



Introduction to sustainable drainage

Outline of presentation



- Challenges of existing drainage
- Drivers for SuDS
- SuDS philosophy and principles
- Benefits of SuDS
- Examples of SuDS
- Challenges of SuDS
- Summary

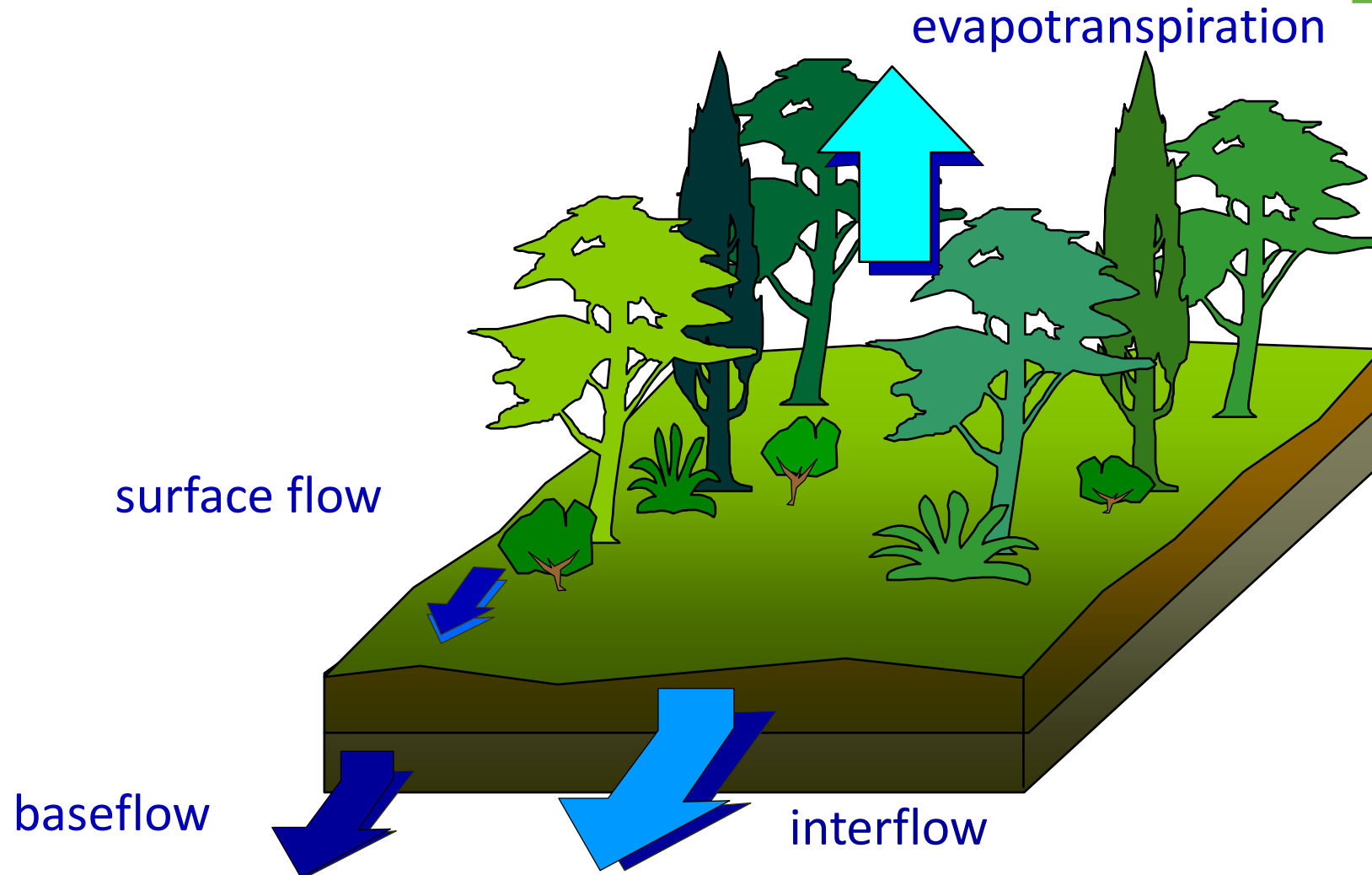
Challenges of existing drainage



