Sizing the Biofilter

things to consider…

EDAW | AECOM

FAWB Facility for Advancing Water Biofiltration

MONASH University

Outline

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

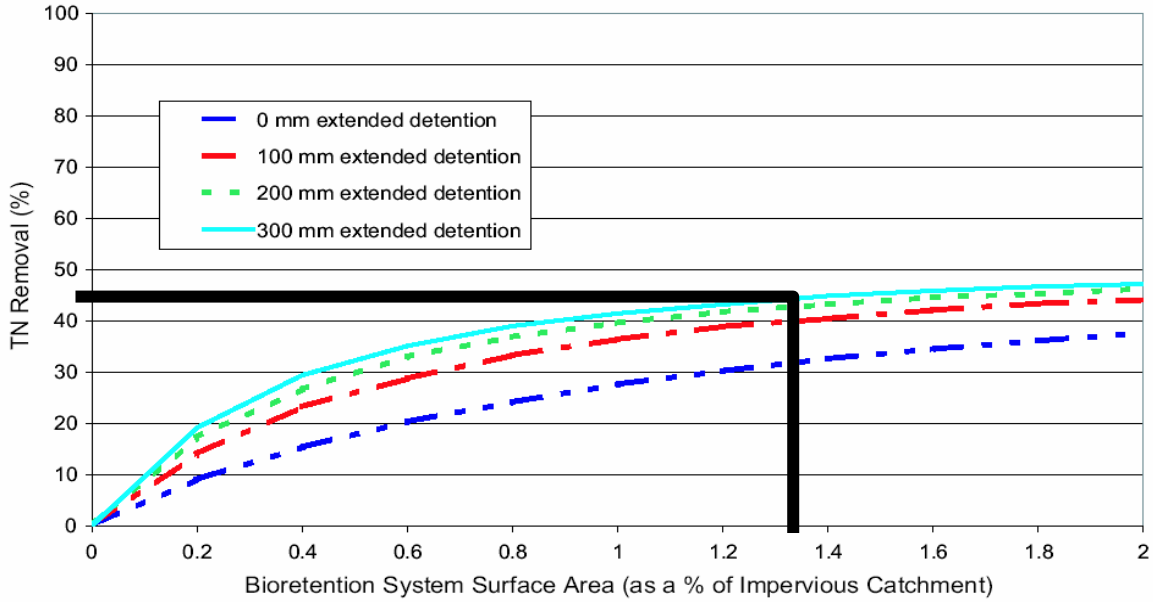
EDAW | AECOM

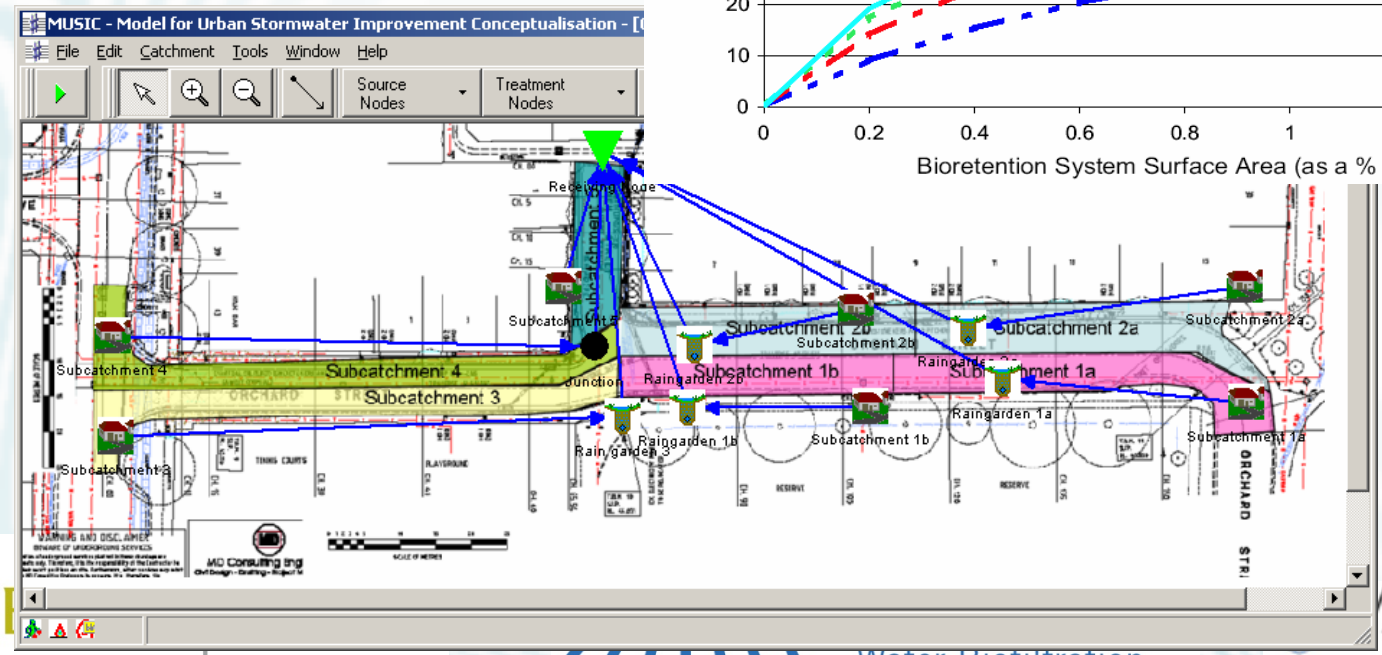
FAWB Facility for Advancing Water Biofiltration

