



Mellissa Bradley, Program Manager

Raingarden fundamentals and SA case studies

16 November 2016



Water Sensitive SA - established to build the capacity of all organisations with a role in the planning, design, approval, construction or maintenance of new developments and infrastructure to implement best practice water sensitive urban design (WSUD)

Water Sensitive SA Program Partners



LOCAL GOVERNMENT RESEARCH & DEVELOPMENT SCHEME



Guiding Principles of WSUD

- Re-integrate water back into urban landscape – create microclimate
- Re-use of water at source (or close as possible)
- Protect receiving water quality (streams and marine)
- Fit for purpose water use
- Solutions at a range of scales



Unions Street Dulwich, B-Pods
(infiltration systems)

Highlights package – streetscape solutions



Drawing upon:

Adoption guidelines for stormwater Biofiltration systems

CRC for Water Sensitive Cities.

Designing Streetscape Raingardens

DesignFlow.

Construction of WSUD Assets

Maintenance of WSUD Assets

DesignFlow.

1. Streetscape Solutions
2. Biofilters / raingardens
3. Raingardens and Trees



Angas Street, Adelaide adjacent SAPOL
Photo: Water Sensitive SA

Why choose a raingarden?

- Remove pollutants
- Create microclimate and reduce heat
- Amenity
- Local harvesting and re-use





Deacon Ave, Mile End



Franklin Street. Source: City of Adelaide



Lochiel Park, (SA)



