SUDS & Roads

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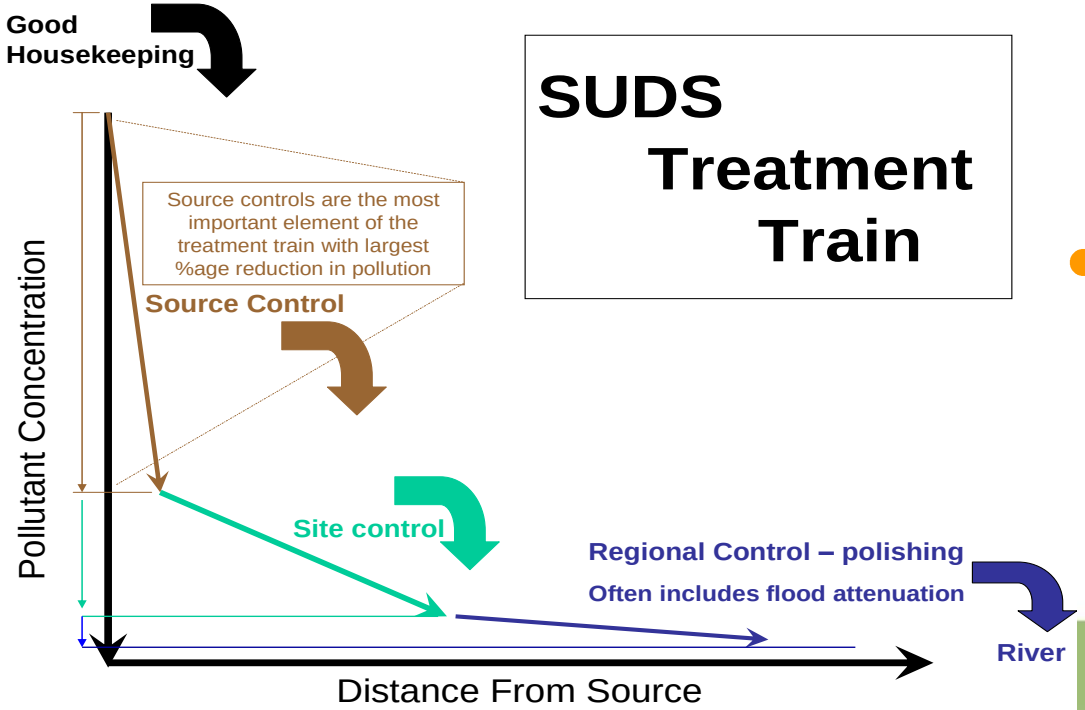
Presentation Contents

1. SUDS Basics
2. "*SUDS for Roads"* Guidance
3. Levels of Treatment
4. GN-IUI Project
5. Clever Drainage!

SUDS Basics

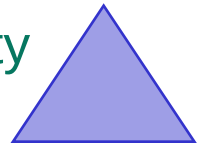
- **SUDS Treatment train**
  - *Good housekeeping*
    - Source Control
      - Site Control
        - Regional control

- **SUDS Philosophy**
  - Mimic Natural Drainage



SUDS Treatment Train

- **SUDS Triangle**
  - Water Quantity
  - Water Quality
  - Amenity/biodiversity



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"Sustainable drainage is an opportunity, not a problem."

Torsten Rosenqvist
Halmstad City Technical Manager

"SUDS for Roads"

New Guidance for Roads Engineers

- Roads sector slow to accept SUDS
- SUDS Working Party & Transport Scotland ran conference in 2007;
- Questionnaire outcome;