MONASH University

Typical approach

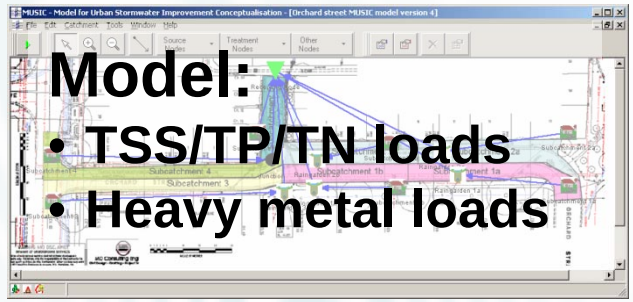
- Modelling
- Lookup tables



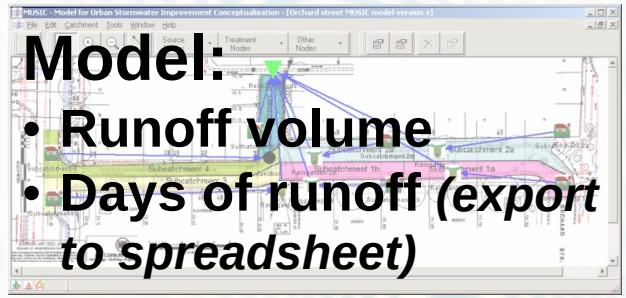


What are our objectives?

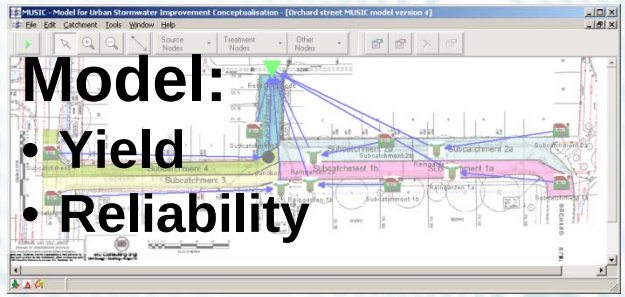
- Pollutant load reduction ?



- Runoff reduction ?
  - Volume
  - Frequency



- Pre-filtering for stormwater reuse?

