Transitioning from drainage to sustainable drainage in housing

Dispelling myths of SuDS in new housing

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The key to success on difficult sites?

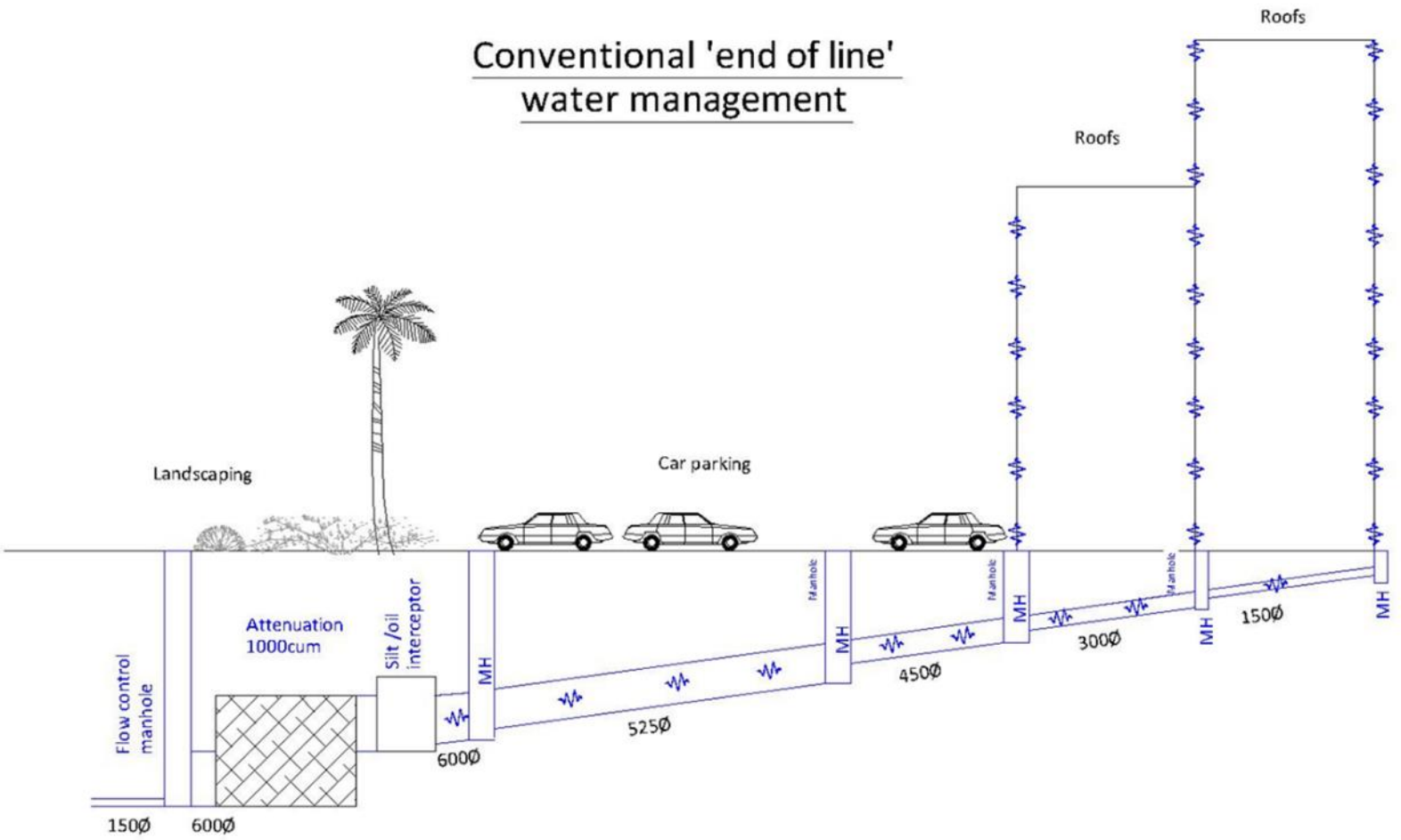
- Qualified and experienced designers who understand the principles
- Open minded – on all sides
- Use the most appropriate method for the location
- The rules of thumb we use to make design of drainage easier may not apply to SuDS.
- Identify constraints and design around them
- **THINK, ANALYSE, ADAPT, PLAN**

