Key recommendations for design of biofiltration systems

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Biofilter Design

Design will depend primarily on

- System objectives
  - Pollution control
  - Runoff reduction (volume, frequency)
  - Stormwater harvesting, etc
- Site characteristics
  - Climate
  - Available size
  - Opportunities & constraints

1. Soil Filter Media

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FAWB Filter Media Guidelines

- ***Hydraulic conductivity***
  - depends on objectives and site
  - Ks of 100-300mm
  - Must be tested!
  - Design/model at 50% of design value
- ***Particle Size Distribution*** (PSD):
  - clay and silt fractions (< 6um) less than 3 %,
  - continuous size grading;
- ***Minimal organic matter*** and ***TP*** content **< 100 mg/kg**;
- Soils used in the filter should be ***structurally stable***

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2. Selecting vegetation

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Vegetation

- Plants are critical for nutrient removal & hydraulic conductivity
- Selection for N is critical
  - Best genera so far: *Carex, Melaleuca, Juncus, Goodenia, Ficinia*
- Mix required for sustainability

3. Saturated zone with carbon to enhance nitrogen removal

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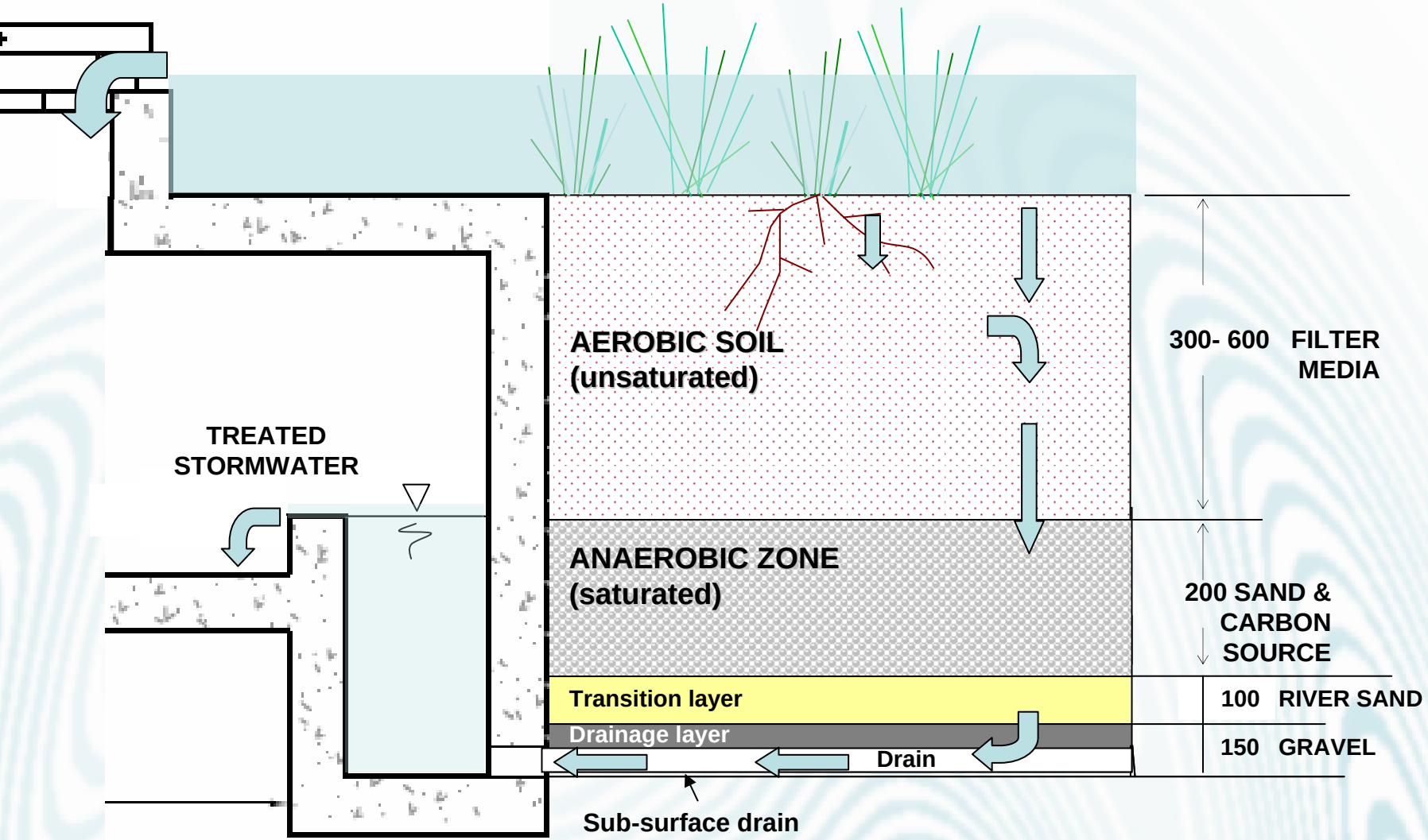
Design Examples: With Anoxic Zone



