

On behalf of the Environment Team of Byron Residents Group  
Together with OurEarth Online Ltd

# Proposal for Water Sensitive Coastal Living

Prompted by  
findings of the  
HotSpots Survey 2016



From mural on Byron Water Tank by Ian Walker

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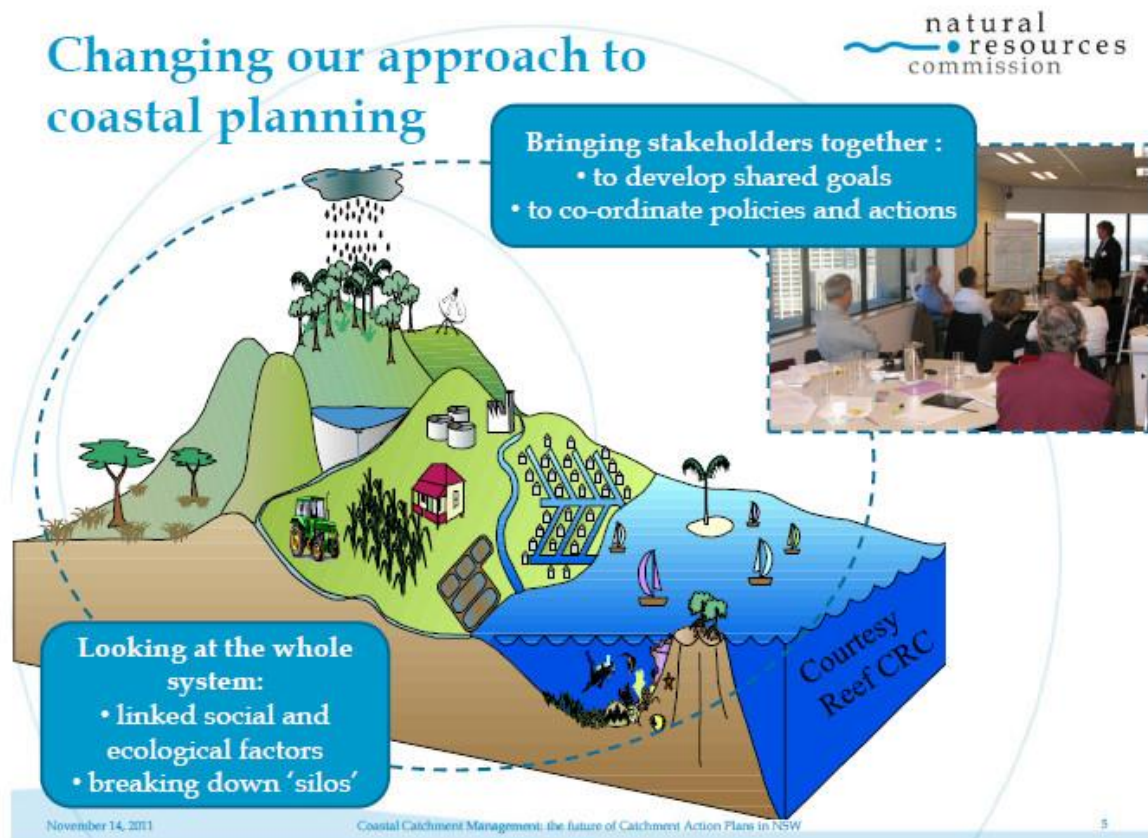
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## Advocating for

*Wholistic plan and actions  
from households to whole-of-catchment scale*

*Supporting water sensitive coastal living*

*Starting in Byron Bay's Belongil catchment  
and extending throughout Byron Shire*



*Acknowledging the Arakwal Bundjalung as traditional custodians*



In the Belongil catchment, the status quo about water is not good enough

### Diminished place



FROM HotSpots Survey flyer 2016, photos from 2014 survey

#### **Belongil, central receiving waterway: poor water quality (OzCoasts 2012)**

Rated 3 (out of 4, 1 being best)

due to high level of pathogens/low dissolved oxygen/low pH (i.e. high acidity)

In living memory, was abundant with coastal and marine life

#### **Ecological coastal communities**

##### **all classified threatened/endangered/vulnerable**

subtropical coastal floodplain forest,  
wallum sand heathlands,  
coastal floodplain wetlands,  
swamp forests, littoral forests, subtropical  
forests

(Office of Environment & Heritage 2015)

#### **Iconic koalas: fragmented but persistent**

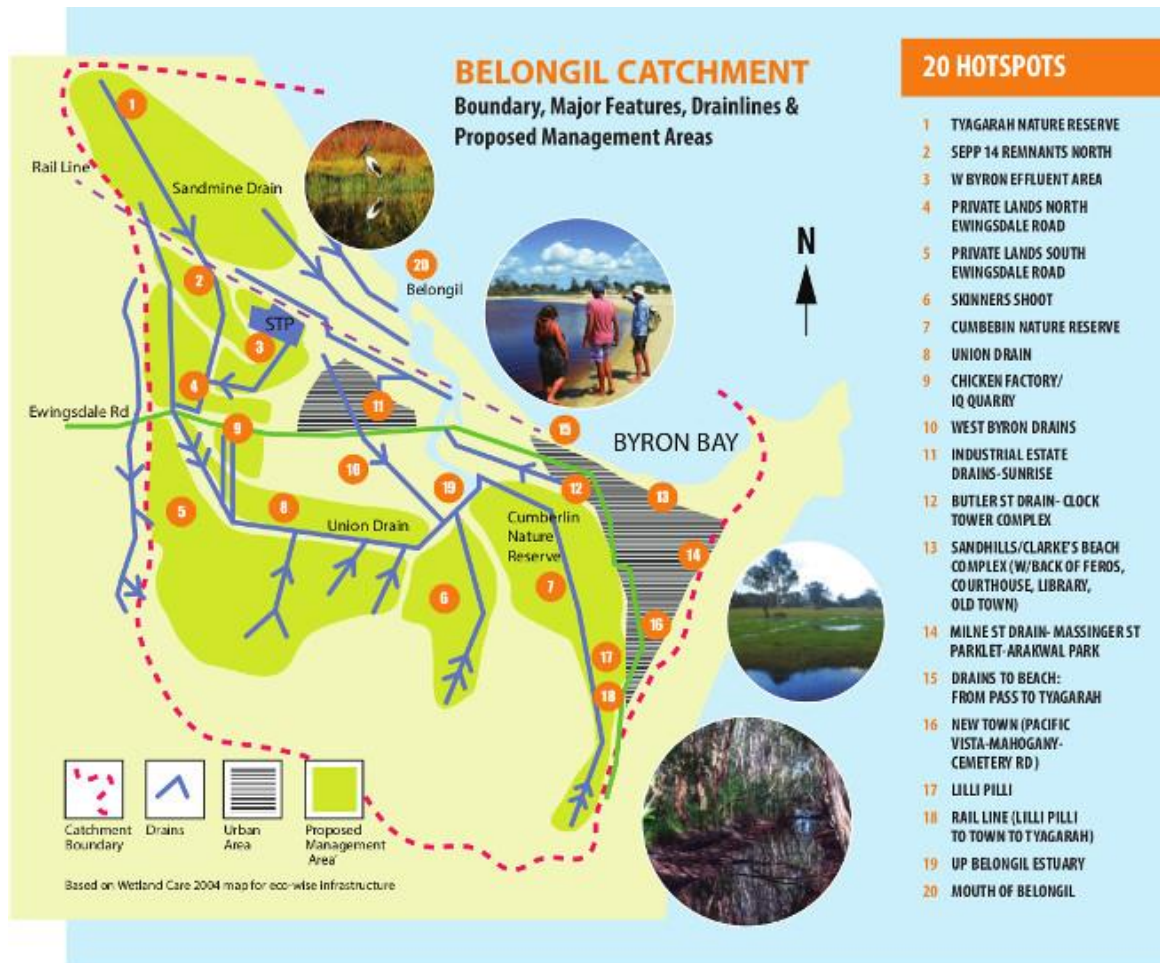
subpopulations (estimate 240 animals):

