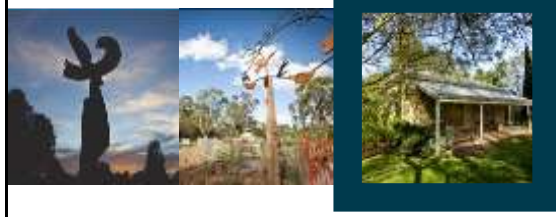
ZAM-WSUD

”Zero Additional Maintenance Water Sensitive Urban Design”



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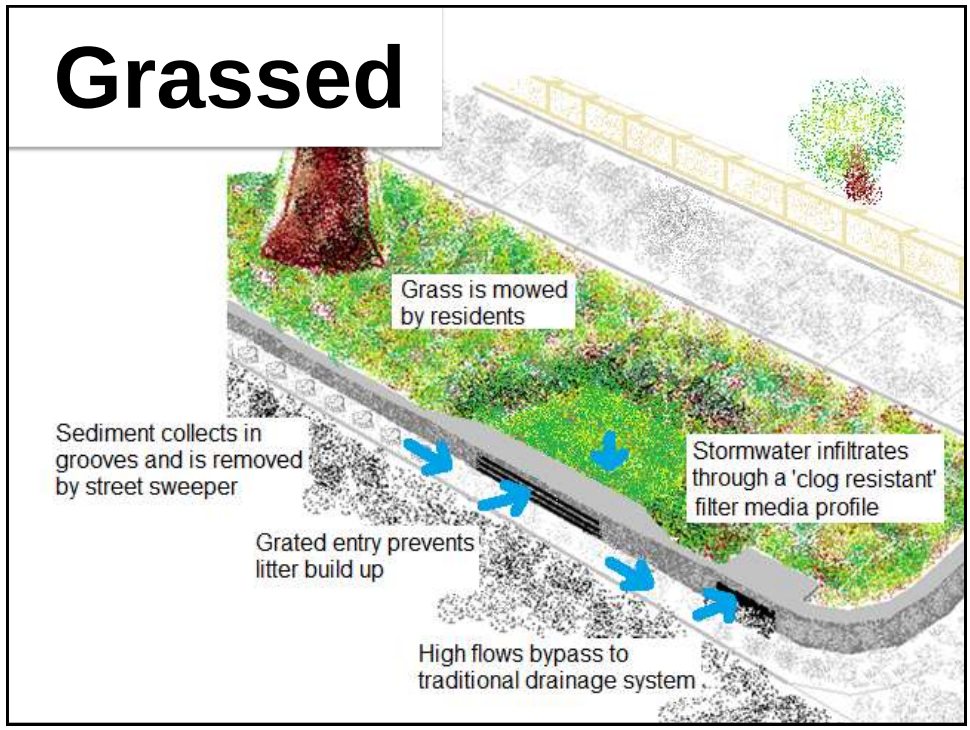
Manningham Council

What is ZAM-WSUD ?

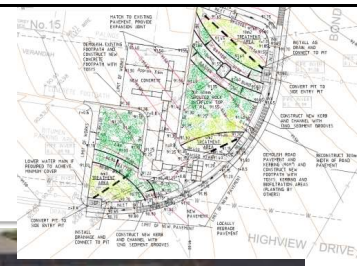
“A Design Philosophy”

