RAINGARDEN MAINTENANCE
Long term maintenance and resetting

Kerrie Burge

FAWB
Facility for Advancing Water Biofiltration

EDAW | AECOM

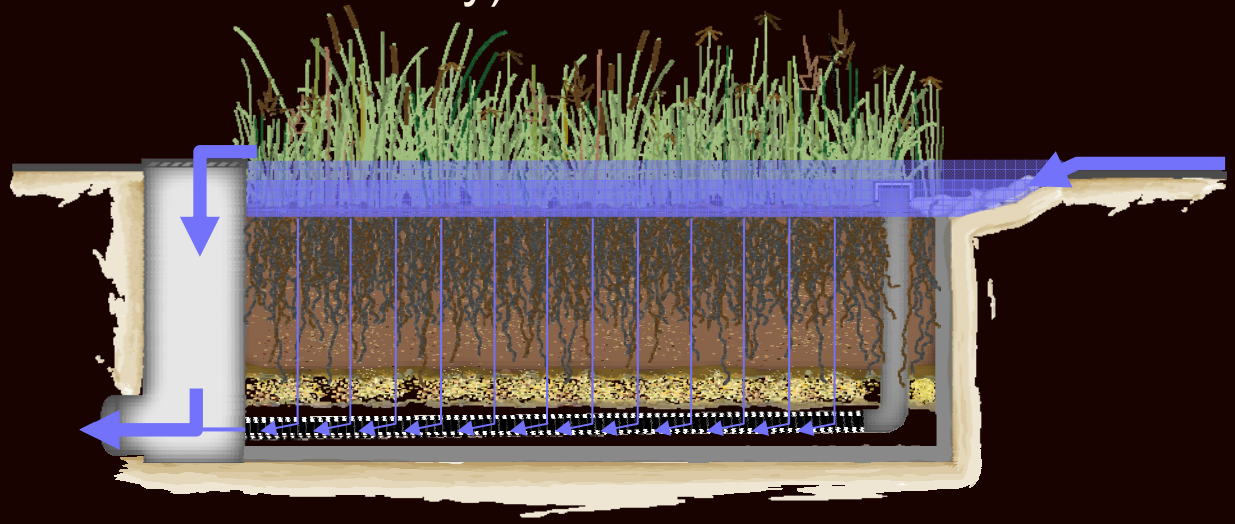
What is the objective of long term maintenance?

- Maintaining aesthetics

  (wide variation depending on individual site, budget etc)

- Maintaining function

  (e.g. pollutant removal efficiency)