Myocum-Tyagarah and W Byron

(Hopkins and Phillips 2012)



From Call-out: Local Koala Photos (LilliPilli)



Summary Map from 2014 Survey

**Waterway:** this blended infrastructure of natural and built channels:  
Managed as set of open and closed drains

Used by 3 different water flows: rain/stormwater, potable tap/effluent and marine

Our December survey of 17 hotspots by community volunteers presents  
A snapshot of 5 characteristic channels: a system of  
dysfunctional ecological links, blocked passageways and untapped potential

A generalised assessment is presented in the following table

Table 1 Generalised assessments of 17 HotSpots

Type	Survey Sites	Known Ecosystem Function & Values	Likely Effects Downstream	Untapped Potential
1. High maintenance swale systems	16 17 7	Moderate water quality function, low to moderate habitat value	Limited moderation of peak discharges, limited pollutant load reduction	Create vegetated swale (with or without trees)
2. Weedy open channels	11 16 9	Moderate water quality function, low to moderate habitat value	Limited moderation of peak discharges, limited pollutant load reduction	Create broader riparian zone with a floodplain function
3. Piped flows entering natural channels	7 11 12	Reduced ecosystem function in this section of waterway (active erosion)	Localised erosion	Use of a sediment pond of flow dissipation device to slow flows
4. Channelized overland flow entering natural channels	7 13 14	Moderate channel function however overflows bypass riparian zone this limiting transformation processes such as sediment trapping and nitrification and denitrification	Result in increased velocities at confluence with the downstream waterway	Create a series of discontinuous shallow swales to traps sediments and distribute flows through riparian zone
5. Natural channel in developing catchment	20	Impacted by increased catchment flows causing bank erosion	Downstream area impacted by increased catchment flows	Stabilize banks and provide increased channel cross sections

(Text adapted from Markwell and Breen 2010)

Also see the companion report

*Community-based investigations informing the Proposal for Water Sensitive Coastal Living*

Complete database of photographs available upon request



From Summary HotSpot 11d



## Diminished community

### Summary of Volunteer responses

**Problems:** mismatch between Byron image & reality, tourism impacts, weeds, neglect, pollution, lack of planning/aesthetics, health hazards to people and other species

**Suggestions:** monitoring, regeneration, education, community participation, art, policy change

'It's a mess with no planning, maintenance or aesthetics. Eg some places could be made 'ponds,' or 'picnic areas' or 'botanic sites of interest.' Lee

'Exploring mysterious underbelly of central Byron...potential health hazard. Nourishing weedy environment when it could be supporting regenerating landscape...wish to see local waterways return to health reverse man's 'manufactured' drainage...Degraded resource not contributing to biodiversity...Need to have a strategy to reduce human and environment impacts on our waterway...May involve GCAT Dunecare looking at regen of waterway complex' Veda

'The layout of Byron has most residential areas configured as fingers in between bushland and wetlands. There are risks and benefits of this particular configuration. The risk is that with any potential source of pollution being close to these natural areas, contamination, whether from households, industry, businesses or roads, is more likely...

Conversely the large area of waterways, and the extra vegetation surrounding them, ensures all our senses potentially benefit...In my opinion the drains, channels and creeks of Byron Shire should be regularly monitored for water quality, for sedimentation, for flora (though not to use herbicides on weeds) and wildlife. I would be prepared to do that with our local creek' Jude

'That the town starts to look at itself from the inside out and recognise the ways in which we do not currently meet our perceived values. We don't practice a commitment to the local environment in the way we are perceived to, or think we do as a community. I would like to see more education at a community level, and stronger marketing campaigns that educate visitors on a zero tolerance policy for any disrespect to the local environment, including the waterways...

Byron Bay has a reputation of being conscious, but we could be doing a lot more individually and collectively to lead and affect positive change in a real way, rather than for the sake of tourism or lip service...

To respect it more and care for it, to listen to our Indigenous brothers and sisters, and that it is vital not only to marine life but all life. Most land dwellers are disconnected from the interconnectedness of the entire environment, and the consequences of individual behaviour...' Monique

'It was quite an 'aha' moment to realise that it's not just about draining or channeling water, but about the ebb and flow of water throughout the ecosystems of the Shire' Anna

'Being involved in the project has just reinvigorated by commitment and given me a further avenue for my goal to work to protect the environment through raising awareness and holding those in charge to account. As many people need to get involved as possible and be prepared to stand up and educate the tourists.' Elaine

'There are lots more drains than I realised, they keep the town clean and free from flooding, and are/were fish breeding grounds. They have not been looked after. We are Byron's people, it is our right and responsibility to be kind and gentle to land and water, there is no value above health. The health of the land is our health. – the land and us all are one.' Suzi

## Current management of our water commons is lacking

Initiatives exist at level of Commonwealth and State Government but not at level of our local government

Commonwealth  
State

*Revitalising Australia's Estuaries* (Creighton 2013)  
*blueprint2013 Stormwater management in a water sensitive city* (Wong et al. 2013)

According to this chart, where is Byron Shire management of Byron Bay?