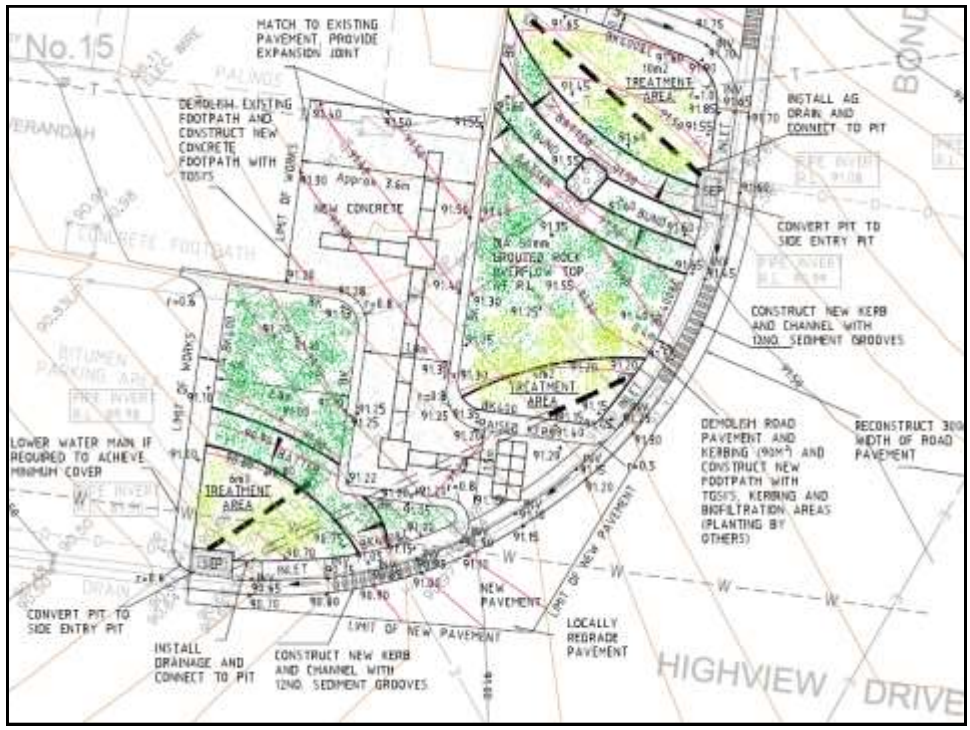
“WSUD without additional maintenance requirements for asset owners”

Grassed


Grass is mowed by residents
Sediment collects in grooves and is removed by street sweeper
Stormwater infiltrates through a 'clog resistant' filter media profile
Grated entry prevents litter build up
High flows bypass to traditional drainage system

Vegetated




No.15
MATCH TO EXISTING PAVEMENT, PROVIDE EXPANSION JOINT
DEMOLISH EXISTING FOOTPATH AND CONSTRUCT NEW CONCRETE FOOTPATH WITH TOSFS
Approx 3.6m
NEW CONCRETE
LIMIT OF WORKS
TREATMENT AREA
INSTALL AG DRAIN AND CONNECT TO PIT
CONVERT PIT TO SIDE ENTRY PIT
CONSTRUCT NEW KERB AND CHANNEL WITH 12NO. SEDIMENT GROOVES
DEMOLISH ROAD PAVEMENT AND KERBING (90m²) AND CONSTRUCT NEW FOOTPATH WITH TOSFS, KERBING AND BIOFILTRATION AREAS (PLANTING BY OTHERS)
RECONSTRUCT 30% WIDTH OF ROAD PAVEMENT
LOWER WATER MAIN IF REQUIRED TO ACHIEVE MINIMUM COVER
CONVERT PIT TO SIDE ENTRY PIT
INSTALL DRAINAGE AND CONNECT TO PIT
CONSTRUCT NEW KERB AND CHANNEL WITH 12NO. SEDIMENT GROOVES
NEW PAVEMENT
LIMIT OF NEW PAVEMENT
LOCALLY REGRADE PAVEMENT
HIGHVIEW DRIVE

Why ZAM-WSUD ?

"MAINTENANCE COST ROADBLOCK"

Typical Annual WSUD Maintenance Costs:

Street scale	$30m^2$
Larger scale systems in public open space	$10-15m^2$

References: National Conference of the Stormwater Industry Association Conference Proceedings, 2010, and Melbourne Water, 2013.

Asset Owner Costs

Example: Manningham Council

- 575km of sealed roads
- 7,000,000m^2 of impervious area
- ~120,000m^2 of raingardens
- $3,000,000 per year
- **About 3% of annual budget...**

Can Costs be Reduced?