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Anoxic Zone with Carbon

- **450 mm deep** (consisting of sand or gravel) **with a carbon source** such as hardwood chips (5% by volume)

- Help to buffer against dry periods

4. Hydraulic conductivity

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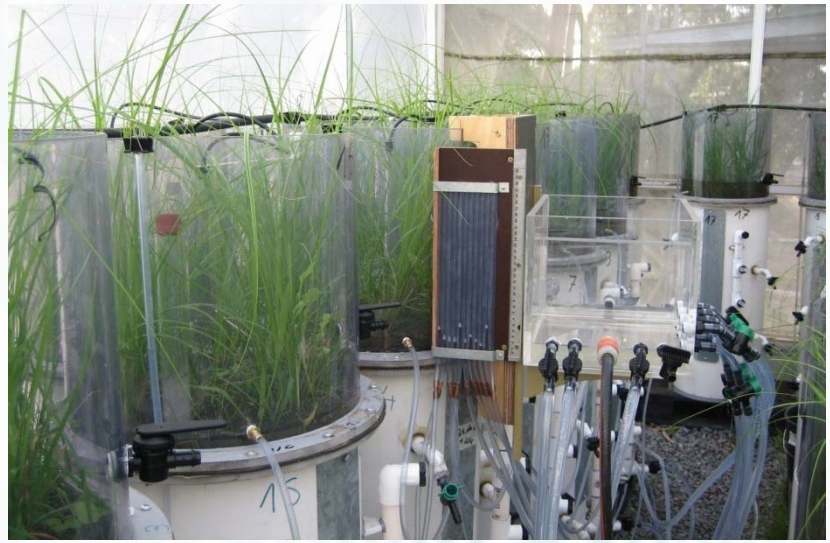
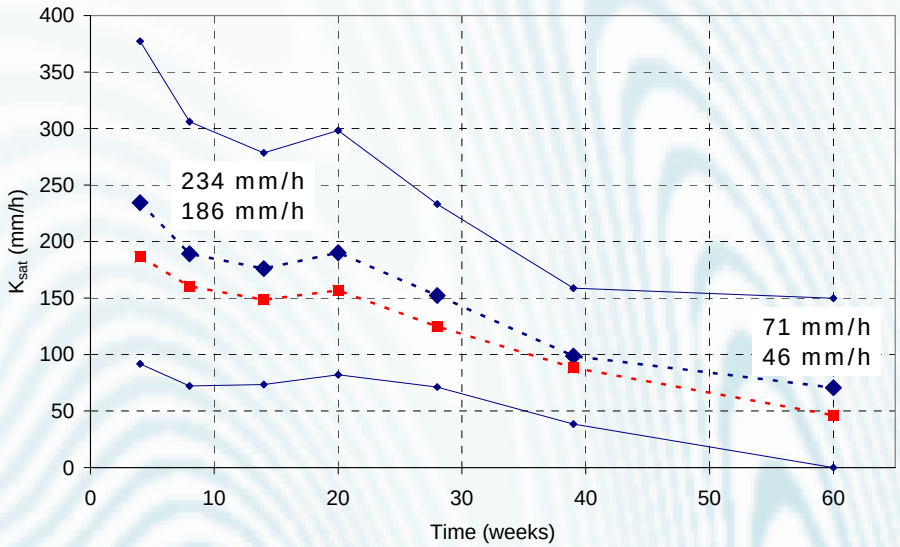
What governs hydraulic performance?

