Sustainable Drainage Systems (SuDS):

Turning a headache into an opportunity for the SI sector.

Russell Bowman
Soil and Structures Ltd

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Questions for the talk

1. Why should the SI sector care about SuDS?
2. Are we best supporting SuDS design?
3. And, if not, what can be done to improve things?
4. Also, what does SuDS innovation look like?

Where does the SI sector find itself in 2021?

Spending money with nothing to show for it

A view from the SI sector

1991 *"You always pay for a site investigation whether you have one or not"*

1994 0.21% average costs

2001 As low as 0.004% reported

2007 Catalogue of costs, e.g. 80% of contractors claimed against SI

2020 Real or perceived drop in quality of pre-construction information

2025 Digital revolution…?

1991 Prof. Stuart Littlejohn
1994 https://www.icevirtuallibrary.com/doi/abs/10.1680/icien.1994.26349
2001 http://www.arcom.ac.uk/-docs/proceedings/ar2001-961-969_Ashton_and_Gidado.pdf
2007 http://www.arcom.ac.uk/-docs/proceedings/ar2007-0703-0712_Wood_and_Ashton.pdf

Taking a walk on the wet side

A view from the flood risk and drainage sector

Flooding
£1,600,000,000 p.a.

Subsidence
£300,000,000 p.a.

Relative annual costs to UK economy

Relative cost based on comparison of 2015/16 winter flood costs (~1.6B; Environment Agency figures) against basic pro-rata of subsidence costs from 2002-2012 (~3.0B; ABI figures). N.B. Claim numbers have reduced since this period.

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Taking a walk on the wet side

A view from the flood risk and drainage sector

National Planning Framework (NPF3)

> *4.16 "...water management and flooding issues will become increasingly important"*
> *4.25 "Catchment-scale flood risk management will become more important..."*

Scottish Water

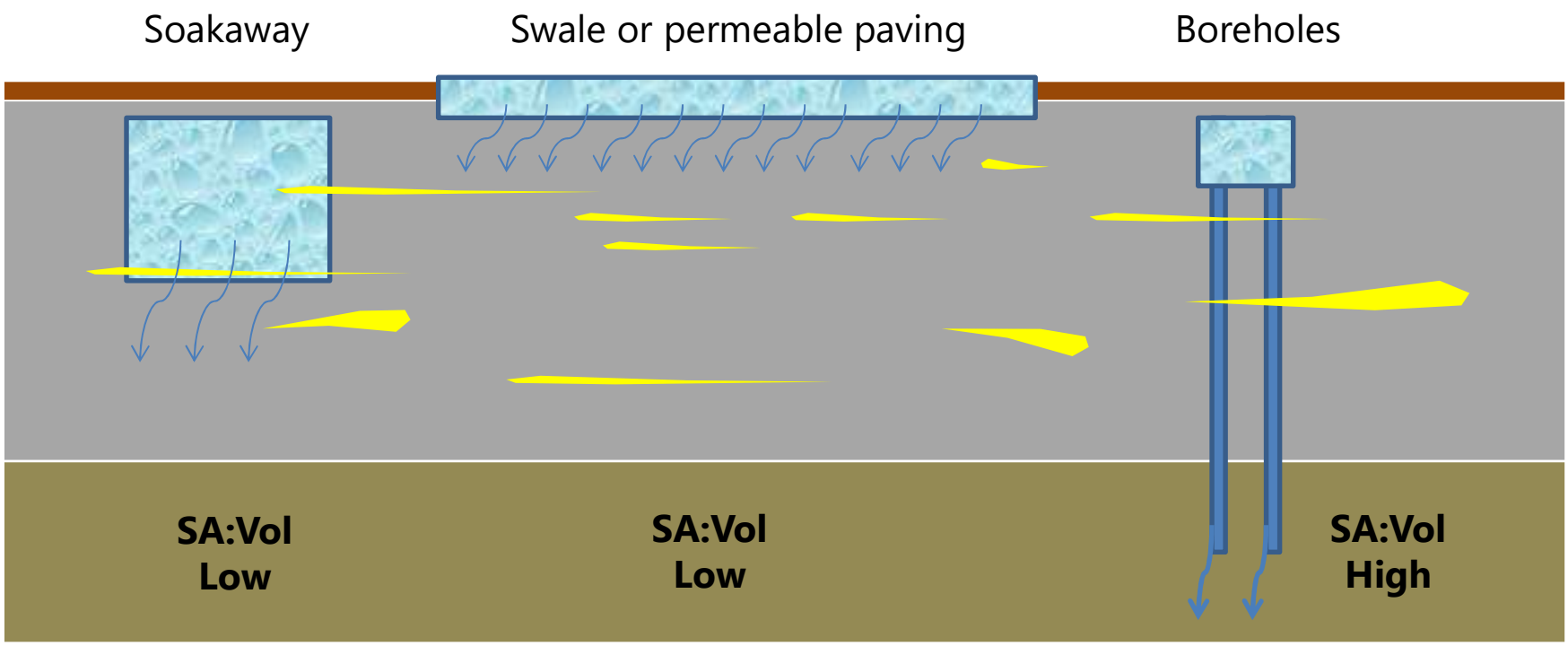
> *Surface Water Policy – 'Preferred options' = drainage hierarchy*