Brooker Terrace, Richmond



Jellicoe Street, Auckland (NZ) Source: DesignFlow

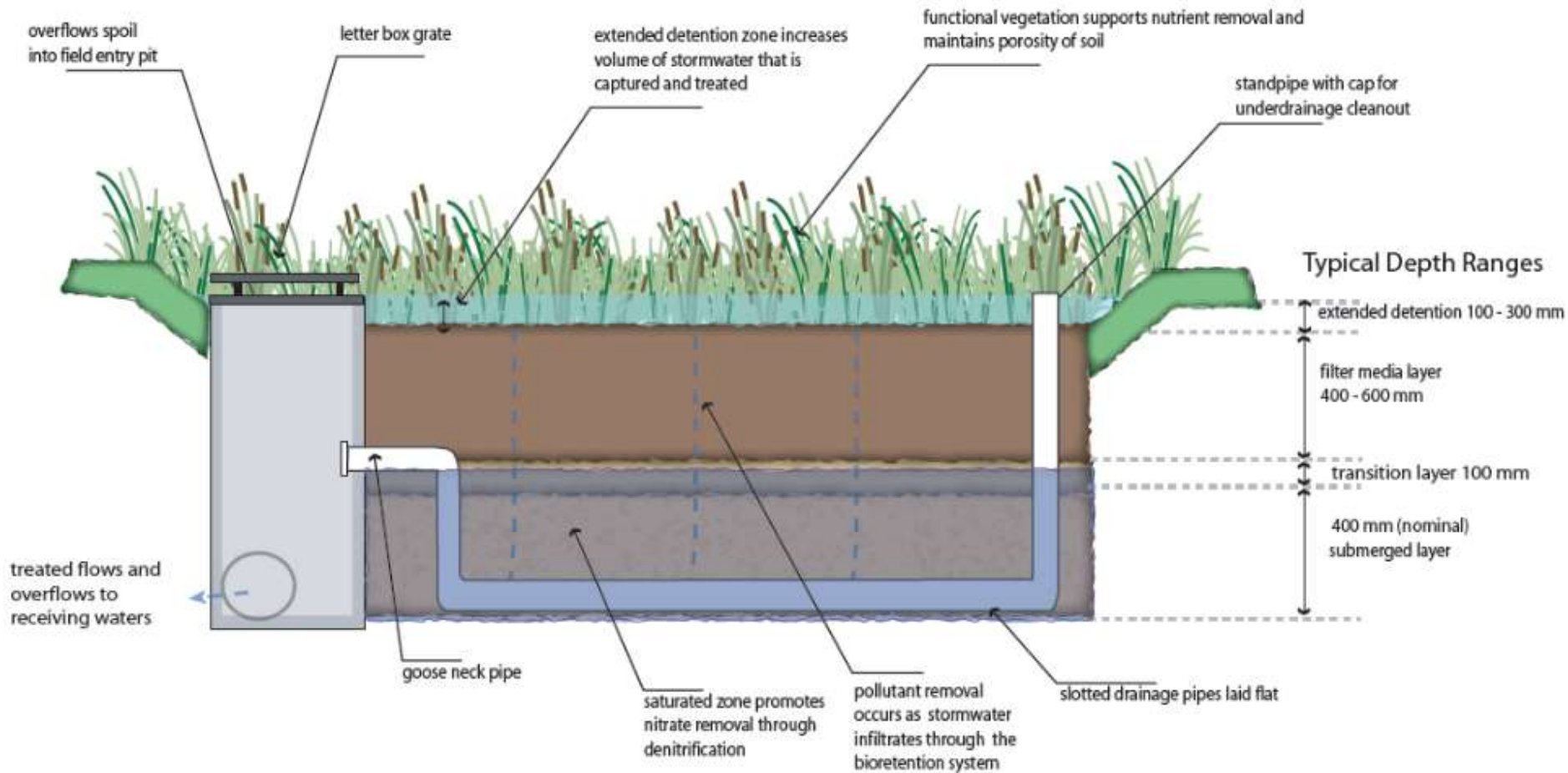
Biofilters – Tree pits



Beachway Ave, Brooklyn Park

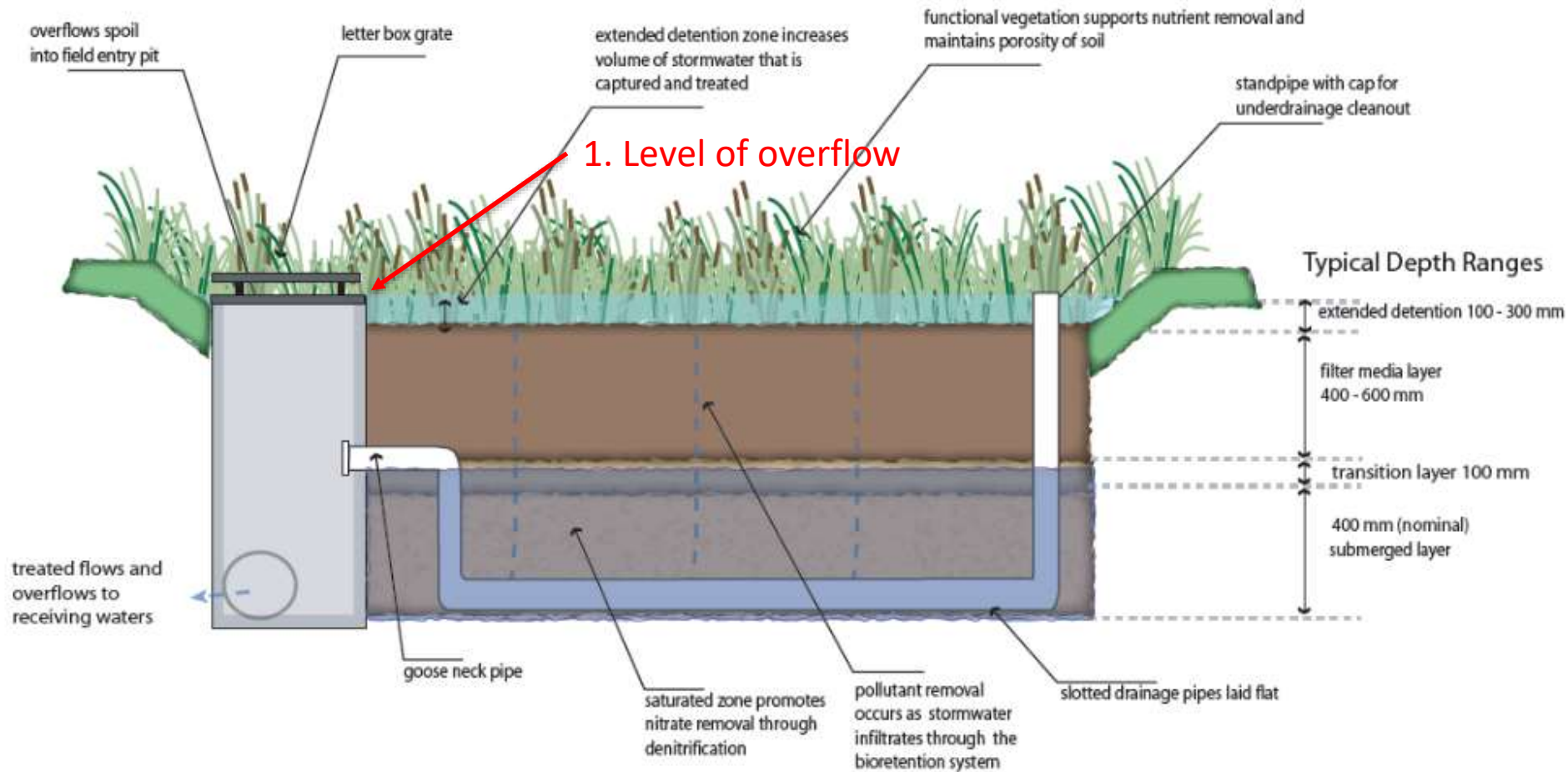
North Terrace Source: City of Adelaide

Raingardens - Overview



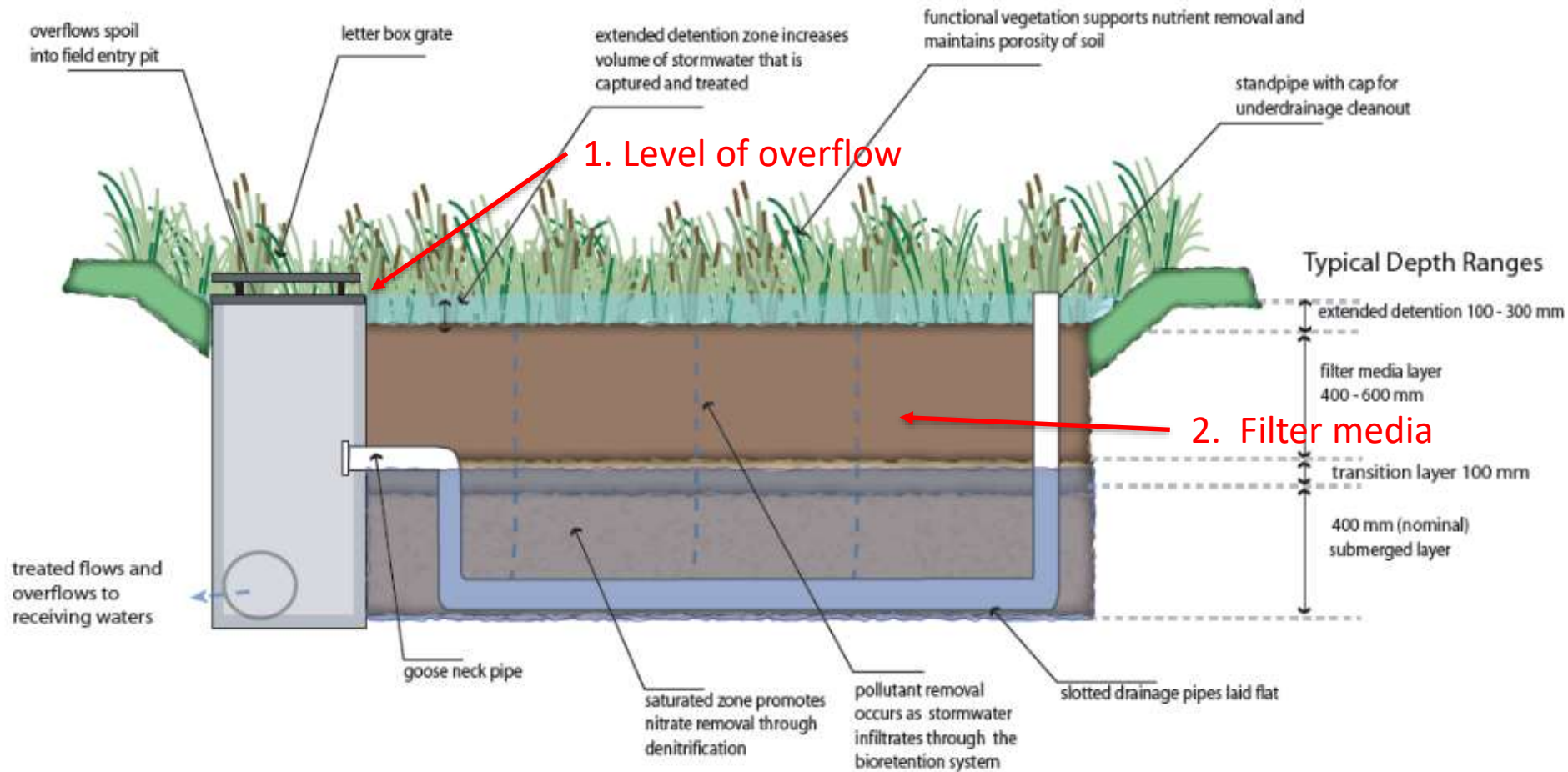