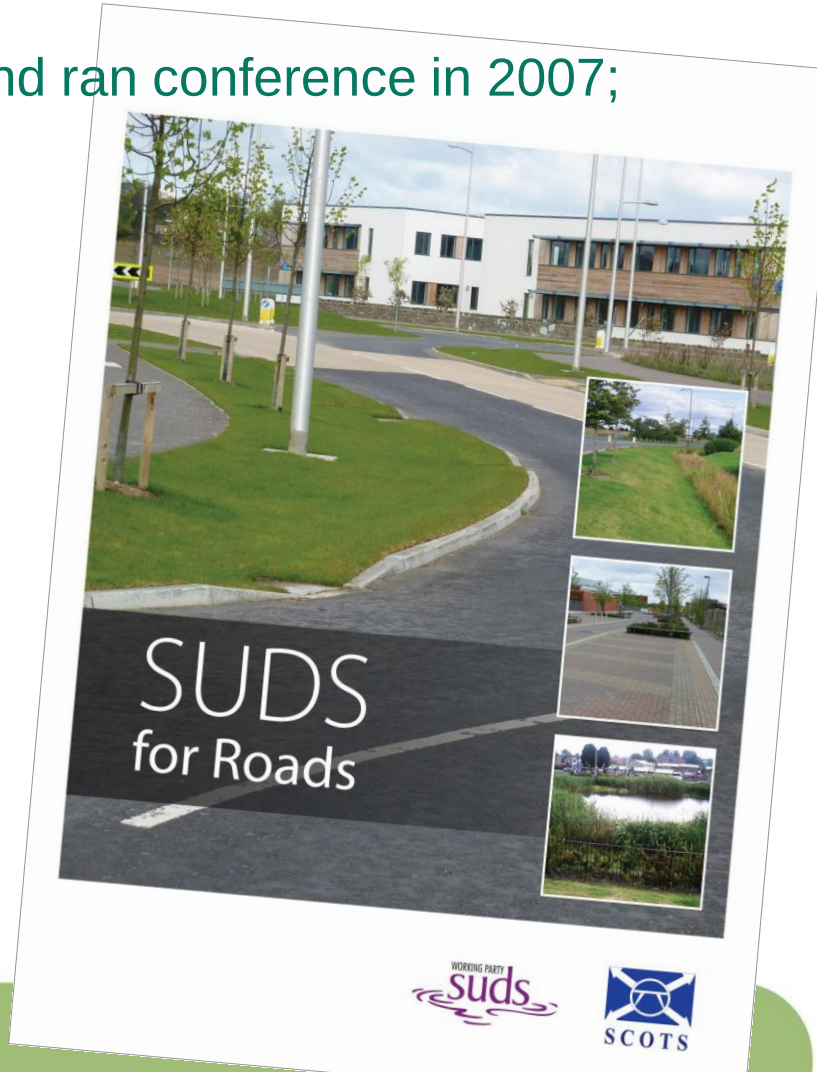
  "Need for dedicated sustainable road drainage guidance"

SUDS for Roads

- Commissioning Parties;
  - SUDSWP

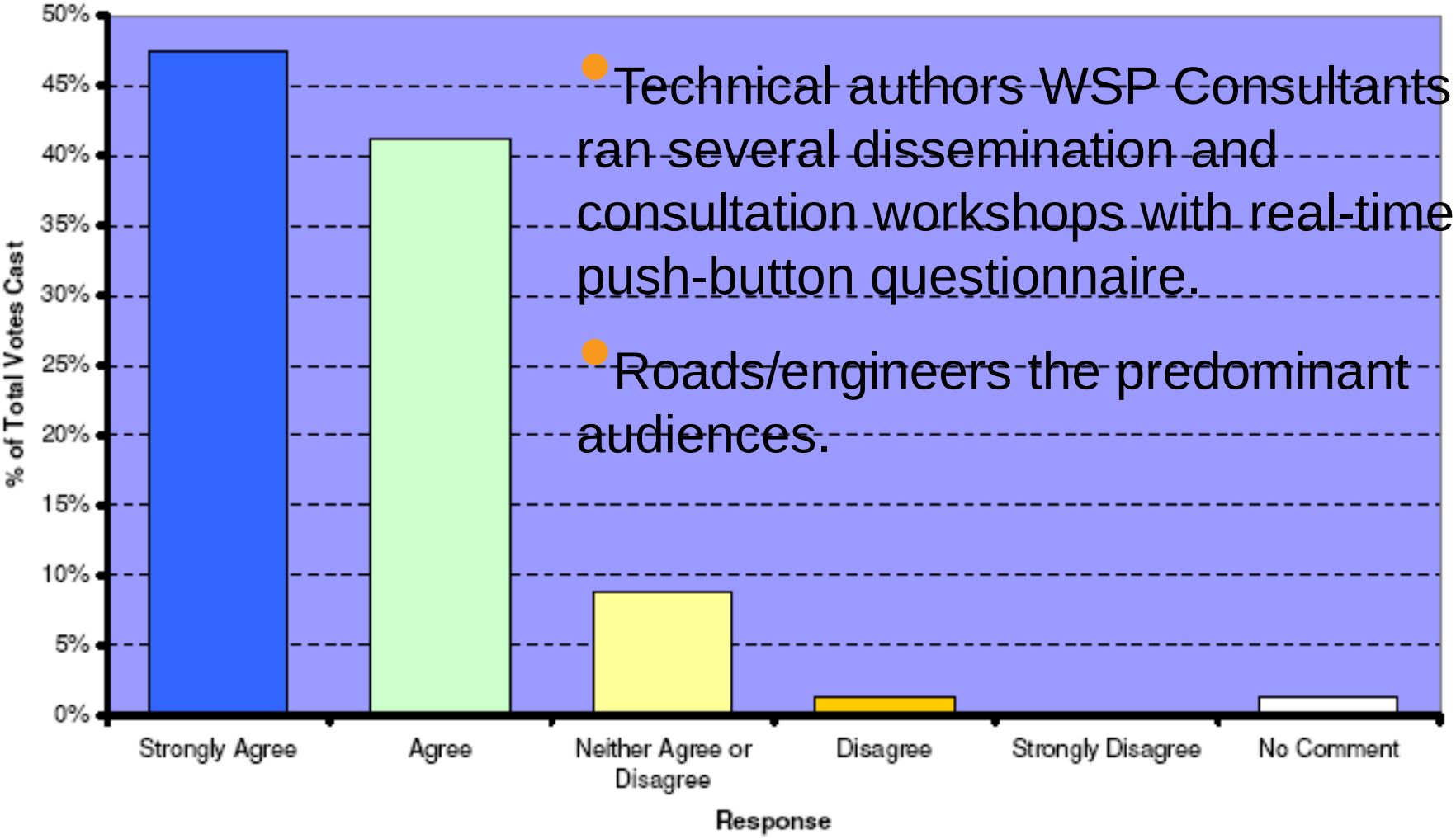
    Sustainable Urban Drainage Scottish Working Party
  - SCOTS