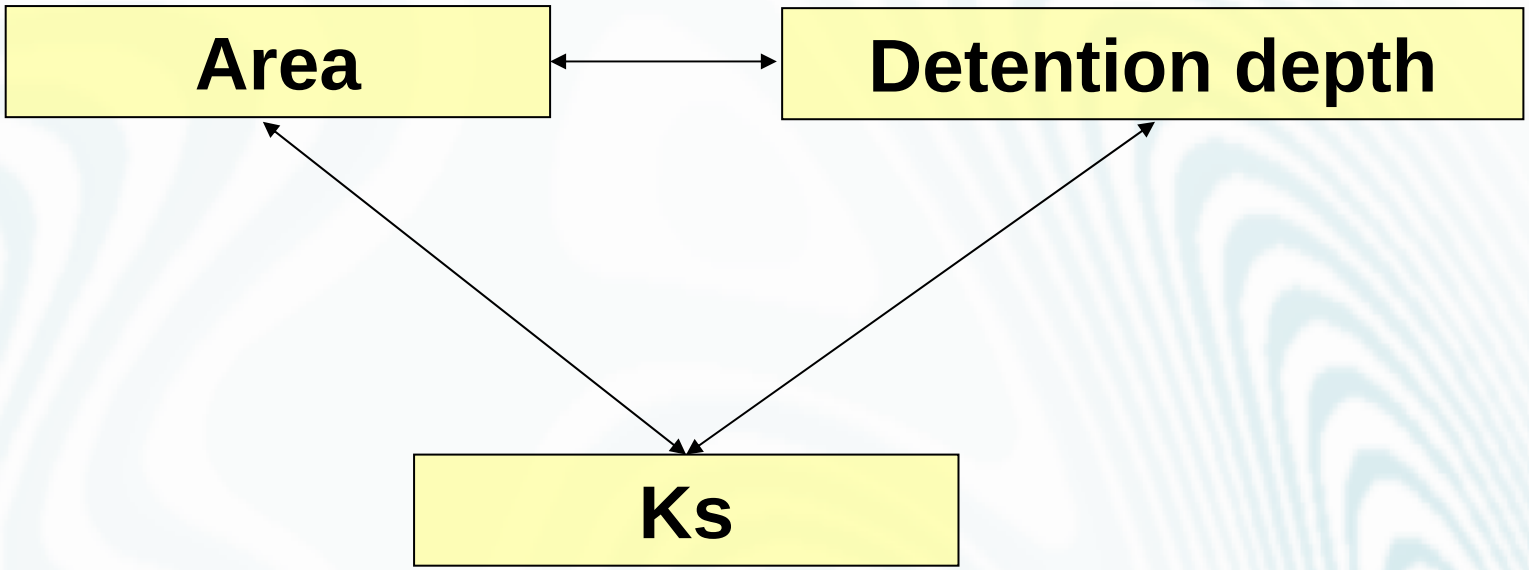


EDAW | AECOM

FAWB Facility for Advancing Water Biofiltration

MONASH University

Interaction of area, depth & Ks



To meet the design objective

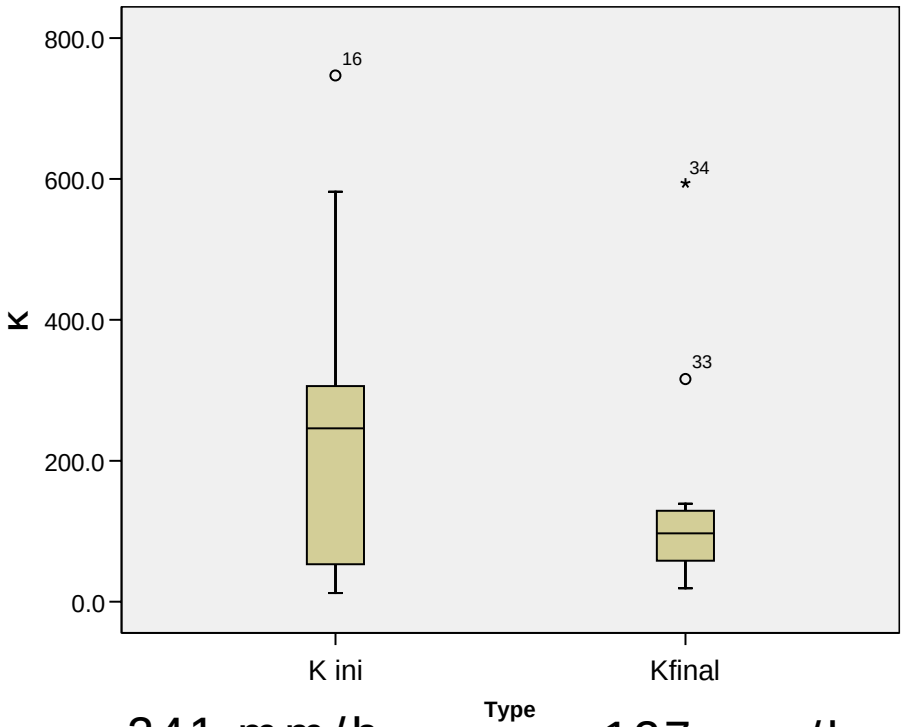
- Recommended range for Ks: 100 – 300 mm/h

