



# Hot Topics Series 2010

## Introduction to Water Sensitive Urban Design (WSUD)

Tuesday 26 October 2010

MC: Jamie Ewert – Melbourne Water

# Overview of today

## Welcome

Introduction: Melbourne Water and Clearwater  
Associate Professor Tim Fletcher

## Morning Tea

Alex Lee  
Ian Penrose  
Ilona Dorian  
Jonathon Griffin & Steve Cobden  
Matt Wilson  
Erika Jeremy

## Lunch

Tony van Noordenburg – NGV tour



# Emily Kaye

Clearwater Manager

# Who is Clearwater?



- We aim to increase the uptake of sustainable water management
- Not-for-profit capacity building program
- Endorsed by government
- Work with Stormwater Vic and AWA
- Partnership with Australia's largest stormwater research program; *Cities as Water Supply Catchments*
- Technical training, events/seminars and tours
- Tailored solutions
- New website – 1<sup>st</sup> November
- Latest industry news: Clearwater e-newsletter

# Council - Responsible Person October 2010

**Matt Mulqueoney**  
**9235 1436**

Whittlesea  
Bass Coast  
Hobsons Bay  
Macedon Ranges  
South Gippsland  
Casey  
Melton  
Moorabool  
Wyndham  
Baw Baw  
Greater Geelong  
Cardinia

**Melanie Holmes**  
**9235 2113**

Hume  
Brimbank  
Nillumbik  
Banyule  
Mitchell  
Manningham  
Moonee Valley  
Moreland  
Darebin

**Dave Greenwood**  
**9235 7071**

Monash  
Frankston  
Whitehorse  
Mornington  
Bayside  
Kingston  
Dandenong  
Knox

**Nick Paulin**  
**9235 7112**

Maroondah  
Yarra  
Stonnington  
Boroondara  
Glen Eira  
Yarra Ranges  
Melbourne  
Maribyrnong

**Cit of Port Phillip- Marion Urrutiaguer 9235 7222**





# Tim Fletcher

Associate Professor in Water Engineering,  
Dept. of Civil Engineering

Monash Centre for Water Sensitive Cities



# Alex Lee

Senior Landscape Architect  
CPG Consulting



A subsidiary of Downer EDI Limited

# Urban Landscape and Community WSUD Drivers

Alexandra Lee



# CPG

# Introduction

WSUD – A Landscape Architect's perspective

What are the issues?

What are the opportunities?

What are the benefits?

How - International Examples / Local Examples

## Where we live – Melbourne and the Yarra



## Why are we here?

Water has shaped our natural and cultural landscapes, our environment and our cities.

The Yarra and its catchment are our lifeline. How have we impacted upon the local natural systems since white settlement?

*'The Place for a Village  
How nature has shaped the city of Melbourne'*  
Gary Presland

*The Water Dreamers*  
Michael Catchcart

## **WSUD – A Landscape Architect's perspective**

- Our landscapes need to be an asset that embody our social, cultural and environmental values concurrently
- We need green within our urban landscapes for public amenity
- The critical outcome is that we need the natural and our urban systems to co-exist.

## Urban and natural systems – Co-existence?



## Environmental impact = Impact on public amenity



## **What are the issues of urbanisation?**

- Polluted urban runoff entering streams
- Increased runoff from impervious areas
- Decrease in groundwater recharge
- Cultural disconnection to the environment
- Urban heat island effect

# What are the drivers for changing our ways?

- Water Scarcity
- Climate Change
- Increased Urban Density
- Counteracting Urban Heat Island Effect

# Urban Heat Island Effect

- Increased temperatures in urban areas due to the intense amount of hard surfaces within the built form
- We rely on the 'green' in our urban environment to provide relief from the intensified climatic conditions
- We need to utilise all avenues for providing green within the urban environment.

Parks

Streetscapes

Green roofs

Rooftop gardens

## Benefits of WSUD

- An 'active' landscape
- Makes visible the processes that we have historically hidden in pipes so that we can begin to reconnect to our landscape again.
- Public amenity improved through increased green within the urban landscape

**What do we need to do?**

Establish our built environments to develop an Urban Ecology



## What do we need to do?

- Create spaces that increase public amenity and environmental principles concurrently
- Let natural processes coexist within the urban environment
- Look for all opportunities to let water infiltrate and be absorbed back into our urban environment



## **We need a city wide approach**

### **What are other cities doing?**

- Singapore ABC program

- Active
- Beautiful
- Clean

- Rotterdam Climate Change Initiative

- Reintroducing water back into the urban landscape
- Green roof reimbursement program
- 80million Euro over 5 years to begin implementation
- Driven by city branding and Marketing

# Sportzplaza Mercator - Amsterdam



## Sportzplaza Mercator - Amsterdam



# Sportzplaza Mercator - Amsterdam



# Waternet - Amsterdam



## BedZED – Social Housing Development, London



# Highline Park – New York

(Image source [www.inhabitat.com](http://www.inhabitat.com) )



# Potsdamer Platz - Berlin



## Ruwenbos- Enschede, The Netherlands



## **Some Local Examples.....**



# University Hill - Bundoora



# University Hill - Bundoora



## Visitor Car Park – Cranbourne Botanic Gardens



## Fieldstone Boulevard - Beaconsfield



## Lawrence Street - Brighton



## Chapel Street - Prahran



# Nicholson Street Mall - Footscray



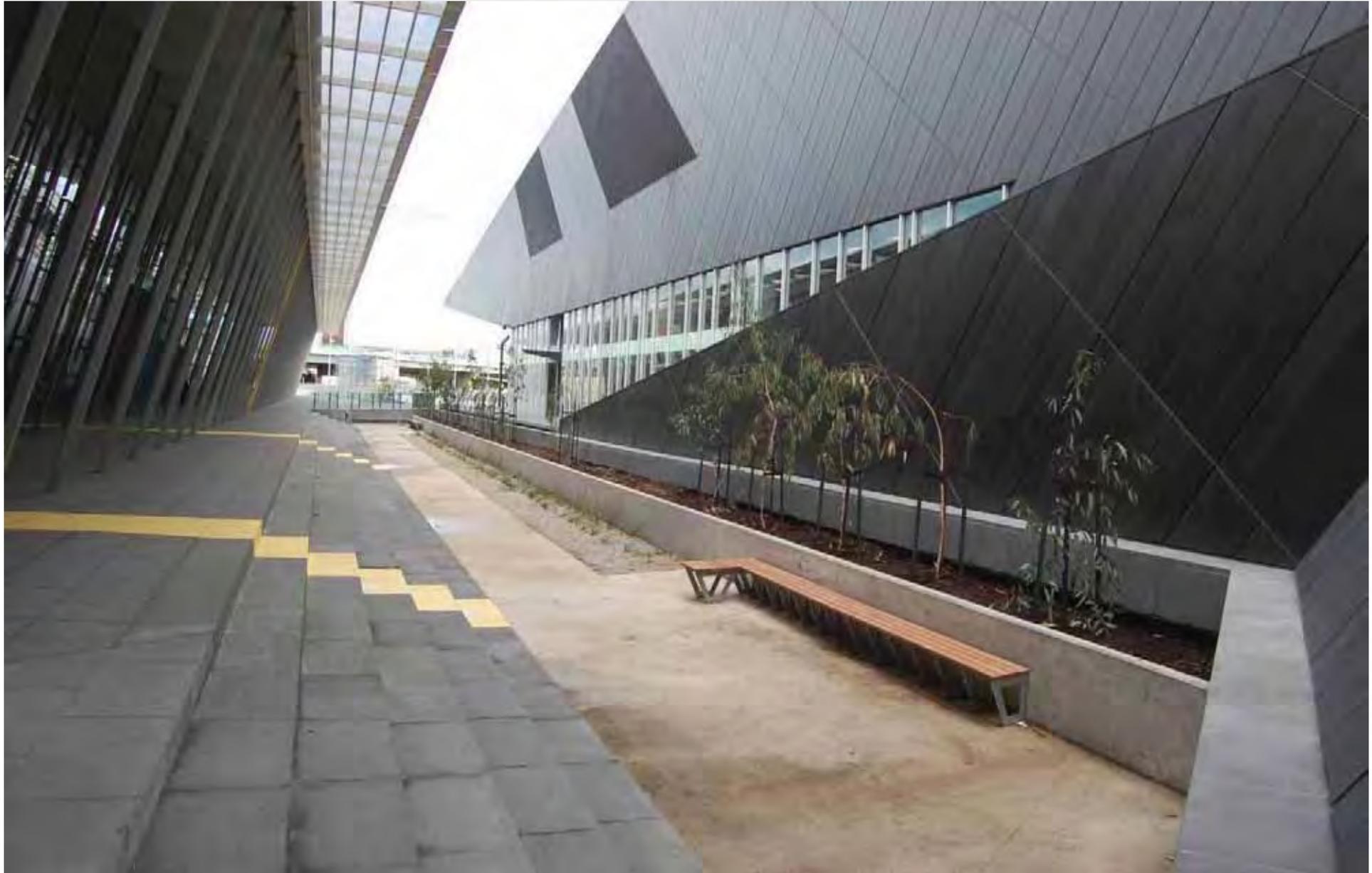
# Willis Street Carpark - Hampton



## Canna Lily Raingarden – RBG Melbourne



## Convention Centre – Melbourne.



## 131 Queen Street Rooftop – Melbourne CBD



## 131 Queen Street Rooftop – Melbourne CBD



# Balfour Street Park - Sydney



# Balfour Street Park - Sydney



# The Venny - Kensington



Image Courtesy of Melbourne City Council

# **George Pentland Botanic Gardens – Frankston Ornamental Lake Conversion**



# George Pentland Botanic Gardens – Frankston



## Wurundjeri Walk – Blackburn South



## **Wurundjeri Walk – Blackburn South**



# Nobelius Heritage Park



## Nobelius Heritage Park Water sensitive urban design drainage works

Project cost: \$500,000  
Jointly funded by Cardinia Shire Council & Melbourne Water  
Completion: May 2009  
Contractor: Sure Constructions (Vic) Pty Ltd



A series of swales, raingardens and rock chutes will be installed in the current drainage line to improve stormwater quality and prevent soil erosion. The raingardens will treat the stormwater that enters Nobelius Heritage Park before it flows into Emerald Park Lake. Raingardens are garden beds that allow stormwater to pond before it infiltrates through a foamy sand material. The water collected at the bottom is much cleaner as nutrients, heavy metals, oils, and other pollutant that are washed from streets and roofs have been removed.