    Society of Chief Officers for transportation in Scotland



Dissemination Workshops Responses

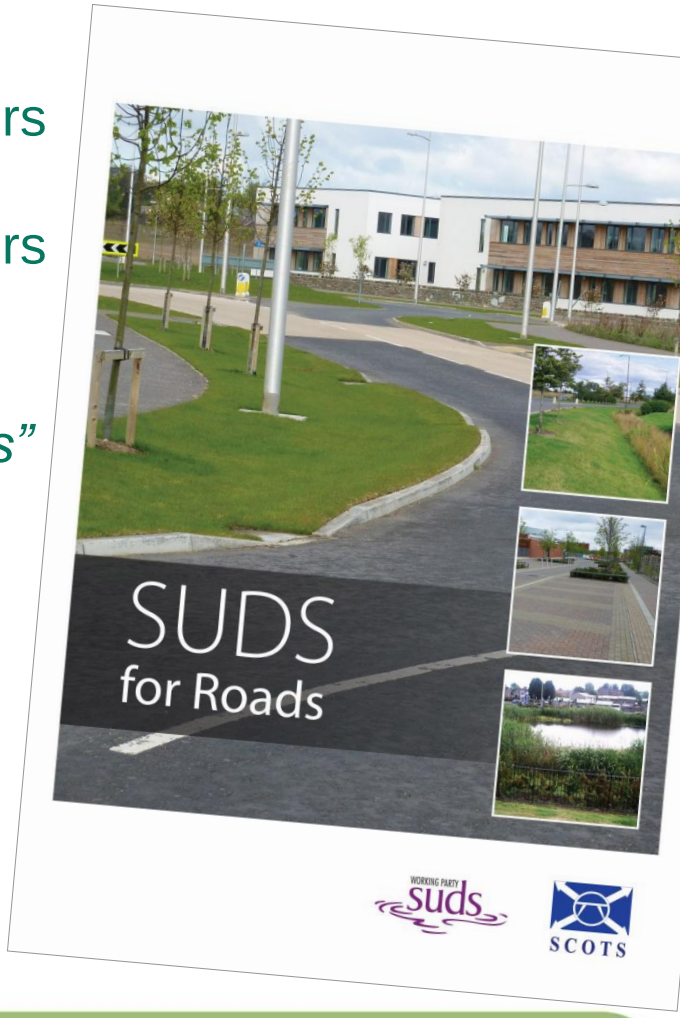
Question; Is it desirable to incorporate SUDS in roads in densely developed urban areas?



- Technical authors WSP Consultants ran several dissemination and consultation workshops with real-time push-button questionnaire.
- Roads/engineers the predominant audiences.

SUDS for Roads

- Dedicated guidance for roads
- Written by roads engineers for roads engineers
- Aimed particularly at local authority engineers
- Endorsed by SCOTS – LA umbrella organisation
- Link on SEPA's front page;*"Quicklinks"*
  www.SEPA.org.uk
- 250 hard copies being printed
- All Scottish LAs will receive several copies and other parties.



SUDS4Rds - Contents

1.1 SCOPE OF THE GUIDANCE

WHO SUDS FOR ROADS IS FOR

This technical guidance document is intended for use by roads engineers within local authorities, Transport Scotland, consulting engineers and by other professionals within the built environment involved with planning, design, construction, operation, adoption and maintenance of roads, surface water drainage and associated SUDS for new and existing developments.