Scottish Environment Protection Agency

> *Flood risk management https://www2.sepa.org.uk/FRMStrategies/*
> *Protecting groundwater https://www.sepa.org.uk/regulations/water/groundwater/*
> *Contaminated land https://www.sepa.org.uk/regulations/land/contaminated-land/*

Taking a walk on the wet side

A view from the flood risk and drainage sector



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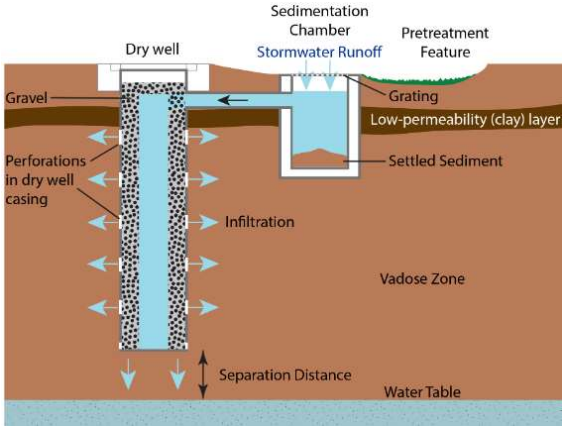
Taking a walk on the wet side

A view from the flood risk and drainage sector

Source: www.abertay.ac.uk



Source: americangeosciences.org

Source: www.dplumridge.co.uk

Source: www.drainagepipe.co.uk

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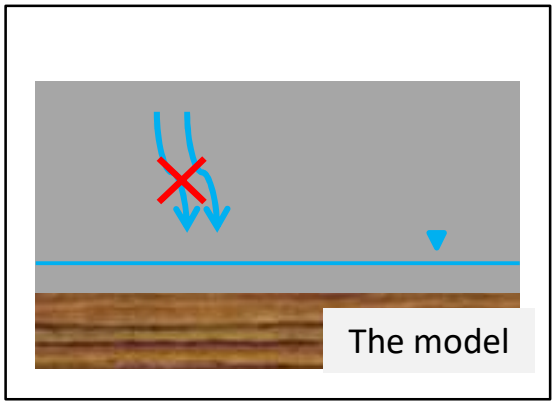
Making SuDS work: What typically happens...

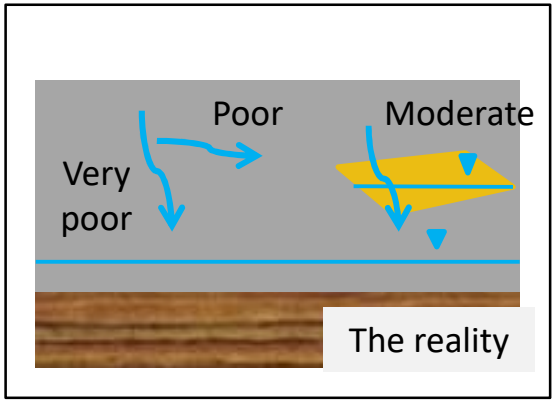
CONTAMINATED LAND

Desk Study
- Ground modelled?

Ground Investigation
- Chemistry
- Engineering

Design
Investigate again?
Construct





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Making SuDS work: What typically happens...

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Design
Investigate
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SOIL AND STRUCTURES

Making SuDS work: What typically happens...

CONTAMINATED LAND

Desk Study
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Design
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DRAINAGE DESIGN

Flood Risk Assessment
Drainage Strategy

Ground Investigation
BRE 365
Tick box?