# Nobelius Heritage Park



# VCA Campus, University of Melbourne



# VCA Campus, University of Melbourne



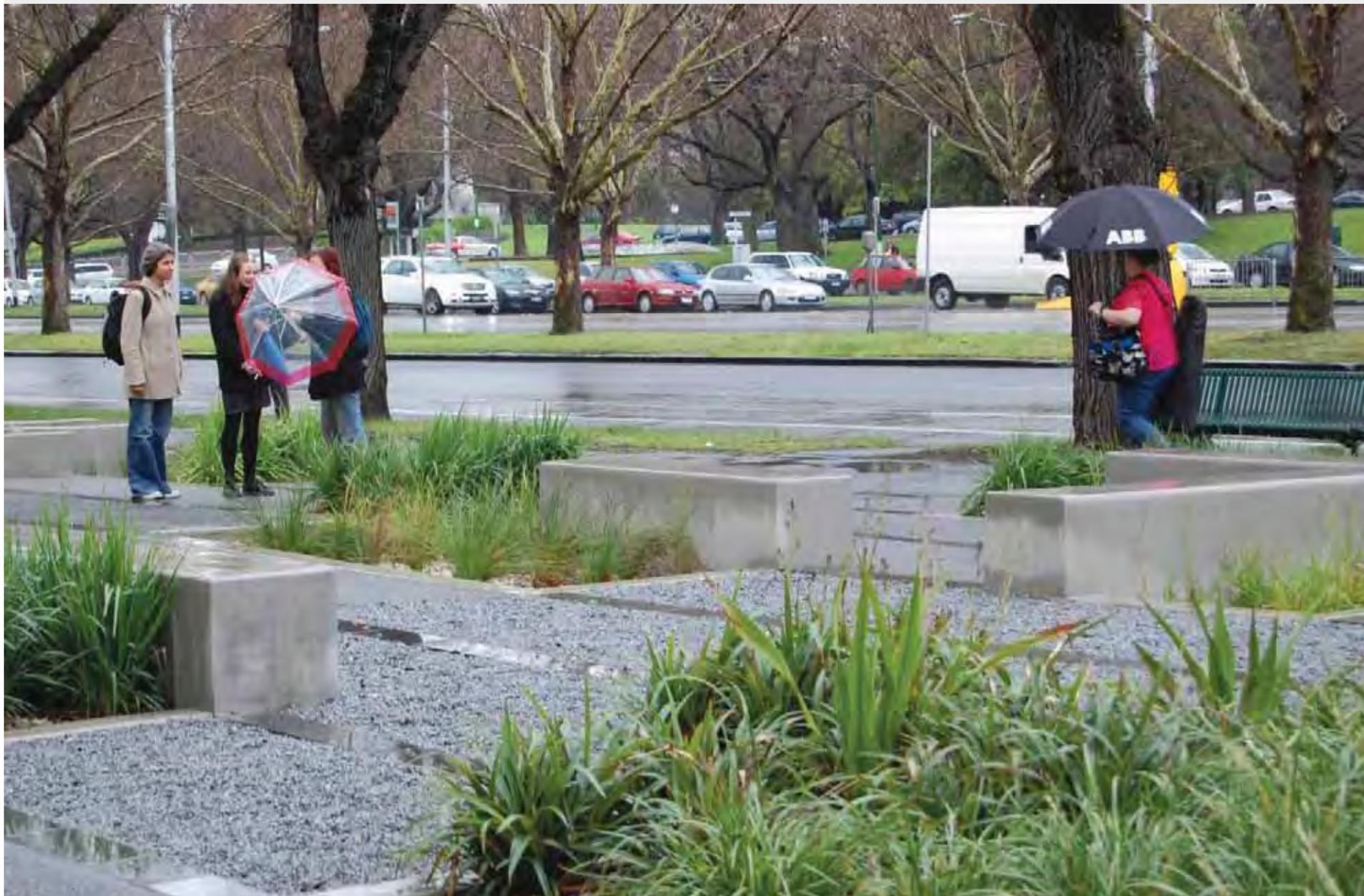
# VCA Campus, University of Melbourne



# VCA Campus, University of Melbourne



# VCA Campus, University of Melbourne



## Koonung Creek Wetland - Boroondara



## Koonung Creek Wetland - Boroondara



## Koonung Creek Wetland - Boroondara



# Koonung Creek Wetland - Boroondara



**Thankyou**

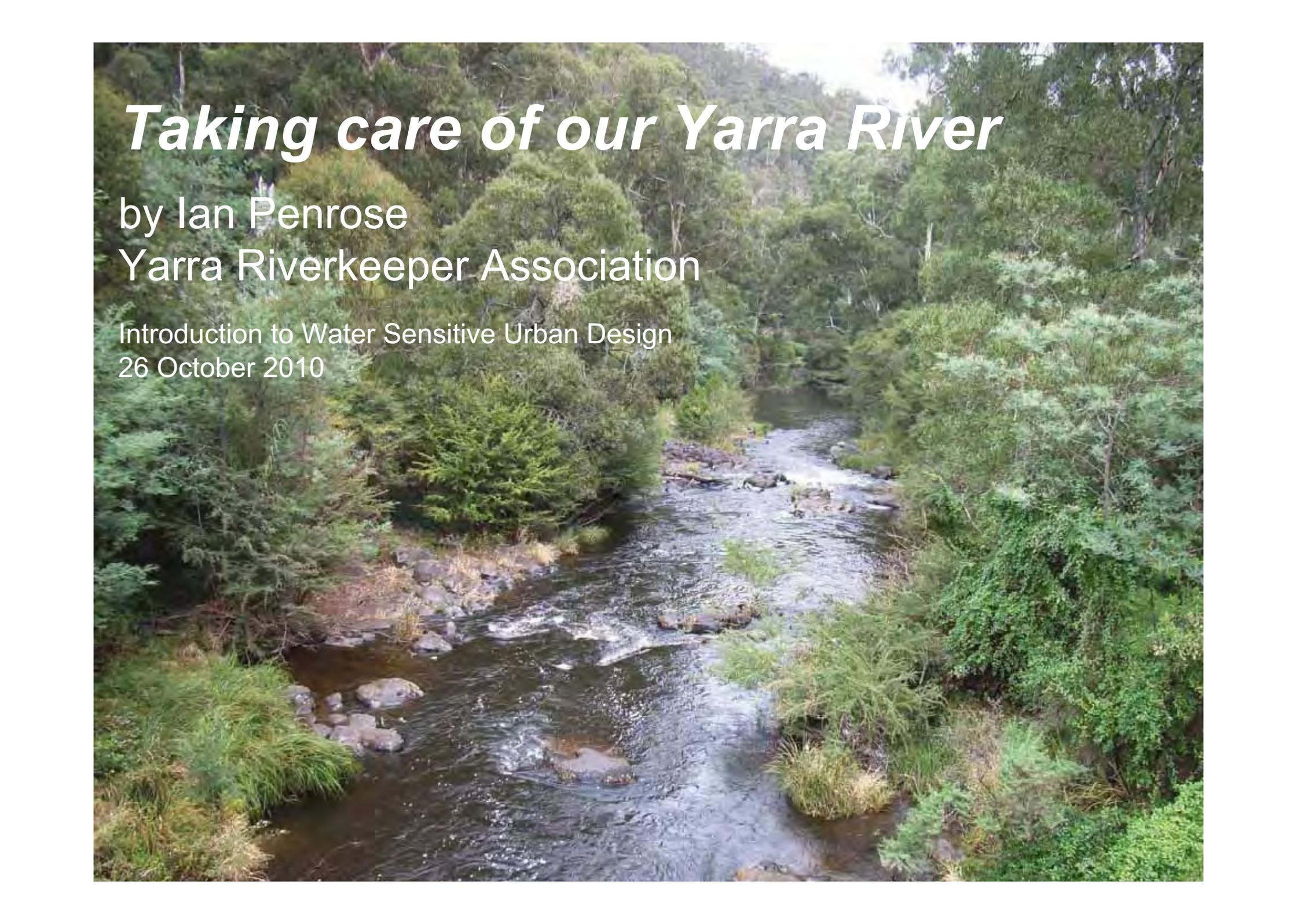




# Ian Penrose

Riverkeeper

Yarra Riverkeeper Association



# *Taking care of our Yarra River*

by Ian Penrose  
Yarra Riverkeeper Association

Introduction to Water Sensitive Urban Design  
26 October 2010



**Short-finned eel**  
**Australia's representative in 2006 Commonwealth Games**



Gunther Schmid



Neil Armstrong

**Short-finned eel  
takes a 4000 km journey to breed**

# The Yarra River (main stem)

Melbourne

Warrandyte

Warburton

● Mt Gregory



## Benefits of WSUD

- Reintroduces natural processes back into the landscape
- Landscape as 'functional asset'
- Passive watering of landscapes
- Offset of adverse environmental effects through stormwater filtration
- Increases biodiversity



Print by Fred Kruger, National Gallery of Victoria

**The Yarra River was central to Wurundjeri life**



**The Birrarung – “*Place of mists and shadows*”**



Colour lithograph by N. Wittock, State Library of Victoria.