Construction cost of SuDS

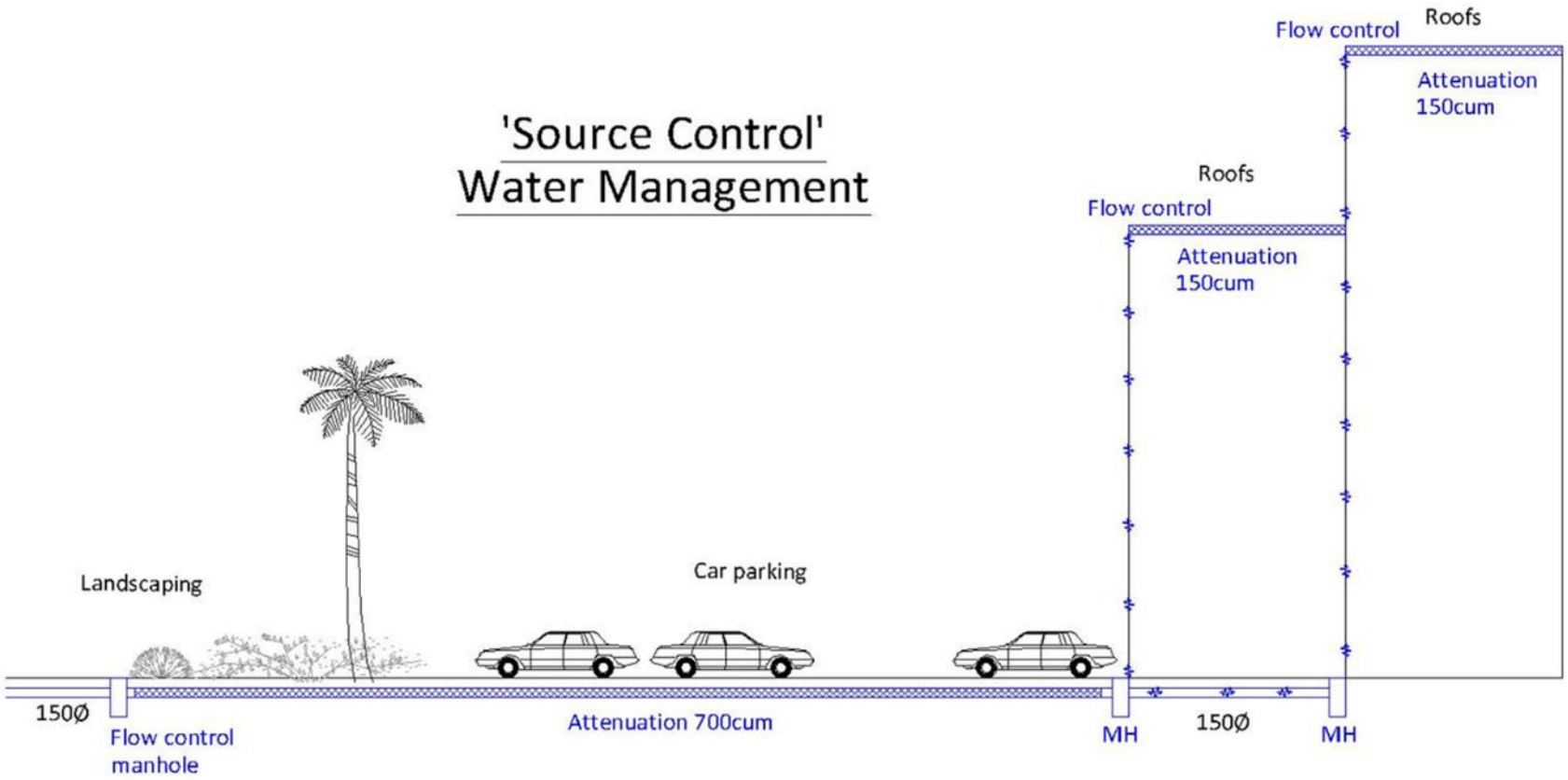
- There have been numerous studies on costs
- 2013 DEFRA study into cost of SuDS
- 2017 Welsh Government study
- It should be a straight forward exercise to cost up construction and maintenance of SuDS
- Construction costs for WELL DESIGNED landscaped based SuDS should be cheaper than traditional drainage with underground storage
- **Should be no extra land take**