1. Introduction
2. SUDS Applications for Roads
3. Practical Guidance for Construction Operation & Maintenance of Road SUDS
4. Procedure for Adoption
5. Un-Adopted SUDS & Retrofitting
6. **Factors Affecting Cost** (This will lead to a follow-up commission)

SUDS for Roads
Aligns Road Construction
with
Sustainable Drainage

- Roads Hierarchy
- Includes Motorways & Trunk Roads
- However, main aim is other road types (local authorities)
- Details regarding RCC

(Road Construction Consent)

- All LAs consulted

Figure 2.2 Residential Layout Showing Current Prescribed Road Hierarchy

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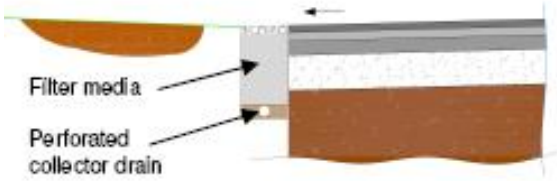
Example Pages (Filter Drains)



Typical Section

Description

Roadside trenches filled with a permeable media to provide treatment and temporary storage of runoff before either infiltration or conveyance to downstream SUDS features

Road Applications

- Trunk roads
- All distributor roads
- General access roads
- Industrial access roads
- Minor access link

Types

- Allowing infiltration [Infiltration trenches]
- Downstream conveyance to SUDS feature

Design Criteria

- Storage of water based on void ration of filter media
- Infiltration rate of surrounding soils requires to be determined for infiltration trenches
- Percolation through media using Darcy's law
- Design details – The SUDS Manual [26]

Pollutant Removal

- Medium to high
- Single level of treatment provided

Maintenance

- Monthly inspections
- Weed control, as required, following inspections
- Replace clogged material, as required, following inspections
- Refer to §3.4 for further details

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Example Pages (Swales)

Description

Shallow vegetated channels designed to convey road runoff and treat pollutants

Road Applications

- Trunk roads
- All distributor roads
- General access roads
- Industrial access road
- Short Culs-de-sac
- Minor access link
- Homezones/ Shared surfaces

Swale Types

- Standard swale – broad shallow vegetated channel
- Dry Swale – vegetated channel to include a filter bed
- Wet Swale – as a standard swale but designed to encourage wet and marshy conditions

Design Criteria

- Design using Manning's equation
- Limiting velocity to prevent erosion to 1 – 2 m/s
- Maintain flow height below the top of vegetation during frequent rainfall events to max 100mm
- Minimum side slopes 1:3
- Design details – The SUDS Manual [26]

Pollutant Removal

- Medium
- Provides single level of treatment
- Dry swale provides two levels of treatment

Maintenance

- Monthly inspections to identify mowing requirements
- Monthly litter removal
- Scarifying and spiking as required following inspection
- Repair damaged vegetation as required following inspection
- Refer to §3.4 for further details

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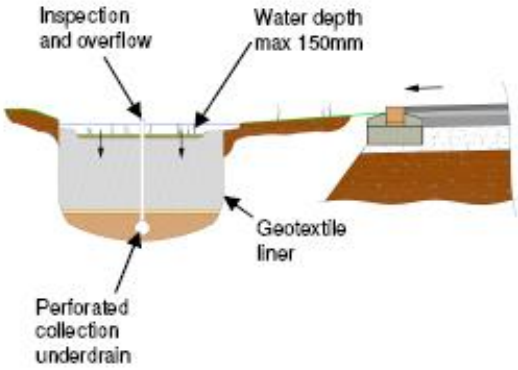
Example Pages (Bioretention)



Typical Section

Description

Shallow landscaped depressed areas that are under drained and rely on enhanced vegetation and filtration to reduce runoff volumes and remove pollutants

Road Applications

- All distributor roads
- General access roads
- Short Culs-de-sac
- Homezones/ shared surfaces
- Minor access link

Design Criteria

- Provide sufficient area for temporary storage of the treatment volume Vt at a depth not exceeding 150mm
- Infiltration rate of surrounding soils to be determined
- Half drain down time should be within a 24 hour period to ensure adequate capacity for multiple rainfall events
- Design details – The SUDS Manual [26]

Pollutant Removal

- High
- Single level of treatment provided

Maintenance

- Monthly inspections
- Weed control, as required, following inspections
- Annual replacement of top mulch layer
- Replace damaged vegetation, as required following inspection
- Spiking or scarifying every 3 years
- Refer to §3.4 for further details

Limiting Factors

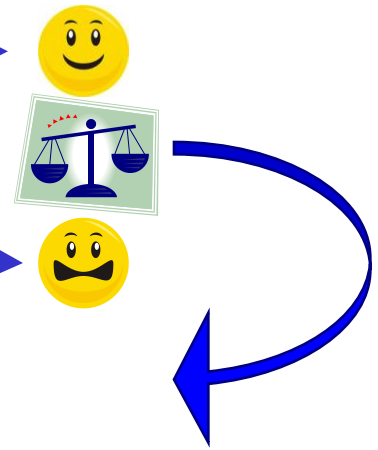
- Catchment area limited to around 0.1 ha to avoid clogging

Adoption of SUDS
(in Scotland)

Scottish Water and WEWS Act

- WEWS Act placed a duty on Scot Water to vest PUBLIC SUDS

- Ponds, Basins, Underground Storage
- Roads and Not In-Curtilage
  (Perm paving, green roofs, filter trenches, others?)
- Wetlands, conveyance swales?