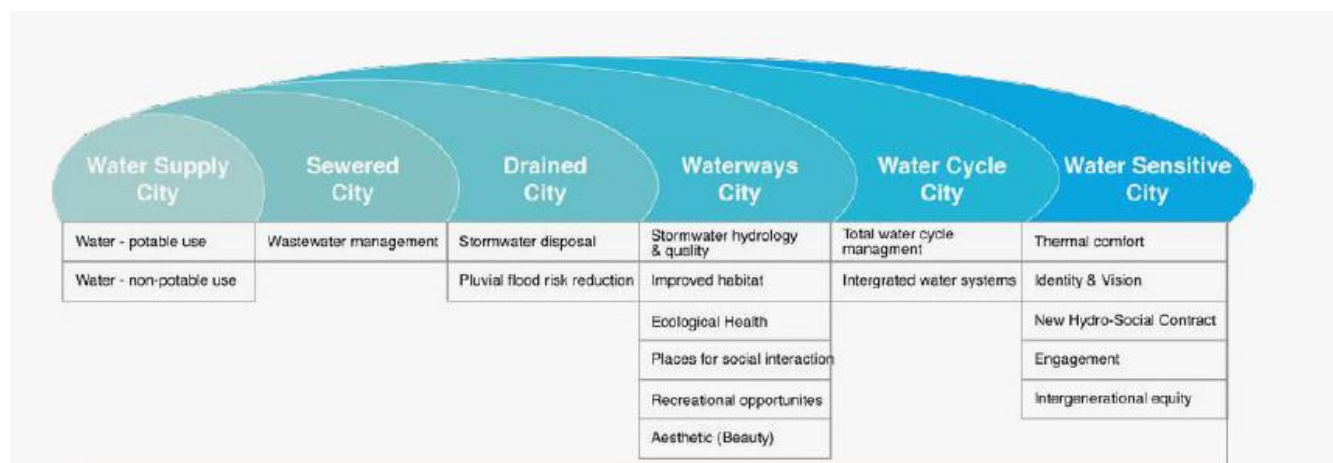


Image (Wong et al. 2013)

*Byron Shire Council only partly meets status as 'sewered city' or 'drained city'*

## No catchment wide plan for water

### Handles the three water flows as 'problems' for separate departments

#### Tap water/effluent flow

- No water conservation programme for tourism or households,
- Failure to meet effluent management strategy and
- Failure to address impacts of tourism and mega-development and projected production of more effluent (Byron Shire Council 2005)

#### Rain/stormwater

- Council resolution to patch-up drains not upgrade infrastructure and
- Council approved plan for Byron town flooding is only to build levees and pumps along Butler St drain rather than manage any stormwater at source using Water Sensitive Urban Design (WSUD) (Flockton 2014)

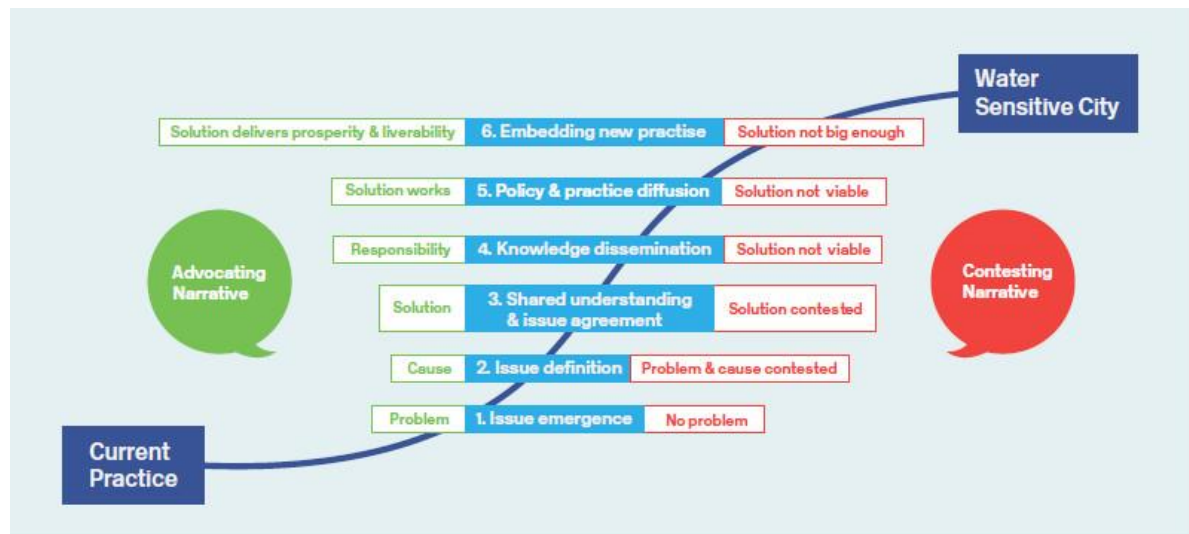
#### The sea

- Quality unacknowledged, estuary productivity diminished
- Impedes success of the Cape Byron Marine Park
- Further complicates catchment hydrology and reduces coastal biodiversity
- Flood control rather than prevention
- No programmes to re-establish carbon sequestration and ecological buffers against extreme events (criteria from Creighton et al. 2013)
- Detracts from Marine Park experience (considered to have an annual recreation value of \$1.9 to 2.5 million, based on consumer value of \$62 per visit (Conner and Koop 2011)



# What we could be: aiming for water sensitive coastal living

Where are we as community and council?



Six phases in the transition to a Water Sensitive City

Image (Wong et al. 2013)

In stages 1 and 2, working towards stage 3

To reach our aspirations for water sensitive coastal living, we support a catchment programme of steps to targets by 2020 starting with a paradigm shift about water management

Table 1. Water Sensitive City attributes compared to our current urban water management paradigms. (Keath and Brown, 2009<sup>15</sup>)

Attributes	Traditional Regime	Water Sensitive Regime
System Boundary	Water supply, sewerage and flood control for economic and population growth and public health protection	Multiple purposes for water considered over long-term timeframes including waterway health and other sectoral needs i.e. transport, recreation/amenity, micro-climate, energy, food production, etc.
Management Approach	Compartmentalisation and optimisation of single components of the water cycle	Adaptive, integrated, sustainable management of the total water cycle (including land-use) designed to secure a higher level of resilience to future uncertainties in climate, water services requirements while enhancing the liveability of urban environments.
Expertise	Narrow technical and economic focused disciplines	Interdisciplinary, multi-stakeholder learning across social, technical, economic, design, ecological spheres, etc.
Service delivery	Centralised, linear and predominantly technologically and economically based	Diverse, flexible solutions at multiple scales via a suite of approaches (technical, social, economic, ecological, etc.)
Role of public	Water managed by government on behalf of communities	Co-management of water between government, business and communities
Risk	Risk regulated and controlled by government	Risk shared and diversified via private and public instruments

table (Wong et al. 2013)

## Water sensitive coastal living



From newsletter Environment Team Byron Residents Group

### **In acting on our aspirations, we promote**

- Engaging with all sectors of community and tourism
- Integrating with established groups, developing paid and volunteer work
- Drawing on resources at local, state, commonwealth and international levels
- Developing deep resilience: transformation of socio-ecological systems as future-proofing