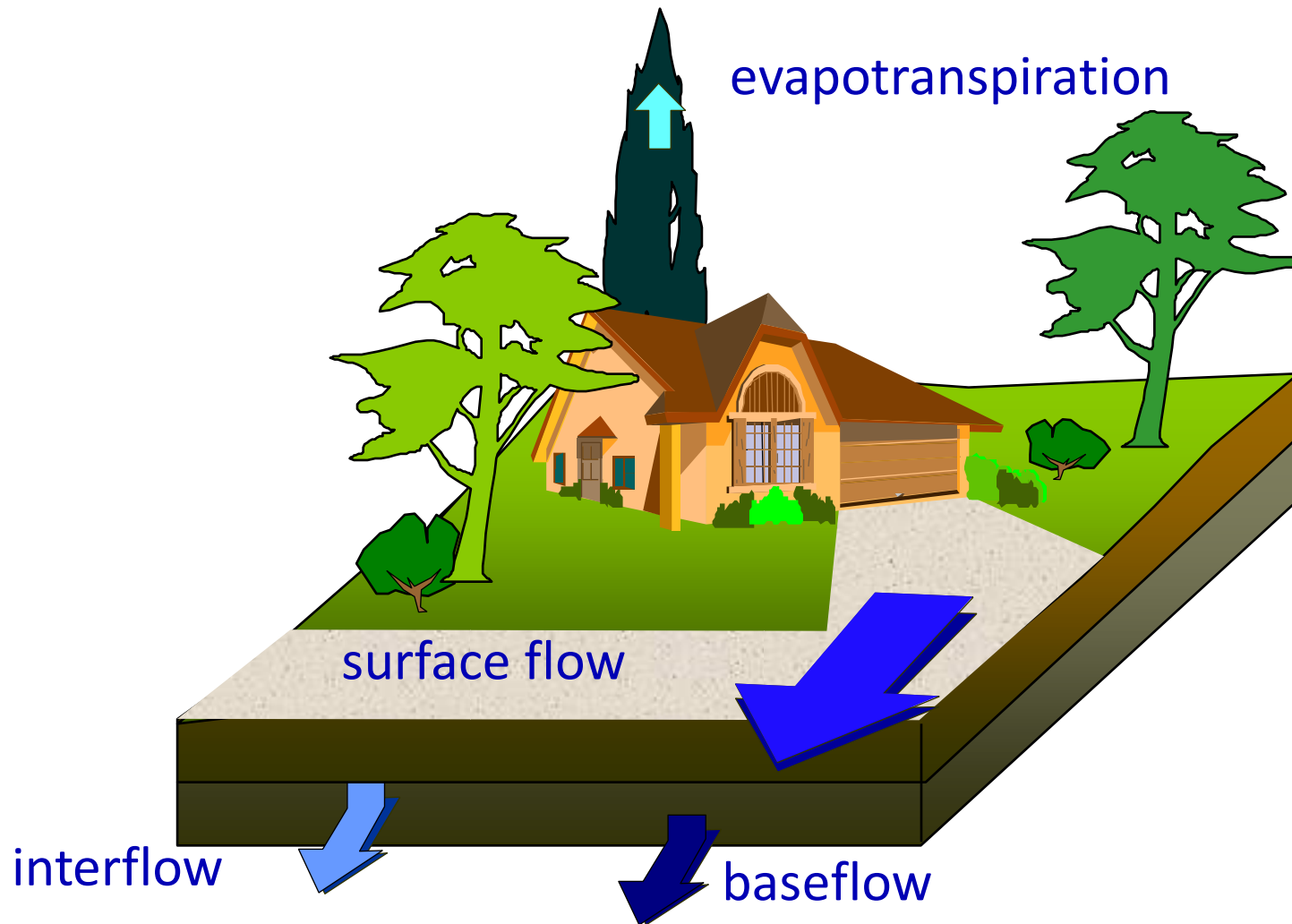
- Flooding
 - Too much runoff from developments into watercourses
 - Runoff drains too quickly into watercourses
- Environmental
 - Runoff is polluted
 - Does not enhance biodiversity or green space



Natural catchment (greenfield)