**The Yarra River was central to Melbourne's establishment**



Art Gallery of New South Wales

**The Yarra River was central to early Melbourne culture  
- Arthur Streeton's "*Still Glides the Stream*"**



AG & AJ Campbell 1904



Photo courtesy of Howard Sierak



Photo courtesy of Mercantile Rowing Club



Photo courtesy of Howard Sierak

**The Yarra River was central to early Melbourne life  
- sports and recreation**



Photo courtesy of Melbourne Water

**The Yarra River is vital to Melbourne today  
- tourism and industry**



**The Yarra River is vital to Melbourne today  
- sports and recreation**

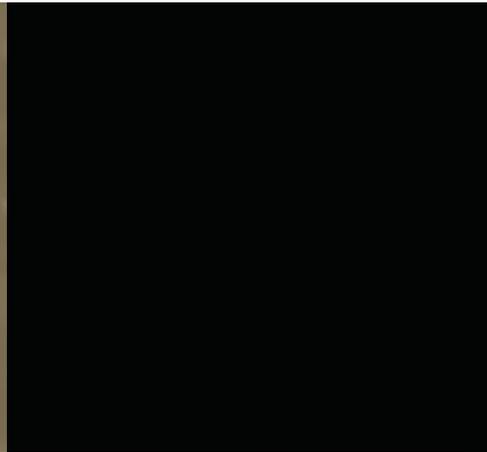


Photo courtesy of Melbourne Water



Photo courtesy of DNRE



Paul Mitrovski

**The Yarra River is vital to Melbourne today  
- our most important natural asset**



**The Yarra River is vital to Melbourne today  
- our most important natural asset**

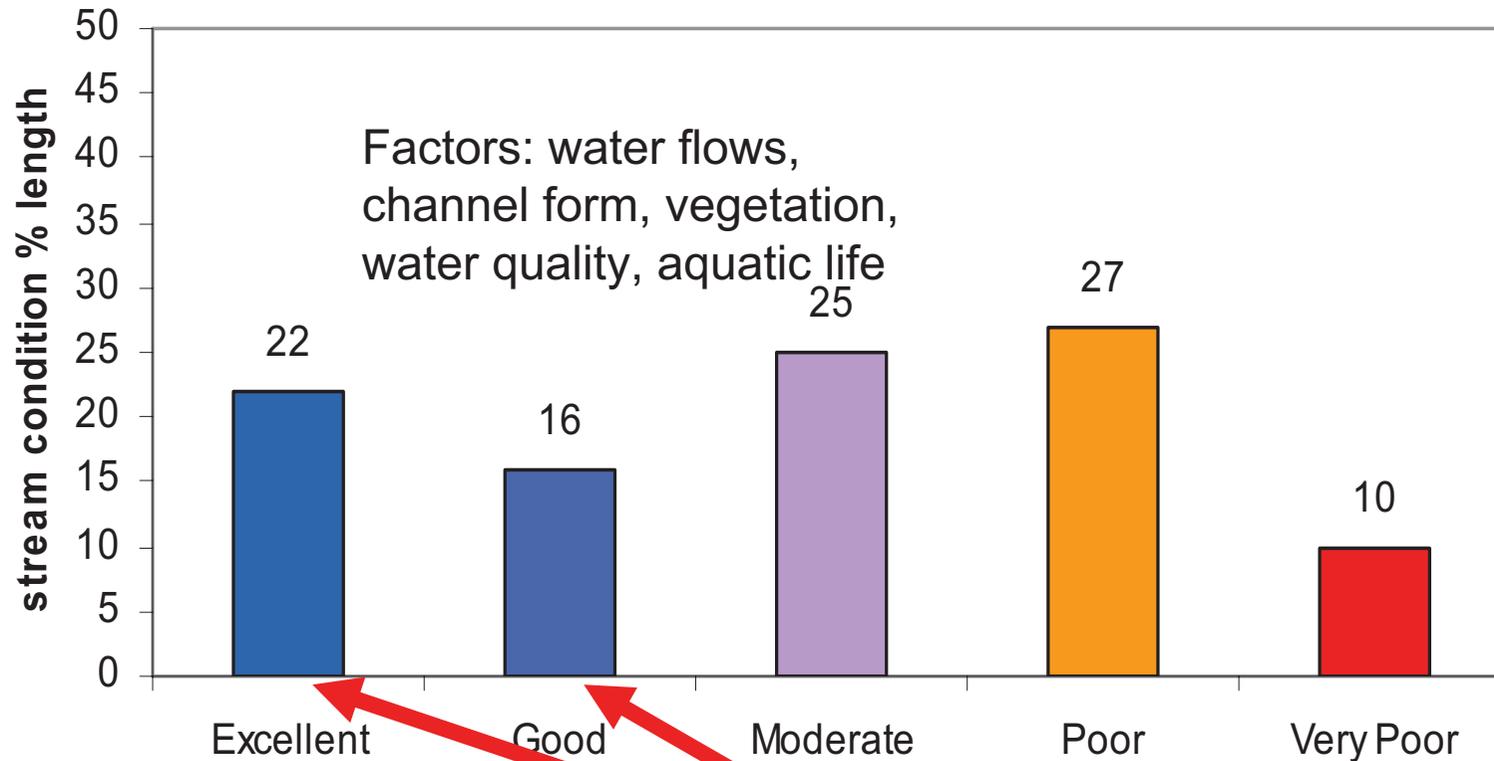


**The Yarra River is vital to Melbourne today  
- it is the city's centrepiece**



**The Yarra River is vital to Melbourne today  
- it is the city's centrepiece**

# Current health of the Yarra and tributaries



Source: Melbourne's Rivers and Creeks 2004

**Only 38% of the river is  
in good+ health !  
And this is in the upper  
catchment**



**We pollute our river water**



Photograph by John Lamb

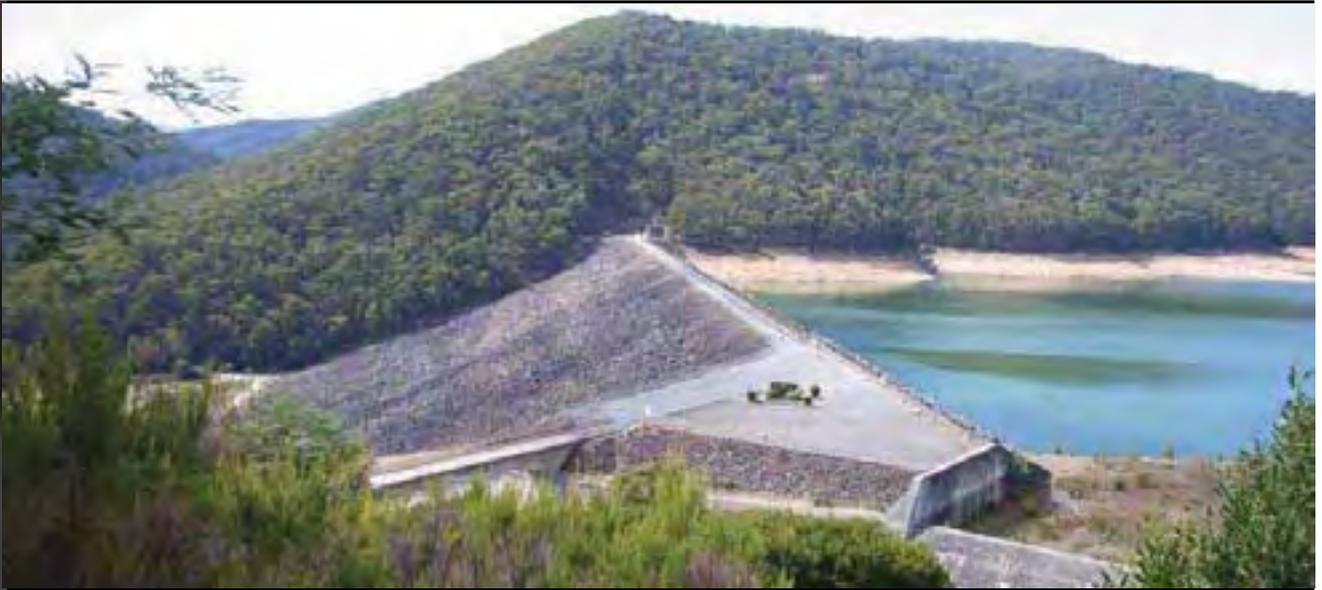
**A water quality expert at work  
– “Norman Gunston” (Gary McDonald) 1980**