Designing robust systems

- Design using all 3 parameters:
  - Ks
  - Area
  - Detention depth
- Consider what will happen if Ks drops

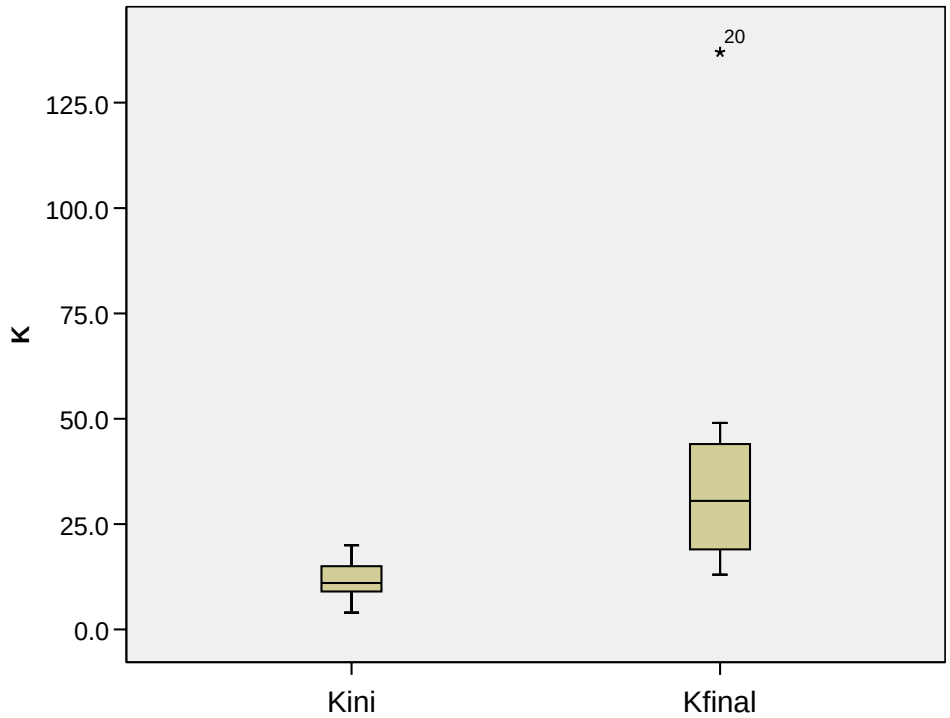
Field results: Hydraulic conductivity

- Observed ‘2 groups’:
  - Those with high initial conductivity (halved)
  - Those with low initial conductivity (unchanged)