Developed catchment



Drivers for SuDS



- National and local planning policy
- Flood and Water Management Act
- Climate Change
- Water Framework Directive
- Building Regulations
- Delivering better places and spaces



Flooding in Sheffield 2007

Environment Agency

The SuDS philosophy



- Mimic natural drainage from a site
- Where possible, manage water on the surface
- Manage runoff close to source
- Provide multiple benefits



SuDS scheme at Stamford
Robert Bray Associates

SuDS principles



- **The management train** – SuDS components in series
- **Source control** – runoff managed as close as possible to where it falls as rain
- **Sub-catchments** – division into small areas with different drainage characteristics and land use



SuDS scheme in Sheffield
CIRIA

SuDS schemes



- SuDS can include a variety of components.
- The selection of SuDS components depends on site opportunities and constraints.
- Provide management and treatment train.
- Shallow systems are always better than deep systems (and usually cheaper)
- Shallow systems are safer (construction and operation)

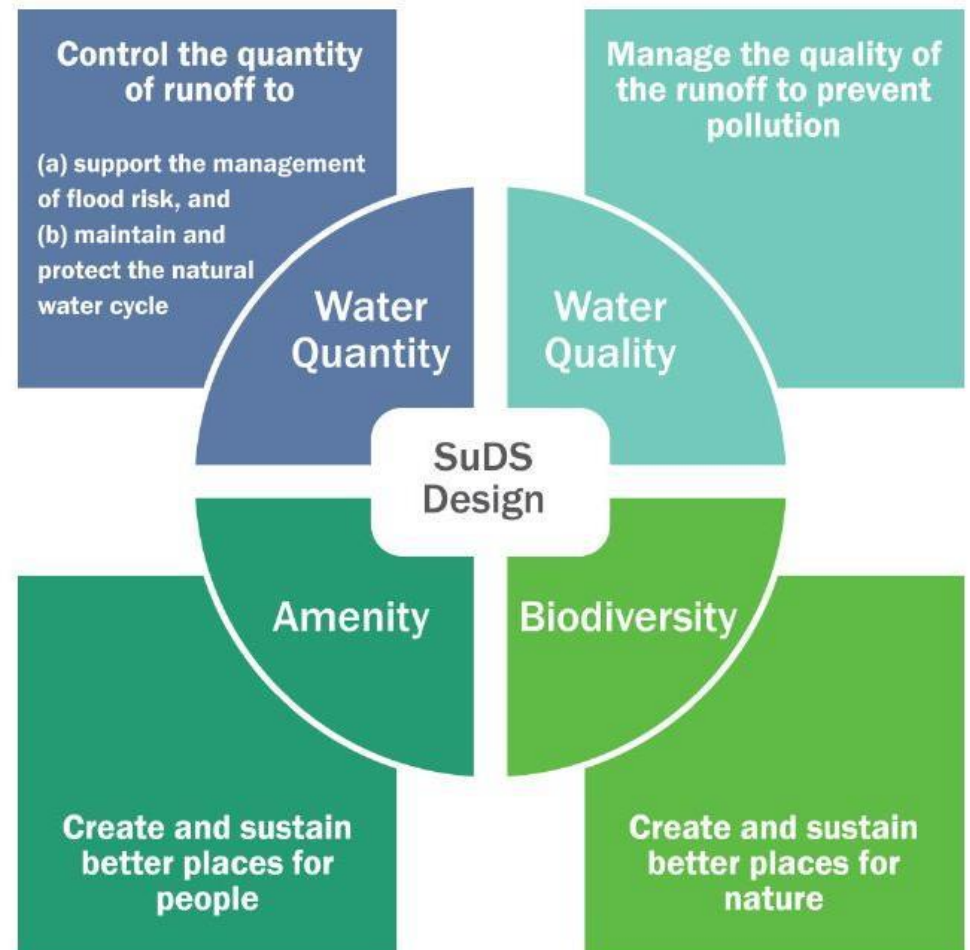


Retrofit SuDS in Islington
CIRIA

SuDS and multiple benefits



- Reduced flood risk
- Improved water quality
- Increased biodiversity
- Increased levels of green infrastructure
- Better places to live
- Engagement with local communities
- Adaptation to climate change
- Carbon management



SuDS can be this...