- **The media type is critical**
  - *Initial Ks of filter media*
  - *Soil structural stability*



- As well as:
  - *System size*
  - *Inflow with high silt loads*
  - *Presence of thick-rooted vegetation*



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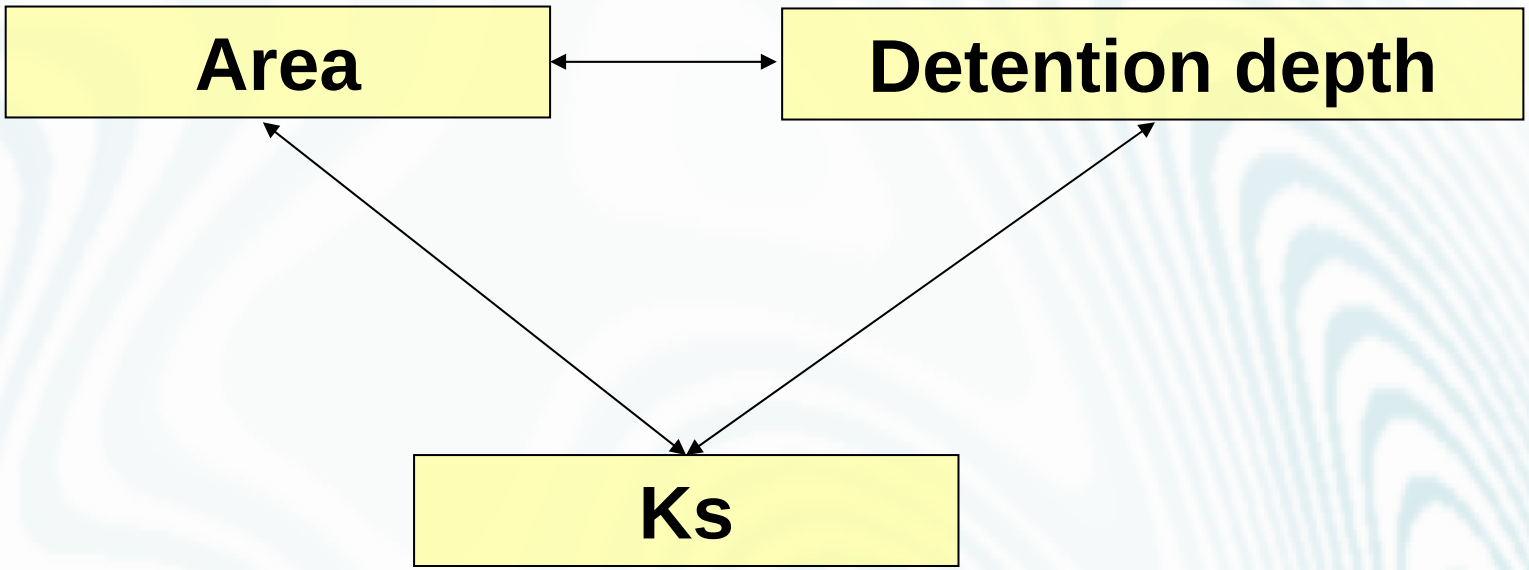
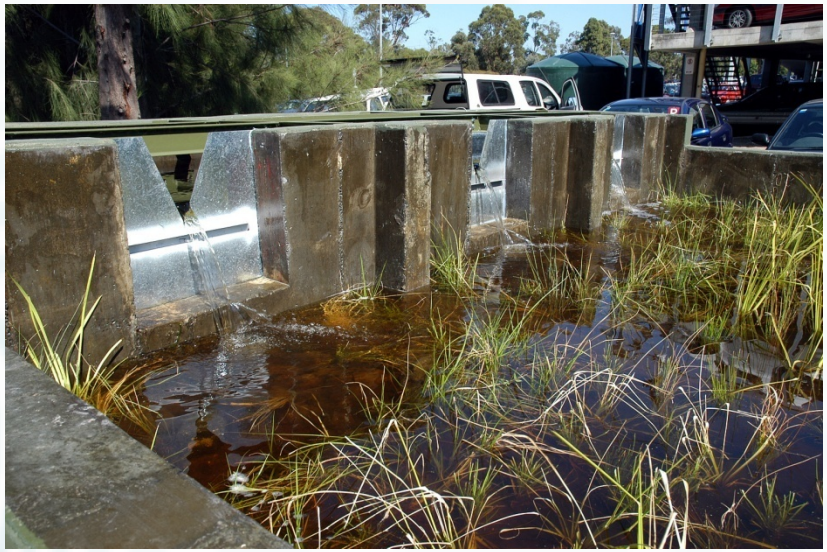
Consider Ks as one of 3 factors in design



50% "safety coefficient" in Ks

5. Treatment Performance



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What performance can we expect?