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Raingardens - Overview



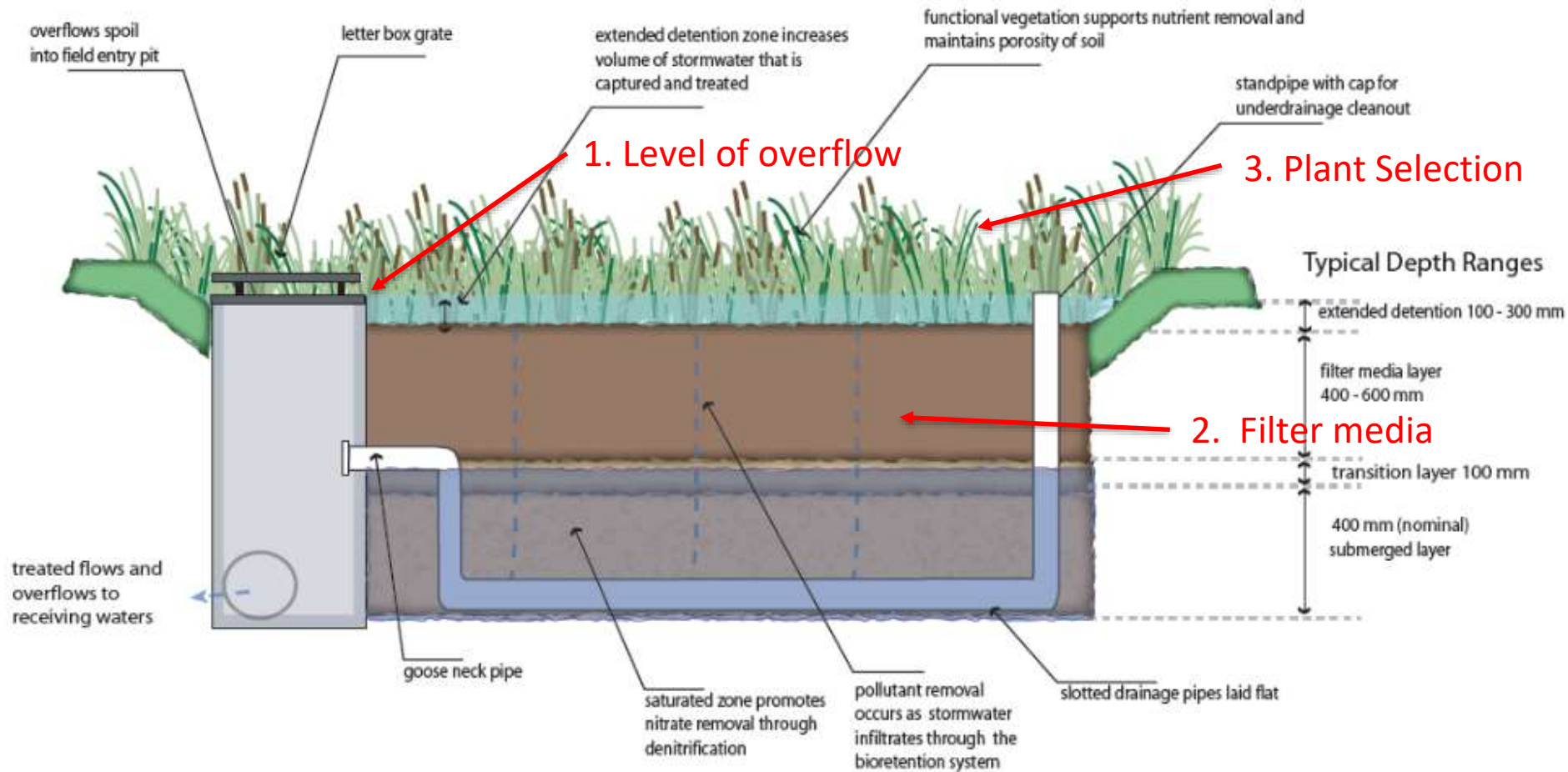
Source: Designflow

Raingardens - Overview



Source: Designflow

Raingardens - Overview



Source: Designflow

Filter media

Specification

Bioretention Technical Design Guidelines:

- References [Adoption Guidelines for Stormwater Biofiltration Systems](#), CRC for Water Sensitive Cities

Key Requirements:

- Hydraulic conductivity of 100-300 mm/hr
- Some organics (3-5%)
- Some silts and clays allowed (<5%)

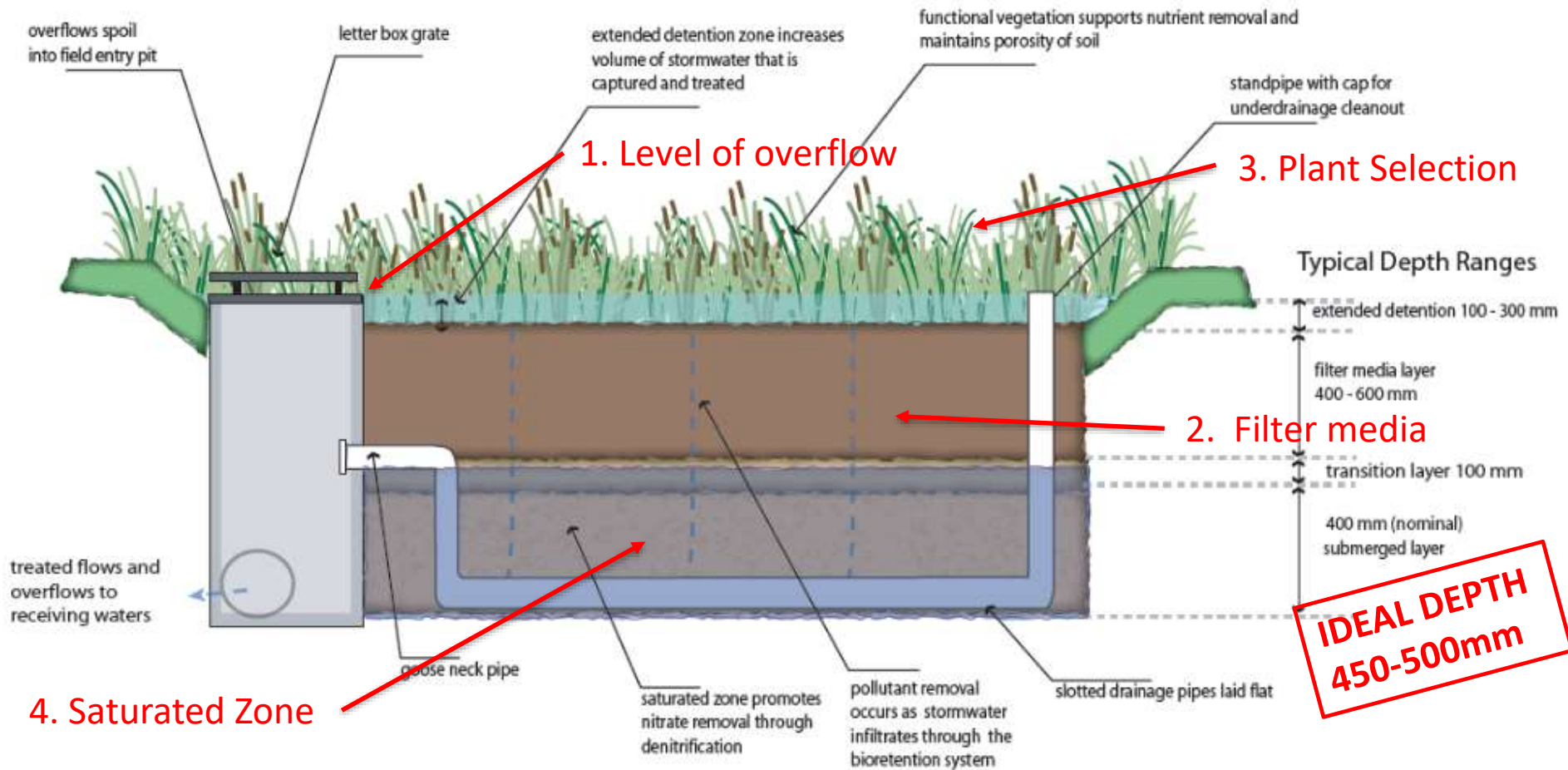
Source: Designflow

More information

[Water Sensitive SA website](#)

[Raingarden 500 Grant Program](#)

Raingardens - Overview



Source: Designflow

Tonsley - raingardens



Tonsley - raingardens



Tonsley - raingardens



Ah ha moments.....



www.ew.com

Small systems – no overflow structure



Murchison Street, Mansfield Park

Surface levels

- Pedestrian trip hazards (keep vertical drop <150mm)
- Flat surface - taper up to overflow pits
- How to deal with batters (hard, soft, structures)