### **A movement**

- Knowledge building and participation
- Supporting core values and necessary behaviours
- Through actions, field days, training with Byron Institute of Global Solutions/Community College

### **A programme**

Council supporting targets in neighbourhood actions across all the catchments in the Shire

### **A brand and a quality standard**

- Adopted by residents and tourists, businesses & festivals  
with a sliding scale for membership fees &  
ongoing public audits to help reach targets
- Public outreach including actions during peaks of tourism, including  
a short inspirational movie and updates shown daily at Byron Theatre
- Collecting funds for actions, paid and voluntary employment, training, monitoring

### **Ecology & art initiatives**

- Community-based citizen science in action towards local empowerment
- A logo and related materials
- Films and multi-media
- Public art from a central mosaic refurbishing the Town Clock, various motifs repeated throughout the different waterways

## Starting transformational development

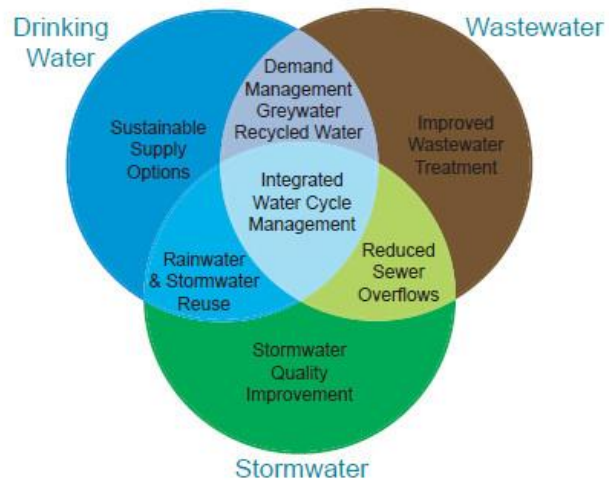
Assess current practices and identify aspirations for whole-of-catchment: place, people and other species

### Community outreach

Develop interests and capabilities of neighbours through Clean and Green Dune Care, Bird Buddies, Byron Bay Master Plan, Byron Residents Group, Union Trust, Friends of Tallow and others

### Governance outreach

Councillors and staff collaborate with community and apply for State and Commonwealth funding. Help back brand, programmes and actions



(Wong et al. 2013)

## A suite of potential integrated targets and practical steps

- Programmes for households, businesses, tourism and rural places to reduce potable water demand and reuse more effluent
- Strengthen sea connections to revive coastal and marine animal populations
- Strengthen connectivity as well as enhance and restore ecological communities throughout the town and rural places of the catchment  
starting with urgent support for expanding koala habitat and population and growth plans for coastal aquatic and marine wildlife

*Greenfield developments on small upland channels that incorporate floodplain engagement, rather than flow evacuation, will provide the greatest benefits to the entire river system.*

(Wong et al. 2013)

- Revitalise waterscapes throughout catchments

- Manage stormwater closer to source using new and retrofits of porous pavements, rain gardens, linear retention systems, swales plus stormwater filtration, ponds and rehabilitated wetlands

*Urban stormwater treatment and harvesting represents a significant opportunity to provide a major new water source for use by cities, while simultaneously helping to protect valuable waterways from excessive pollution and ecosystem degradation.*

(Wong et al. 2013)

- Apply *sponge concept*: mimics natural flow process through subsurface and natural filtration process through dense vegetation

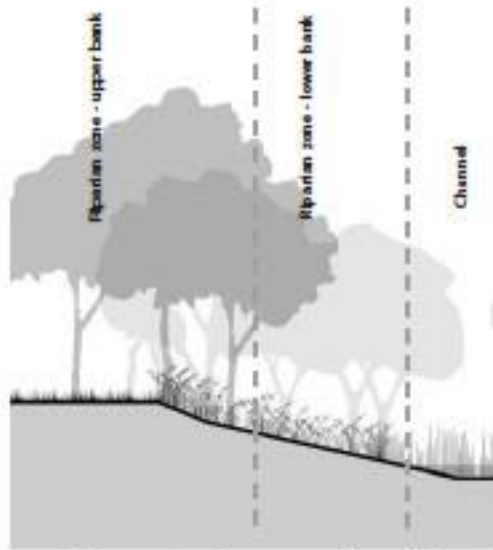


Figure 2: Cross section of a waterway channel showing riparian revegetation planting zones.

(Markwell and Breen 2010)

- Install *biofilters*

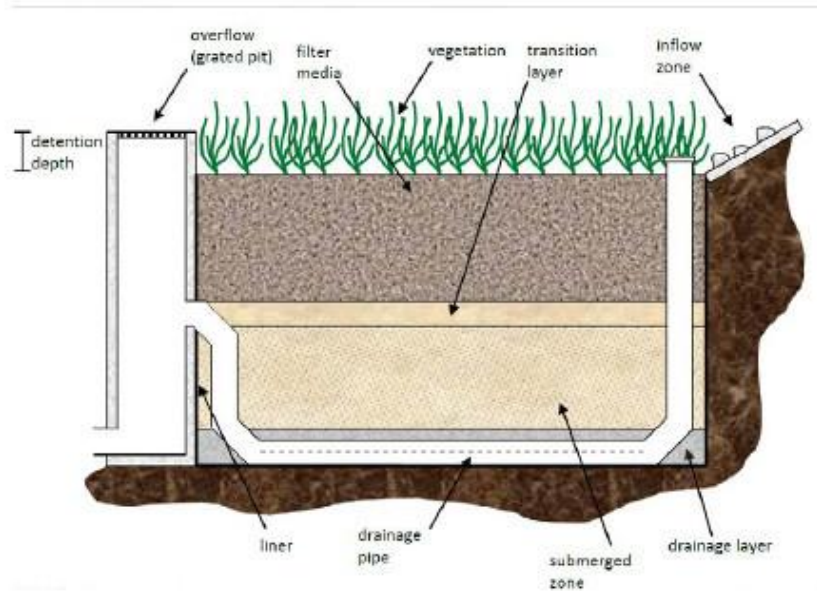


Figure 8. Biofilter design with submerged zone as recommended by FAWB (2009)<sup>30</sup>

(Wong et al. 2013)