241 mm/h

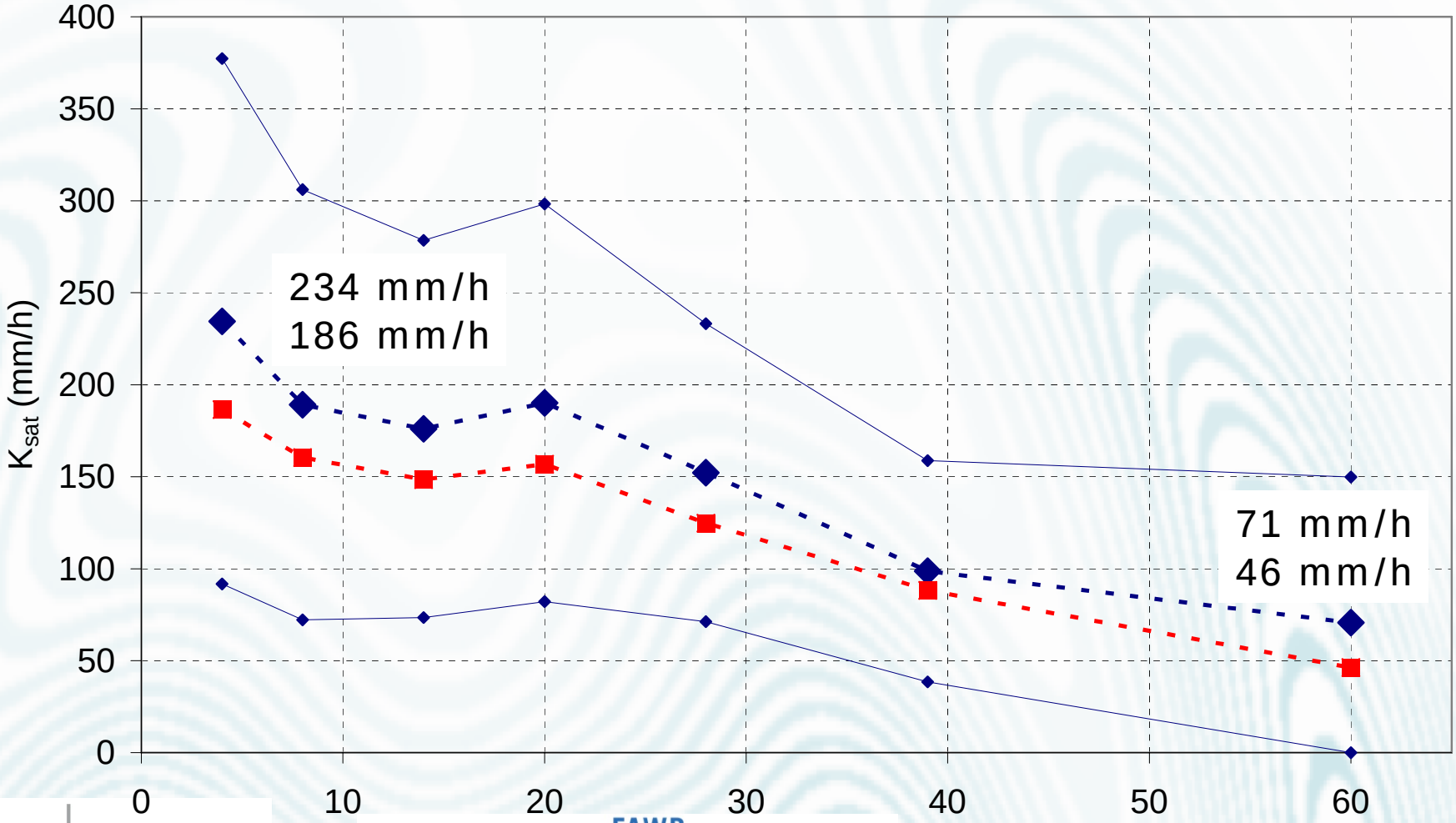
127 mm/h



12 mm/h

37 mm/h

Lab results: 125 biofilters – 60 weeks of ‘intense dosing’