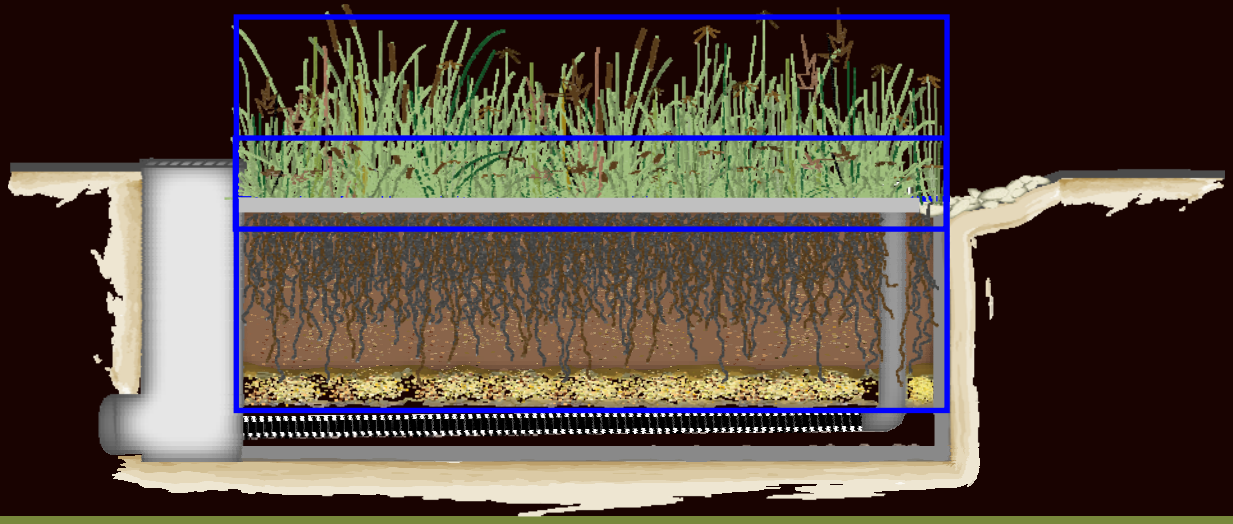


Key elements to long term function

Three elements that can greatly impact long term maintenance requirements

1. Correct filter media
2. Dense vegetation cover
3. Protection during construction

→ **Long term maintenance predictable**



FAWB Facility for Advancing Water Biofiltration

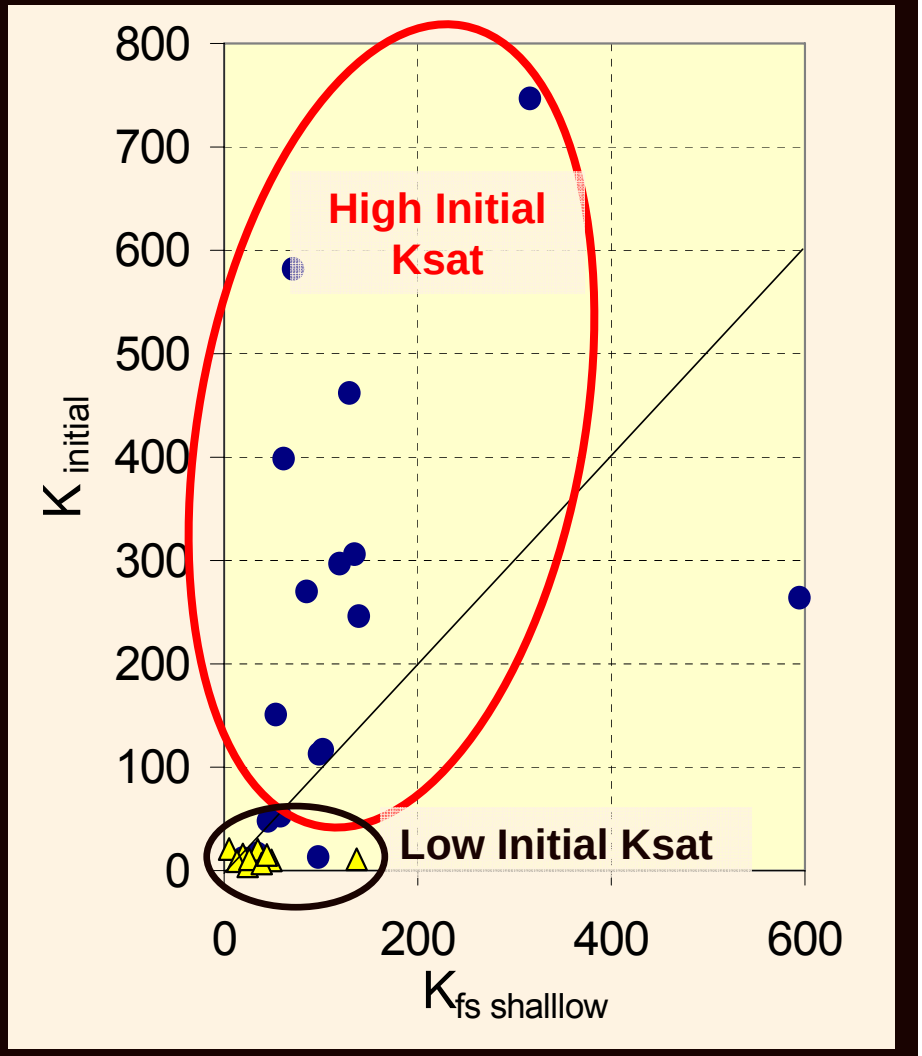
EDAW | AECOM

1. Filter media specification

- Correct specification (silt + clay)
  - Hydraulic conductivity
  - PSD
  - Soil properties
  - Soil nutrition
- Correct installation
  - light compaction