Linear wetland, Scotland

CIRIA
34



Swale in a school, Exeter

Robert Bray Associates



Wetland pond, London

CIRIA

SuDS can be this...



Green roof, London

Lambeth Council



Bioretention, Portland, Oregon

Environmental Protection group



Permeable pavement, Stamford

Robert Bray Associates

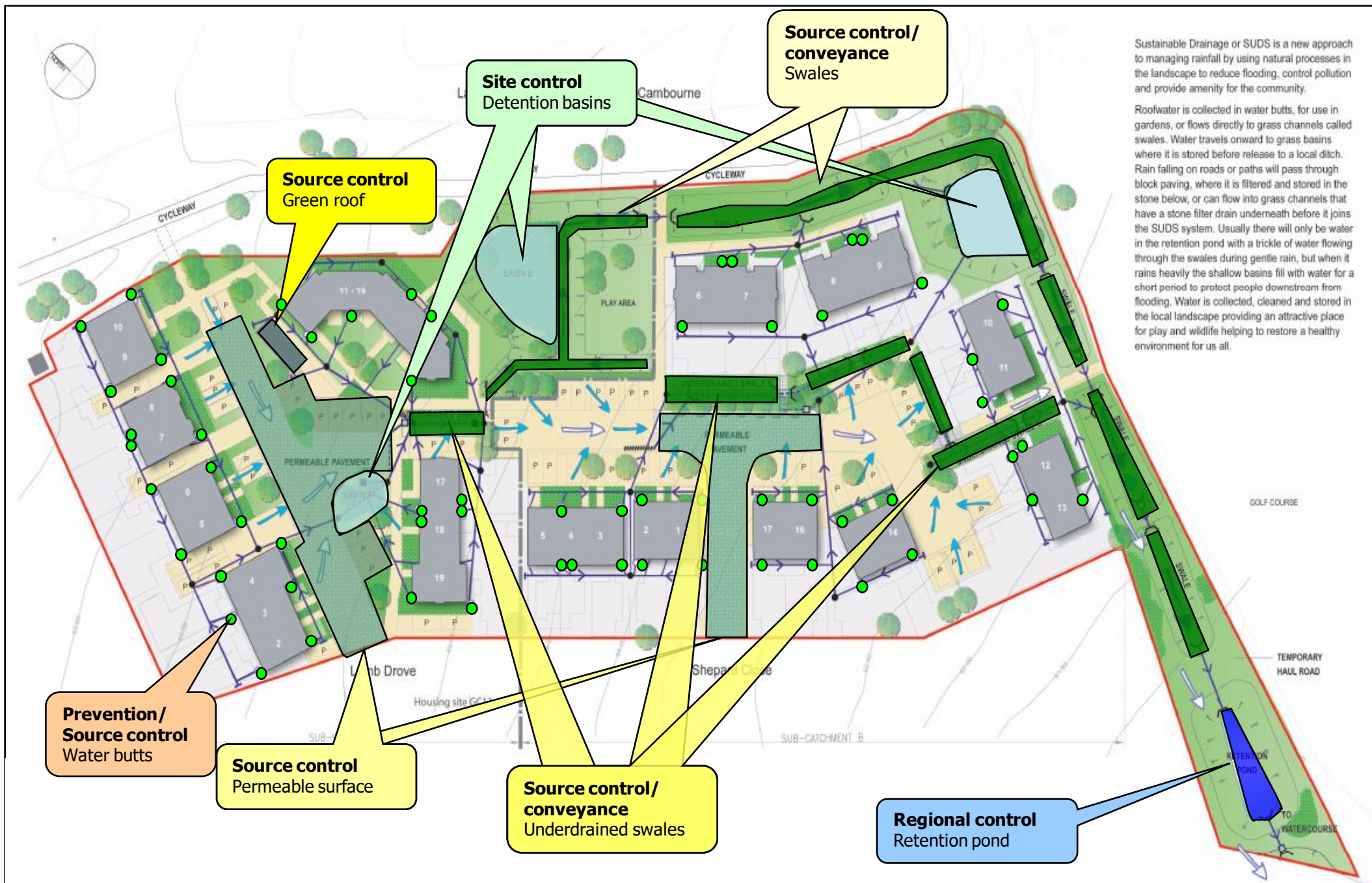
Delivering SuDS



- SuDS at Lamb Drove, Cambourne, Cambridge
- 35 dwellings per hectare
- Adaptation to climate change
 - SuDS retrofitted to existing layout
 - Attenuation to 1:100 year storm return period (plus 20% climate change)
 - Resilience and resistance measures included
- *Thanks to Cambridgeshire County Council and Royal Haskoning!*



Artist impression of Lamb Drove



Sustainable Drainage or SUDS is a new approach to managing rainfall by using natural processes in the landscape to reduce flooding, control pollution and provide amenity for the community.