Design
Investigate again?
Construct

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Making SuDS work: What typically happens...

Early BRE 365 testing:
60% of the time, it works every time

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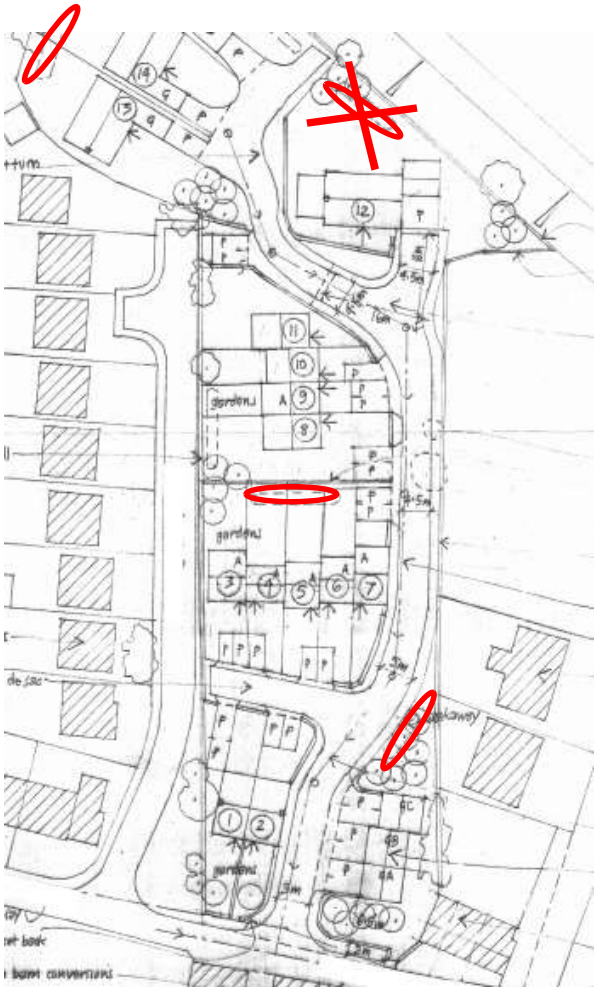
Making SuDS work: What typically happens...



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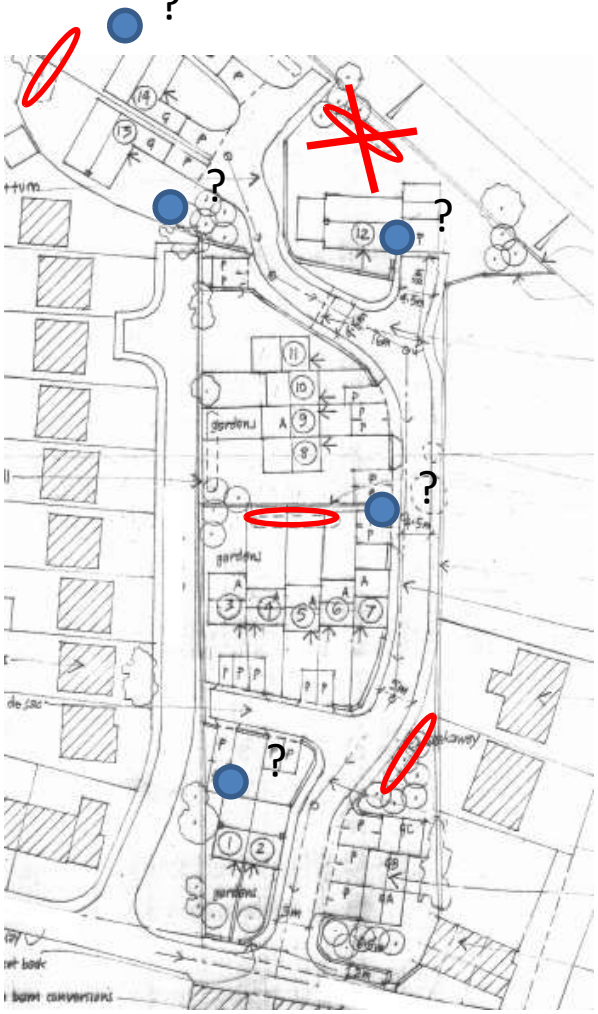
Making SuDS work: What typically happens...



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Making SuDS work: What typically happens...