1. Filter media specification

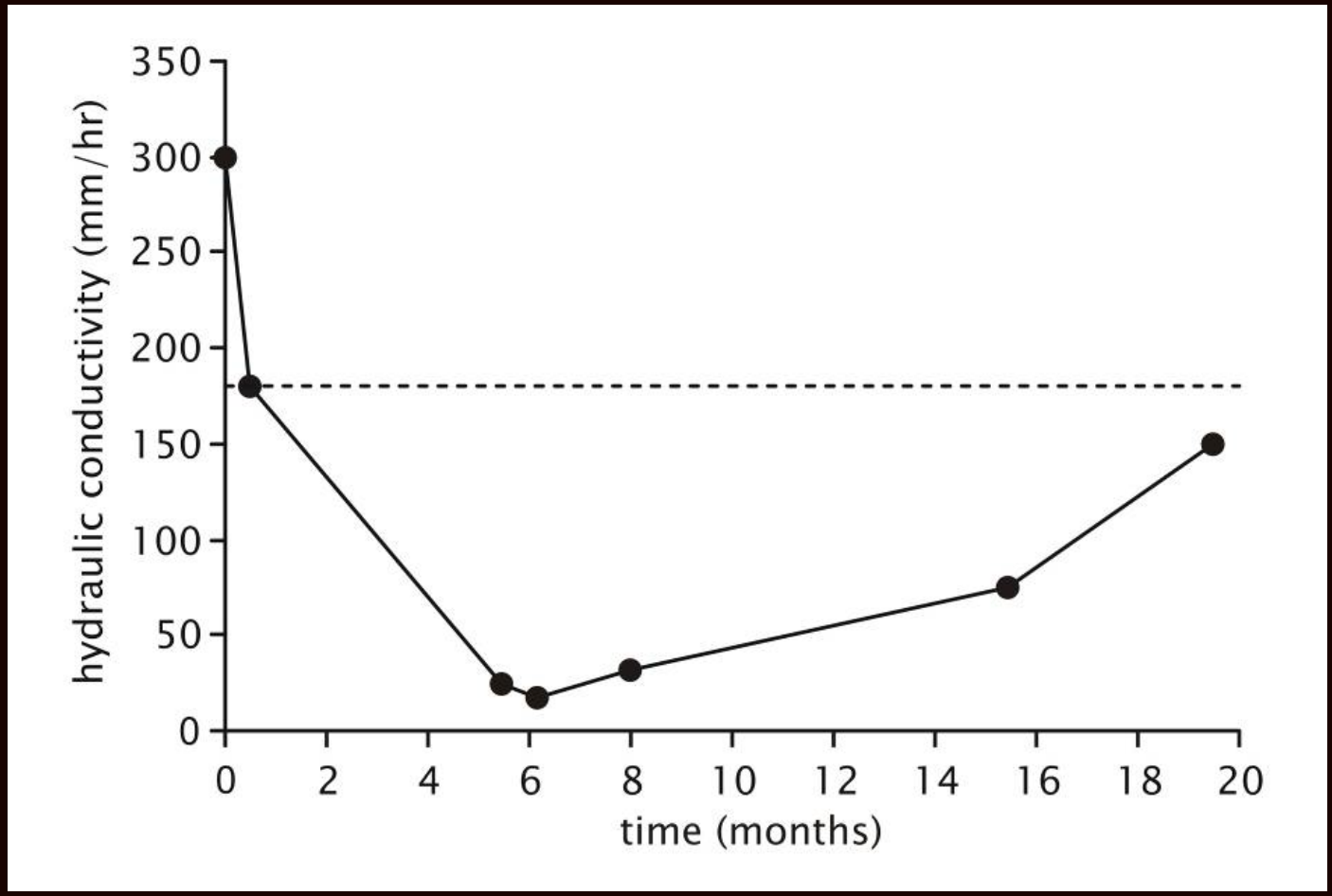
- Initial research (FAWB) on existing raingardens indicates:
  - » <u>High initial hydraulic conductivity:</u> decreases a lot – but stays within guidelines
  - » <u>Low initial hydraulic conductivity:</u> (initial soil specification inappropriate or incorrect): no evolution with time