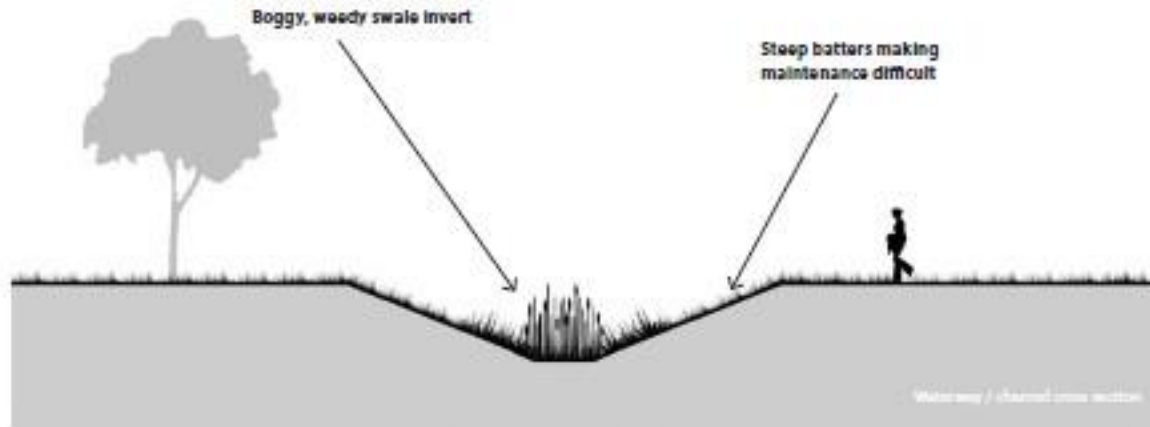


## Enhancing potential of different channels: illustrations indicative not prescriptive

(images on pg 10-16 are all from Markwell and Breen 2010)

### Existing Waterway Condition

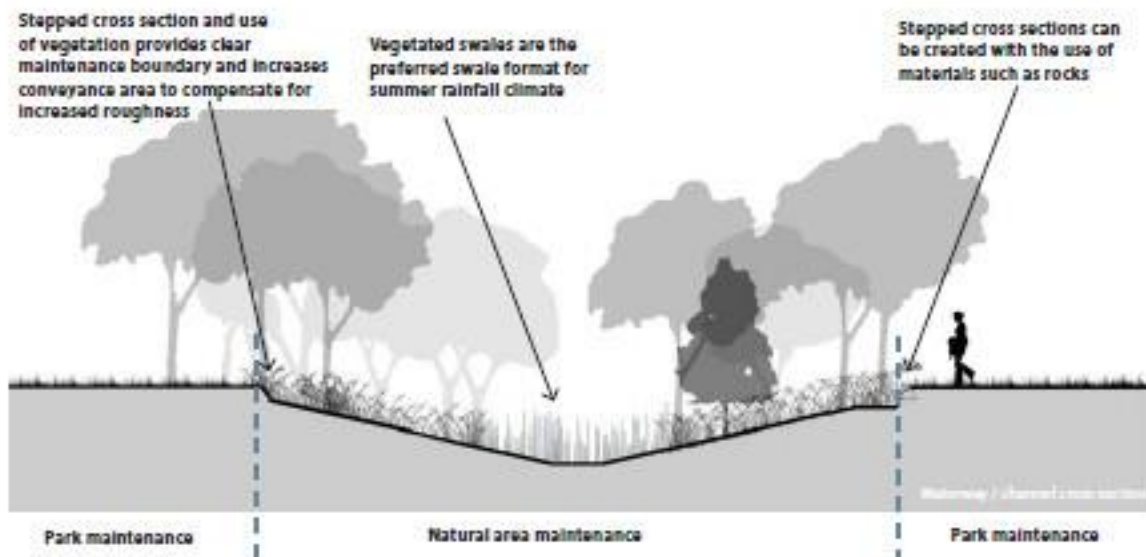
Woody, open swale in public area; no shade cover on batters; difficult to maintain channel due to wet / boggy invert.



Park maintenance for entire area

### Improved Waterway Condition

Low flow channel with vegetated batters; shade trees on batters to control weed growth; defined maintenance boundary created between the mown area / and the riparian vegetation.

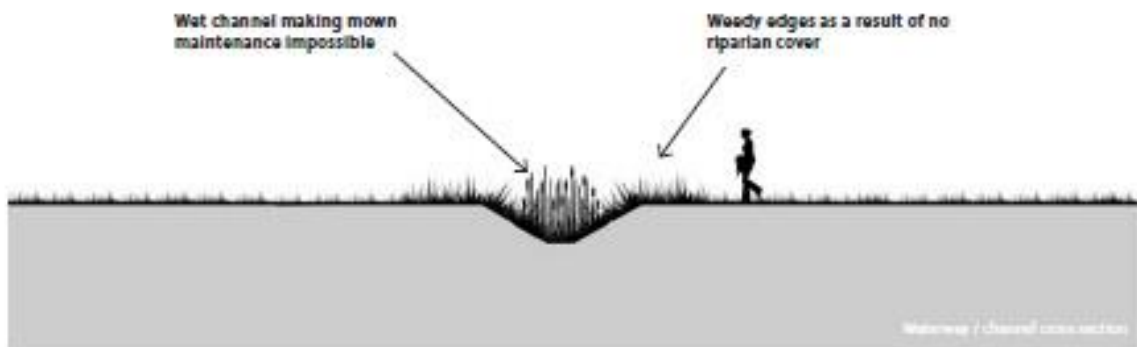


*Flow conveyance can be maintained by increasing the cross sectional area of the vegetated swale by battering back the banks.*

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## Existing Waterway Condition

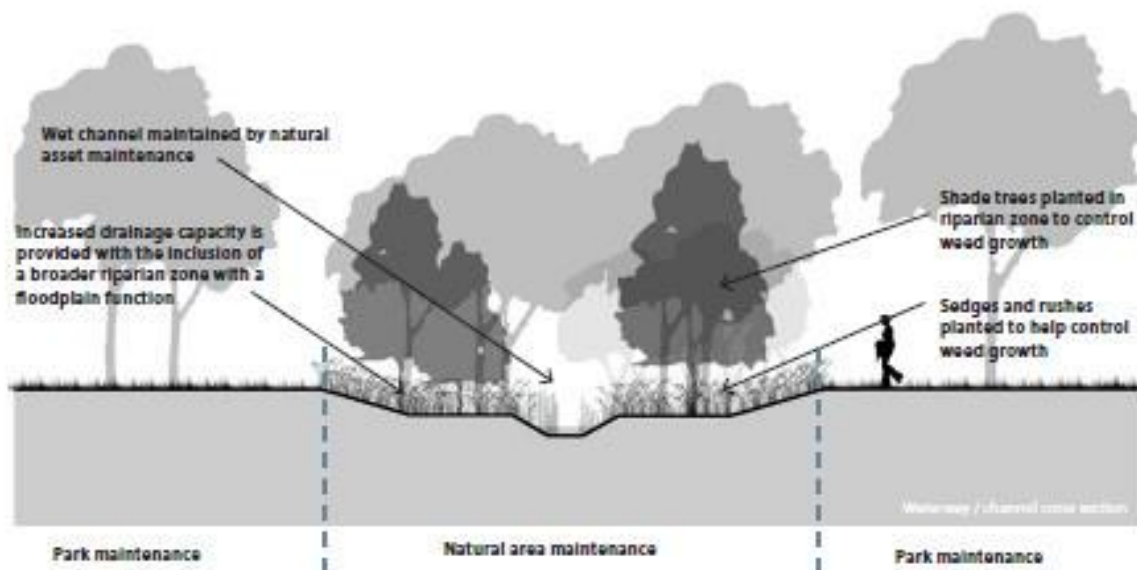
Weedy, open channel within grassed parkland area; no riparian cover; difficult to maintain waterway as part of parkland.



