

TREES AND WATER SENSITIVE URBAN DESIGN

URBAN TREES – AN OVERLOOKED ASSET IN STORMWATER MANAGEMENT?

A presentation by GreenBlue Urban

The Evolution of Urban Stormwater Management

- The past 2000 years getting stormwater off site as quickly as possible.
- Combined sewers designed for less population and for more permeable surfaces.
- Many combined sewers now have inadequate capacity.
- Sewage treatment plants dealing with lightly contaminated water unnecessarily.



Stormwater Retention Onsite

The last 30 years

- Water attenuation (slowing down) by holding on site – below ground tanks, attenuation basins, ponds etc.
- Reversion to ‘green field run-off rates’.
- Measure of water cleansing by precipitation of solids.



Swales & Raingardens

The last 10 years

- Water attenuation
- Vegetation cleansing
- Soil medium filtration



Rain Gardens & Bioswales

The advantages


- Lowest cost LID tree pit
- Landscaping feature
- Effective at removing urban pollutants
- Maintain ground porosity
- Adds additional attenuation capacity
- Flexible layout
- Easy retrofit capability



The disadvantages

- Requires landscaping and management
- High maintenance
- Susceptible to clogging if poorly managed
- Becomes unsightly when not upkeep
- Unsuitable for steep slopes
- Mulch layer replacement
- Reduced usable ground space





One tree within a 880 ft³
GreenBlue Urban RootSpace
system can attenuate more than
1,450 gallons of stormwater.

Stormwater Canopy Interception volume

~ 1 Inch Rainfall Event

Xiao Q., and E.G. McPherson, 2003. Rainfall interception by Santa Monica's municipal urban forest. Urban Ecosystems.

2" Caliper Jacaranda versus 22" DBH London Plane Tree

Jacaranda Acutifolia
(~2" Caliper)

15.9%
Interception



Platanus x acerifolia
(~22" Caliper)