2. Dense vegetation cover

- Research suggests pollutant removal efficiency related to root structure and density (FAWB)
- Plants have a role in the recovery of infiltration capacity (hydraulic conductivity) as they mature
  - » (FAWB Monash University Carpark Raingarden)
  - » (Bioretention Trials in CiCheng, China)

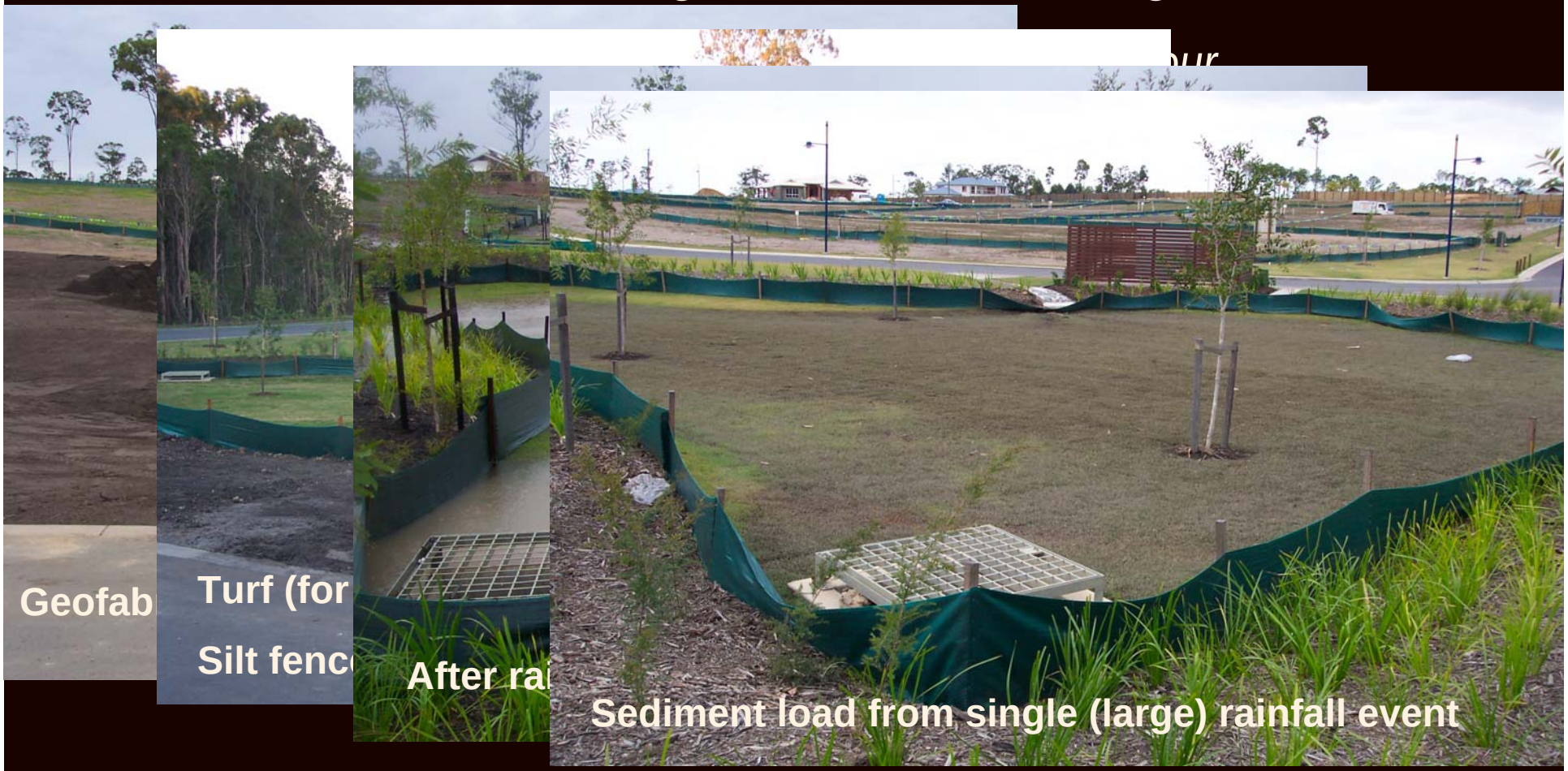
Effect of Vegetation on Filter Media Hydraulic Conductivity