Roofwater is collected in water butts, for use in gardens, or flows directly to grass channels called swales. Water travels onward to grass basins where it is stored before release to a local ditch. Rain falling on roads or paths will pass through block paving, where it is filtered and stored in the stone below, or can flow into grass channels that have a stone filter drain underneath before it joins the SUDS system. Usually there will only be water in the retention pond with a trickle of water flowing through the swales during gentle rain, but when it rains heavily the shallow basins fill with water for a short period to protect people downstream from flooding. Water is collected, cleaned and stored in the local landscape providing an attractive place for play and wildlife helping to restore a healthy environment for us all.

Source control

Cambourne



Swale – intercepting Swale - Greenway

Site control

Cambourne



Detention basin – near golf course (NE)

Construction and operation



Construction

- Programme management
- Silt management
- Attention to detail essential
- Inspection of works

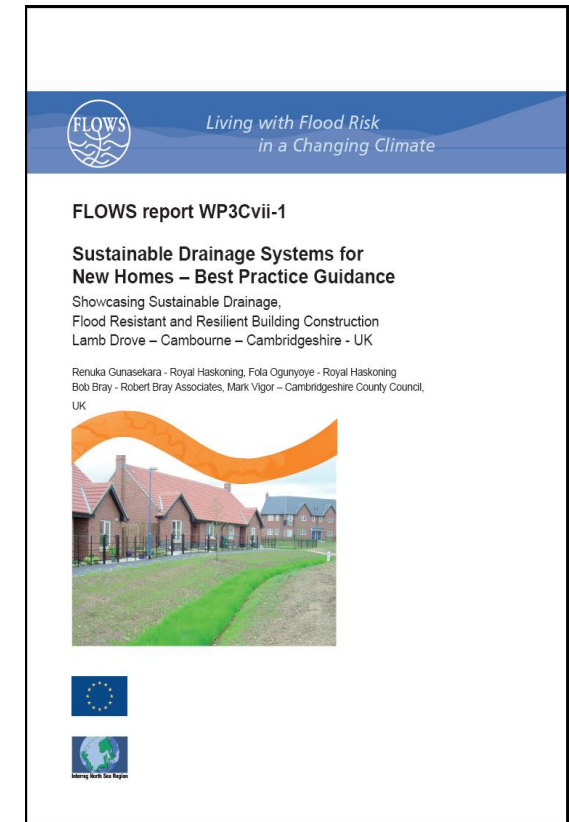
Operation

- Assess any H&S risks
- Maintenance - landscape tasks
- Simple checklist of tasks
- Multiple adoption:
 - Cambridge Housing Society – site care
 - Wildlife trust – off-site care
 - County council – permeable paving

Lessons learnt from Lamb Drove



- SuDS philosophy is suitable for any development.
- Early planning discussions are essential.
 - Setting/agreeing the design criteria
 - Consider/agree adoption mechanisms
- SuDS design is interdisciplinary.
- Well designed SuDS can be cheaper than traditional drainage.
- Keep it simple.



Possible challenges



- Adoption and ownership – who does what?
- What about existing problems
 - Urban creep
 - Retrofitting surface water management
- Linkages with spatial planning (surface water management plans)
- Delivering **multiple benefits**



Summary



- Many different components available to develop SuDS for a site.
- SuDS are a flexible drainage concept that can be used on any site.
- Specific constraints may preclude the use of some but not all components.

Sources of information



- **CIRIA:**
www.susdrain.org
- **EA:**
<https://www.gov.uk/government/organisations/environment-agency>
- **Natural Resources Wales:**
<https://naturalresources.wales/?lang=en>
- **SEPA:**
www.sepa.org.uk