Useful to think of BRE 365 as a field test

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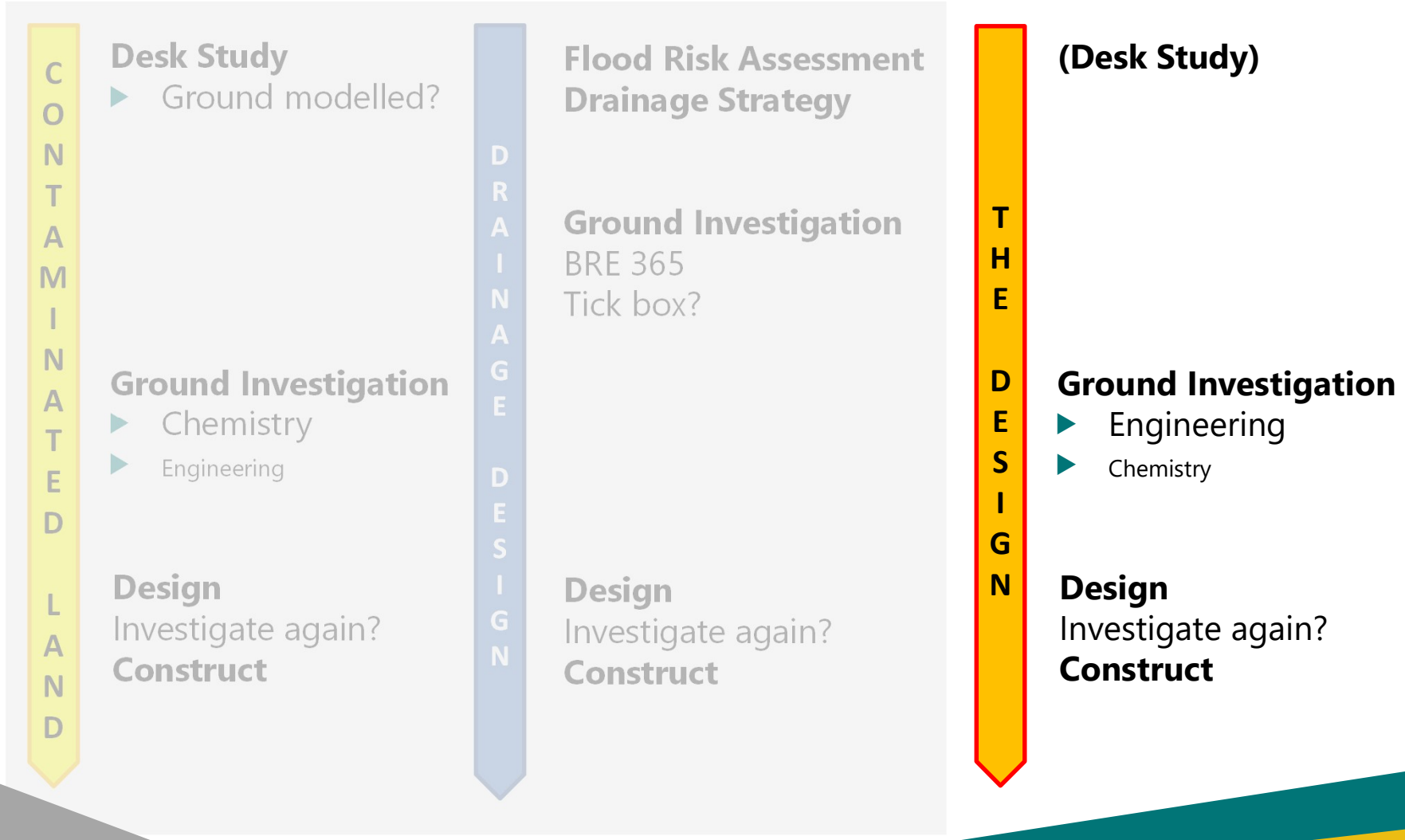
ASIDE: What happened pre-2000…