79.5%
Interception





Trees are an excellent resource for stormwater management



Sustainable and eco-friendly



Make sure trees are healthy, mature and strategically planted





14-
BRANCHES
IS
LIVING
2017

GROW
Shaping the city
from the ground up
HARVEY NETER CONSULTING

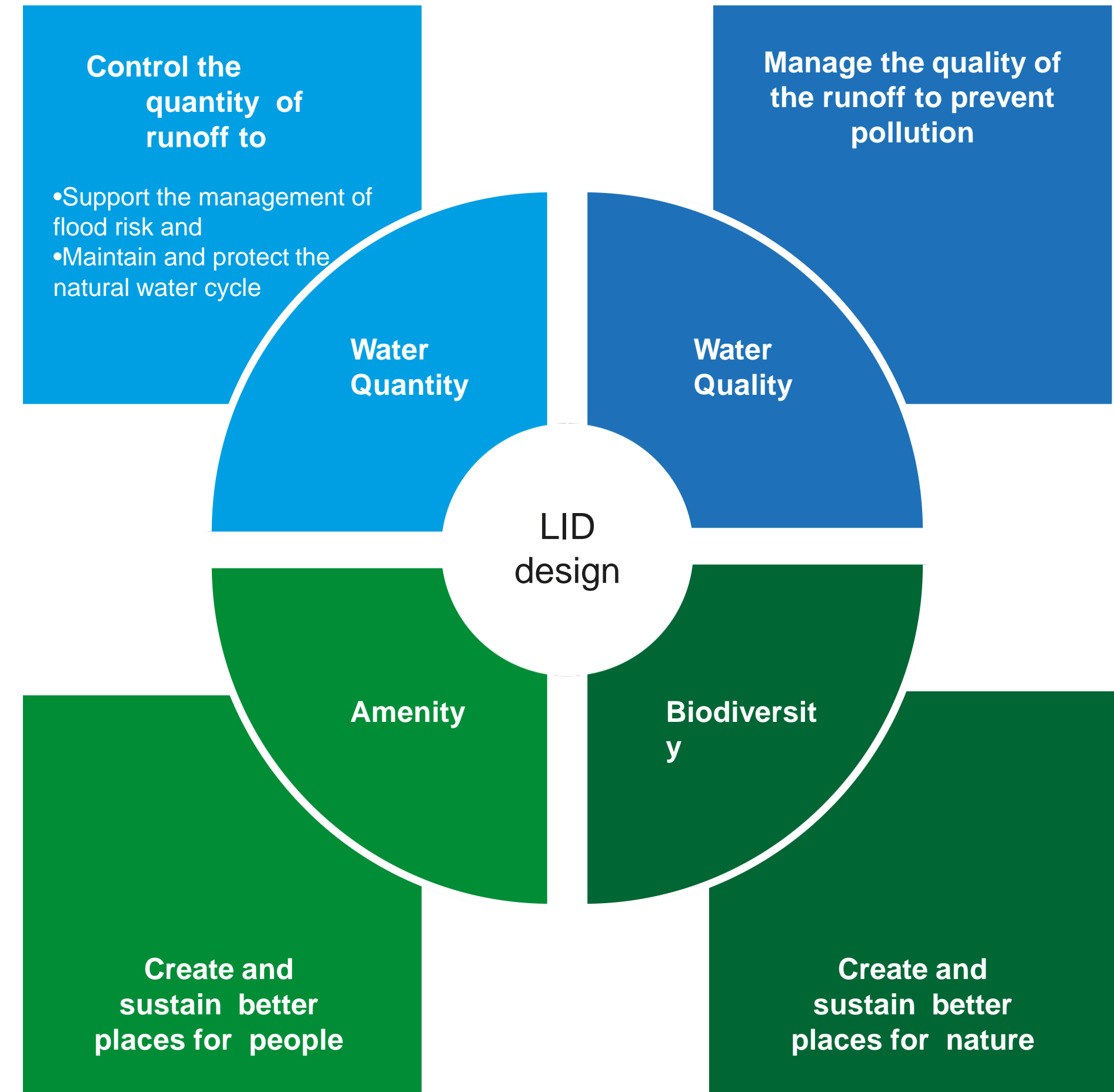
HOW CAN WE BETTER UTILIZE TREES FOR LOW IMPACT DEVELOPMENT (LID)

Utilizing trees for Sustainable stormwater management



Why use a tree as part of a LID system?

- Canopy interception
- Water draw for transpiration
- Deep infiltration to surrounding soil
- Symbiotic relationship with soil mycorrhiza helps deal with pollutants
- Meets the requirements of the four pillars of LID strategy