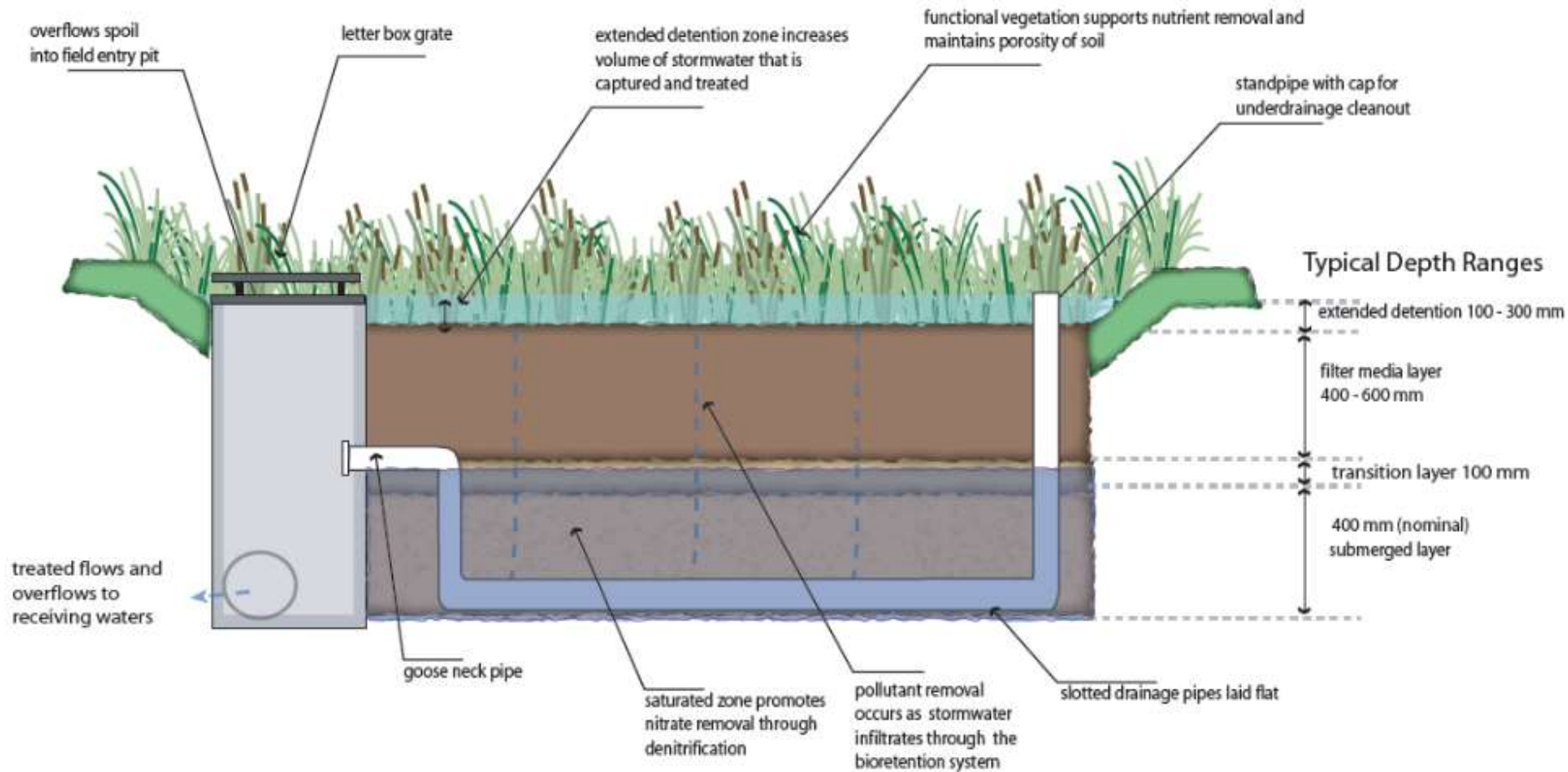


Source: DesignFlow



Source: DesignFlow

Raingardens - Overview



Source: Designflow

Raingarden Species Selection

Planting zones

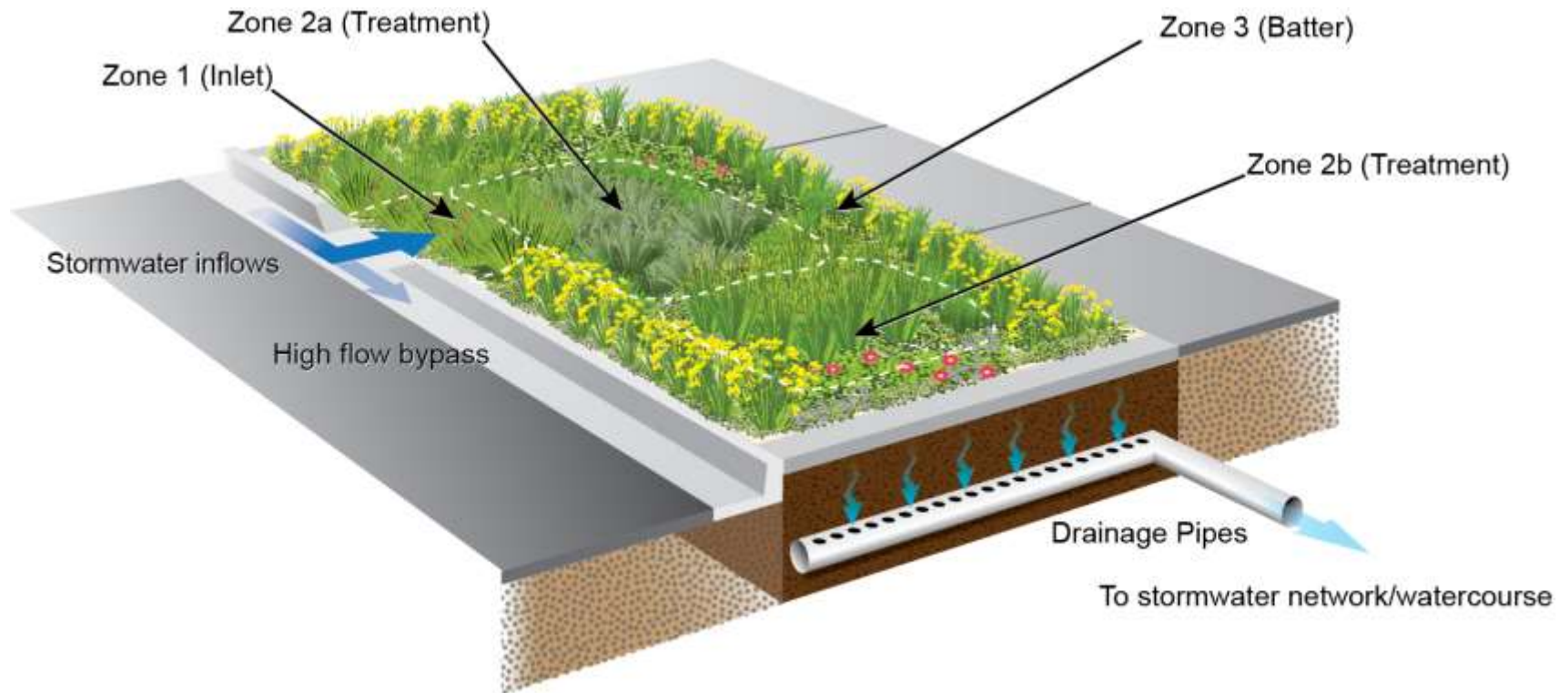


Figure 1 – Raingarden zones for plant selection

Raingarden Planting zones

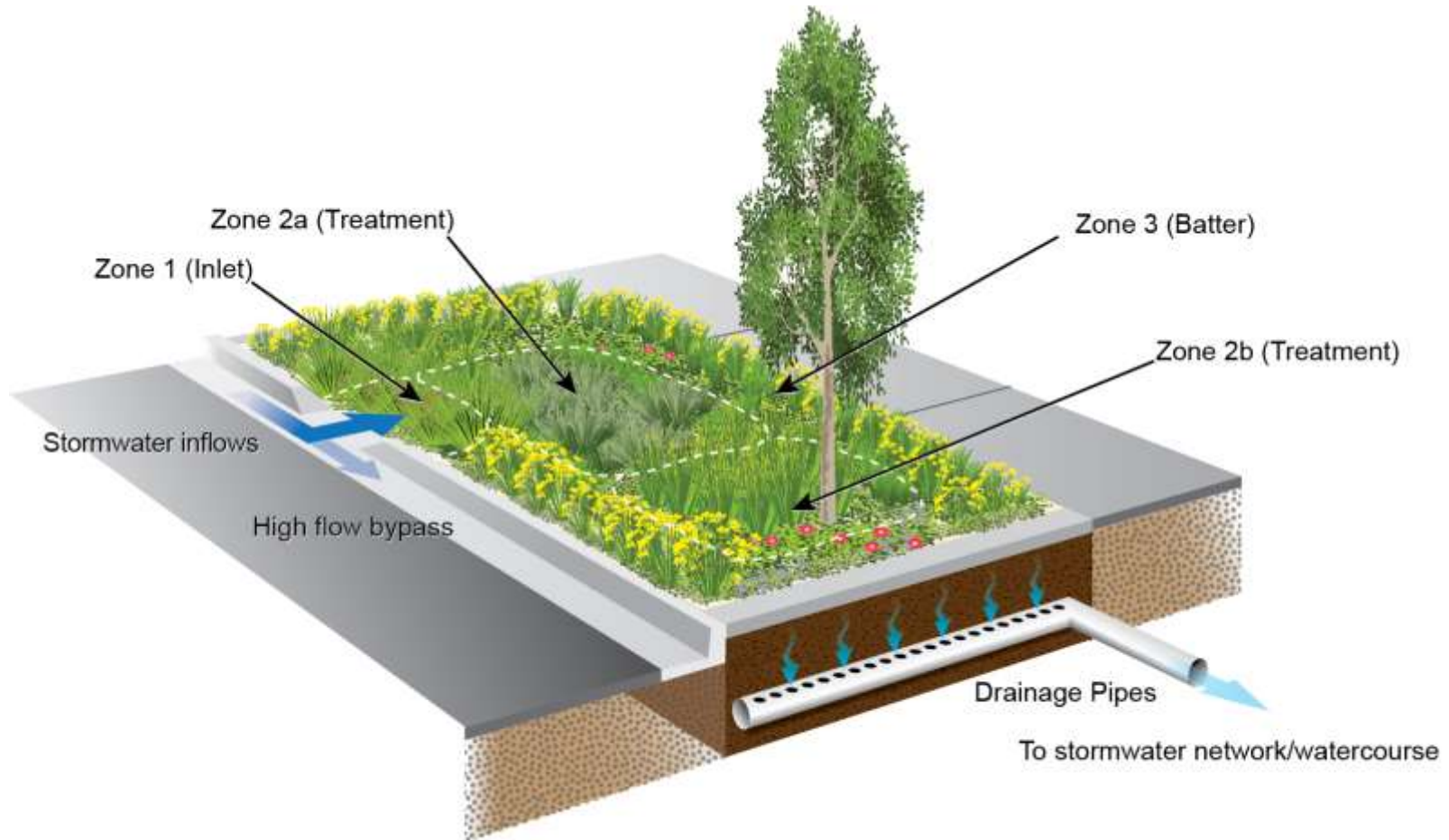


Figure 1 – Raingarden zones for plant selection

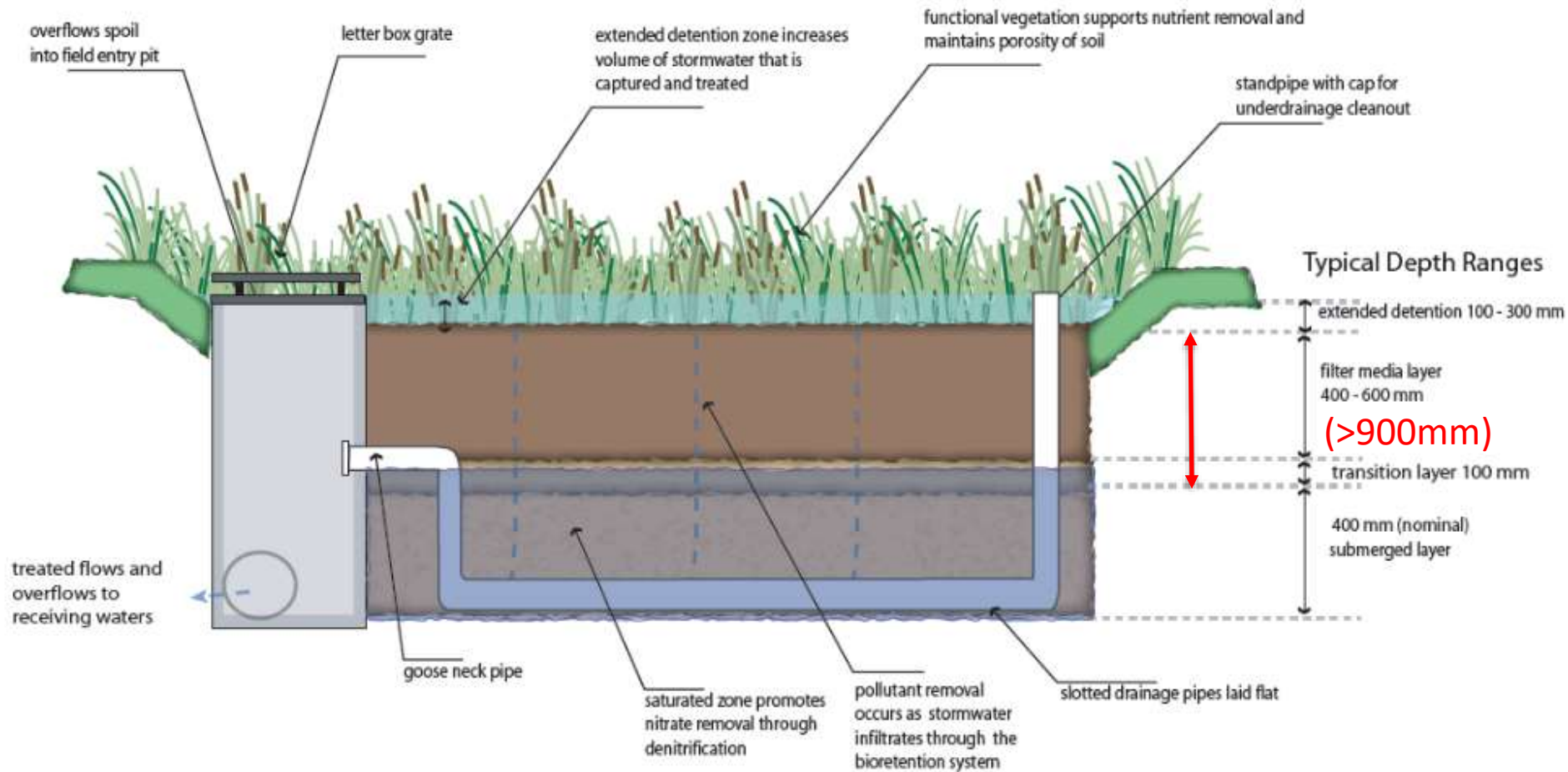
Trees & Raingardens



Angas Street raingarden early and established, showing arrangement of filter media