FAWB Monash University Car Park Raingarden

3. Protection during construction phases

- Protection of the raingarden while its being constructed



3. Protection during construction phases

Temporary creation of sediment forebay

Long Term Maintenance Activities

Four areas of maintenance

- Horticultural
- Drainage
- Filter media
- Observation after rainfall to check infiltration

Horticultural - Long Term Maintenance Activities

- Maintain high plant densities
  - » *replacement lost plants (check appropriate of species is large losses occur – shade and frost tolerance)*
  - » *limit trimming*
- Weed control (manual)
  - » *manage/reduce herbicide use to prevent overspray*
- Pest & disease control

Drainage - Long Term Maintenance Activities

- Removal of blockages from inlets, outlet and overflows
- Check for structural integrity of civil works
- Occasional sediment removal from pits and entry sites etc.

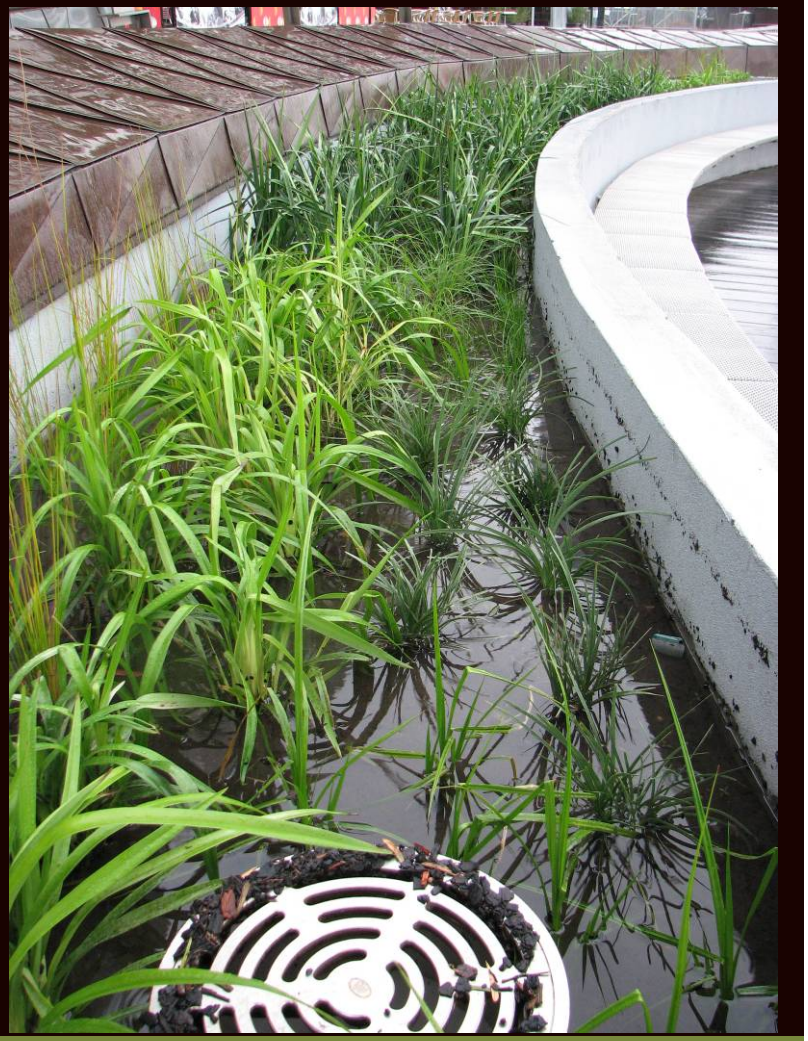
  (likely to be an irregular occurrence in a mature catchment)