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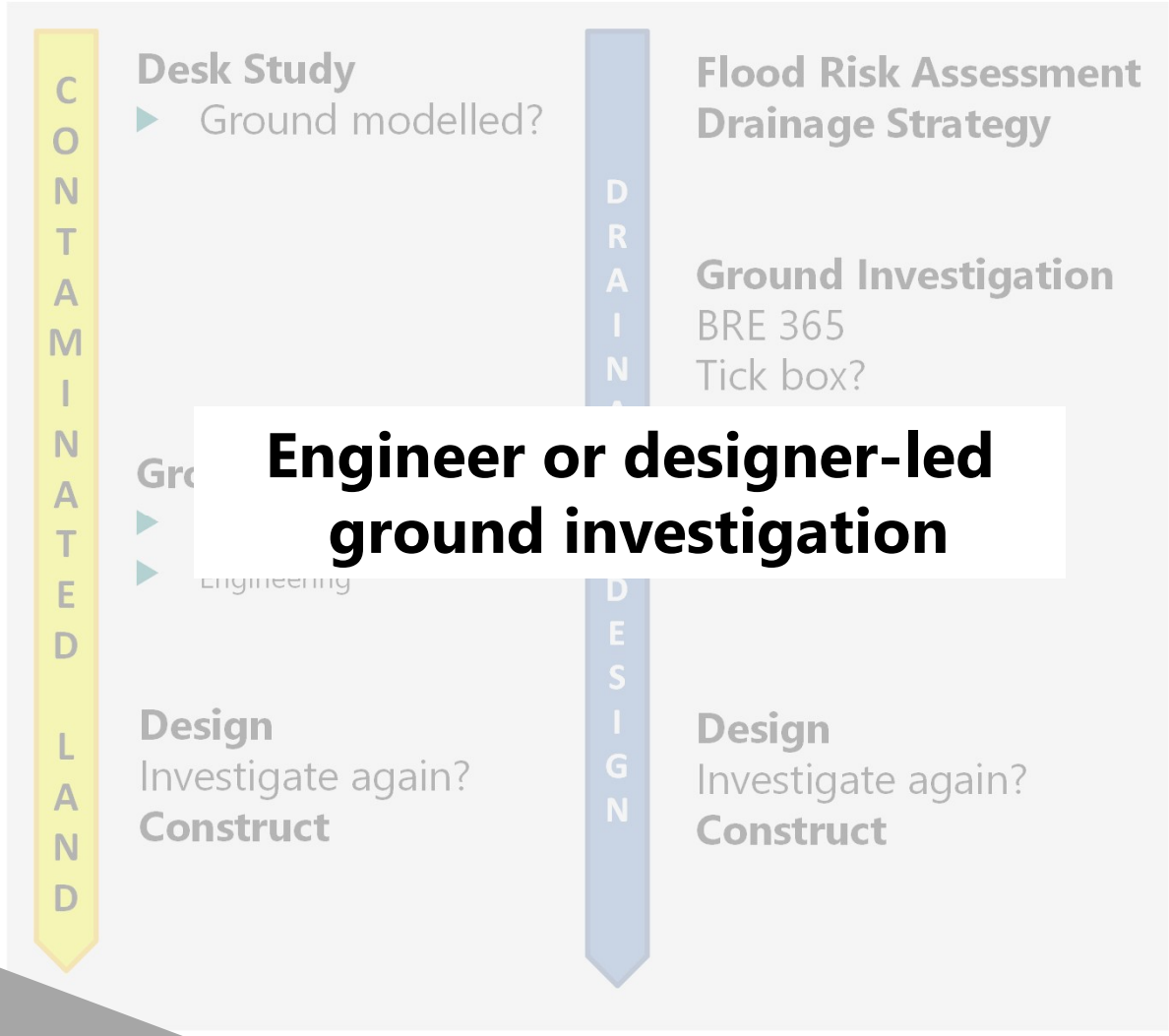
ASIDE: What happened pre-2000…



(Desk Study)

Ground Investigation
- Engineering
- Chemistry

Design
Investigate again?
Construct

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Making SuDS work: What could happen...

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Making SuDS work: What could happen...

TOTAL ENGINEERING GEOLOGY APPROACH

Step 1 Desk Study
- Ground model

Step 2 Preliminary Ground Investigation
- 'Pitting and percolating'

Step 3 Design Ground Investigation
- BRE 365

Break ground

Step 4 Supervision
- End-to-end involvement

Cut ribbon

Making SuDS work: What could happen...

17.2 Phased investigation

Following the desk study, a ground investigation should normally be performed in phases in accordance with BS EN 1997-2:2007, Section 2. These phases are preliminary investigation, design investigation, controlling and monitoring during construction; the first two investigation phases may be carried out in a single site visit.

The initial phase (preliminary investigation), which might involve widely spaced boreholes, probing or trial pits, should be designed to establish the general geological conditions, the suitability of different methods of investigation and the groundwater conditions.