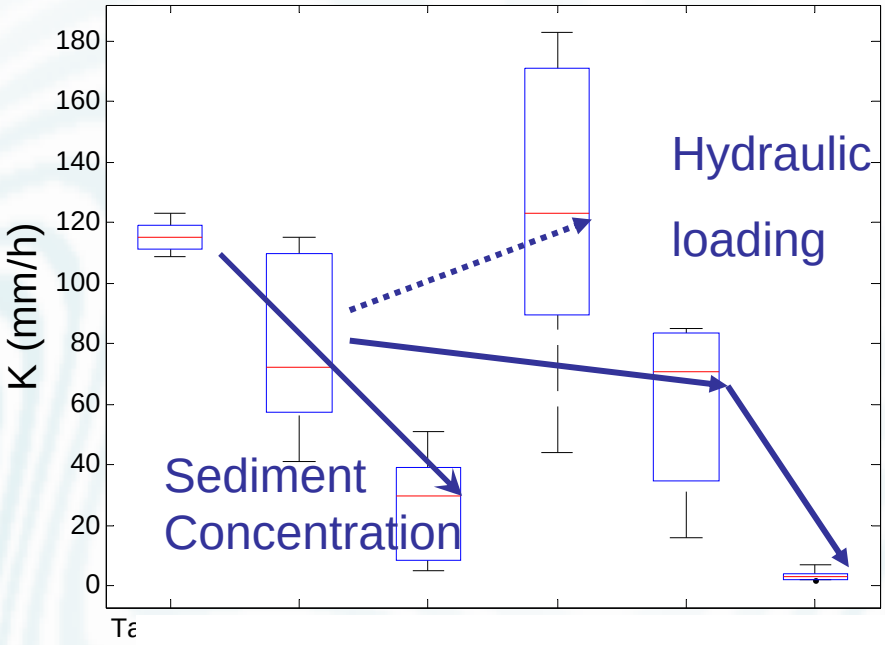
EDAW | AECOM

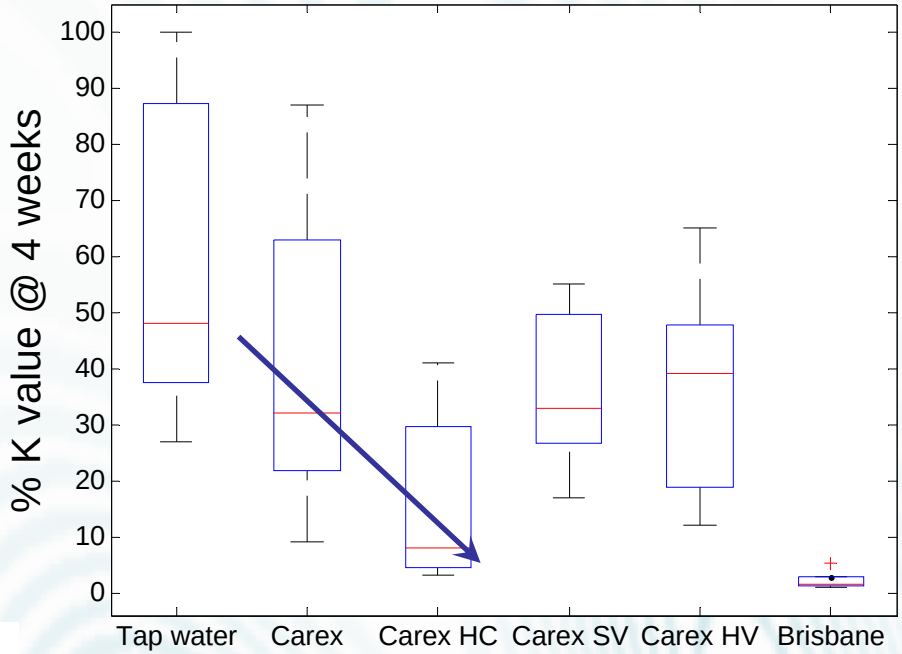
FAWB Facility for Advancing Water Biofiltration