ZAM-WSUD Research Project

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Melbourne Water

CRC for Water Sensitive Cities

Monash Water for Liveability

Supported by Glen Eira Council

Aims

- No manual litter removal
- Prevention of sedimentation
- No filter media replacement
- No additional vegetation maintenance for asset owners

50+ year design life with zero additional maintenance for asset owners

Initiatives

- Grass mowed by residents
- In-kerb sediment capture *(removal by street sweeping)*
- Clog resistant surface layer
- Litter by-pass

Grass


Soft leaf buffalo grass

Initial trials:

-> Soft leaf buffalo

- Good heavy metal & nutrient removal
- Palmetto & Sapphire cultivars trialled

Residential –> Residents to mow

Reserves –> 'Normal' mowing by Council

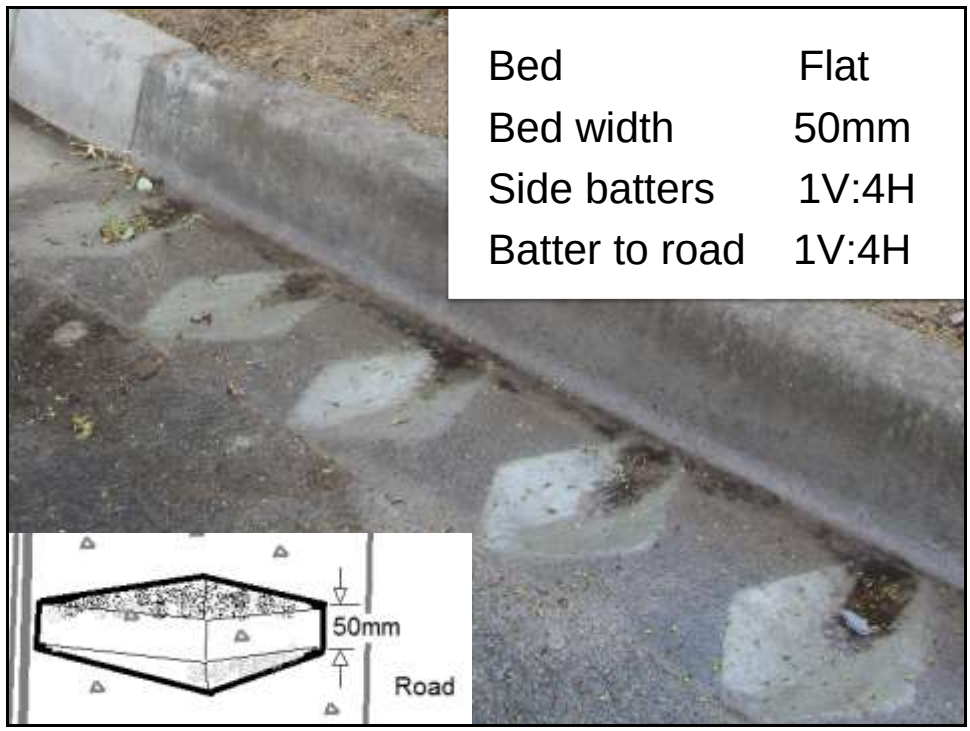
Channel Grooves

Trap sediment in roadway

- Sedimentation protection
- Street sweeper collection

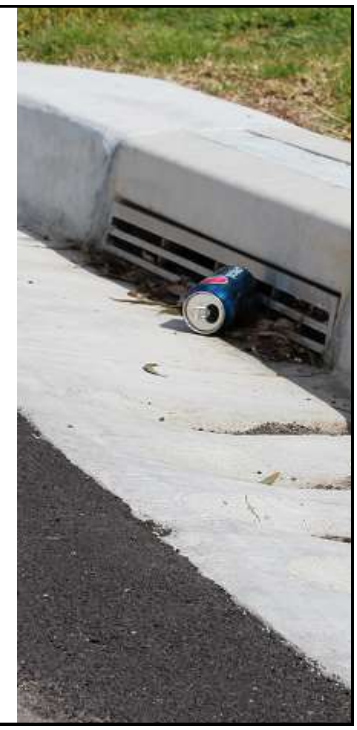
Groove design based on:

- street sweeper trials
- bicycle safety considerations


Bed Flat
Bed width 50mm
Side batters 1V:4H
Batter to road 1V:4H
50mm
Road

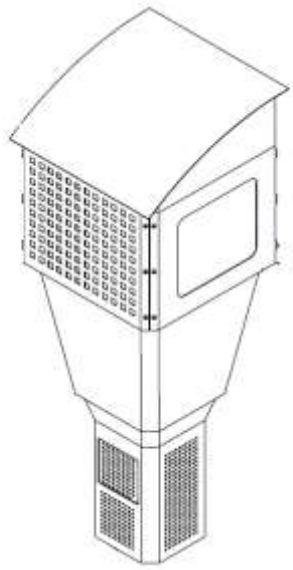
Grated Inlet

- Prevents litter entry
- Prevents scouring
- Flush with kerb face
- Cleaned by street sweeper