Park maintenance for entire area

## Improved Waterway Condition

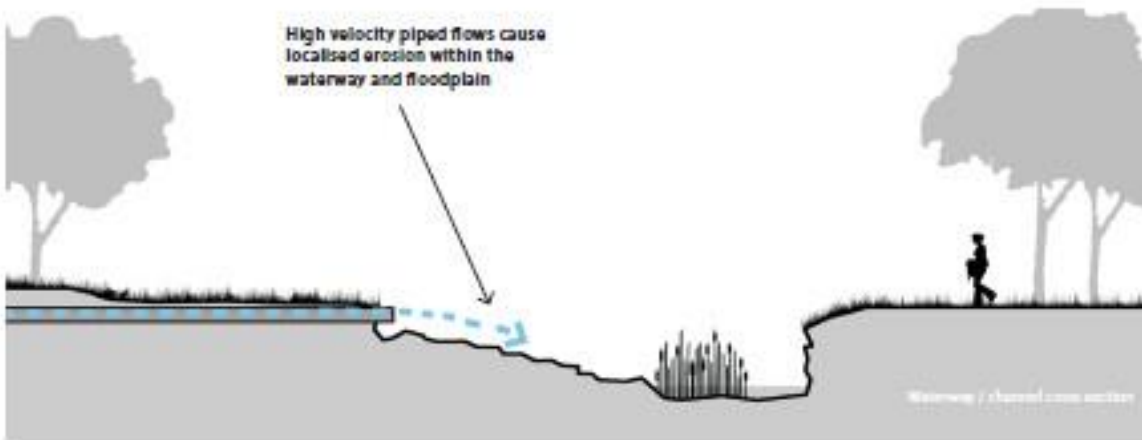
Low flow channel with vegetated riparian zone floodplain area within grassed parkland area; riparian shade trees control weed growth; defined maintenance boundary created between the mown park and the natural asset.



*Flooding risk is reduced by increasing the cross sectional area of the channel by battering back banks to create a defined riparian floodplain area. This allows trees to be planted in this area without increasing flooding.*

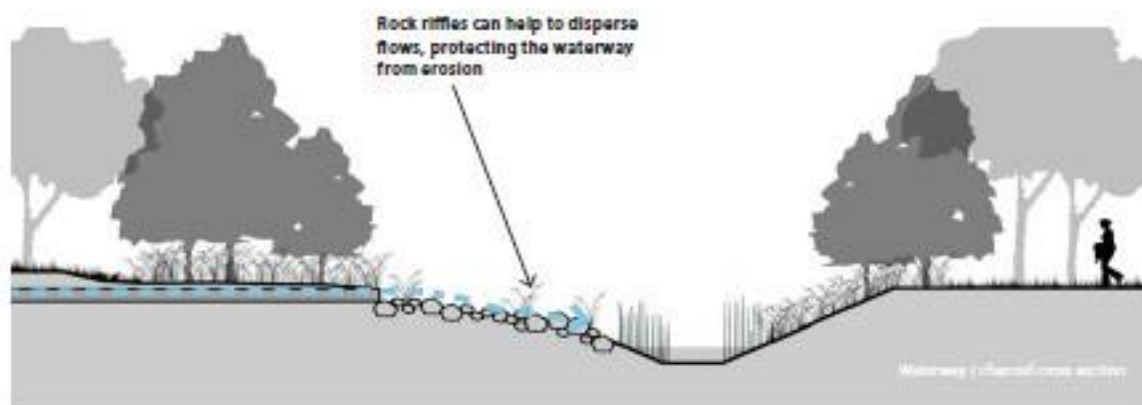
### Existing Waterway Condition - Example #1

Erosion present at pipe outlets due to high velocity flows entering the waterway



### Improved Waterway Condition - Example #1

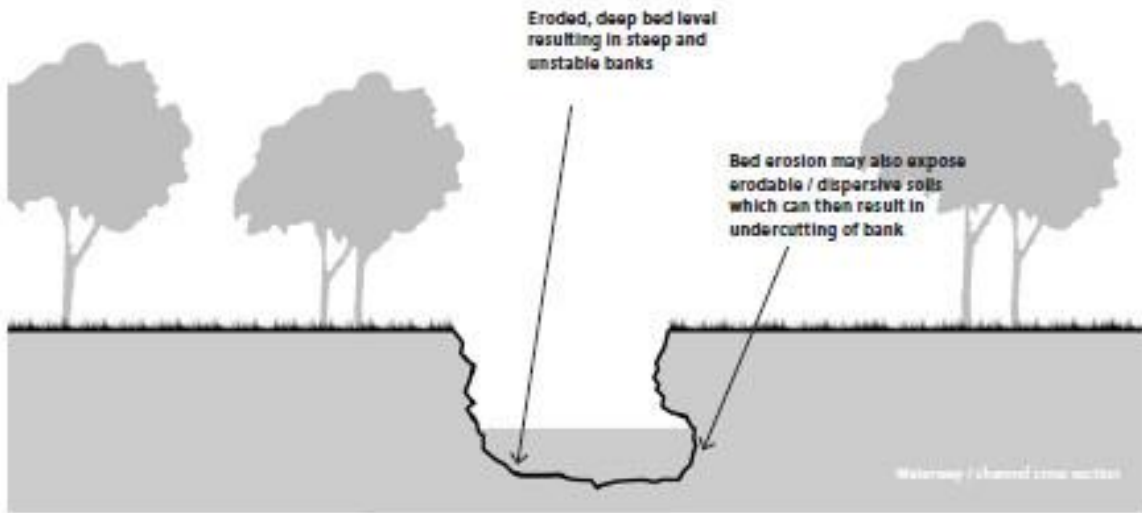
Piped flows are dispersed, reducing velocities and the receiving environment is protected from scour.