**Detecting pollution - water quality “experts” at work !!**



**Our river needs a healthy flow pattern AND retain most of its water**



**70% of Melbourne's water is taken from the Yarra**





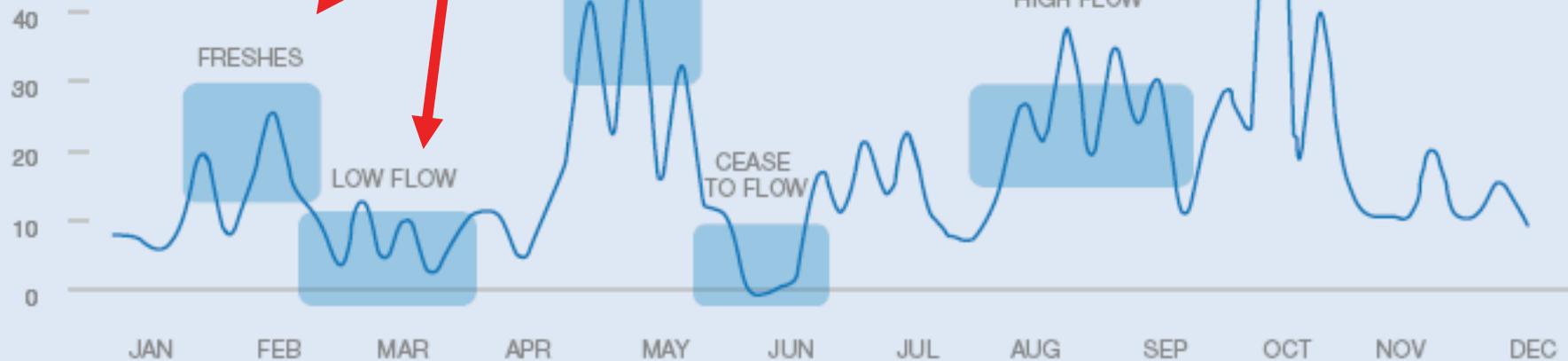
### Overbank Flow

Maintains floodplain and wetland connectivity

### High Flow

Allows for fish migration

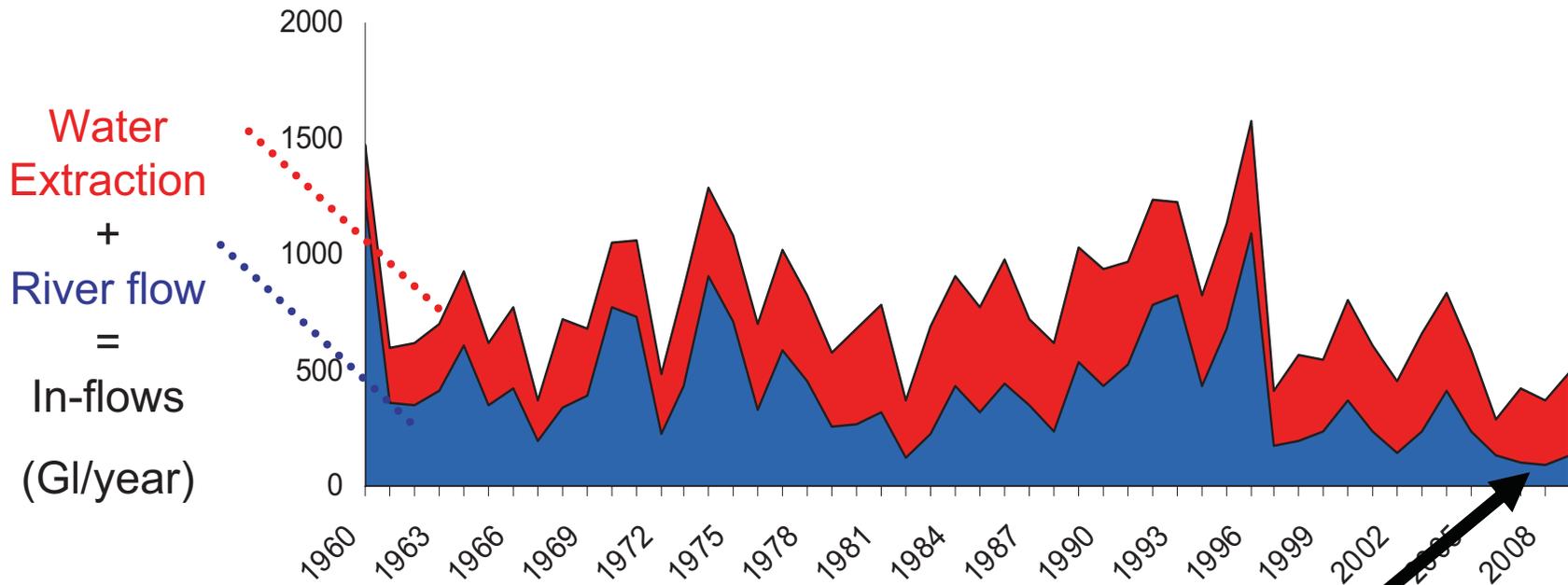
### OVERBANK FLOW



Photos courtesy of DSE

**The flow in a healthy river follows the rhythm of the seasons**

# Yarra Flows and Water Extraction



River flow	2007: 25%
as percent	2008: 25%
of in-flows	2009: 28%

**The worst three years on record!**

# Impacts of persistent low flows in the Yarra

Loss of in-stream habitat

Invasion of pest species

Algal blooms

Loss of fish spawning triggers

Fish confined to pools

Very low oxygen in the water





***“We did not inherit the Earth from our ancestors.  
We have borrowed it from our children.”***

**Lester Brown, author**



## Yarra Riverkeeper Association Inc

Supported by



# What do the Yarra Riverkeepers do?

## 1. Educate



## 2. Advocate



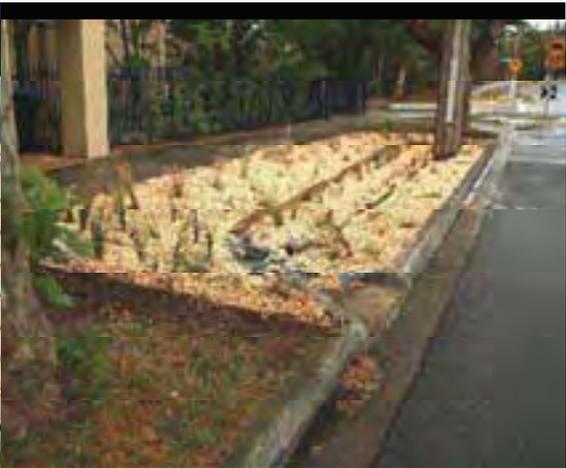
## 3. Connect





**Educate**

**Our "Yarra Yabber" bus tours**

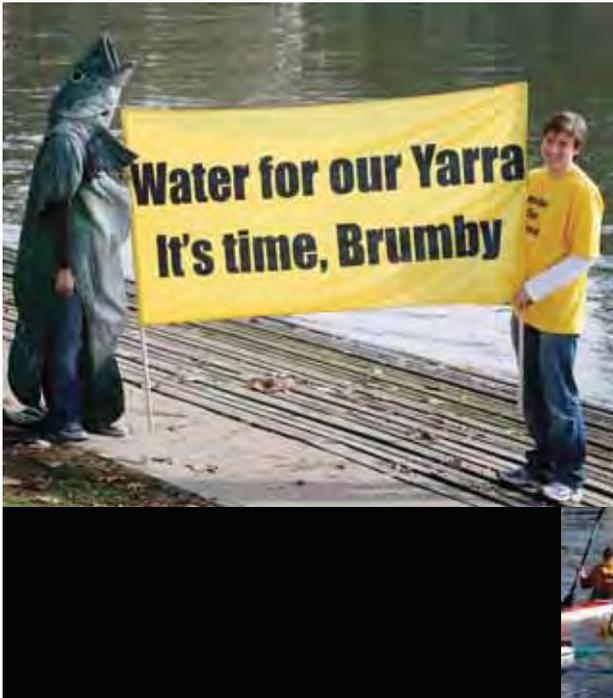


# Educate

A Yarra Riverkeepers' bike ride highlighting Water Sensitive Urban Design



# Advocate





# Water for Rivers



www.yarrahep.org.au

Autumn 2009

www.environment.vic.gov.au

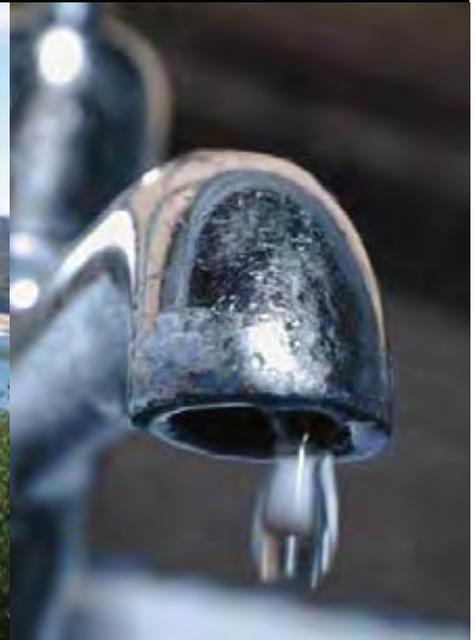
## Advocate

River relief  
How we can protect the Yarra  
and meet Melbourne's water needs



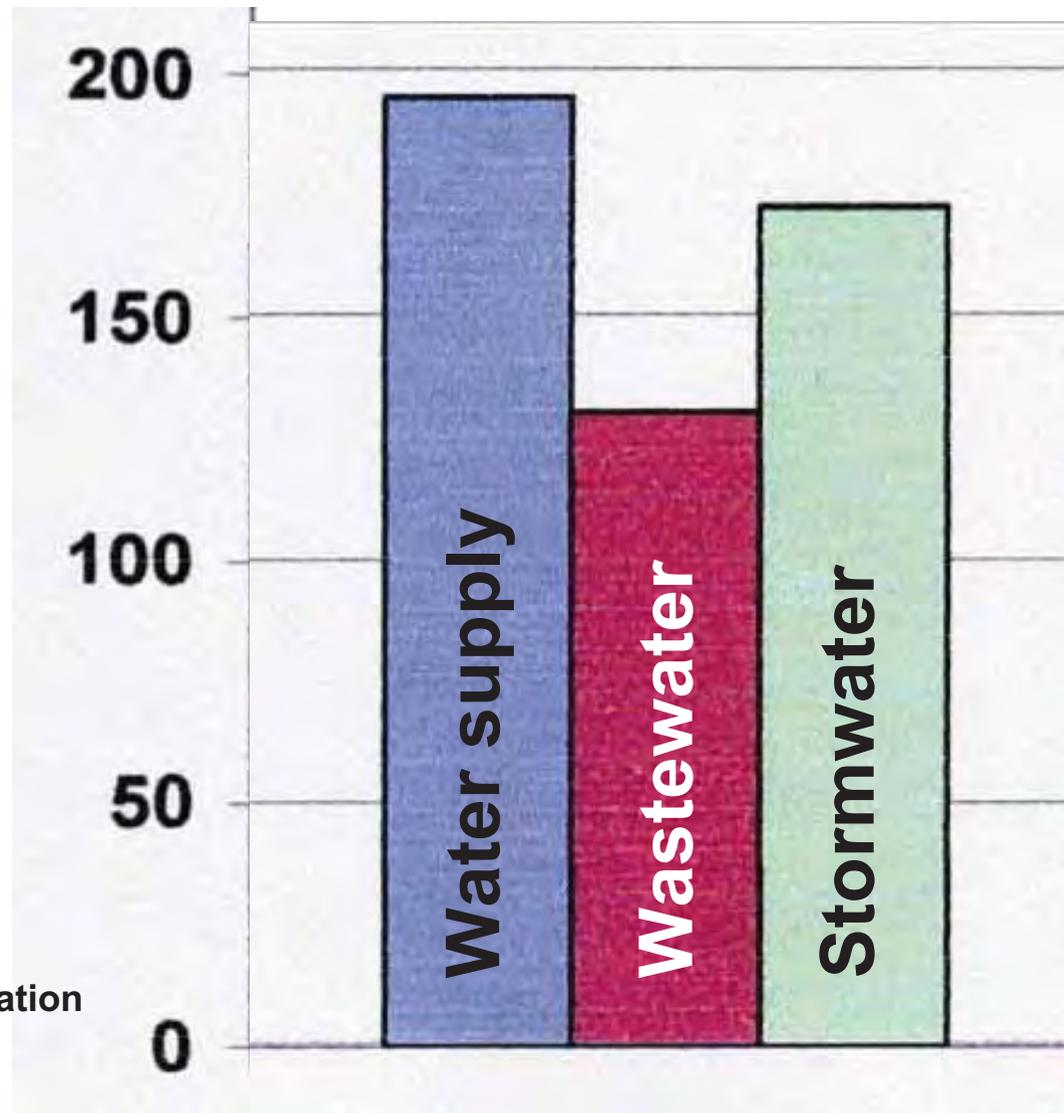
# ***How we can secure Melbourne's water needs and protect the Yarra***

- 1. Maximise the capture of rain/stormwater  
*“a tank under every roof”***
- 2. Recycle all “waste” water and  
use it for potable supply**



# Water systems in Melbourne

Kilolitres per household per year



Source: Prime Minister Science, Energy & Innovation Working Group (2007)

# *How we can secure Melbourne's water needs and protect the Yarra*

- 1. Maximise the capture of stormwater**
- 2. Recycle all “waste” water**
- 3. Ensure the Yarra keeps most of its natural flow**



# Connect

**We urge the community to:**

- Understand the river's ecology and its needs**
- Celebrate and take pride in our river**
- Enjoy our river's wonders**









# Our Yarra needs YOUR help

Embrace Water Sensitive Urban Design and help ensure a safe and healthy river for the future



Please support the Yarra Riverkeepers and invite us to speak at your next forum



# Ilona Dorian

Regional Stormwater Policy Advisor  
Clearwater

A collage of six images illustrating water-sensitive urban design: a park with a pond and wooden walkway; a stream with a grassy bank; a garden bed with mulch and small plants; a residential street with green landscaping; a large white rainwater storage tank next to a brick wall; and a wetland area with water and vegetation.