Local Authorities

- Road drainage

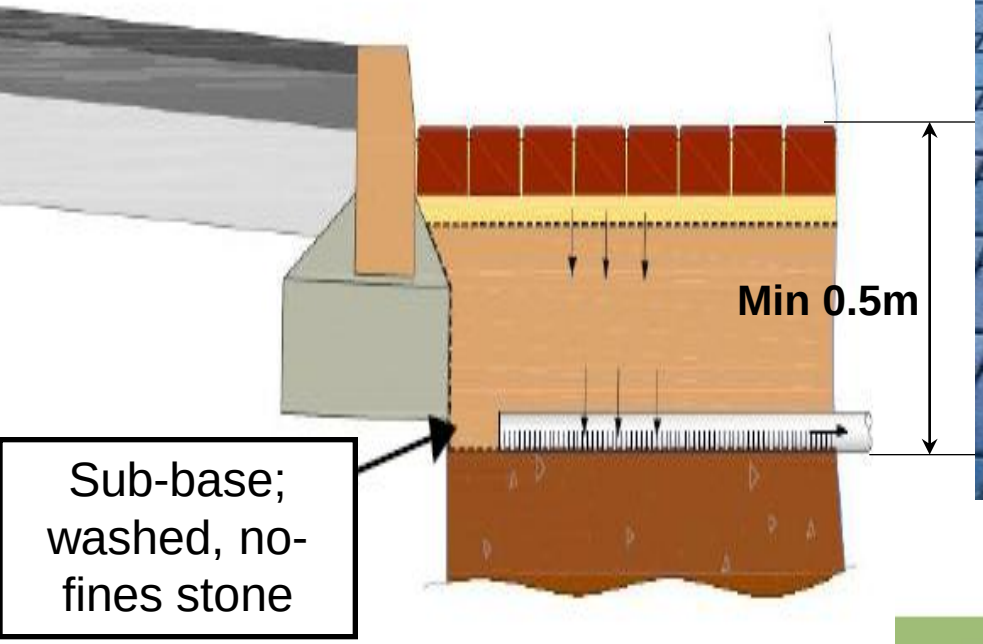
Shared responsibilities between Scot Water and Roads Authorities

"SECTION 7 AGREEMENTS" will be progressed with all Local Authorities

SEPA - Levels of Treatment
1. Permeable Paving

- 2 levels of treatment can be assumed if;
  - A minimum of 0.5m surface to base floor
  - Sub- base is washed, no fines stone
  - Impermeable : permeable ratio is 2:1 max;