NOTE The preliminary investigation assists in the design of an effective programme for the detailed investigation. It might also provide an opportunity to take samples for chemical analysis to determine whether they are contaminated. However, such testing is not a substitute for a properly planned investigation for contamination (see 17.8 and 17.9).

For more complex structures, the preliminary investigation should be followed by a more detailed (design) investigation.

BS5930:2015

"A limited intrusive ground investigation to gain an initial appraisal of the site..."
AGS, Client's Guide... 2004

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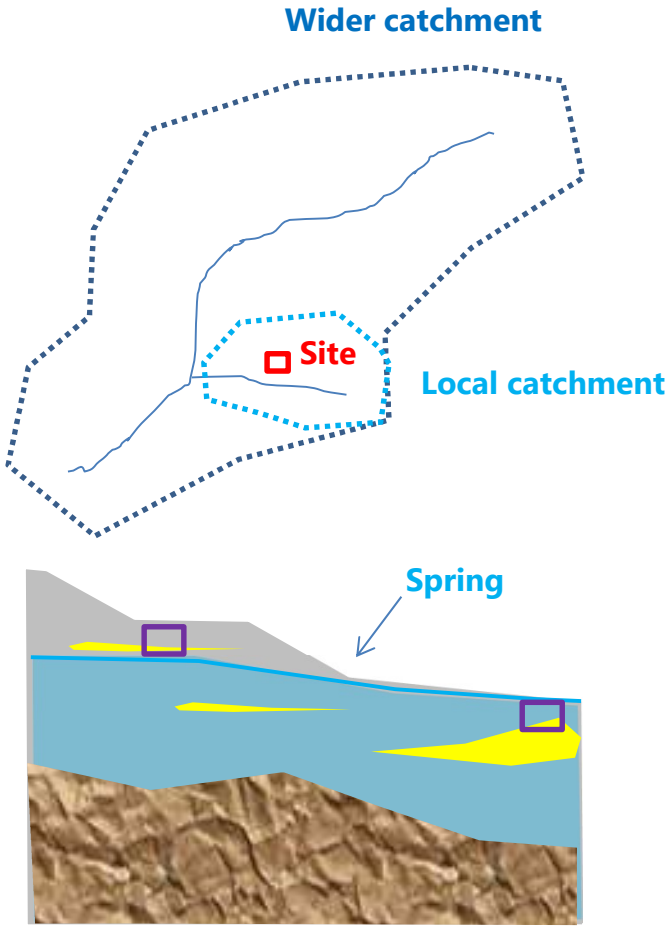
Making SuDS work: What could happen...

Step 1
Desk Study

- What is the geology?
- What groundwater regime?
- What constraints?

- Ground model
- Hydrogeolgogical model
- Conceptual site model

Literature values



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Making SuDS work: What could happen...

Step 2

Preliminary ground investigation

- What ground?
- What groundwater regime?
- What constraints?

Soil logging
Rock logging
Groundwater logging
Percolation testing results
Classification testing (PSD)
Classification testing (chemical)
Hazen's formula...
Literature values ... Again
Zoning site

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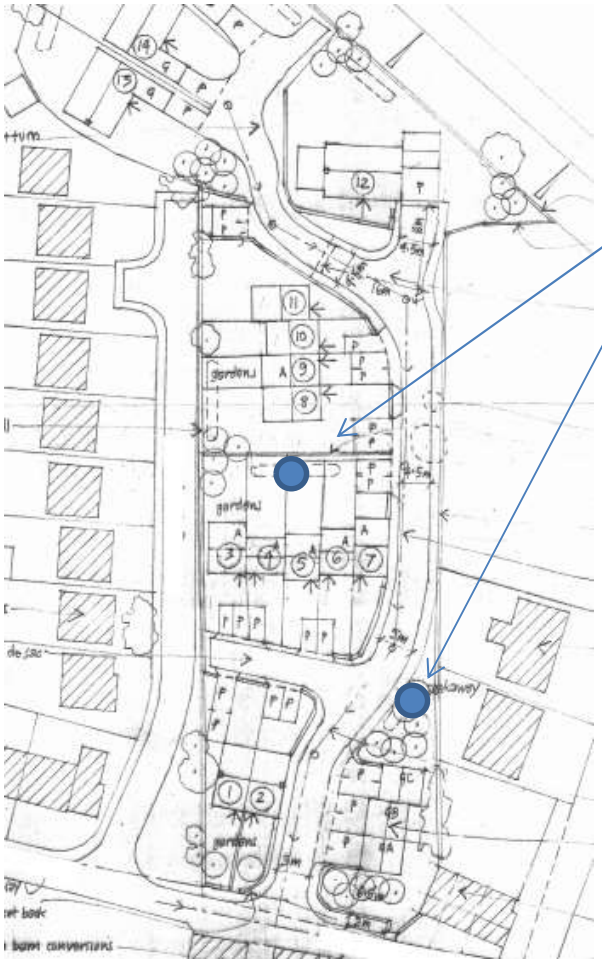
Making SuDS work: What could happen...