Filter Media - Long Term Maintenance Activities

- Sediment removal
  - » *from forebays in raingardens and on surface of street tree raingardens*
- Infill of holes (i.e. from tree stakes)
- Repair erosion or scour (assess cause including distribution of inflow)
- Anthropogenic litter removal
  - » *and removal of leaf litter from tree pits where no understorey vegetation is present*

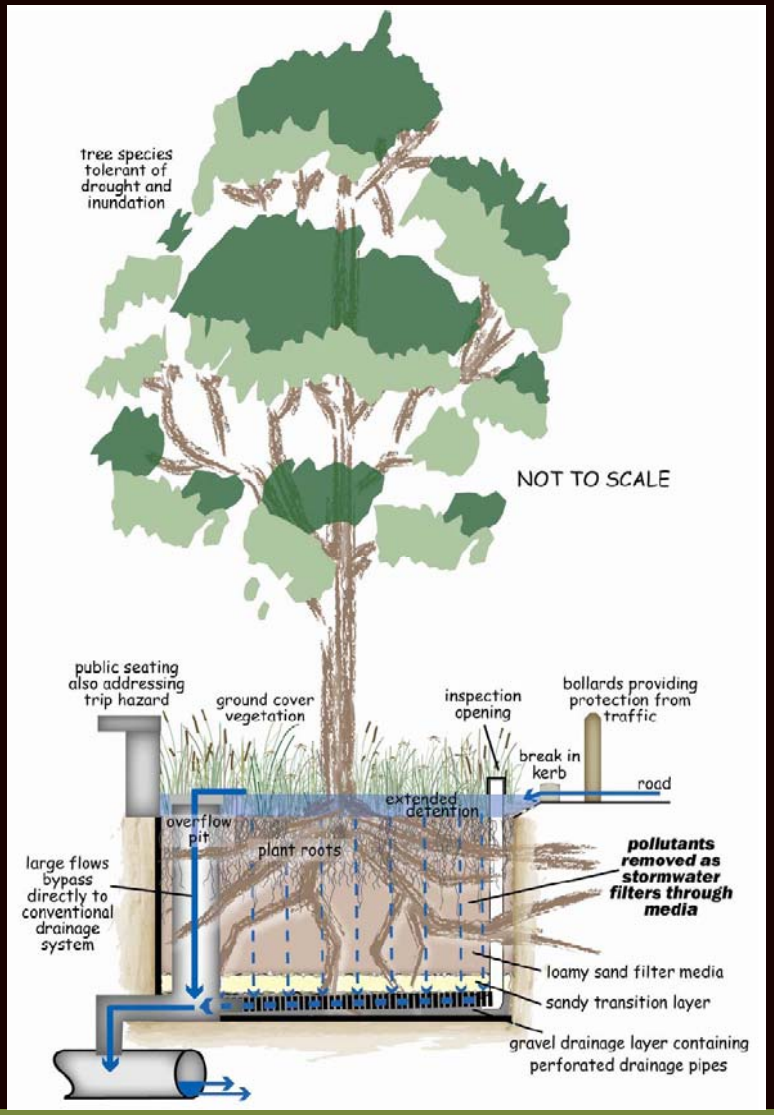
Observation - Long Term Maintenance Activities

- Observation after rainfall to check infiltration
  - » If other factors ok (e.g. no pipe blockage and vegetation densities high)
  - » Check land use - Has it altered or does it vary from design capacity (e.g. unusually high sediment loads may require installation of a sediment forebay)