3	Indicative build costs					
4						
5	Bio-retention in street either within road (2 parking bays long) or behind footway	Qty	Units	Rate	Total (£)	SPONS Reference 2018 Civil Engineering and Highway Works Price Book (unless stated otherwise)
6						
7	Breaking out existing surfacing; disposal off site	30	m2	8.31	249.30	Page 402 eo for excavation in hard materal in drainage, existing pavement, assume 300mm thick
8						
9	Excavation below formation for planters; disposal off site	18	m3	31.62	569.16	Page 194 Excavate for foundations 1m deep plus page 186 disposal 15km distance (exludes tipping charges or LFT)
10						
11	Stone filling to bottom of planters	12	m3	52.89	634.68	Page 390 Type B filter material
12						
13	100mm perforated drain in bottom	12	m	2.26	27.12	Landscape page 266 Wavin plastics perforated 100mm
14						
15	Lift existing gulley gratings to act as overflow	1	Nr	54.53	54.53	Page 401 raise laval of 700 x 500mm cover and frame by 150mm or less
16						
17	Connections back into existing underground storm water drainage	1	Nr	1500.00	1,500.00	Based on tander returns for similar scheme
18						
19	Supply and place engineered soil (sand:compost mix in accordance with SuDS Manual)	6	m3	121.72	730.32	Landscape page 440 Amsterdam tree soil
20						
21	Double kerb to edge of bioretention: insitu concrete foundation and haunching	16	m	32.30	516.80	Page 304 Foundations 450mm by 150mm plus kerb over 12m radius 150mm by 305mm
22						
23	Extra for angles, mitres, openings, etc.	10	%		51.68	
24						
25	Extra for breaking through existing surfacing; making good to both sides	16	m	20.00	320.00	Based on breaking aout above plus allowance for making good
26						
27	Forebays to reduce flow velocity	1	Nr	577.91	577.91	Assumed - based on rate for yard gulley page 400 and rates from previous contract
28						
29						
30	Planting	30	m2	24.31	729.30	Landscape page 468 shrub planting 6.75 plants/m2
31						
32	Street furniture: dwarf walls, etc to improve streetscape - Allowance				5,000.00	
33						
34					10,960.80	
35						
36	Preliminaries	15	%		1,644.12	

Traditional drainage design - expensive



Integrated SuDS - cheaper



So why does SuDS end up being more expensive?

- Adoption issues result in doubling up of surface water systems with one for house drainage and one for highway drainage
- Water Companies will not recognise contribution of private source control (eg permeable pavements)
- Poor design of systems results in large land take for end of line features
- Local authorities will not consider multi functionality of open spaces
- Unrealistic commuted sums for maintenance asked for by adopting authorities
- Contractors who are unfamiliar with methods applying risk premiums to SuDS
- Unreasonable requirements from others (eg water companies requiring barrier water pipes below permeable paving, utilities not allowing services below or crossing swales)

Maintenance costs

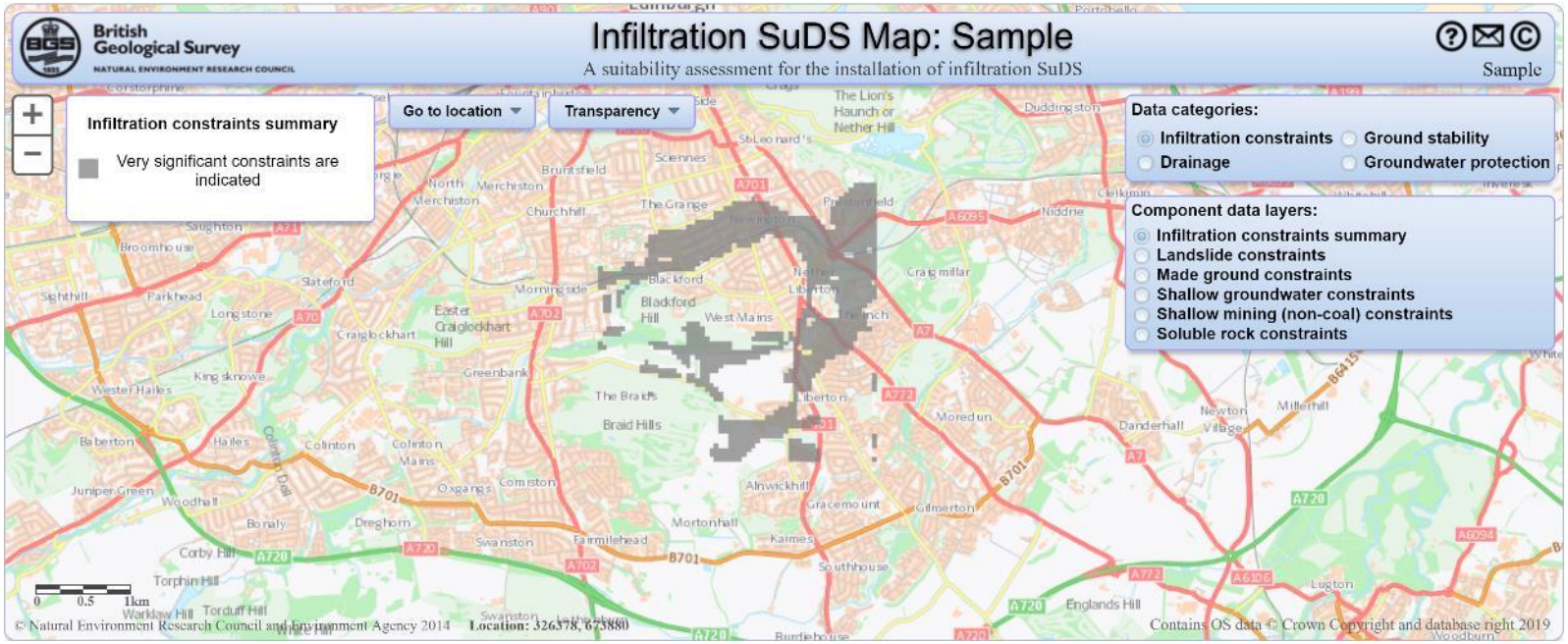
- Need to maintain the SuDS to ensure they operate effectively as a drainage system
- Main items - regular inspections and review of maintenance regime
- Inspect flow controls, inlets and outlets
- These are usually places where blockages occur
- Vegetation management is not that critical – often visual appearance is driver for this. Can use low maintenance vegetation
- Lots of guidance/information on maintenance costs eg Cambridge City Council Adoption Guide, 2013 DEFRA study and 2107 Welsh Government report
- SuDS Manual has lots of items that “may be required”
- Costing all these into each scheme is unrealistic
- Use risk management and contingency sums
- Reconstruction costs? Be realistic