*Slowing the velocity of water at the pipe outfall could increase risk of localised flooding. The flow dissipater device or sediment pond should be sized to ensure that flooding risk is reduced.*

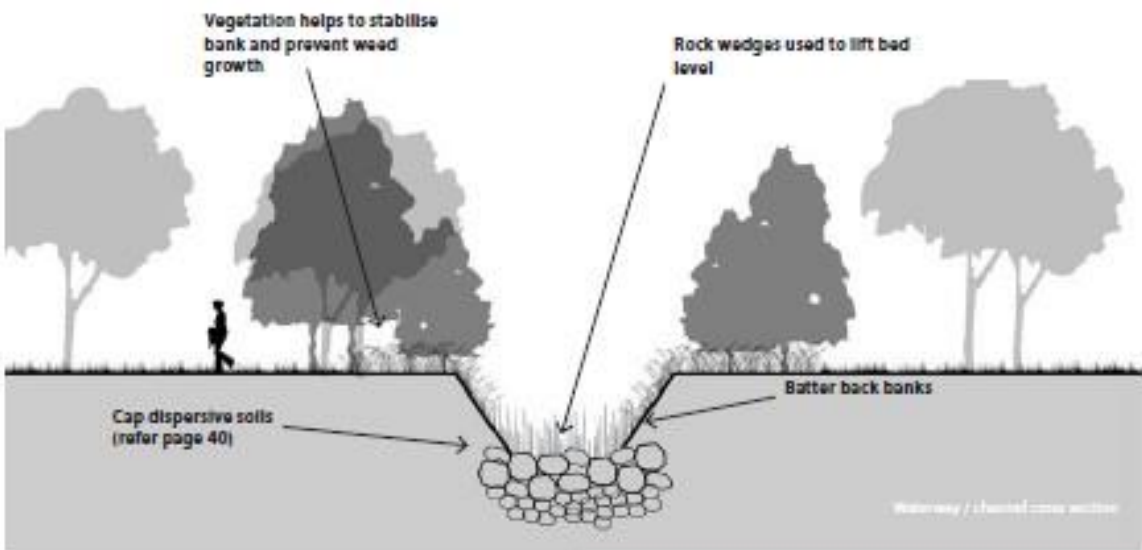
### Existing Waterway Condition

Deep channel with eroded banks due to past bed erosion



### Improved Waterway Condition

Shallow channel with stabilised banks.

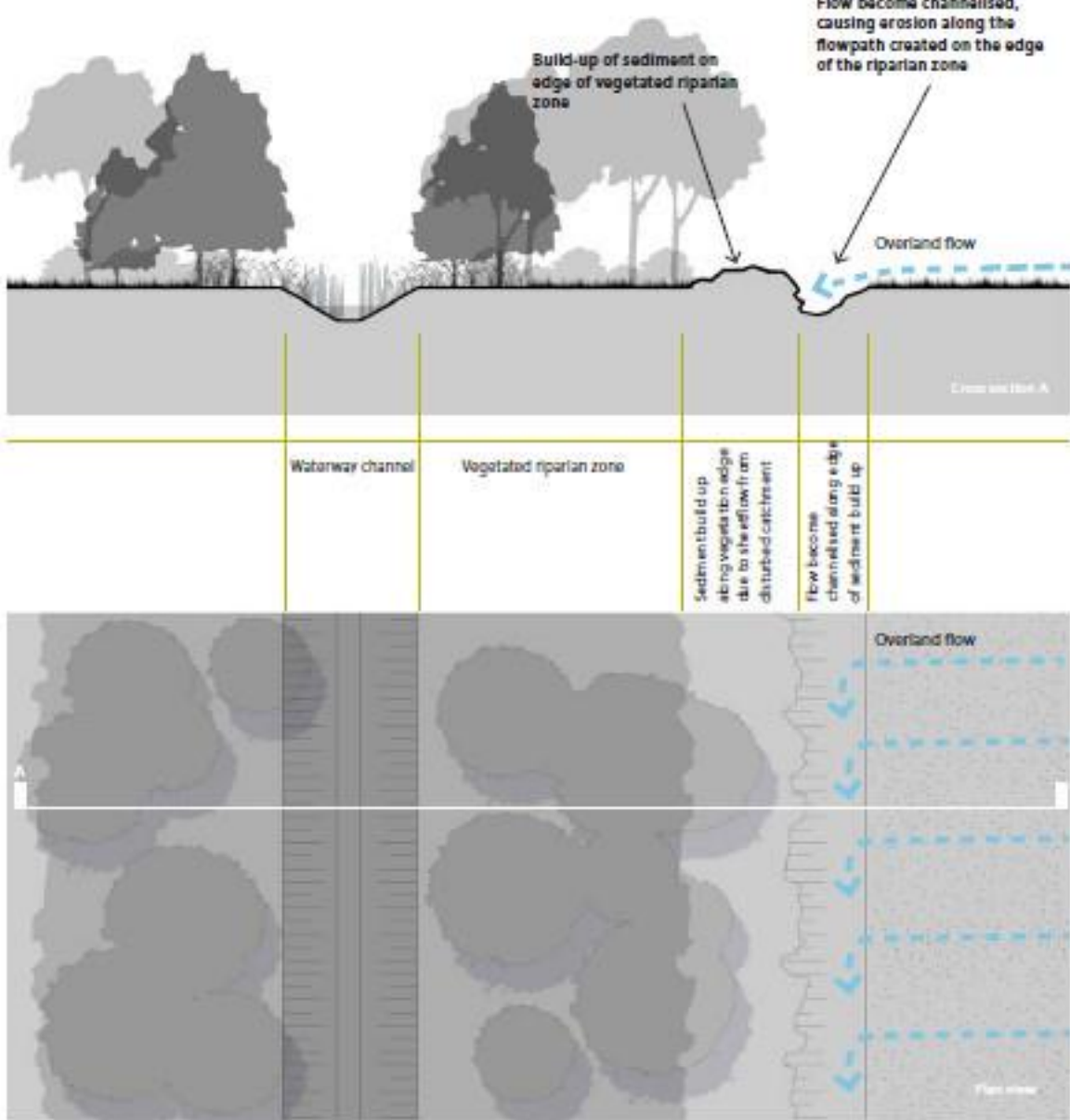


*Raising the bed level of the waterway decreases the conveyance capacity of the waterway. Battering back the banks will help to maintain the cross sectional area of the channel.*



