Sizing the Biofilter

things to consider…
Outline

• Typical approach to sizing
• Key factors to consider
  1. Design objectives
  2. Interactions between Ks and sizing
  3. Robustness
  4. Vegetation selection
Typical approach

- Modelling
- Lookup tables
What are our objectives?

- Pollutant load reduction?
- Runoff reduction?
  - Volume
  - Frequency
- Pre-filtering for stormwater reuse?

Model:
- TSS/TP/TN loads
- Heavy metal loads

Model:
- Runoff volume
- Days of runoff (export to spreadsheet)

Model:
- Yield
- Reliability
Interaction of area, depth & Ks

- Recommended range for Ks: 100 – 300 mm/h

To meet the design objective
Designing robust systems

• Design using all 3 parameters:
  – Ks
  – Area
  – Detention depth

• Consider what will happen if Ks drops
Field results: Hydraulic conductivity

- Observed ‘2 groups’:
  - Those with high initial conductivity (halved)
  - Those with low initial conductivity (unchanged)
Lab results: 125 biofilters – 60 weeks of ‘intense dosing’

![Graph showing the decline of Ksat over time with data points indicating specific values of 234 mm/h, 186 mm/h, 71 mm/h, and 46 mm/h.](image-url)
Influence of loading \(\approx\) biofilter size

- Laboratory study (Le Coustumer et al., 2007)

- High sediment C and high hydraulic loading (= small biofilter relative to catchment) decrease K
Using area and ponding depth to ‘buffer’ variations in Ks

Hydrological effectiveness (%)

Hydraulic conductivity (mm/h)

Ponding depth:
Thick: 30 cm
Dash: 10 cm
Thin: 5 cm

1.80%
1.65%
1.00%
0.60%
Given these results…

• Design and model based on Ks of half the design value
Ideas to increase effective size

• Breaking up the catchment
Ideas to increase effective size

- Breaking up the catchment

- Increase ponding depth
  - Use novel design to ensure safety
Biofilter Sizing: Key messages

• Infiltration performance is a function of 3 design parameters
  – Ks, Area, Ponding Depth
  – Systems must be designed/modelled in an integrated way considering all 3 factors

• Larger systems will be more robust against variations in Ks
  – consider breaking up catchment if area is limited

• Consider hydrologic effectiveness during design