

**urbanwater**  
TECHNOLOGY CENTRE

UNIVERSITY  
ABERTAY DUNDEE

The Interreg FVB  
North Sea Region  
Programme

## SUDS for high density locations

June 9<sup>th</sup> 2010

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### What's in my talk?


- Issues with SUDS in high density locations
- Functions
- Drivers
- Strategic view
- SUDS for Roads
- Concluding remarks  
(That means a test!)



A pond – as soft as they come



Cultural Heritage and Water Management Bergen 9<sup>th</sup> June 2010




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A roadside swale – still soft



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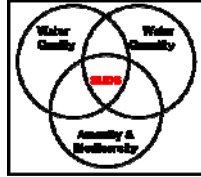
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## Issues with High Density SUDS

- Attenuation
- Water quality
- Diffuse pollution
- Lack of space
- High wheel loadings
- Underground services
- Safety



Urban Water Planning Triangle



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## SUDS Drivers in Cities

Many cities worldwide are investing in sustainable drainage. Each has a different justification (driver)

**Colombia - Bogota - wetland and species conservation**

Brazil - Belo Horizonte - flooding and community.

USA - Austin Texas - Long term community interest.

Germany - Berlin - quality of water for swimming in lakes.

China - Wuhan - polluted lakes and loss of fish.



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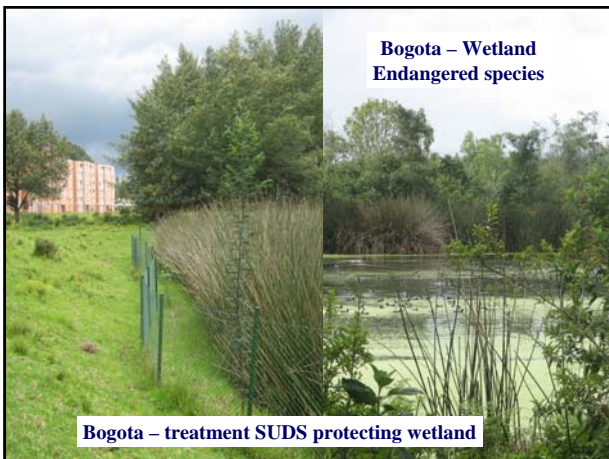
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**Bogota - Wetland  
Endangered species**

**Bogota - treatment SUDS protecting wetland**

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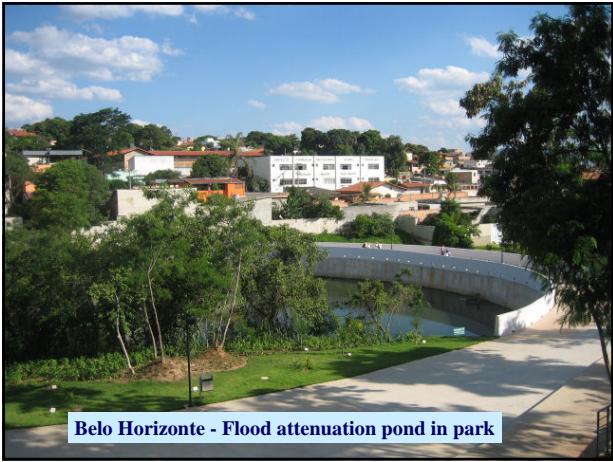
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Belo Horizonte - Flood attenuation pond in park

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Barton springs – highly valued heritage – must be protected

Austin filters – very expensive protection of groundwater

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Berlin – street

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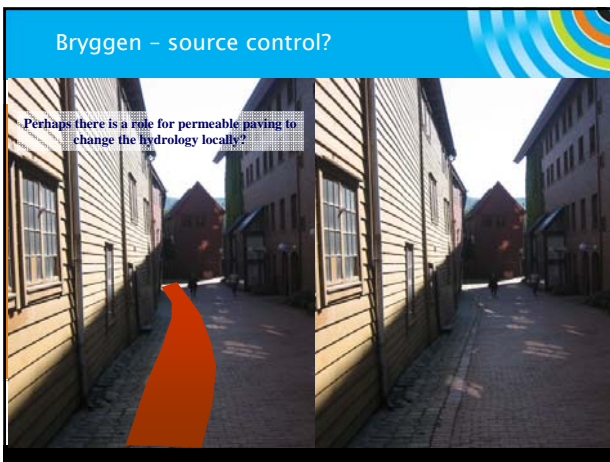
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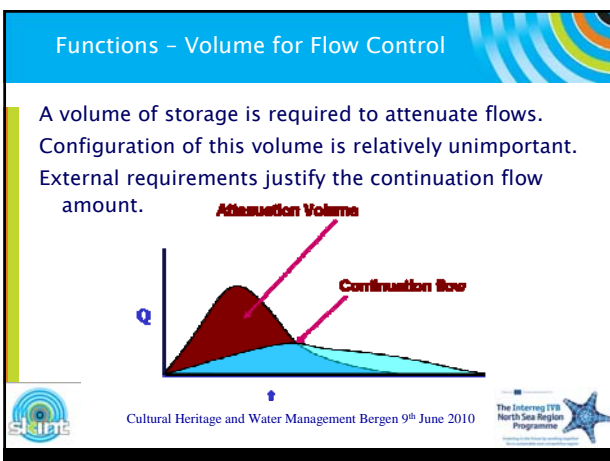
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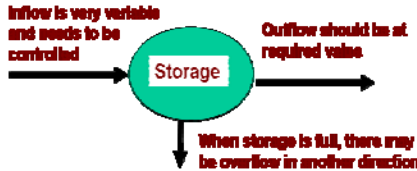
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## Functions – Volume for Flow Control

A volume of storage is required to attenuate flows. Configuration of this volume is relatively unimportant. External requirements justify the continuation flow amount.