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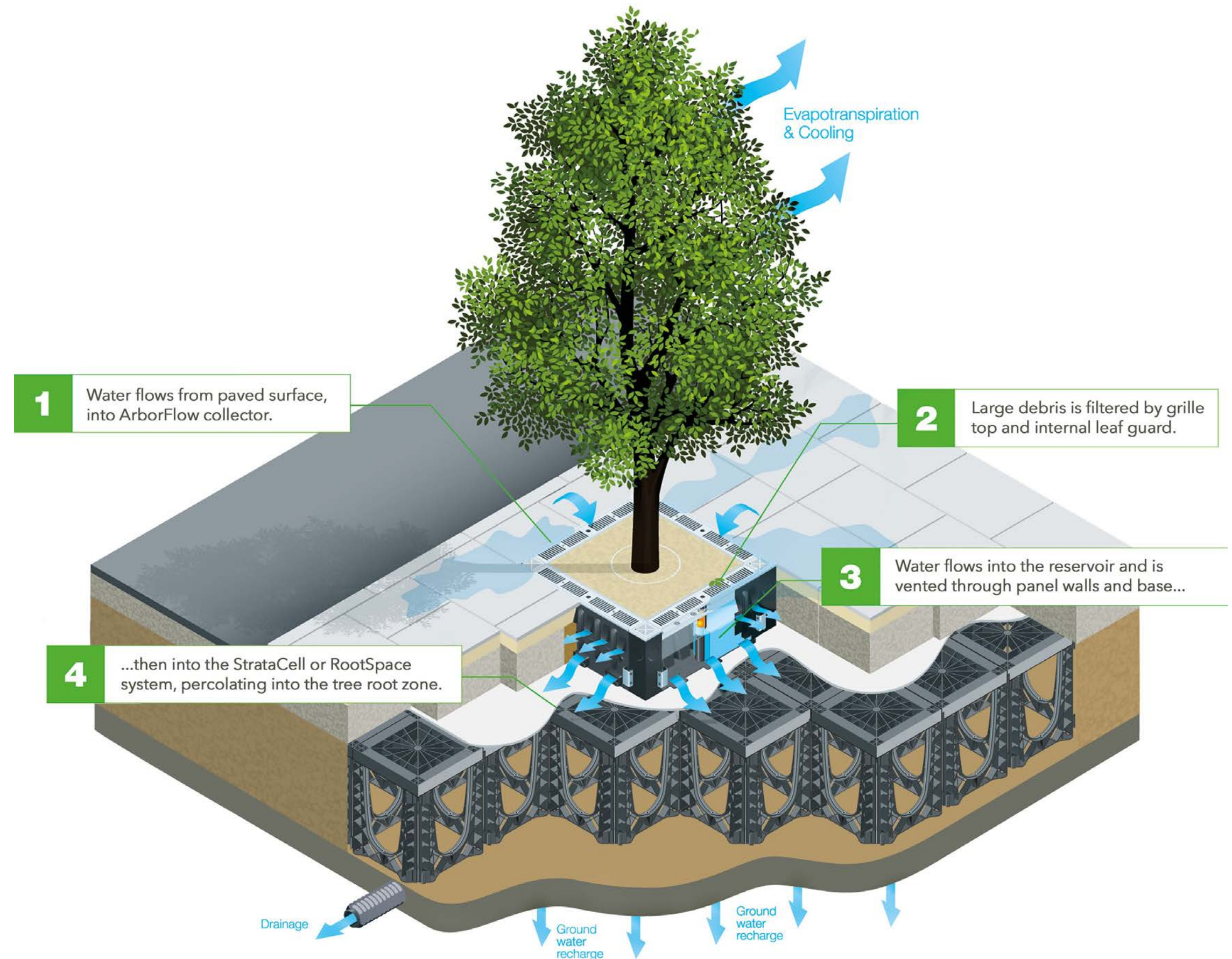
LID tree pit design



How the ArborFlow System works

Managing surface water runoff

- 1** Water flows into the stormwater inlet
- 2** Debris is filtered
- 3** Water flows through and is vented
- 4** Enters system, percolating into roots