**POLICY TO SUPPORT  
WATER SENSITIVE  
URBAN DESIGN**

**Why we need it?**

**What is it?**

**How we go about it?**

## Who needs to know?

- Councils
- Drainage Authorities
- Water Retailers
- Developers
- Land Owners
- Consultants



38 METROPOLITAN  
COUNCILS AND 41  
REGIONAL COUNCILS

## Population and Demand

- Increasing rapidly
  - ... Increasing urban densities (↑ impervious area)
  - ... Increasing total area (↑ impervious area)
- Increasing water demand
- Increasing environmental impact
- Water restrictions



## Run-off Quality

Urban land use

= increased pollutants in catchment

Direct route to waterway

= limited treatment potential

### **Result**

**= decreased runoff quality**

**= damage to receiving waterways**

## Opportunities

- Increasing reuse
- Targets to reduce nutrient discharges
- Water Sensitive Urban Design (WSUD)
  - ... Protect natural systems
  - ... Integrate water treatment into landscape
  - ... Protect water quality
  - ... Reduce runoff and peak flows
  - ... Adds value



A photograph of a river flowing through a lush, green landscape. The water is calm and reflects the surrounding trees and sky. In the foreground, a large eucalyptus tree trunk with characteristic peeling bark is prominent on the right side. The background shows a dense forest of similar trees along the riverbank.

We need to return to a  
**more natural water cycle!**

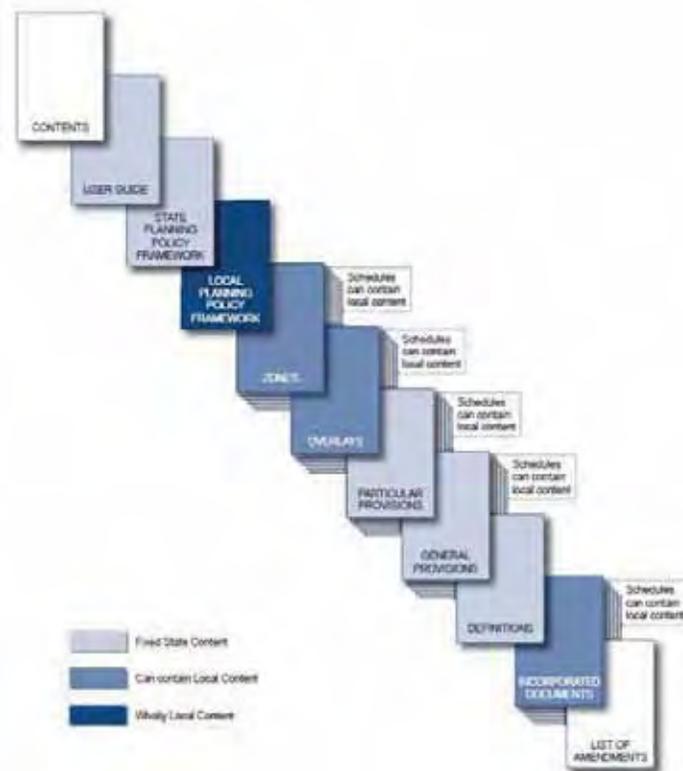
## Clause 56.07-4

- Residential Subdivision
- Introduced 9 October 2006

Sustainable Neighbourhoods Provisions

Applies to Residential Subdivision in:

- ... Residential 1, 2 and 3 Zones
- ... Mixed Use Zone
- ... Township Zone
- ... Comprehensive Development Zone
- ... Priority Development Zone



## Clause 56.07-4 – Urban Runoff Management

- ‘To minimise damage to properties and inconvenience to residents from urban run-off.’
- ‘To ensure that the street operates adequately during major storm events and provides for public safety.’
- ‘To minimise increases in stormwater run-off and protect the environmental values and physical characteristics of receiving waters from degradation by urban run-off.’



## Targets

- Requires new residential subdivision to meet best practice stormwater management targets:
  - ⑤ 80% reduction in Total Suspended Solids (TSS)
  - ⑤ 45% reduction in Total Phosphorus (TP)
  - ⑤ 45% reduction in Total Nitrogen (TN)
  - ⑤ 70% reduction in Gross Pollutants (litter)
  - ⑤ Maintain 1.5-year ARI flow discharges at pre-development levels

# Approach

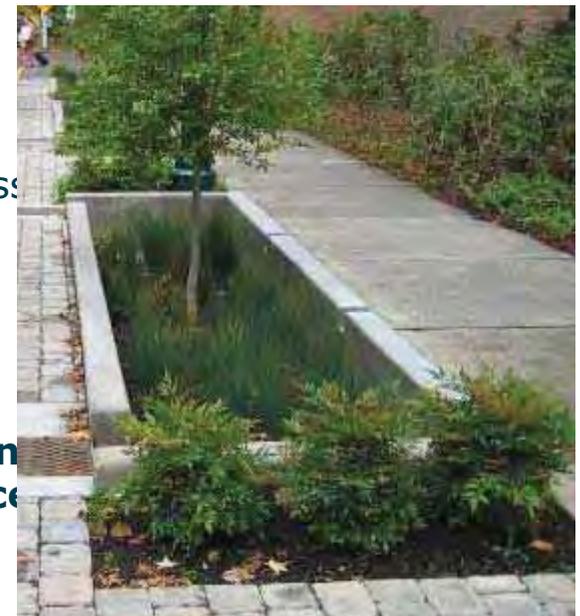


Promotes distributed water quality treatment  
**at or near**  
the source of polluted runoff

- Treatment needs to be incorporated into the development
  - ... Easy to integrate into landscape if planned early
  - ... Don't wait to stipulate requirement by condition!
- Councils should consider building capacity among staff to assess models

USEFUL TIP:

**Stormwater quality treatment standards only require an average of 2% of a subdivision area to meet best practice**



## Tools

- STORM - for smaller, simpler treatments that do not propose WSUD measures in series (free software)
- MUSIC model - for larger, more complicated systems including 'treatment trains' (licensed software)

## The Gaps

- Does not apply to subdivision of existing buildings – infill
- Does not apply to commercial/industrial
- Does not adequately address the Directly Connected Imperviousness (DCI) issue

## Addressing the gaps

- Develop Local Planning Policies to strengthen policy backing
- Use other planning policies to support your decisions
- Provide feedback on policy issues to DPCD, MAV, PIA etc. (get active to initiate change!)

## **Achieving better WSUD planning outcomes**

- Go beyond existing policies – look at using stormwater on-site to meet Clause 56.07 and deliver greener developments
- Talk across council departments (e.g. Planning, Eng)
- Communicate with applicants as early as possible
- Inform and negotiate with applicants for better, mutually beneficial outcomes

Planning policies aim to protect our waterways from the  
damaging effects of urbanisation

Planning policy sets your direction

## HOWEVER...

Through good communication early in the process, and using the support of the full suite of existing policies, councils are able to negotiate solutions beyond the minimum requirements...

**..... stormwater quality treatment standards only require an average of 2% of a subdivision area to meet best practice**

## Assistance Available

- [www.clearwater.asn.au](http://www.clearwater.asn.au) – includes resources and information on upcoming training courses
- [www.wsud.melbournewater.com.au](http://www.wsud.melbournewater.com.au) – includes STORM, fact sheets, guidelines, WSUD treatment types and case studies
- <http://www.dpcd.vic.gov.au/planning> – includes Planning Practice Note on Clause 56.07
- [ldm.melbournewater.com.au](http://ldm.melbournewater.com.au) - includes offsets and contributions rates and offsets application forms (Form A)
- Presenter: Ilona Dorian (Clearwater)