Available from R&S Grating

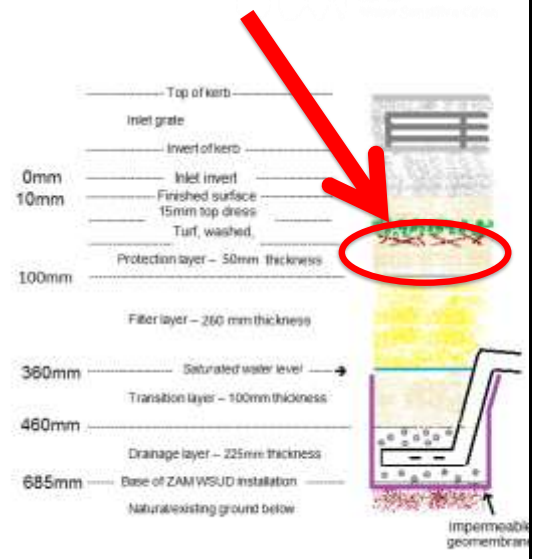
Very Low Maintenance GPT's



Manufactured in South Australia

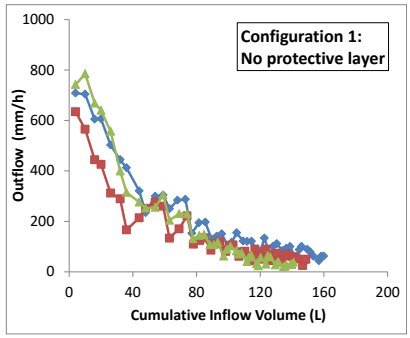
Protection Layer

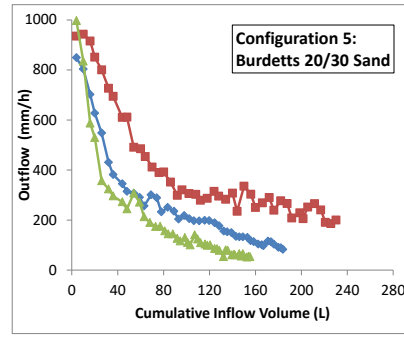
- course sand layer at top
- reduces filter media surface clogging
- 20/30 sand
- 50mm thick



Laboratory Testing

- Artificial stormwater inflow over 15 days
- Equivalent to 1.5 years of stormwater



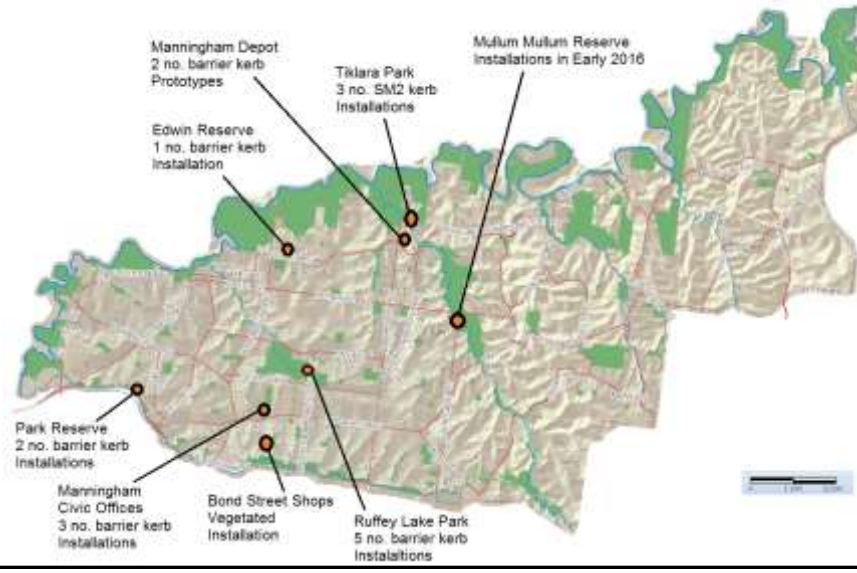


FAWB specification control (300mm) **20/30 Sand (100mm) above FAWB Spec (200mm)**

Post-settling outflow rates from designs with a protective layer 1.3 – 2 times higher than that with no protective layer.