Images: Adelaide City Council and Water Sensitive SA

Filter media depth - Trees













Source: Designflow







Plant species proven to be effective at Nitrogen removal

	Form	Zone				Species	Common name	Height (mm)	Preferred location	
		1	2a	2b	3					
		✓	✓			<i>Carex appressa</i>	Tall Sedge	1000	All	Less frost tolerant
		✓	✓			<i>Carex tereticaulis</i>	Rush Sedge	600-1200	All	Spiky
				✓	✓	<i>Goodenia ovata</i>	Hop Goodenia	1000-2500	All	Spreading shrub
		✓	✓	✓	✓	<i>Ficinia nodosa</i>	Knobby Club-rush	500-1500	All	Formerly <i>Isolepis nodosa</i>
		✓	✓			<i>Juncus amabilis</i>	Gentle Rush	600-1200	All	Less common juncus species in Adelaide region

Adapted from EPA Raingarden 500 guidelines













Plant species proven to be effective at Nitrogen removal

	Form	Zone				Species
		1	2a	2b	3	
		✓	✓			<i>Carex appressa</i>
		✓	✓			<i>Carex tereticaedosa</i>
				✓	✓	<i>Goodenia</i>
		✓	✓	✓	✓	<i>Ficinia vossii</i>
		✓	✓			<i>Juncus amplexicaulis</i>

Common name	Height (mm)	Preferred location
Sedge		
Herb		
Mat forming		
Grass		
Shrub		
Tree		