# Floor Questions

Alex Lee  
Ian Penrose  
Ilona Dorian



## **Steve Cobden**

Student Development Engineer  
Greater Shepparton City Council

## **Jonathan Griffin**

Team Leader Development Coordinator  
Greater Shepparton City Council

# WSUD IN SHEPPARTON

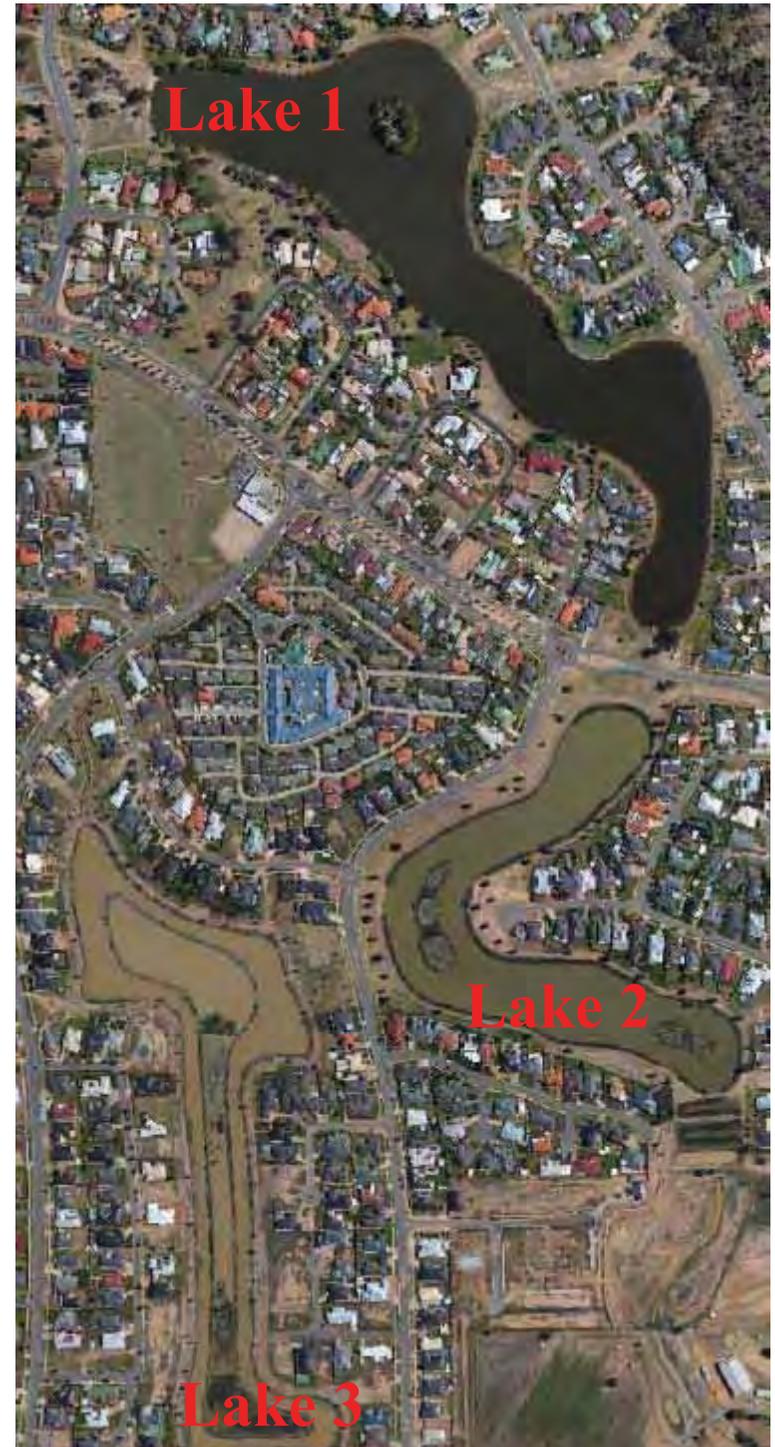
Lessons from the past influencing  
designs for the future

# Progress from 1980 to 2010

Lake 1 is a 1980's designed lake to provide landscape amenity and fill for developing within flood encumbered land

Lake 2 is a 1990's designed lake with some stormwater treatment known as the "serpentine"

Lake 3 is a 2000's designed lake with stormwater treatment function



# Not Quite Right

NOT IN THE GROUND!  
NO INTEGRATION WITH PASSIVE OR ACTIVE PUBLIC OPEN SPACE  
NOT OTHER WSUD PRINCIPLES



# Recently Completed Projects

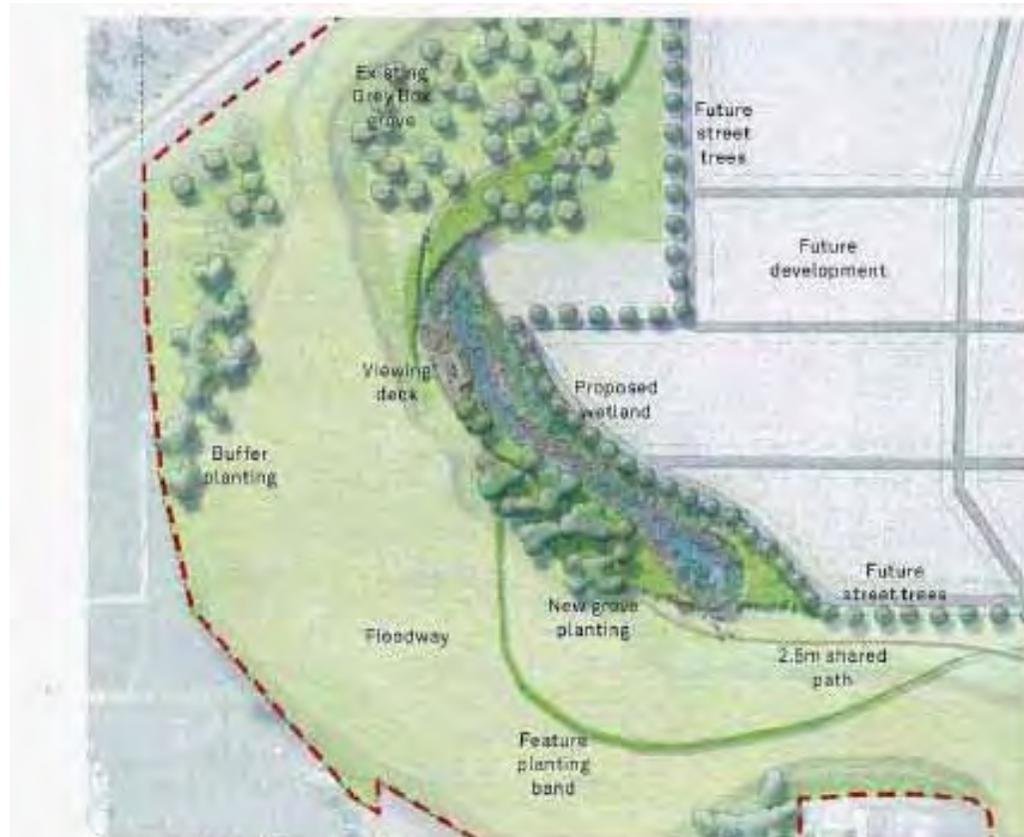
- **FULLY INTEGRATED WITH EXISTING FLOODWAY**
- **IS AFFECTED BY HIGH RIVER EVENTS**
- **DOESN'T LOOK LIKE A HOLE IN THE GROUND**



# Future Projects

Legend

- Major Landscape Character Space
- Minor Landscape Character Space



Southern Major Character Space

AECOM Mooroopna Floodway Landscape Masterplan Report Landscape Masterplan



# How to deal with infill development?

- **NOT PRACTICAL TO PROVIDE WSUD ON SOME SITES**
- **UNLIKELY TO BE MAINTAINED OR RETAINED OVER LONG TERM PERIOD**
- **CONTRIBUTE TO OFF SITE WORKS**
- **INTEGRATION OF RAINWATER TANKS WITH STORMWATER RETENTION**

# Contact Details

**Jonathan Griffin – Team Leader Development**

**Greater Shepparton City Council**

**Ph. 5832 9825**

**Steven Cobden – Student Development Engineer**

**Greater Shepparton City Council**

**Ph 5832 9825**



# Matt Wilson

Senior Urban Designer  
Hume City Council



# **Clearwater Hot Topics Seminar**

## **26 October 2010**

### **Case Study: Main Street Extension**

### **Broadmeadows**

**Matt Wilson**  
**Hume City Council**  
**Senior Urban Designer**





## ► *Overview*

- **Context and Reasons for establishing WSUD**
- **Stakeholders**
- **Design Process (and challenges)**
- **Construction Phase (and challenges)**
- **Lessons**



## ► *Context and Reasons for Establishing WSUD*



## ► *Desired Outcomes*

- **Change perceptions about Broadmeadows**
- **Improve the quality of the public realm**
- **Create an integrated and coherent precinct**