Prototypes

Construction Phase




Concrete Pour


Sediment
Grooves

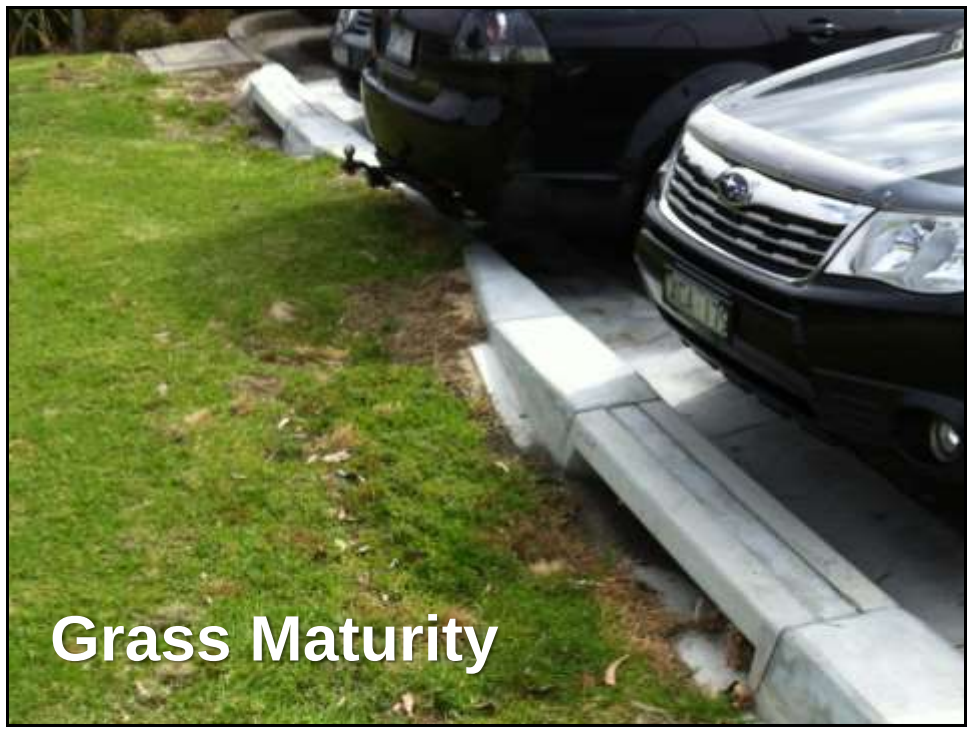
Commissioning Issues

- Concrete rubble left in filter media
- Incorrect liner used *(it was permeable)*
- Poor grass and plant establishment
- Grass dried out during establishment
- Soil pH *(concrete raises pH)*
- “Edge spraying” with herbicides


Turf Placement


Poor Initial Grass Establishment


Replanting


Grass Maturity

Continuous Improvement

Documentation changes:

- Watering requirements updated
- Fertiliser now recommended
- Alternative grass species trial

ZAM-WSUD Handbook

- Collaborative approach
- A shared resource
- Technical specifications
- Standard drawings
- Available on-line

www.clearwater.asn.au/resource-library/publications-and-reports/zero-additional-maintenance-water-sensitive-urban-design-zam-wsud-handbook.php