Step 3

Design ground investigation

- What drainage system?
  - Where?
  - What test?
  - What level?

Infiltration testing results



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Watch points

- **Desk study:**
  - Think ground and groundwater model
  - The site was likely draining to ground, in part or in full, before development.

- **Site investigation:**
  - There are many other data streams that inform a groundwater model.
  - Make the most out of that early request for an investigation.
  - Consider staging the investigation. Explain this to the client – not all answers given.
  - Benefits include:

a) more 'fee' less 'cost';
b) focuses on site characterisation;
c) May answer a lot of questions/uncertainty in the ground;
d) reduces professional risk 'preliminary';
e) compliance – it is writ large in all SI guidance documents; and,
f) reputation – it is what the SI sector advises clients we'll do.

- **Design:**
  - Don't comment on the viability of SuDS. Let the designer do that.

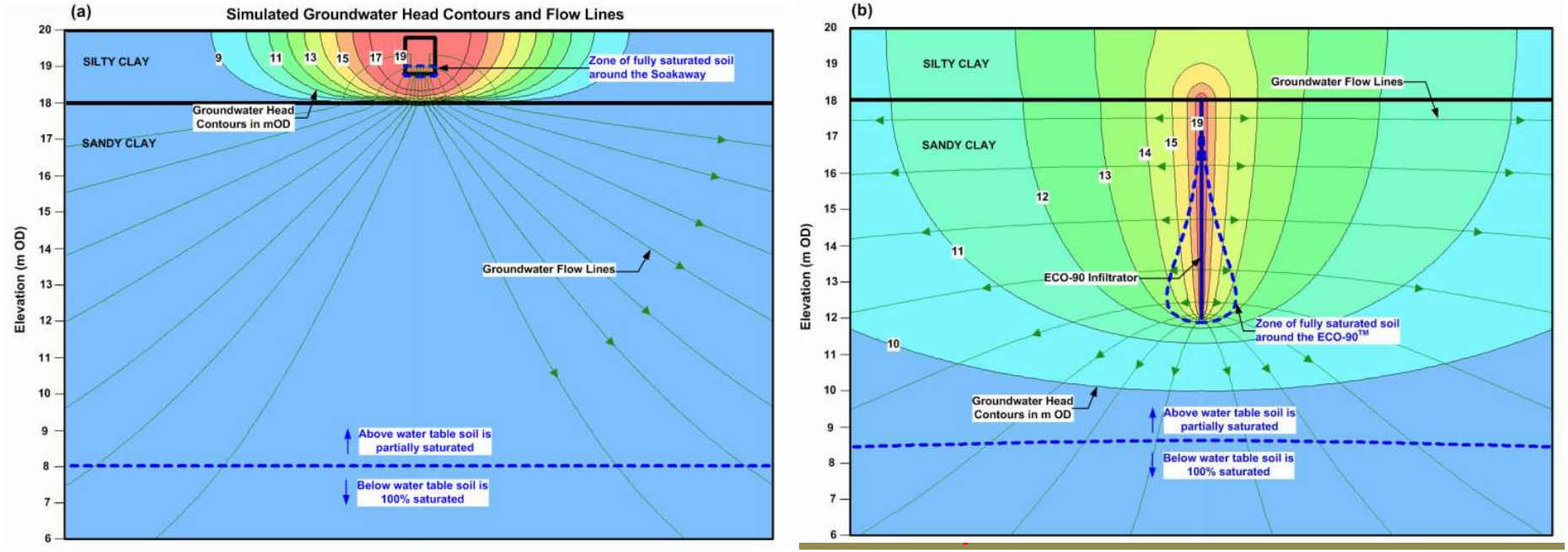
Final thought

Use an infiltration system that removes uncertainty!

Soakaway

ECO-90tm

Boreholes



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Any questions?

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