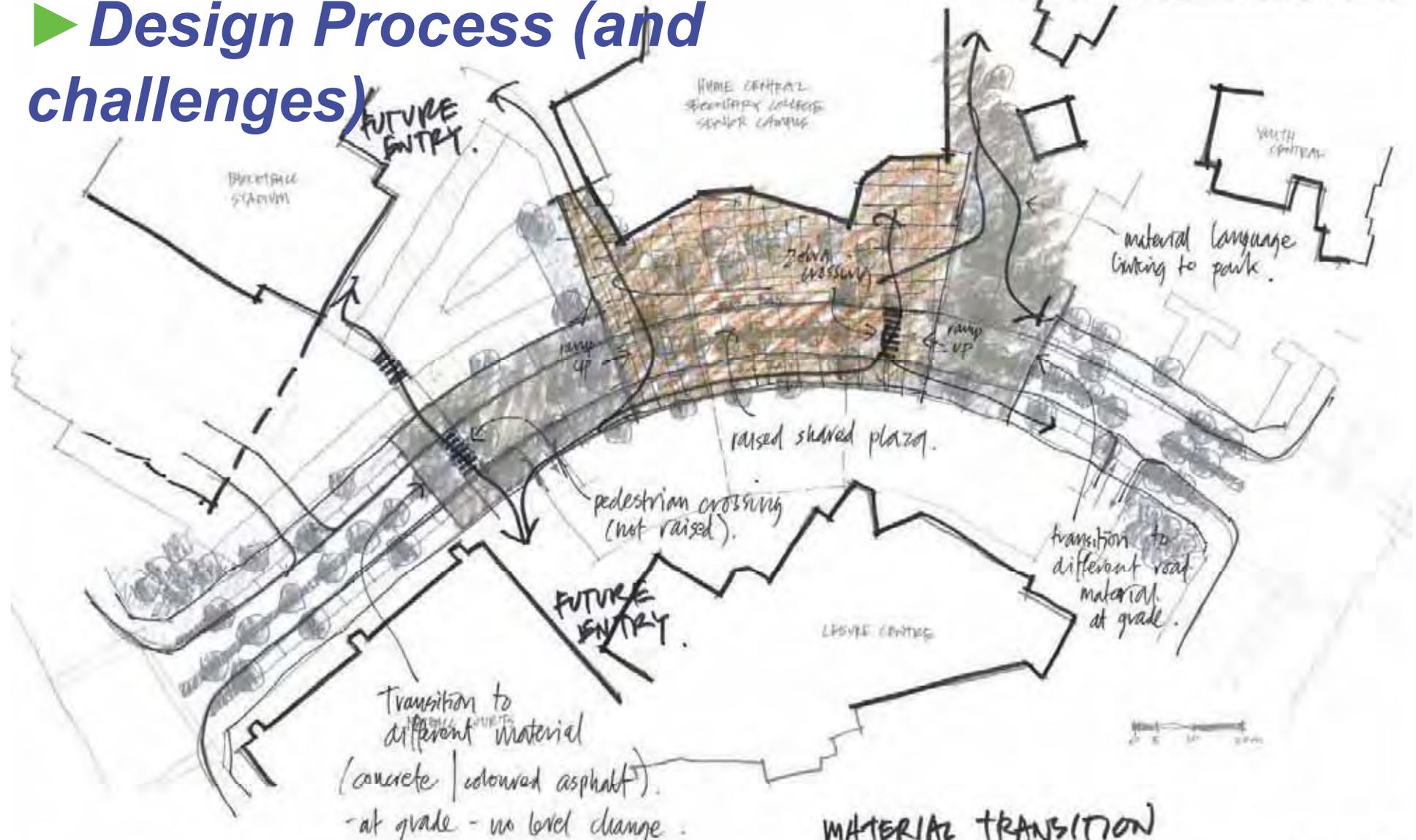


## ► Stakeholders



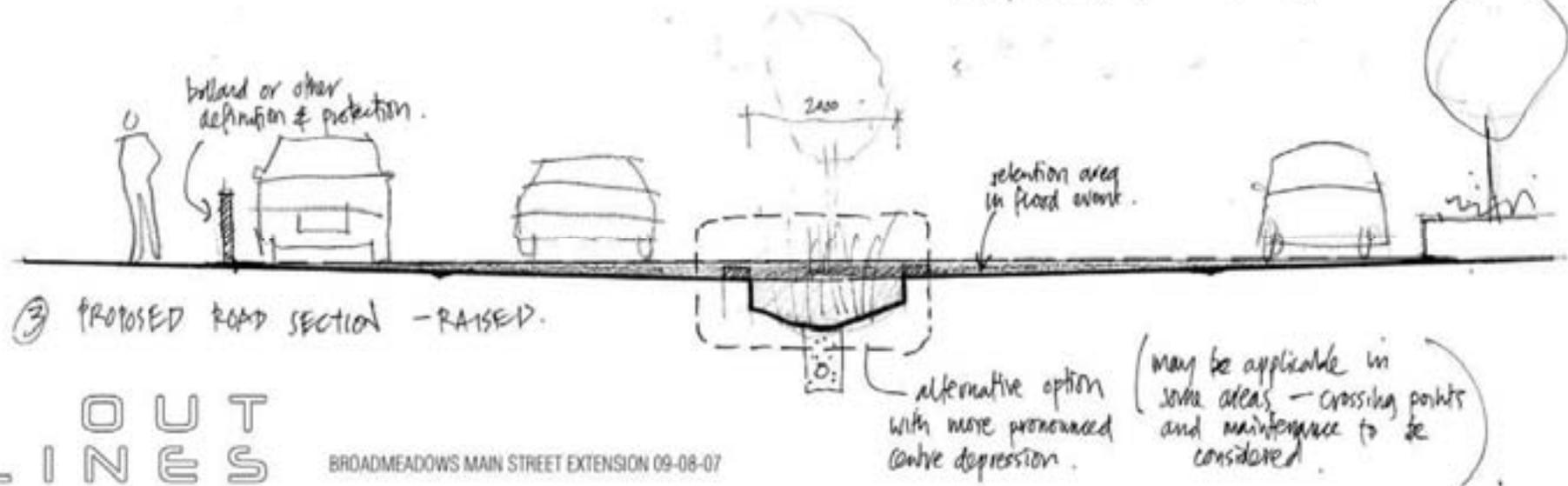
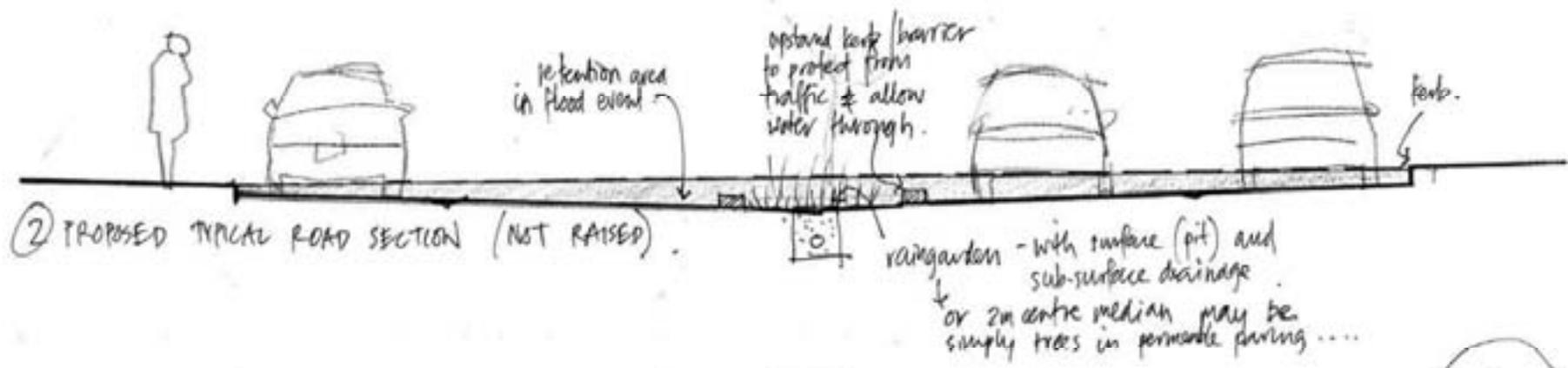
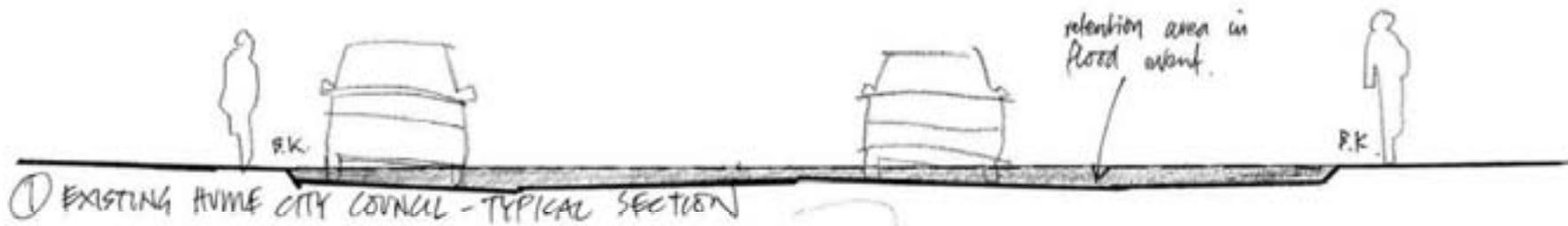
# ► Design Process (and challenges)

0818 Broadmeadows Main Street



Transition to different material (concrete / coloured asphalt).  
- at grade - no level change.

**MATERIAL TRANSITION**  
- SMALLER CENTRAL  
RAISED SHARED  
PLAZA.





**CENTRAL MEDIAN**

-  Hard paved median
-  Pedestrian trafficable permeable paved median with street trees accepting runoff from vehicular & pedestrian pavements
-  Pedestrian trafficable permeable paved median without street trees accepting runoff from vehicular & pedestrian pavements
-  Planted rain garden median accepting runoff from vehicular and pedestrian pavements

**STREETSCAPE**

-  Permeable paved with street trees accepting runoff from pedestrian pavements
-  Planted rain garden with street trees accepting runoff from pedestrian pavements. Plantings protected by furniture & fixtures
-  Permeable paved or grated street tree planting that can have minor inflows but that could accept more runoff from pavements pending peripheral areas design

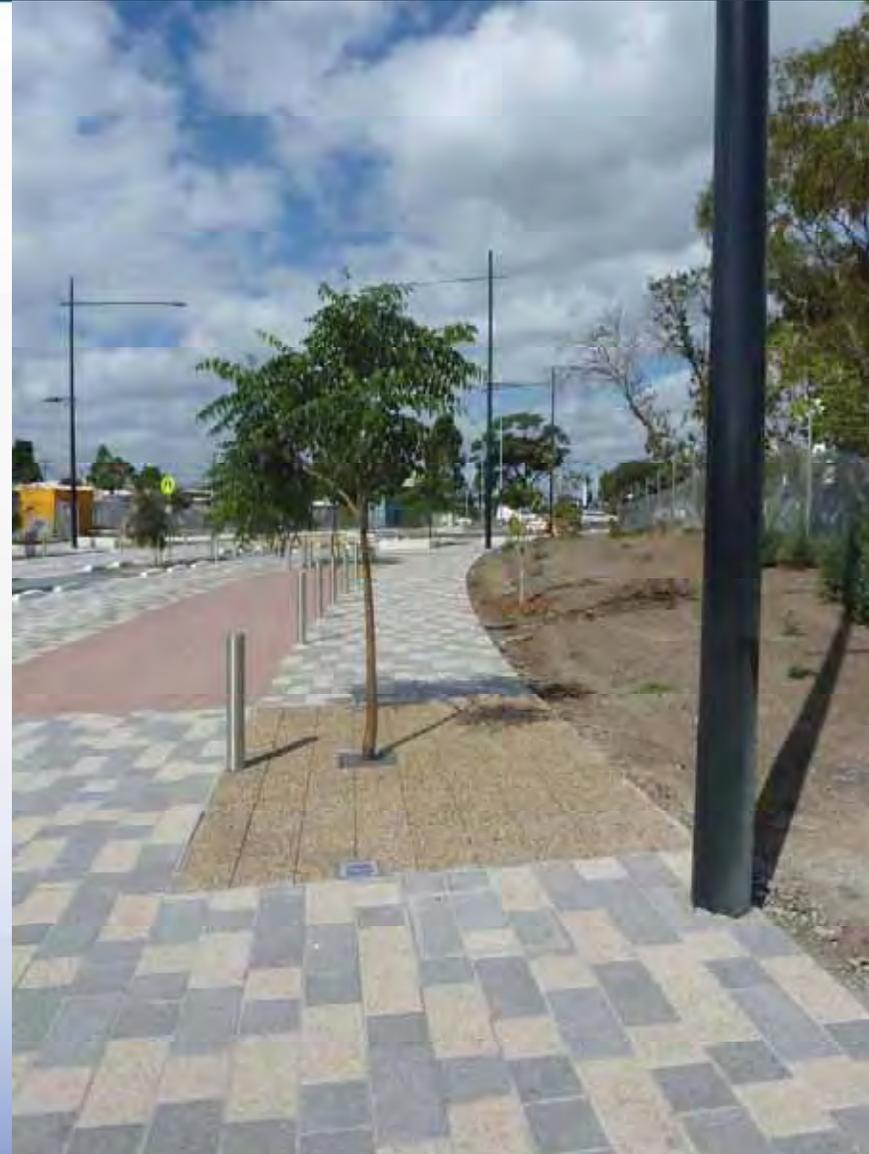
**PERIPHERAL AREAS**

-  Further opportunities for WSUD



## ► **Construction Phase (and challenges)**

- **Communication and Coordination**
- **Melbourne Water inspections**







## ► *Lessons*

- Get stakeholders onboard early!
- Use all available resources
- Leverage greater urban outcomes