Grass Species Trail

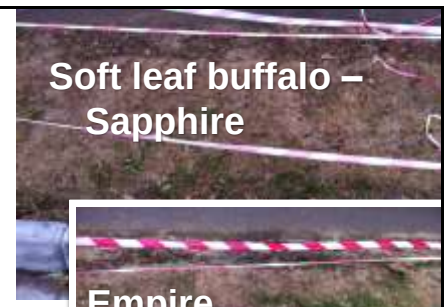
Field trials, 2016

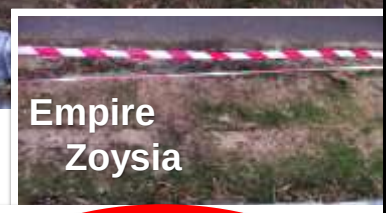
Laboratory trials, 2017

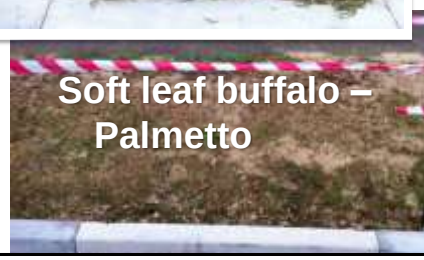
Soft leaf buffalo – *Sapphire, Palmetto*
Zoysia – *Empire, Nara Native*
Kikuyu (male sterile) – *Kenda, Village Green*
Couch -- *Santa Ana*


Field Trail

Observations







Current Status

- Sediment grooves – successful *(not yet quantified)*
- Grass survival – good, except for high traffic sites
- Mowability – successful
- Inlet – successful, some sedimentation behind inlet
- Trip hazards and cyclists – no incidents
- Filter media clogging – no issues
- Nutrient removal – confirmed for buffalo, **other species being tested in 2017.**
- Residential nature strip installations – **community response not yet confirmed.**

Transitioning to ZAM-WSUD as 'Business as Usual'

- Communication essential
- Change is difficult!!!
- Victoria – No mandatory implementation


Existing WSUD


WORRELL ST ZAM-WSUD LAYOUT PLAN
Place 4m2 of 300mm diameter rockwork. Top of rockwork to be below inlet invert level
Install double lintel ZAM-WSUD inlet with ZAM-WSUD inlet grate and concrete tray at bottom (as per MCC standard drawing S408)
ex pit
1.50
Locally excavate to make free draining
Demolish part pram crossing
Demolish part kerb and channel
Reconstruct kerb, channel and part pram crossing
Construct 4no. sediment grooves (as per MCC standard drawing S408)
Sawcut and replace 300mm width of asphalt
WORRELL ST.

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Questions?

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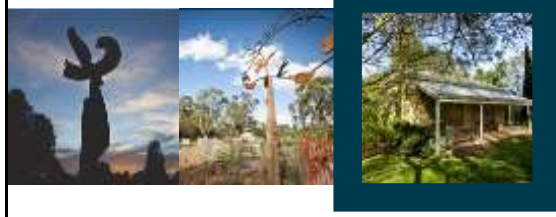
Manningham Council