e.g. 200m^2 impermeable tarmac:100m^2 permeable paving

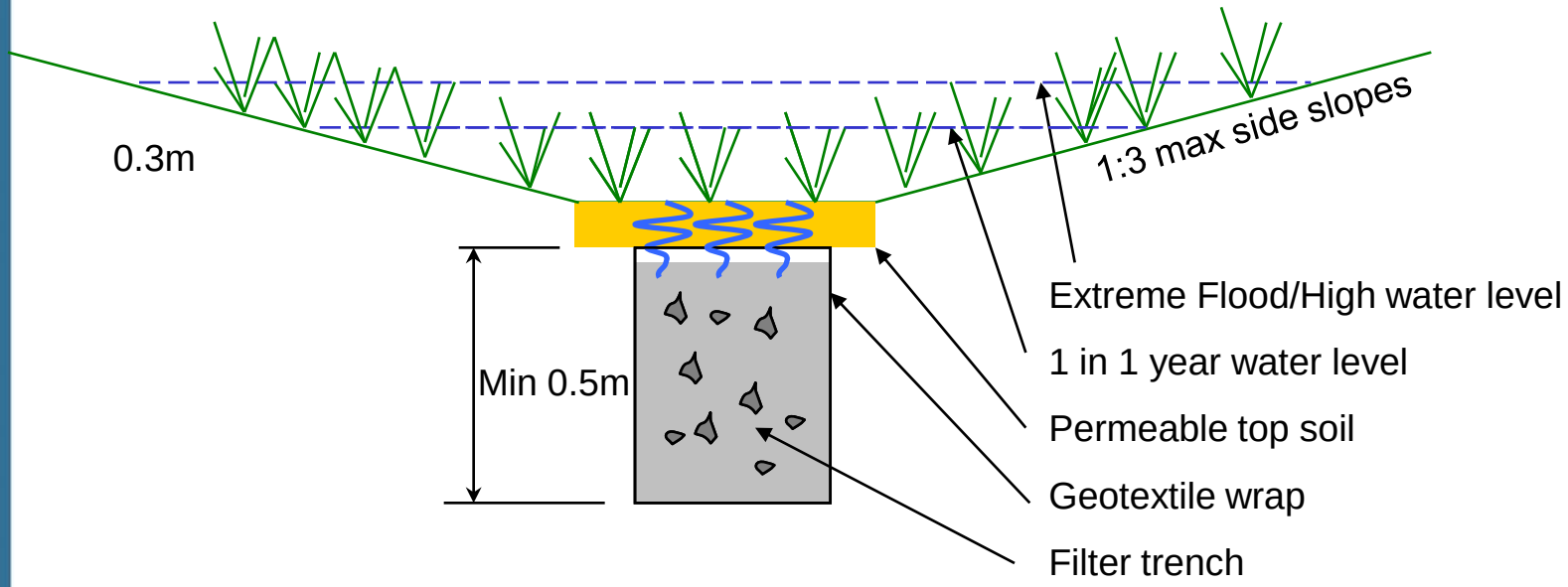


Permeable Paving **Vs** **Conventional Monoblock**

SEPA - Levels of Treatment
2. Underdrained (Dry) swales

- 2 levels of treatment can be assumed if;
  - Swale floor is of adequate permeability

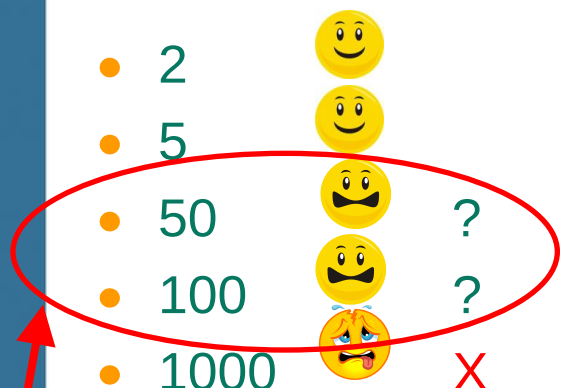
    i.e. soil on swale floor is of correct permeability – not clay; not gravel
  - Filter trench is min 0.5m deep



SEPA - Levels of Treatment
3. “Small” developments

- CIRIA Manual says 2 levels of treatment for roads
- This is considered unnecessary for *small* developments where 1 level will do
- **What is small – how many housing units?**

- 2
- 5
- 50 ?
- 100 ?
- 1000 X



Depending on receiving water sensitivity

Proportionate and Fair

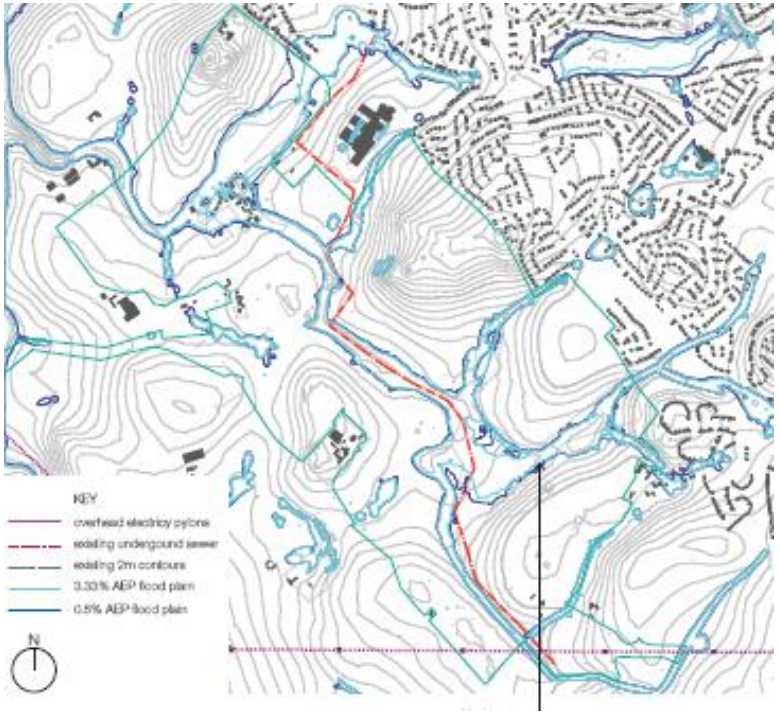
Green Network – Integrated Urban Infrastructure Project

- Strong Partnership Project;
  - 8 stakeholders (including SEPA, Scottish Water and 3 local authorities) and a collaborative commission to deliver 4 “Concept Plans” for 6 identified sites

“The objective is to implement a holistic, design lead approach to the site. This incorporates the understanding of the existing water opportunities and constraints at the site and to ensuring that appropriate decisions are made in developing areas where future communities will be able to thrive and be engaged.”