MONASH University

Influence of loading ≈ *biofilter size*

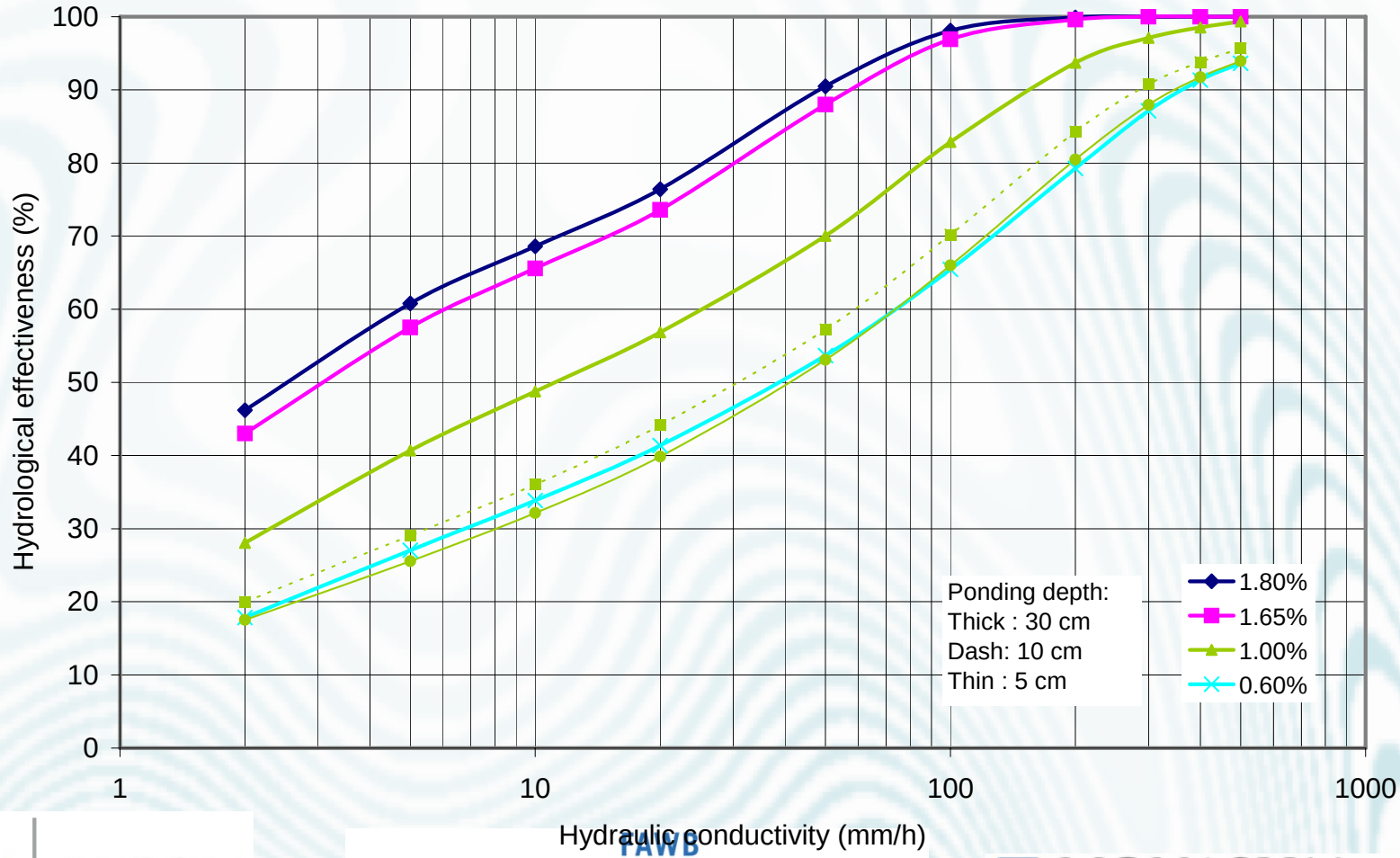
- Laboratory study (Le Coustumer *et al*., 2007)