Adapted from EPA Raingarden 500 guidelines

Plant species for companion planting

Image	Form	Zone				Species	Common name	Height (mm)	Preferred location	Comment
		1	2a	2b	3					
		✓	✓			<i>Bolboschoenus caldwellii</i>	Marsh Club Rush	300-1200	Often coastal	Spreading sedge
			✓	✓	✓	<i>Crassula helmsii</i>	Swamp Crassula	50	All	Spreading riparian herb, ground cover
			✓	✓	✓	<i>Dichondra repens</i>	Kidney weed	200	All	Spreading herb, ground cover
					✓	<i>Ranunculus lappaceus</i>	Australian Buttercup	500	Adelaide Hills	
			✓	✓	✓	<i>Selliera radicans</i>	Shiny Swamp-mat	50	All	Spreading riparian herb, turfy
					✓	<i>Wahlenbergia stricta</i>	Austral Bluebell	100-900	All	Spreading herb

Randolph Ave, Streetscape Upgrade City of Unley



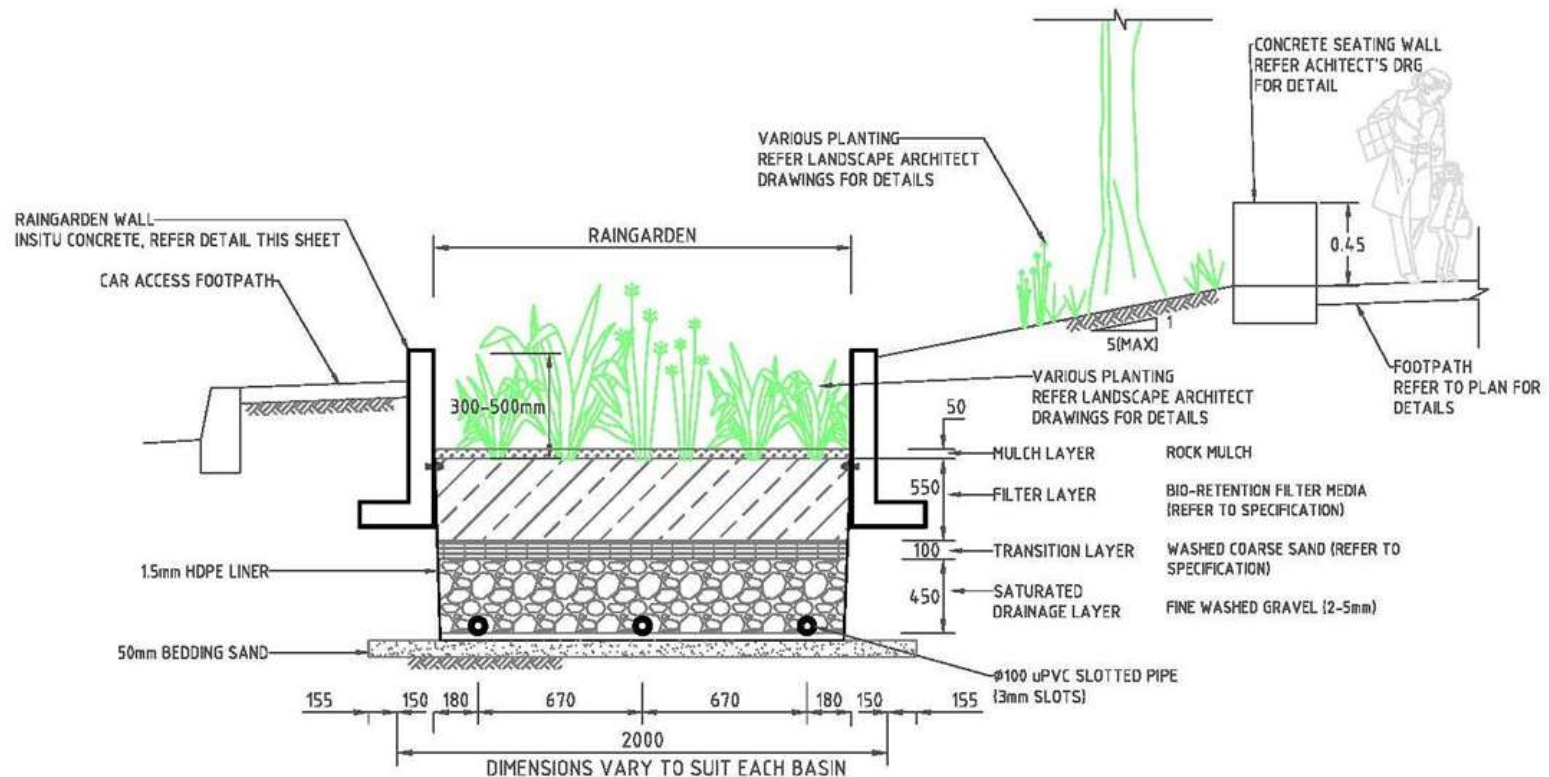
Bioretention – raingardens

- 10 raingardens of dimensions 1.70-2.10m wide x 6.75-25.5m long)
- Total area 245m² (0.5% of impervious contributing catchment)
- A saturated zone of 450mm depth to assist plant viability and storage capacity
- A design infiltration rate of 160mm/hr through filter media
- HDPE lined system with no exfiltration

Stormwater infiltration wells

- 31 infiltration wells of dimensions 600x400x450 mm deep
- Waterproof membrane top and bottom with geofabric and 20mm screenings around the perimeter, providing lateral infiltration to adjacent trees and garden beds.

Typical Raingarden Cross Section



Source: Southfront

Raingardens and trees



Raingarden in full sun



Raingarden shaded to the west by mature tree

Infiltration systems the hero



July 2015 - establishment



January 2016



September 2016

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interest

Construction of WSUD assets

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**Detailed design of constructed stormwater
treatment wetlands**

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Designing streetscale raingardens

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Mellissa Bradley
Program Manager

mellissa@watersensitivesa.com
0431 828 980