GN – IUI Project

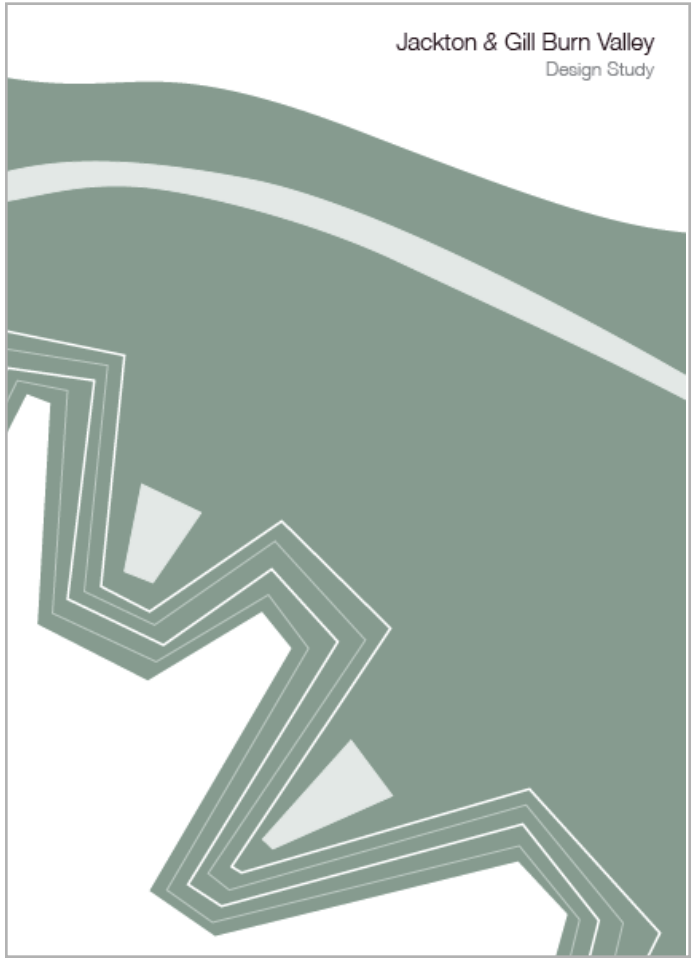
- Need to encourage (& build) “communities”, not just housing estates
- Current economic downturn offers good opportunity to present these ideals
- Actually **cheaper to install swale network than pipe network**



GN – IUI Project

- 4 plans for 6 sites
- High Quality reports will be produced
- 1st site = “Jackton & Gill Burn Valley”

  (E Kilbride-Community Growth Area)
- 2 sites in Glasgow & 3 in Renfrewshire
- Already been shortlisted for national architects award



GN – IUI Project

"Infrastructure First"

- Emphasis on multi-use components assisting a "Sense of Place"
- For example;
  - SUDS and biodiversity
  - Flood storage & amenity e.g. playing fields
  - Green corridors
  - Encourage activity – walk to shops
  - Community engagement
  - Safe & Healthy
  - Economic investment
  - Sense of place