## ► *Broadmeadows Town Park*

- Stormwater Harvesting
- 500KL Capacity
- Irrigation + Natural Flows





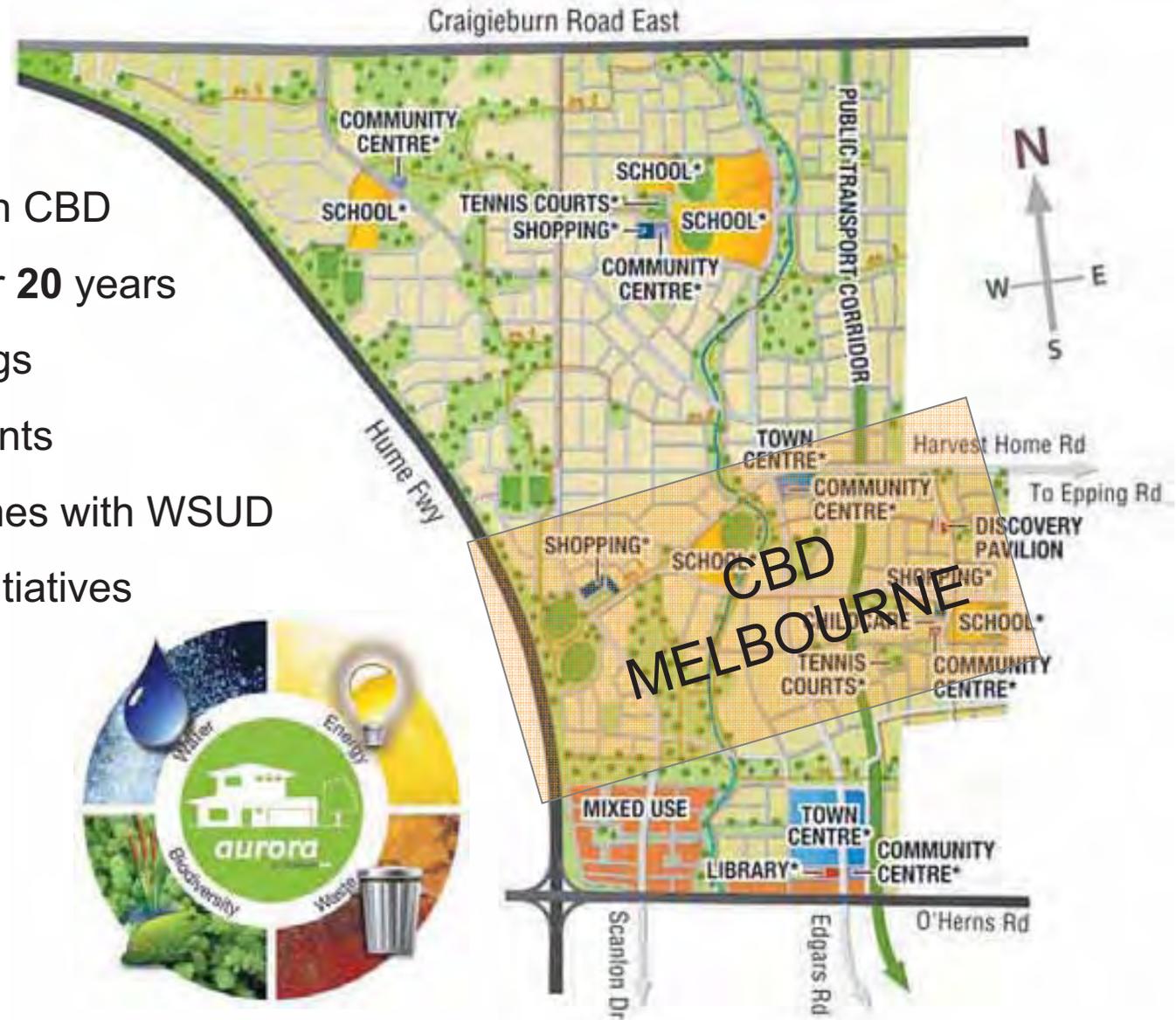
# Erika Jeremy

Development Manager

Aurora

# Aurora - Creating the suburb of the future

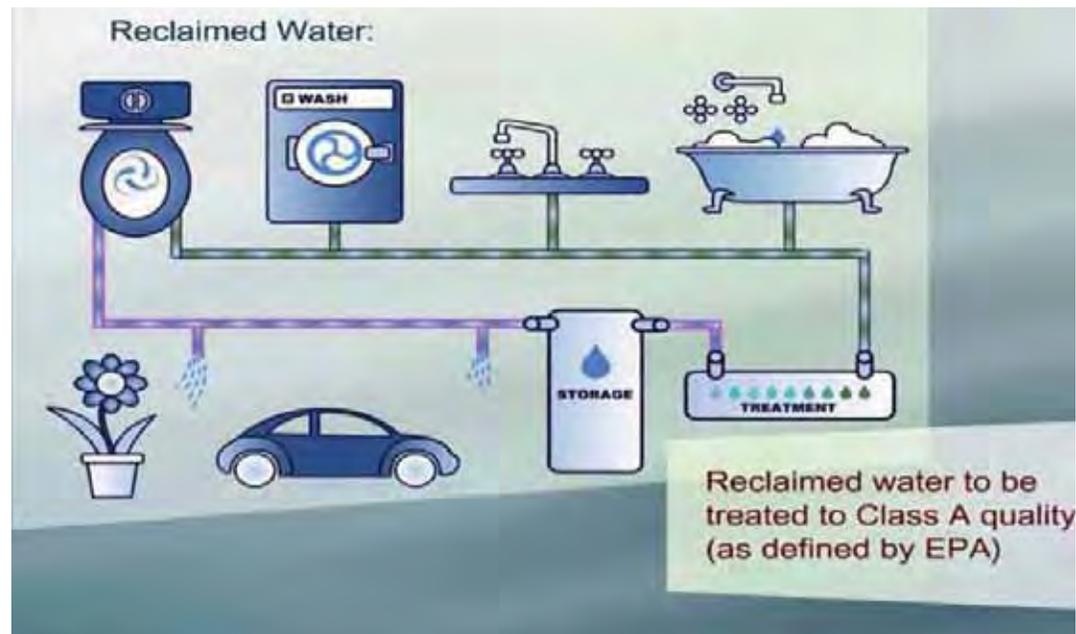
- Approx. 40kms north CBD
- Project delivery over **20** years
- **8,000** future dwellings
- **25,000** future residents
- **6** star designed homes with WSUD
- **4** key sustainable initiatives



# Integrated Water Management

## Black Water + Grey Water ▶ CLASS A RECYCLED WATER

- Yarra Valley Water on-site treatment plant became operational in March 2009
- All homes at Aurora and nearby City of Whittlesea recreation assets will be connected to the facility
- Recycled water used for irrigation, toilet flushing, laundry use and car washing

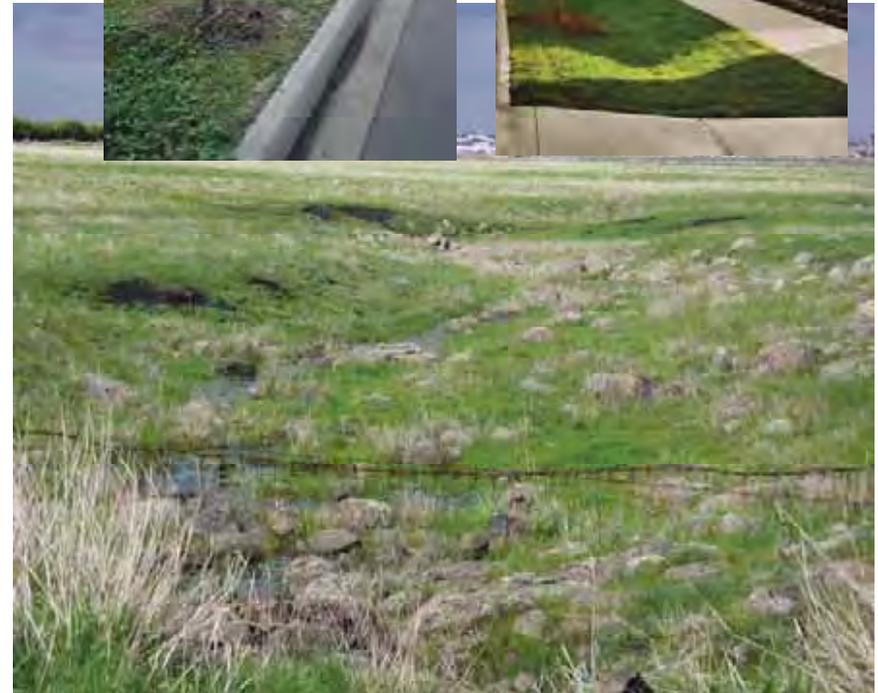


# Integrated Water Management

## Stormwater Management

NOW: Bio-retention swales in nature strips  
Rain water tanks not required

NEXT: Streetscape rain gardens  
Rain Water for Hot Water  
Edgars Creek rehabilitation



# Community Benefits

## Community benefits

- 1200 residents now call Aurora home
- Savings on home running costs and the benefits of recycled water has been a key selling feature
- Extensive community engagement programs are in place

## Extensive stakeholder buy-in and commitment

- VicUrban
- City of Whittlesea
- Melbourne Water
- EPA Victoria
- Yarra Valley Water





# Floor Questions

Steve Cobden/Jonathon Griffin

Matt Wilson

Erika Jeremy



# Thank you

Contact Clearwater

03 9235 5335

[info@clearwater.asn.au](mailto:info@clearwater.asn.au)

[www.clearwater.asn.au](http://www.clearwater.asn.au)