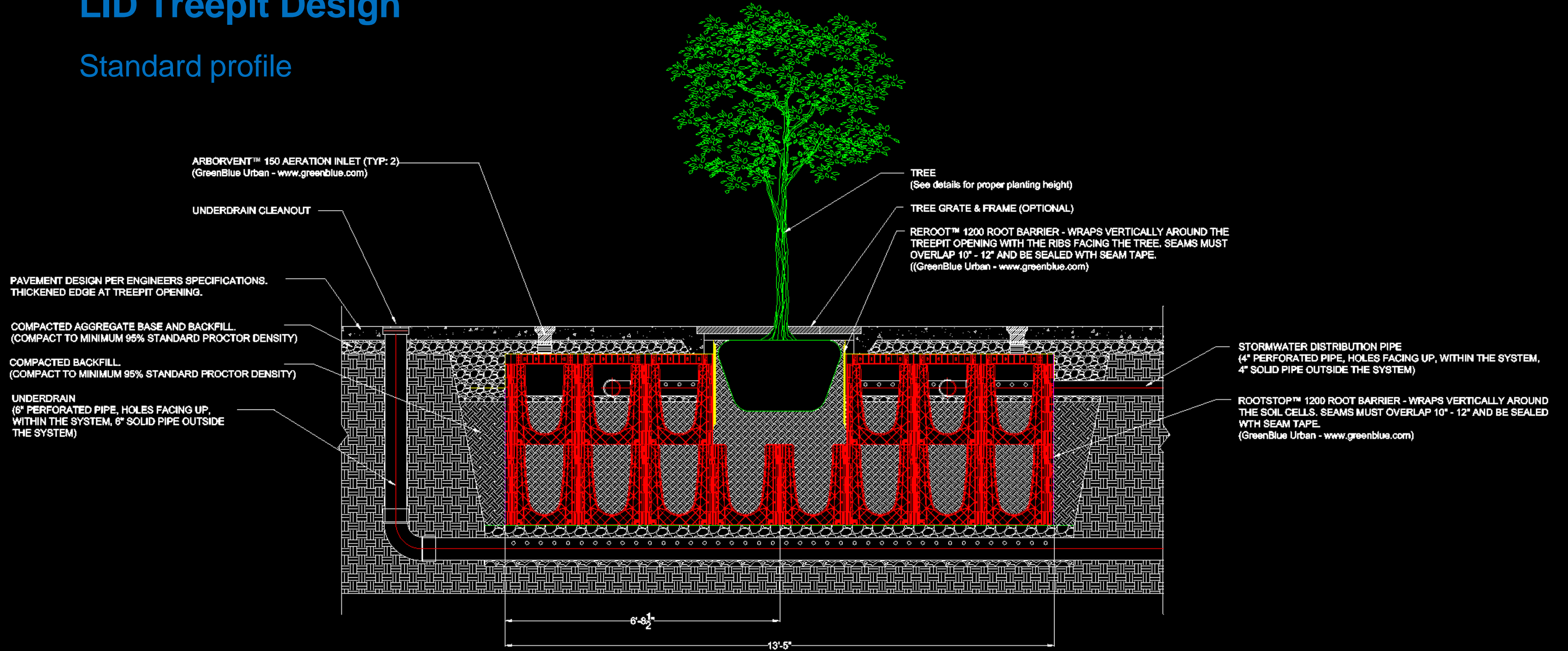
The 10 focus points

1. Review catchment areas,
2. Ascertain whether ground recharge is acceptable,
3. Decide number of trees and species,
4. Design tree pits to accommodate soil for each tree,
5. Ensure appropriate uncompacted soil volume,
6. Link tree pits together,
7. Choose suitable water inlets,
8. Consider weir and rain inlets,
9. Decide where tree pits will drain to,
10. Run completed designs past support team.



LID Treepit Design

Standard profile



ARBORFLOW™ SYSTEM - SECTION DETAIL
SECTION B-B

Soil

- Constituent parts of soil
- Percolation rates
- Particle size analysis
- GreenBlue Urban rootzone soil mixes
- Need for uncompacted soil medium



The problem with compacted soil

- Eliminates macro pores (Lack of gaseous exchange, ion exchange, and microbiological activity)
- Detrimental to root growth
- Limits water movement
- Unable to endure intermittent inundations in a heavy storm
- Limits ability for tree to extract nutrients
- Removes space for attenuation and transport
- Uncompacted soil attracts air for long-term health



Historic uncompact soil case study

Northumberland Avenue, London, UK

Trees now 150 years old and capable of dealing with in excess of >2,000 gallons of stormwater each.

Using the same concept of using an engineered construction to protect soil from over compaction.



The story of the soil cell

- List soil cells and dates launched etc.
- 100% recycled material
- Class leading load bearing capacity
- Recyclable up to five times
- Side infill panels for maximum lateral stability
- Fully interlocking design, creating one integral structure.



RootCell® (2001)



StrataCell® (2007)



RootSpace® (2016)