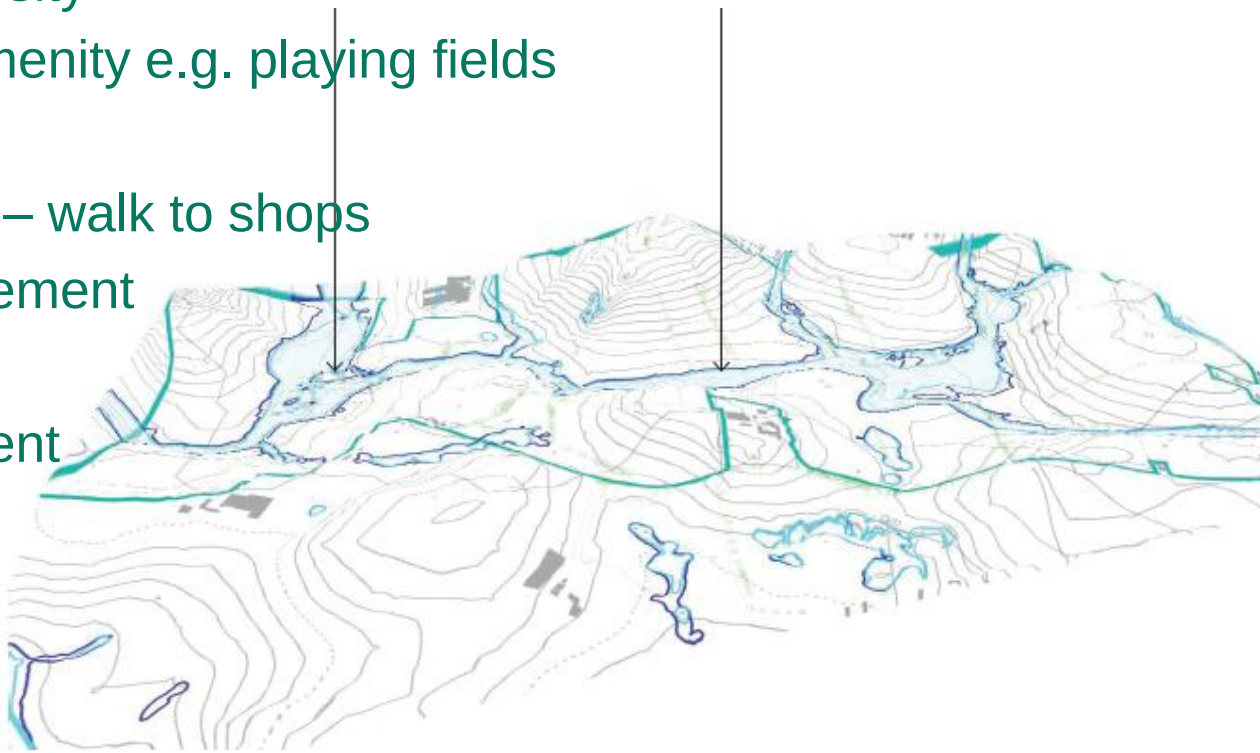


Fig 4.1. Digital Terrain Model, general view looking north east, 2010 AECOM Ltd. Not to scale

Jackton & Gill Burn Valley

South side of Greater Glasgow

Fig 6.2. Schedule of accommodation schematic, 2010 Collective Architecture. Not to scale.

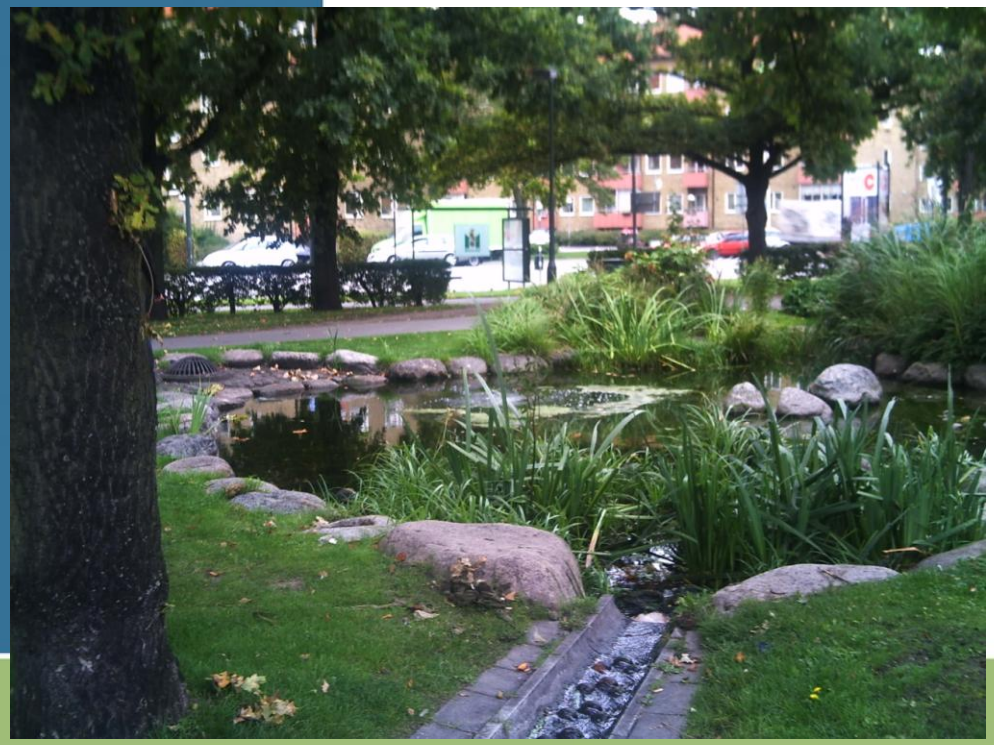
Alternative Drainage

There now follows alternative drainage options……

Pipe-Free Drainage!

No Pipes and no Kerbs

- The Pipe free system
  … and no kerbs
- Serving new developments
- Retrofitted system



Creative Drainage!

- So given that we (will) *have* to install SUDS
- We should maximise the benefits they can deliver
- Achieve integration with other infrastructure components
- Providing water management
- Delivering habitat and biodiversity
- Adapting to climate change

Subtle Drainage!

- Public open space is often a planning condition
- We must think how to integrate necessary elements to the benefit of the surroundings
- Cost savings are easily achievable
- Maintenance will be done anyway

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Clever Drainage,

…..not Stupid!

Thanks