Design Example



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Design Example

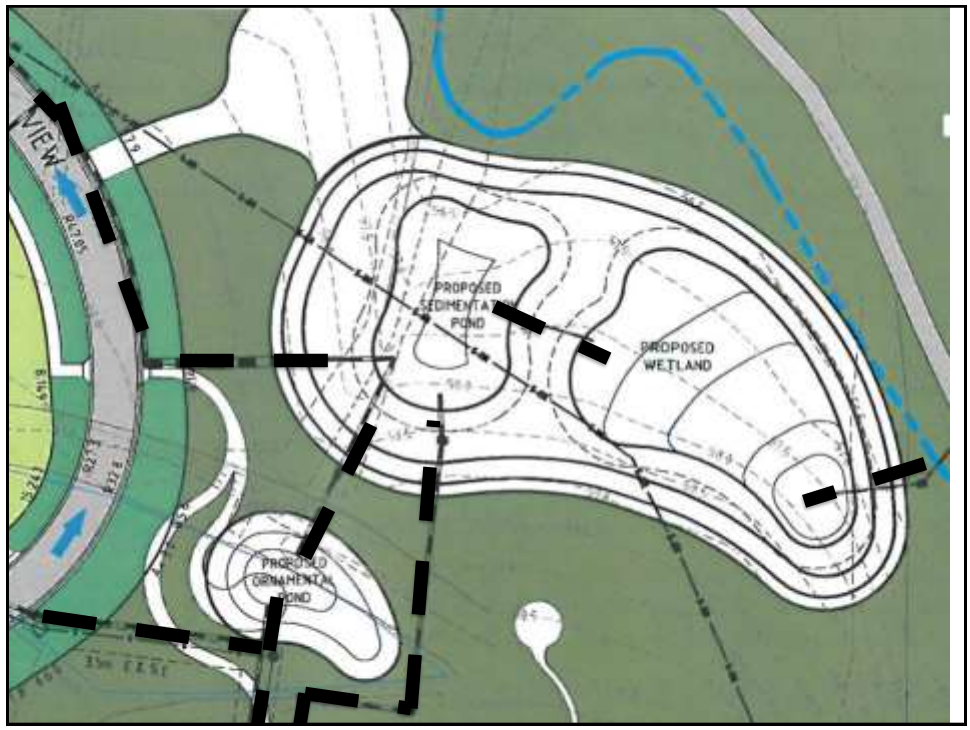
New Subdivision

- Identify opportunities
- Locate installations
- Installation details


LEGEND


BULLUM MULLUM CREEK LINEAR PARK


NULLUM MULLUM CREEK LINEAR PARK



Site Selection

Strategic Value
Drainage
Catchment Area
Road Gradient
Nature Strip Geometry
Trees

Pedestrians
Services
Vehicles
Residents

Strategic Value

Stormwater treatment requirements?

Receiving waterway ecological values.

Are there other existing or planned downstream stormwater treatments?

Drainage

ZAM-WSUD's do not replace stormwater pits

Install just upstream of existing pit

(maximises catchment area)

Catchment Area

Impervious catchment – 100m^2 to 400m^2

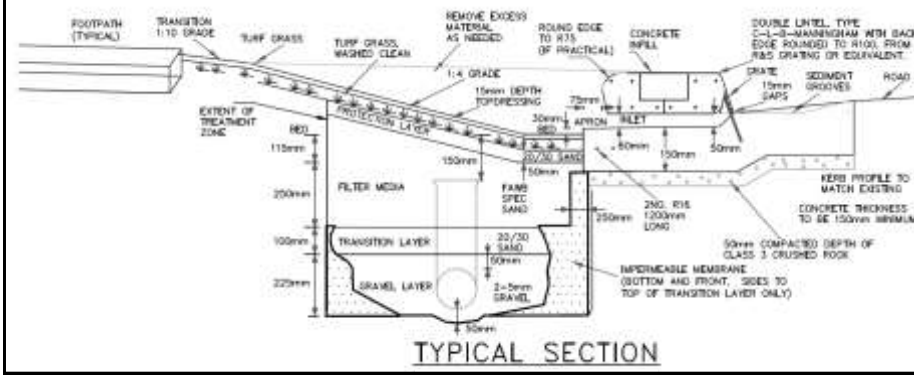
Larger area?
- Use multiple ZAM-WSUD's.

Road Gradient

- Scour risk - if gradient is too steep
- Velocity control can be used in inlet
- Successful installs at 1 in 12 grade
- Flatter than 1 in 10 preferable
- Wider nature strips needed if gradients are steeper

Nature Strip Geometry

- Footpath level similar to kerb
- Width at least 2m.



TYPICAL SECTION

Trees

- Tree roots remove nutrients and moisture
- Some trees release toxins

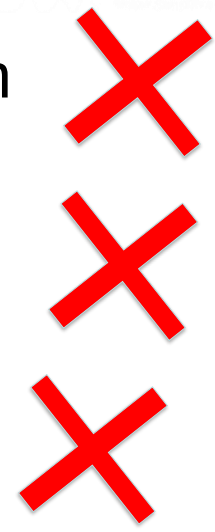
Locate ZAM-WSUD's outside of tree canopies

Services

- Services alterations can be costly
- Dial-before-you-~~dig~~-design **1100**
- Can build over many services
- Need to ensure “minimum cover” is maintained
- Consider service locating services

Pedestrians

- very high pedestrian traffic sites
- fast moving traffic close to kerb
- Very dark at night