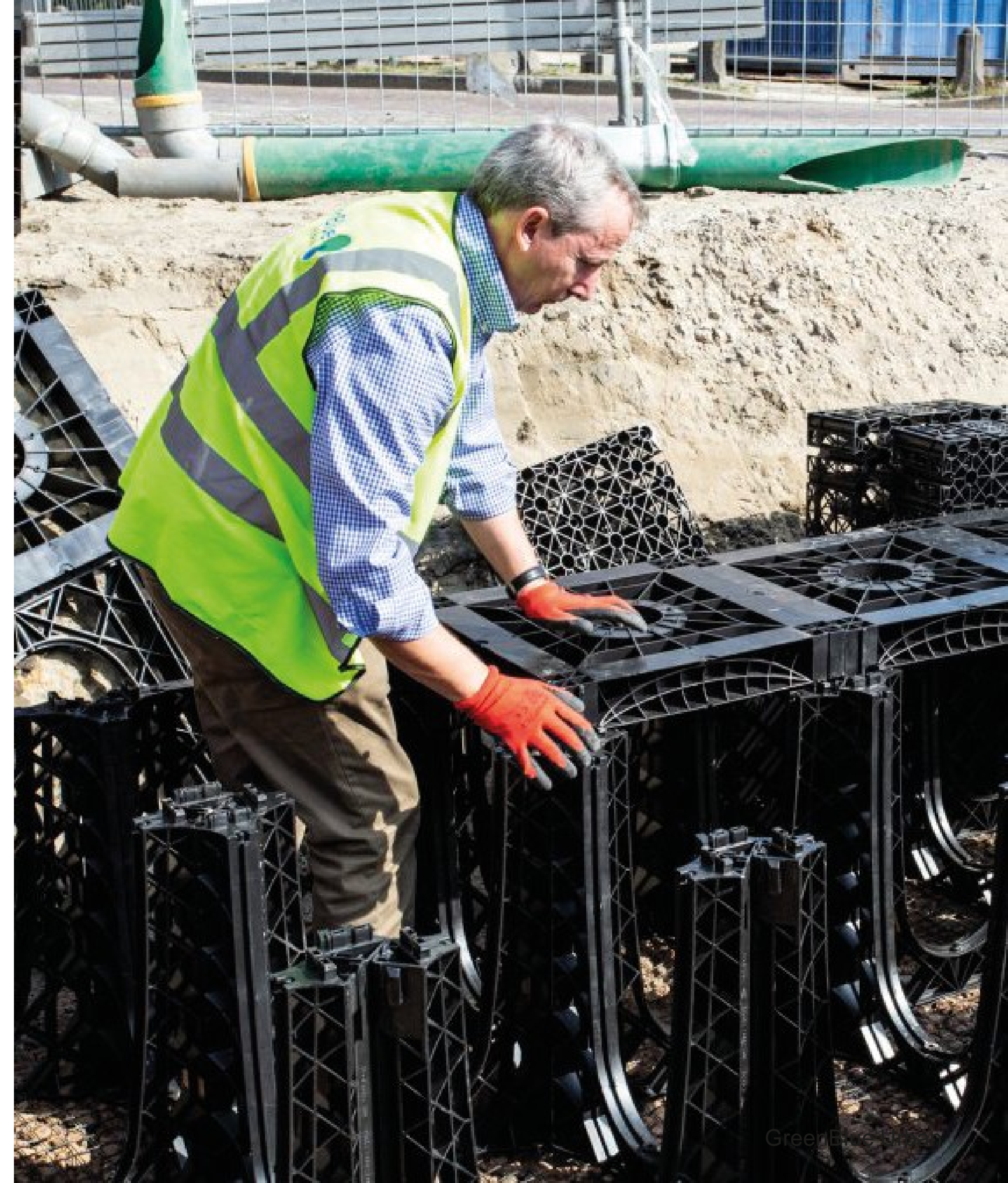
RootSpace®

Recreating forest floor
soil conditions



The Principal Components

- Load bearing soil cell or panel structure
 - RootSpace®



The Principal Components

- Load bearing soil cell or panel structure
- Root Management
 - Root Barriers
 - Root Directors



The Principal Components

- Load bearing soil cell or panel structure
- Root Management
- **Control Chamber - Inlet & outlet control**



The Principal Components

- Load bearing soil cell or panel structure
- Root Management
- Control Chamber - Inlet & outlet control
- **Drainage**
 - Positive drainage
 - Infiltration into the soil



The Principal Components

- Load bearing soil cell or panel structure
- Root Management
- Control Chamber - Inlet & outlet control
- Drainage
- **ArborFlow**
 - Curb Inlet



The Principal Components

- Load bearing soil cell or panel structure
- Root Management
- Control Chamber - Inlet & outlet control
- Drainage
- **ArborFlow**
 - Curb Inlet
 - Permeable Paving