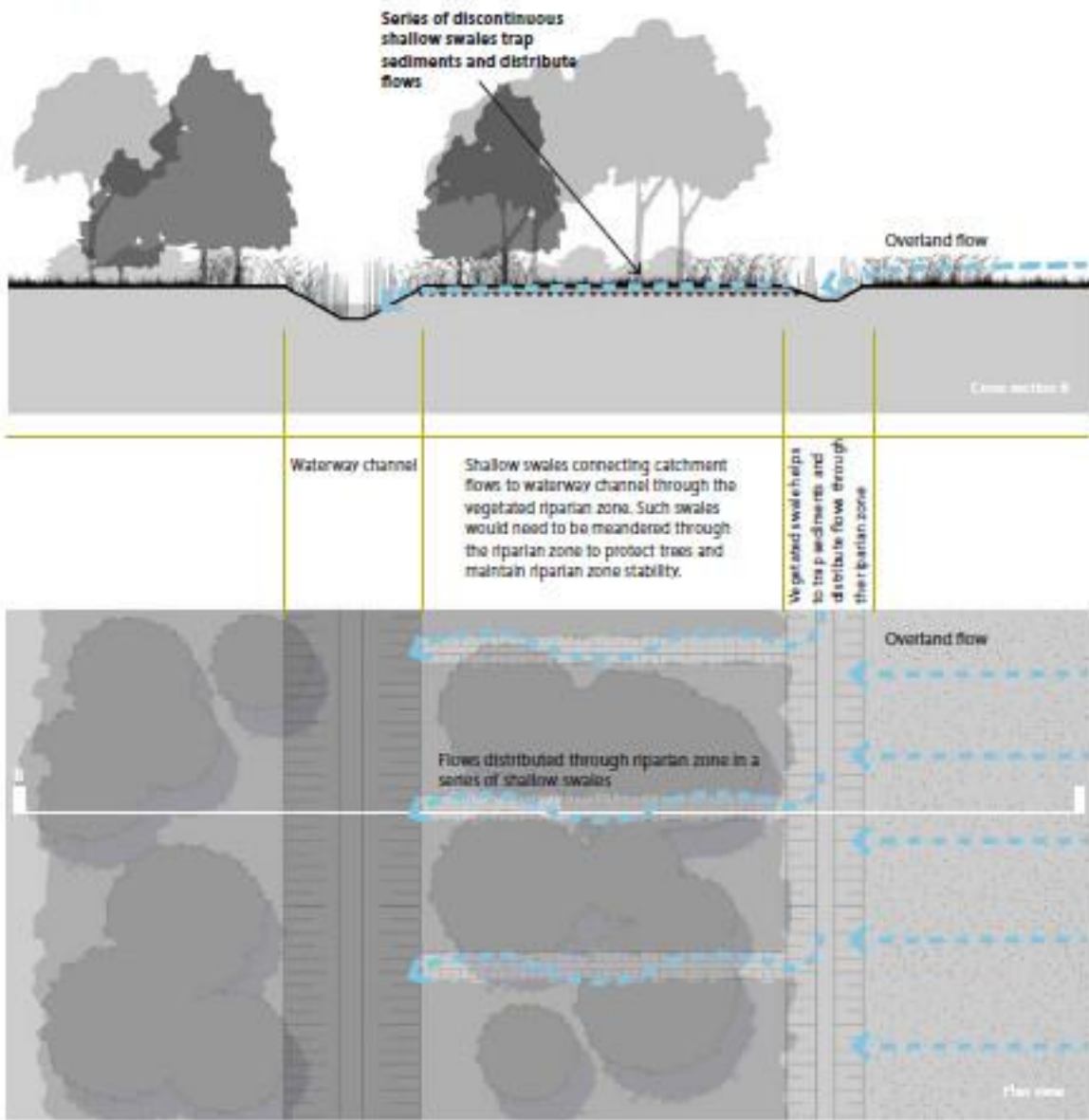
## Existing Waterway Condition - Plan and Cross Section

Natural channel with vegetated riparian zone, overland flow from disturbed catchments drop out sediment when they meet the riparian edge which causes flows to channelise and bypass the vegetation.



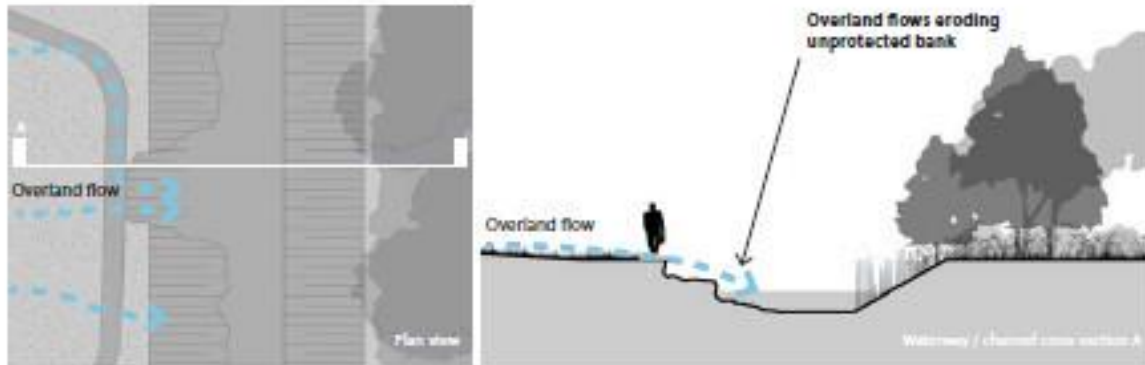
## Improved Waterway Condition - Plan and Cross Section

Linear sediment traps (in the form of a series of discontinuous shallow swales) trap sediments and distribute flows through the riparian zone.



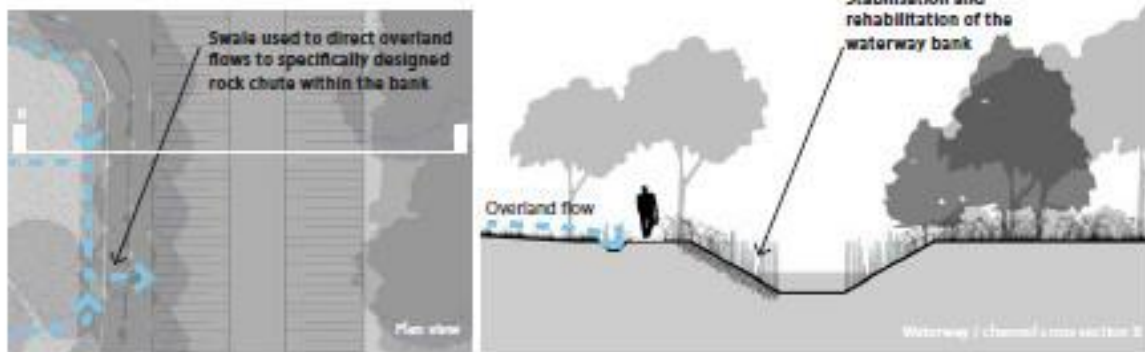
## Existing Waterway Condition

Erosion of exposed banks due to channelised overland flows



## Improved Waterway Condition

Overland flows managed with vegetated swales and rock chutes



*Flooding risk can be managed by ensuring channel capacity is not impacted by riparian revegetation*

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