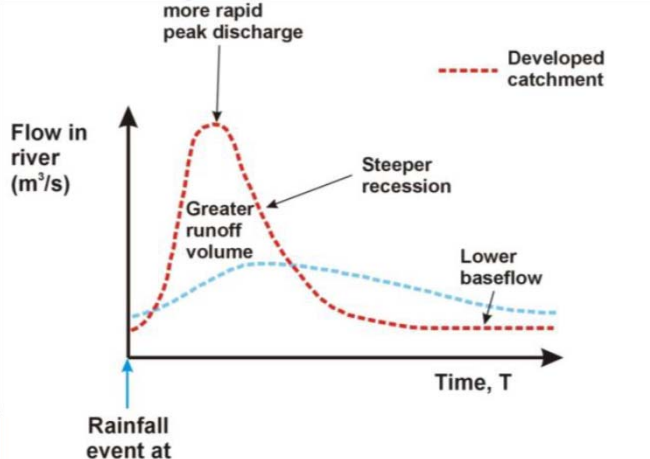





### 3. Control volume of runoff

Control 1 in 100 year runoff volume to the greenfield equivalent



- > 6 hour suggested as suitable event duration to reflect events that would impact on receiving catchment response



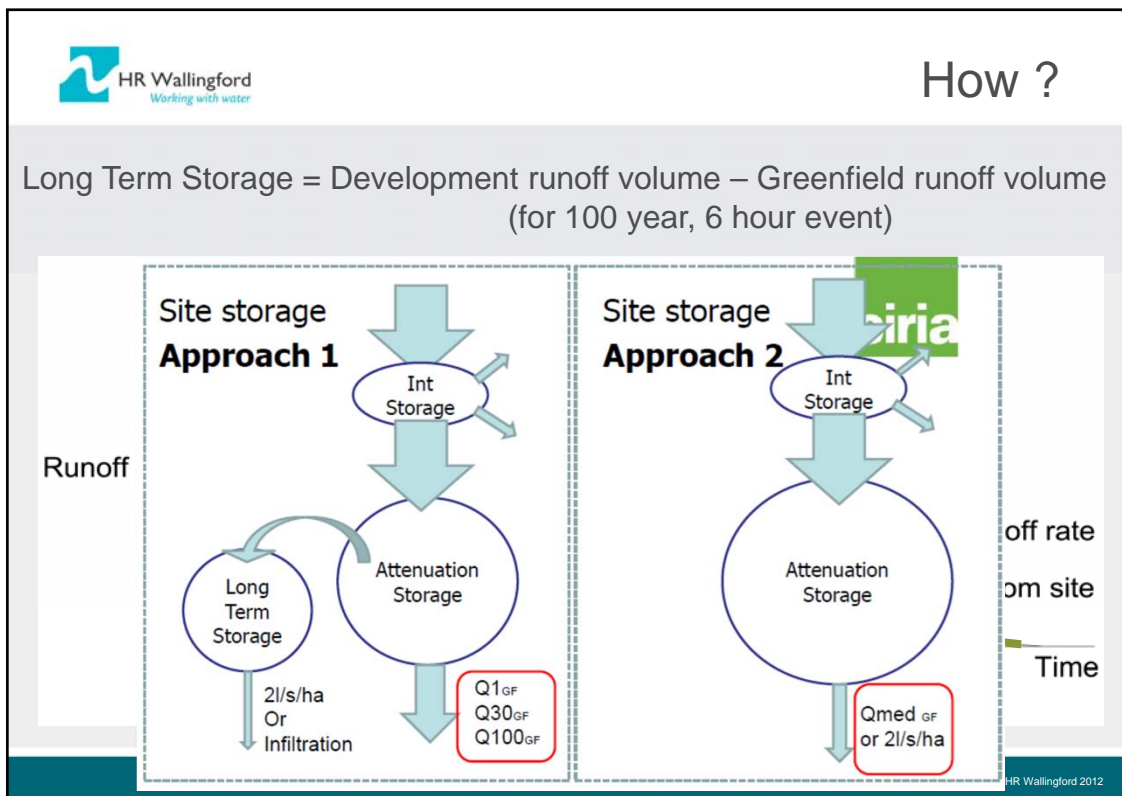
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### Why ?