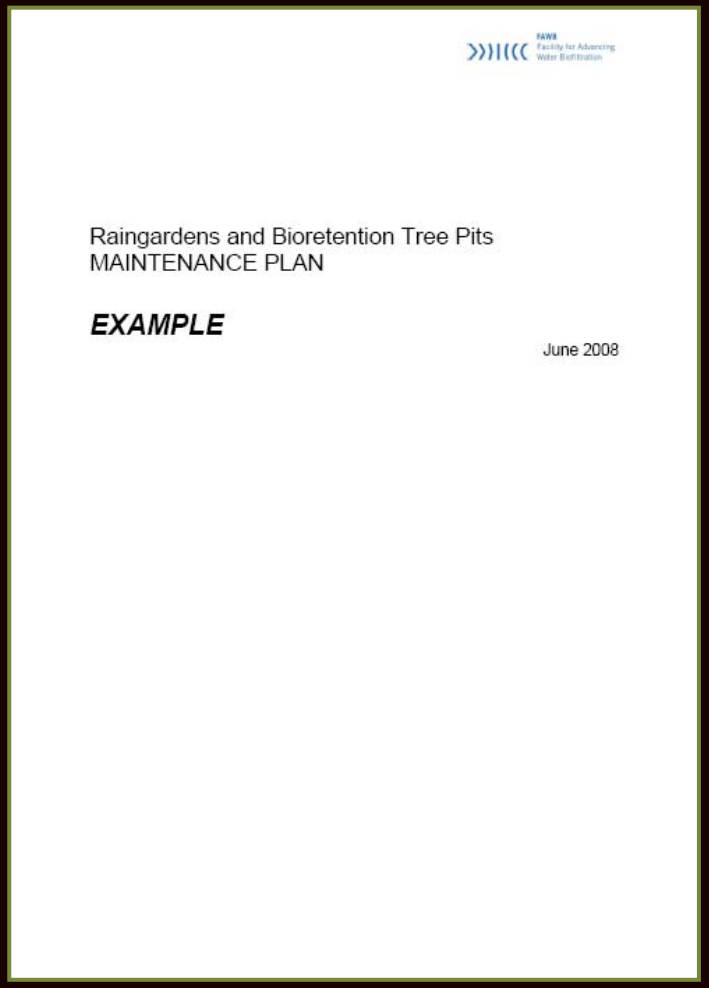


Other considerations for successful maintenance

- Maintenance plan
  - » *Include description and sketch of how the system operates*
- Identify maintenance jurisdiction
- Delineate raingarden
  - » *Defines area where the maintenance is required*
- Irrigation during dry spells*
  - » *May become part of maintenance (predictive not regular maintenance)*



Maintenance plans - TEMPLATE


Raingardens and Bioretention Tree Pits
MAINTENANCE PLAN

EXAMPLE

June 2008

Template maintenance plan (raingardens and tree pits)

- Facility for Advancing Water Biofiltration (FAWB) website
  http://www.monash.edu.au/fawb/products/

Broader discussions on variety of WSUD

- EPA, Maintaining water sensitive urban design elements

Checklists for maintenance of various WSUD elements

- WSUD Engineering Procedures: Stormwater Manual

Key elements during design and construction

- Correct filter media
- Dense vegetation cover
- Protection during construction

Predictable long term maintenance activities

- Horticultural
- Drainage
- Filter media
- Observation after rainfall event

Questions?

FAWB
Facility for Advancing
Water Biofiltration

EDAW | AECOM

Other considerations

- Roots in drainage pipes

  generally not an issue – capacity of perforated pipes far exceeds infiltration capacity of filter media

- Harvesting of plants

  generally not required - only to open canopy and promote understorey growth

Resetting

- Two reasons why raingardens require setting
  - » Clogging
  - » Pollutant breakthrough

Clogging

Assuming correct media specification and placement

Observation indicate surface of filter media is clogged

(e.g. extended ponding on surface, plant failure)

1. Poor plant growth or low densities → Re-establish plants to manage surface porosity

2. Plant growth ok → filter media failure → replace top 200-300 mm filter media and check catchment landuse

Pollutant breakthrough

- Soil media has reached capacity (e.g. for retaining metals) and leaching occurs

RECENT RESULT ON BREAKTHROUGH OF METALS

- For a typically sized biofilter - 2% of imp. catchment area, 0.5 m deep
- Preliminary results indicate breakthrough will not occur for at least 15 years
- Conservative because testing was done at a low pH (~5.6)
- At a neutral pH it is expected typical raingarden will demonstrate an even longer lifespan