- *High sediment C and high hydraulic loading (= small biofilter relative to catchment) decrease K*

Using area and ponding depth to ‘buffer’ variations in Ks



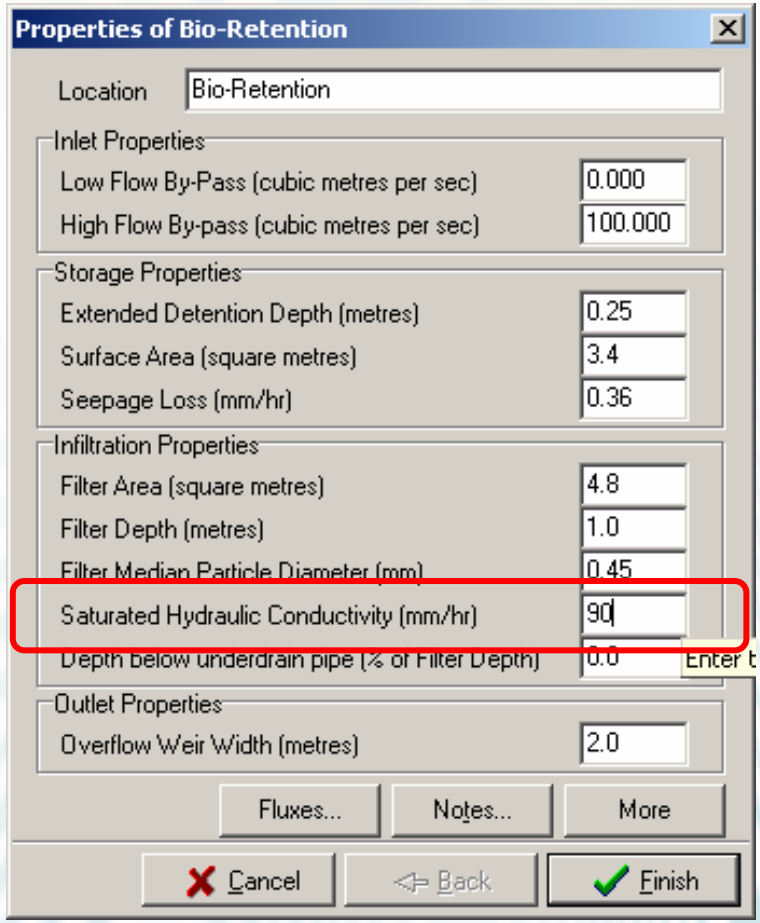
EDAW | AECOM

FAWB Facility for Advancing Water Biofiltration

MONASH University

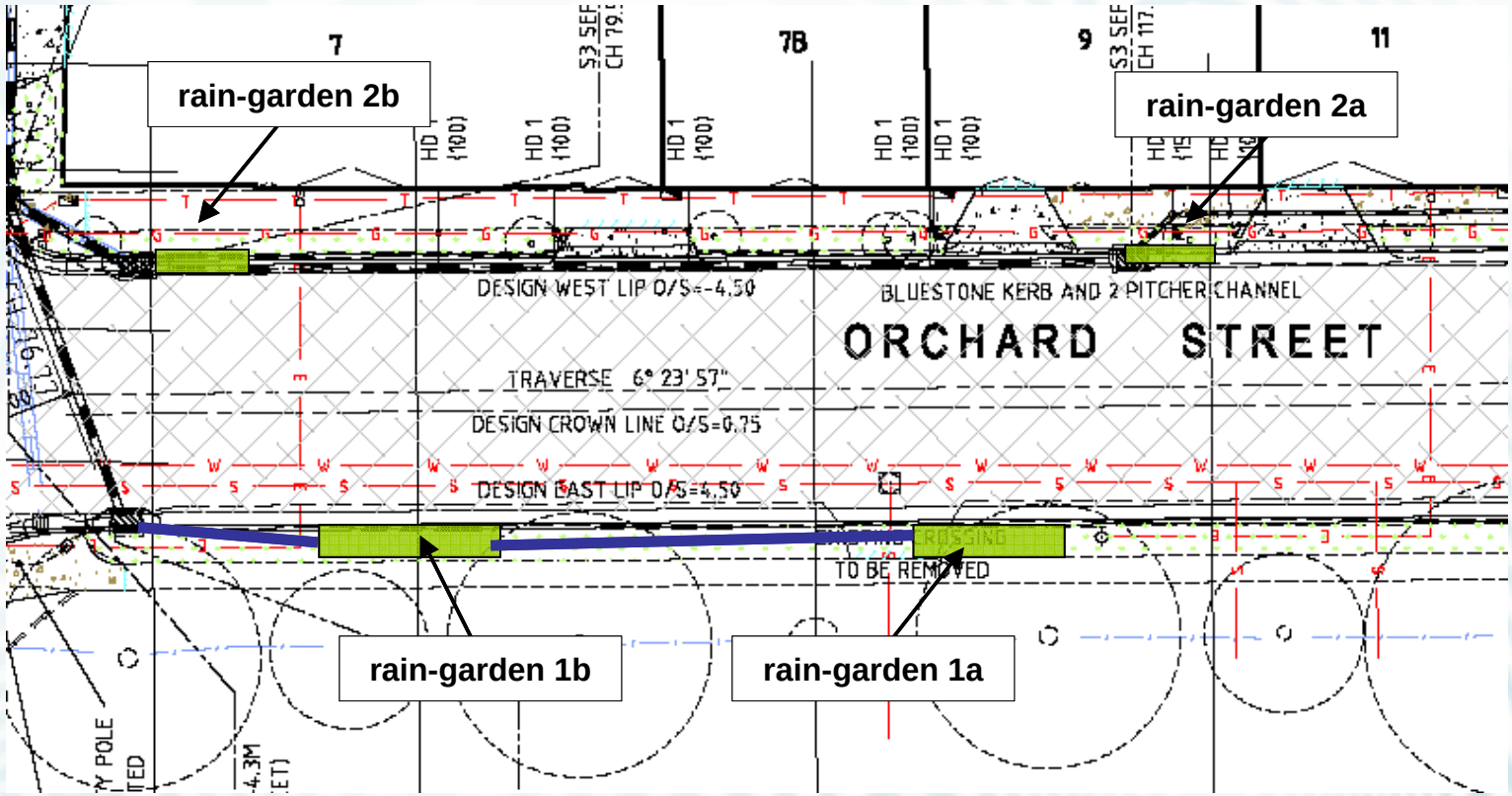
Given these results…

- Design and model based on Ks of <u>half</u> the design value



Ideas to increase effective size

- Breaking up the catchment



EDAW | AECOM

FAWB Facility for Advancing Water Biofiltration

MONASH University

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