If designed properly vegetated, soil-based biofilters will reduce

- Over **95%** of TSS,
- Over **85%** of TP,
- Over **50%** of TN (even over **70%** for some configurations)
- Over **90%** of heavy metals
- High level of pathogen removal (>80%)

6. Combining WQ & flow management

- Aim is generally to manage both water quality and flow impacts of urbanisation
- Design features to help flow management:
  - unlined wherever possible
  - maximise opportunity for infiltration and evapotranspiration
    - Elevated outlet or no overflow only (infiltration)

7. Construction and Maintenance

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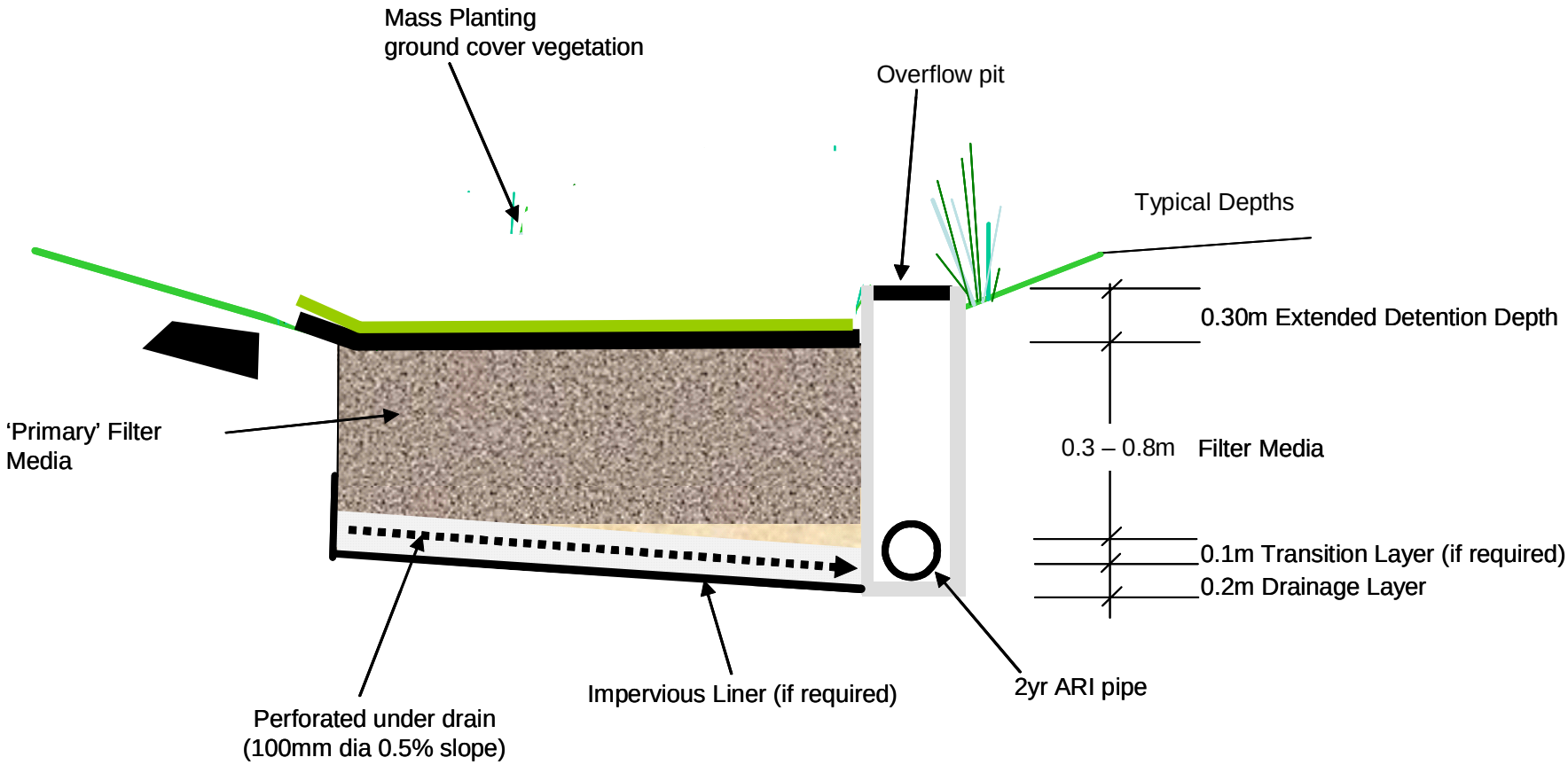
BIORETENTION BASINS – Stage 1



Key findings from field studies

- Some **leaching of silt and nutrients** during establishment phase (2-6 months).

- Effective communication between **designers and construction contractors is essential**

- **Maintenance requirements** initially high but reduces as vegetation grows (higher planting density helps)

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Last chance for Discussion

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