Vehicles

- Crush filter media
  –> Potential for biofilter failure

Select sites where vehicle access is not expected

Residents

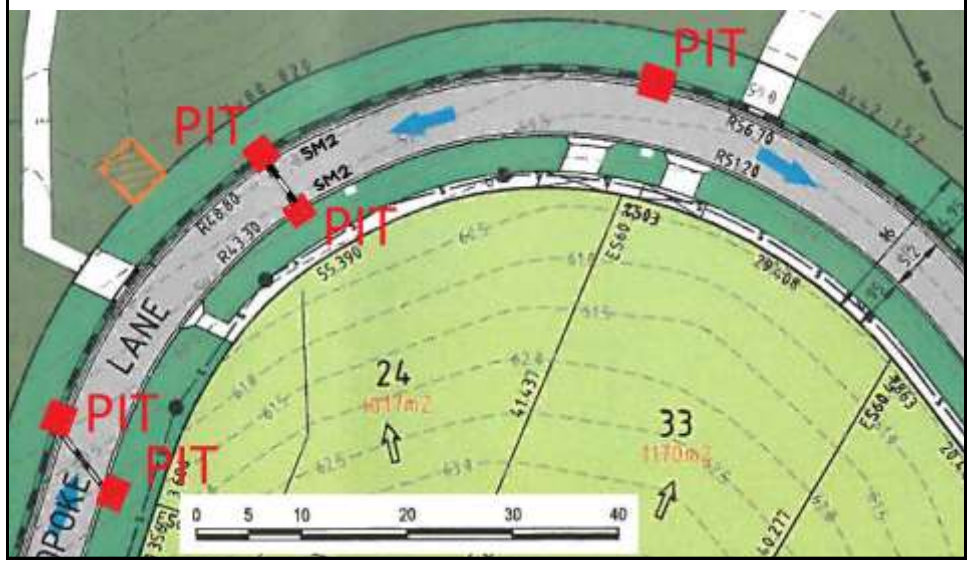
- Who will mow the grass?
- How will the resident/s respond to the installation?

Consult early

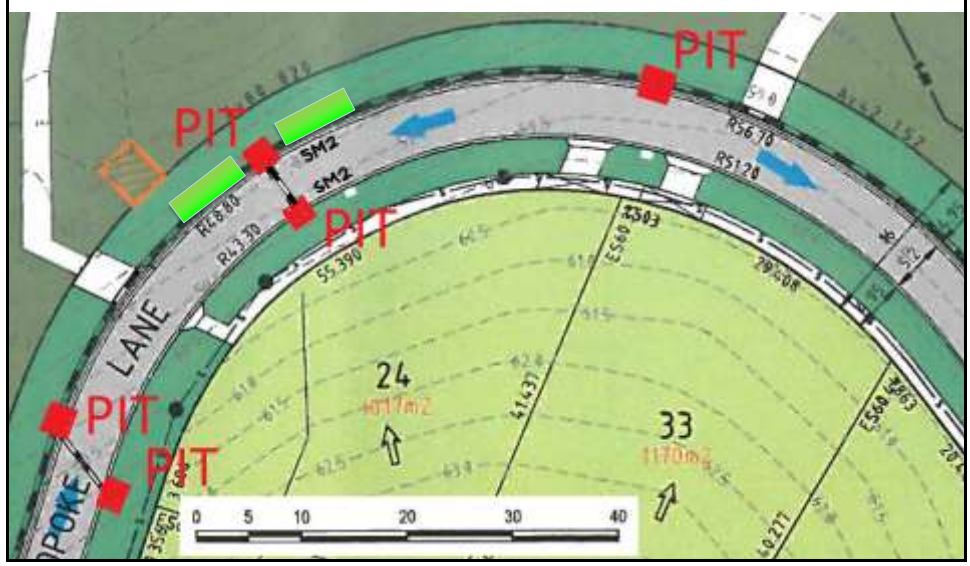

LEGEND


LEGEND

Design Example



Suitable Locations



Design Details

- Standard drawing number
- Number of sediment grooves
- Vehicles access issues
- Trip hazards
- Mowing

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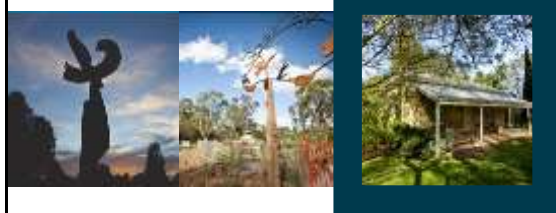
THANKS AND GOOD LUCK!!!



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