Maintenance for biodiversity reduced costs

www.ciria.org | www.susdrain.org

Ground conditions

- When using infiltration SuDS a good understanding of the ground and groundwater levels is vital
- Get advice from competent geotechnical engineers or engineering geologists
- Need pragmatic advice that takes account of risks and consequences of failure
- British Geological Survey Infiltration SuDS map



Sites underlain by clay soils

- If the site is underlain by clay soils use of SuDS is still possible (including permeable pavements)
- Have to adapt design to use attenuation rather than infiltration
- Can use infiltration blankets over wide areas in low permeability soils down to 1 x 10^{-7}m/s (eg silty clayey sands) in some cases
- Infiltration to clay can help provide interception

Unlined rain garden on clay soils provided with outfall connection

Contaminated sites

- It is possible to use SuDS where contamination is present
- The SuDS design should take account of the remediation
- Co-operation between drainage and remediation designers
- Example of SuDS basins constructed over processed landfill material
- Producing landfill gas so had to be lined and also venting below.
- Allowance for settlement

Infiltration close to buildings

- Building Regulations – “5m rule” is a rule of thumb intended for deep normal soakaways
- It was not intended to apply to shallow blanket type systems such as permeable pavements and rain gardens
- SUSDRAIN – fact sheet on infiltrating near buildings
- Obtain advice from a geotechnical engineer

Permeable pavement with infiltration close to house foundations

Infiltration close to buildings

- Unlined rain garden close to buildings
- Monitored soil moisture content between rain garden and building
- No adverse effects
- Consider building foundation types –infiltration will have no effect on deep piled foundations
- Consider basements and whether they are waterproof

Health and safety

- Can be addressed easily in SuDS design without big and ugly fences or preventing access
- Health and safety should not be a reason for omitting surface water features
- Well designed SuDS are inherently safe
- Framework is in the SuDS Manual and checklists at www.susdrain.org
- Developed with assistance from RoSPA

Balancing risk and benefit

Counter-intuitively, the key to challenging risk aversion is the application of balanced risk assessment. There is a need to accept that uncertainty is inherent in adventure and this contains the possibility of adverse outcomes. The Royal Society for the Prevention of Accidents (RoSPA) sums up this approach: *We must try to make life as safe as necessary, not as safe as possible*.

Fencing

It is not reasonable, practical or desirable to attempt to prevent drowning by denying access to every piece of water across the UK. Fencing is an effective but comparatively expensive option which does not remove all the risks arising from water.

Health and Safety

- Do you need life saving equipment?
- What is the likelihood of someone swimming in a feature?
- Is rescue possible without equipment?
- Make SuDS safe through design – not by fencing, signs, etc

- Do we need life belts here?
- Can an adult just wade in ?

Thank you

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