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**4. Designing for exceedance**

- Manage risks from events that exceed the system design capacity (people, property, the environment)
- Some areas may be allowed to flood at lower return periods than others – depending on use etc
  - For example:
    - You may elect to flood landscape areas during period of extreme rainfall
    - Or protect landscape areas but route exceedance flows to designated site storage facilities
    - Roads / car park areas could be allowed to flood during extreme events
- Take account of benefits of multi functionality in delivering development value and viability

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## Tools to help you

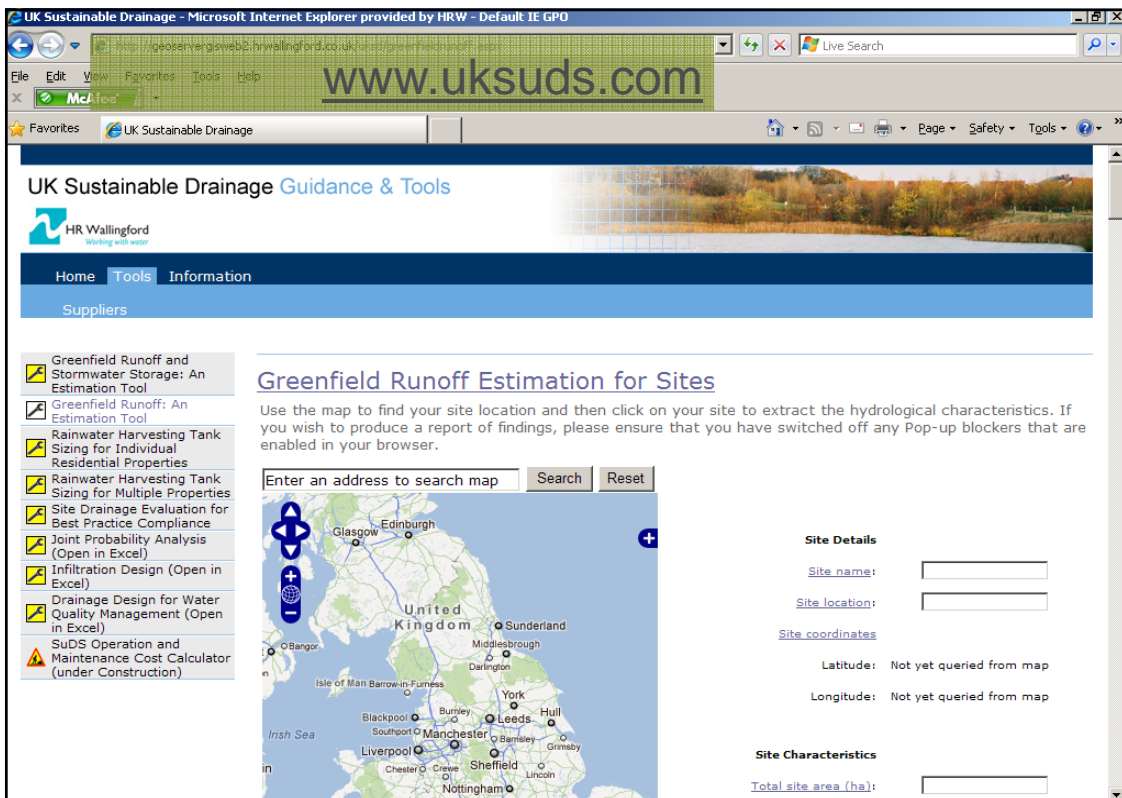
> Simple, feasibility level tools, @

### www.uksuds.com

- > Greenfield runoff rate estimation
- > Storage volume estimation
- > RWH design for stormwater control
- > Site evaluation
- > Costing.... (later)

**Updated EA report:  
RF-RO management  
for new  
developments  
W5-074**

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The screenshot shows a web browser window displaying the 'UK Sustainable Drainage' website. The browser's address bar shows the URL 'http://geosdnrgaweb2.hrwallingford.co.uk'. The website header includes the HR Wallingford logo and navigation tabs for 'Home', 'Tools', and 'Information'. The main content area is titled 'Greenfield Runoff Estimation for Sites' and includes a map of the United Kingdom with a search bar and 'Search' and 'Reset' buttons. To the right of the map are input fields for 'Site name', 'Site location', 'Site coordinates', 'Latitude', 'Longitude', and 'Total site area (ha)'. A sidebar on the left lists various tools, including 'Greenfield Runoff and Stormwater Storage: An Estimation Tool', 'Greenfield Runoff: An Estimation Tool', 'Rainwater Harvesting Tank Sizing for Individual Residential Properties', 'Rainwater Harvesting Tank Sizing for Multiple Properties', 'Site Drainage Evaluation for Best Practice Compliance', 'Joint Probability Analysis (Open in Excel)', 'Infiltration Design (Open in Excel)', 'Drainage Design for Water Quality Management (Open in Excel)', 'SuDS Operation and Maintenance Cost Calculator (under Construction)', and 'Suppliers'.





Thank you