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## Functions – Treatment

SUDS are not SUDS if there is no treatment. A pond will remove nutrients but a swale will not. Critical pollutants in the context of high density SUDS;

- Sediment
- Hydrocarbons
- Heavy metals

Treatment - excellent



Treatment - good



Treatment – almost none



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## Functions – Evidence of performance

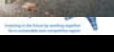


New permeable car park in Edinburgh

Earlier car park - asphalt with ponding



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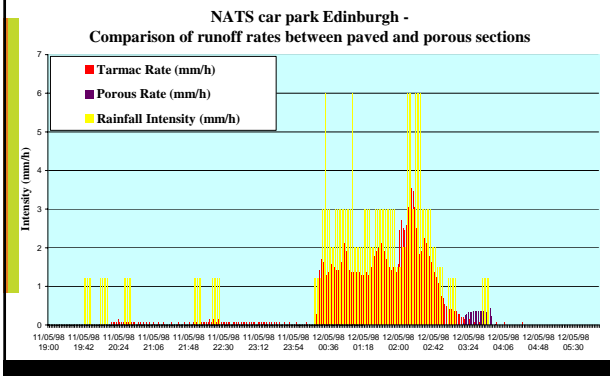
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## Functions – Evidence of performance




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## Simple risk assessment tool

Table 3.3 Number of treatment train components (assuming effective pre-treatment is in place)

Receiving water sensitivity →	Low	Medium	High
Runoff catchment characteristic ↓			
Roofs only	1	1	1
Residential roads, parking areas, commercial zones	2	2	2
Refuse collection/ industrial areas/ loading bays/ lorry parks/ highways	3	3	3

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## High Density SUDS

### Control of runoff;

- Block Paving.
- Permeable Asphalt.
- Below ground storage systems
- Green roofs
- Proprietary SUDS.

### Re-using rainwater;

- Storage and treatment systems.



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## Permeable Asphalt



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## Below Ground Storage (no treatment)

Performs the storage component of SUDS.  
But no treatment is provided.  
Use in conjunction with permeable paving  
Excellent as a component of rainwater harvesting.

The diagram illustrates a 'Hybrid Solution' for below-ground storage. It shows two types of storage units: one for pedestrians and one for light traffic. The pedestrian unit is made of POLYSTYRENE LITE POLYSTYRENE POLYSTYRENE EXTRA (20 tonnes) and is 1.0m high. The light traffic unit is made of POLYSTYRENE POLYSTYRENE EXTRA (40 tonnes) and is 1.5m high. Both units are shown with a concrete base and a concrete panel on top. A worker is shown installing the units on a permeable paving surface.

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## Many strange ideas are suggested

Soakaway  
Retention  
ATS + tyre bales  
Tyre bales in construction  
(PPR080) (TRL, 2006)  
PAS 108 standard

The diagram shows a cross-section of a soakaway retention system. It features a concrete panel on top, a concrete panel below, and a layer of sand in between. Tyre bales are placed in the sand layer. The system is connected to a drain pipe and an outlet pipe. The diagram is labeled with 'Soakaway Retention', 'ATS + tyre bales', 'Tyre bales in construction (PPR080) (TRL, 2006)', and 'PAS 108 standard'. A reference sketch of a tyre bale is also shown, with dimensions: length, width, and height.

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## Proprietary SUDS

Must be considered as treatment systems with the maintenance that requires.

Unlikely ever to be adopted by water companies.

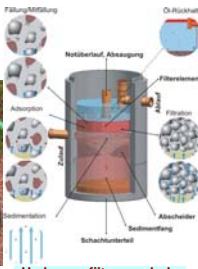
Have an important role in difficult locations.



Storm X4



Gully filter



Hydrocon filter manhole

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## Proprietary SUDS



Rain Clean gutter



Innolet filter cartridge

KOMPETENZ IN SACHEN  
REGENWASSER  
INGENIEURGESELLSCHAFT  
PROF. DR. SIEKER MBH



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## Green Roofs

Reduce annual runoff by at least 50%.

Reduce need for cooling in summer and heating in winter.

Provide habitats;

- London buildings require green roofs now.
- Skylarks and raptor species.

Assists BREAM score.

Code of best practice is under development (by Groundwork Sheffield)



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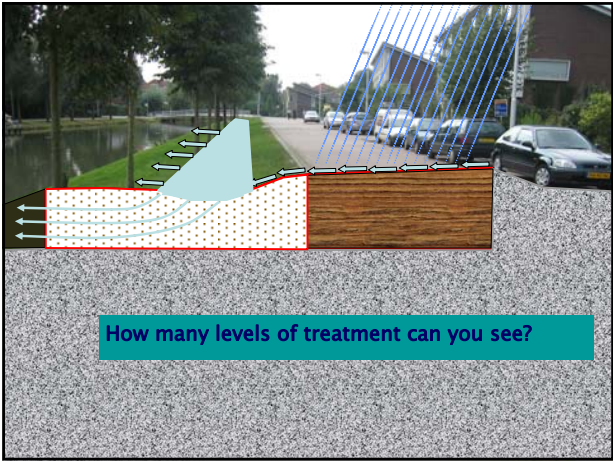
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Summary of Talk



**Thanks for your attention**

Scotland – the western province of Norway?  
Cultural heritage?

Golf at St Andrews



Heritage an

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