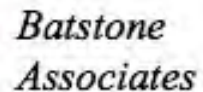


# ACTIVATING WATER SENSITIVE DESIGN IN NEW ZEALAND – UNDERSTANDING THE COSTS AND VALUES



Sue Ira, Robyn Simcock, Jonathan Moores and Chris Batstone



# Outline

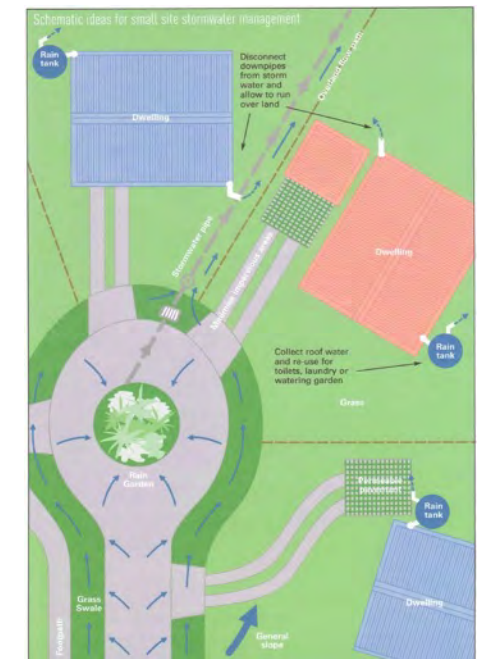
- Research background
- Cost estimation
- Kirimoko Park
- Learnings



# What is Water Sensitive Urban Design?

A design approach to site development that **protects** and **incorporates** natural site features into the stormwater management plan.

- minimising impervious areas
- minimising site disturbances
- creating or enhancing natural areas
- use of green infrastructure



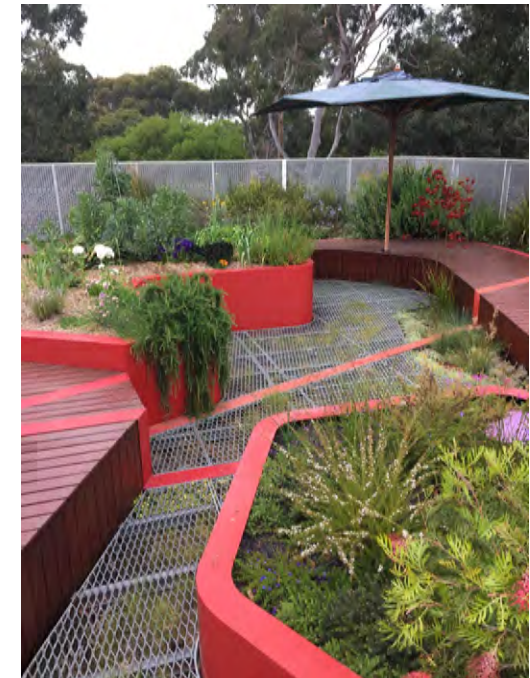
# WSUD across the world....

USA: Green Infrastructure/ LID

Europe: SUDS

Australia: WSUD

WSUD is case specific – use of design philosophies and mitigations reflect key drivers



# Project overview

- Building Better Homes, Towns and Cities National Science Challenge
- Project Aims
  - Activate WSUD community of practice
  - Deliver 'quick wins'
  - Longer term strategic research plan
- Project Structure
  - Discovery phase
  - Research phase
  - Dissemination phase



# Phase 2 activities

- Core research
- Further discovery
- Enhancement & dissemination of existing information

Approved by:

- International peer reviewer
- External Advisory Group
- BBHTC NSC

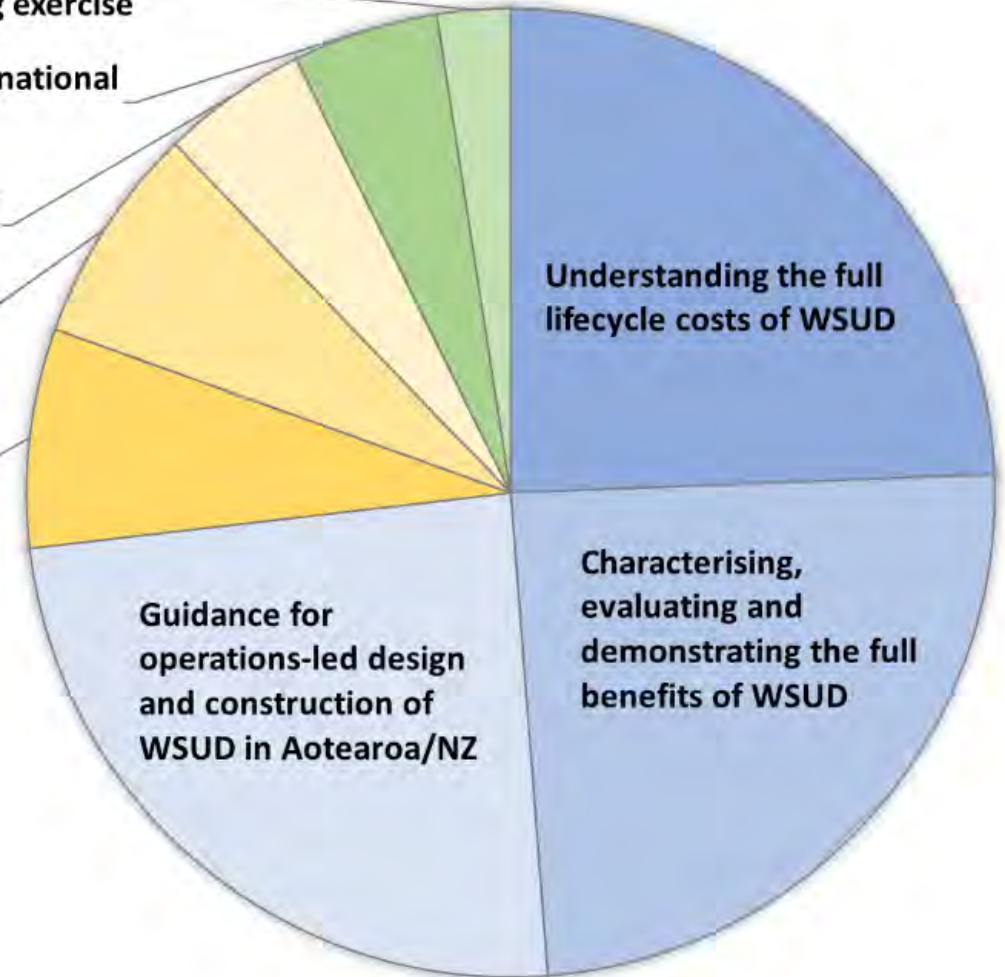
WSUD success stories: awards evaluation protocol and website scoping exercise

Incentives and funding: international options analysis

Investigating WSUD barriers: roading and development sectors

Knowledge transfer: learning from the Australian experience

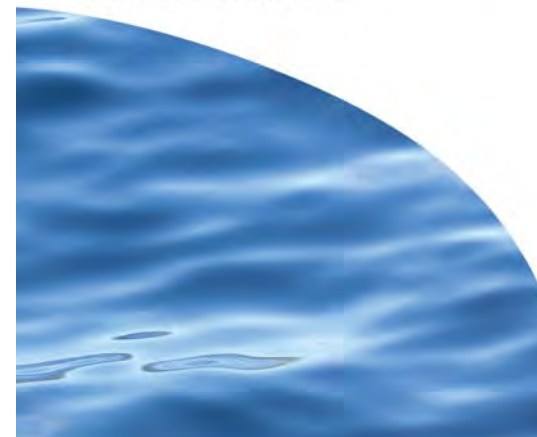
WSUD and Te Ao Māori: scoping exercise



# Understanding the full costs of WSUD

*Despite the importance of cost as a tool in the decision-making process, until recently, there has been scant research undertaken in New Zealand on quantifying long term costs of alternative forms of development such as WSUD.*

- COSTnz
- MBIE funded “Urban Planning that Sustains Waterbodies”
- Greater Wellington Whaitua CMP



**COSTnz**

 Landcare Research  
Manaaki Whenua

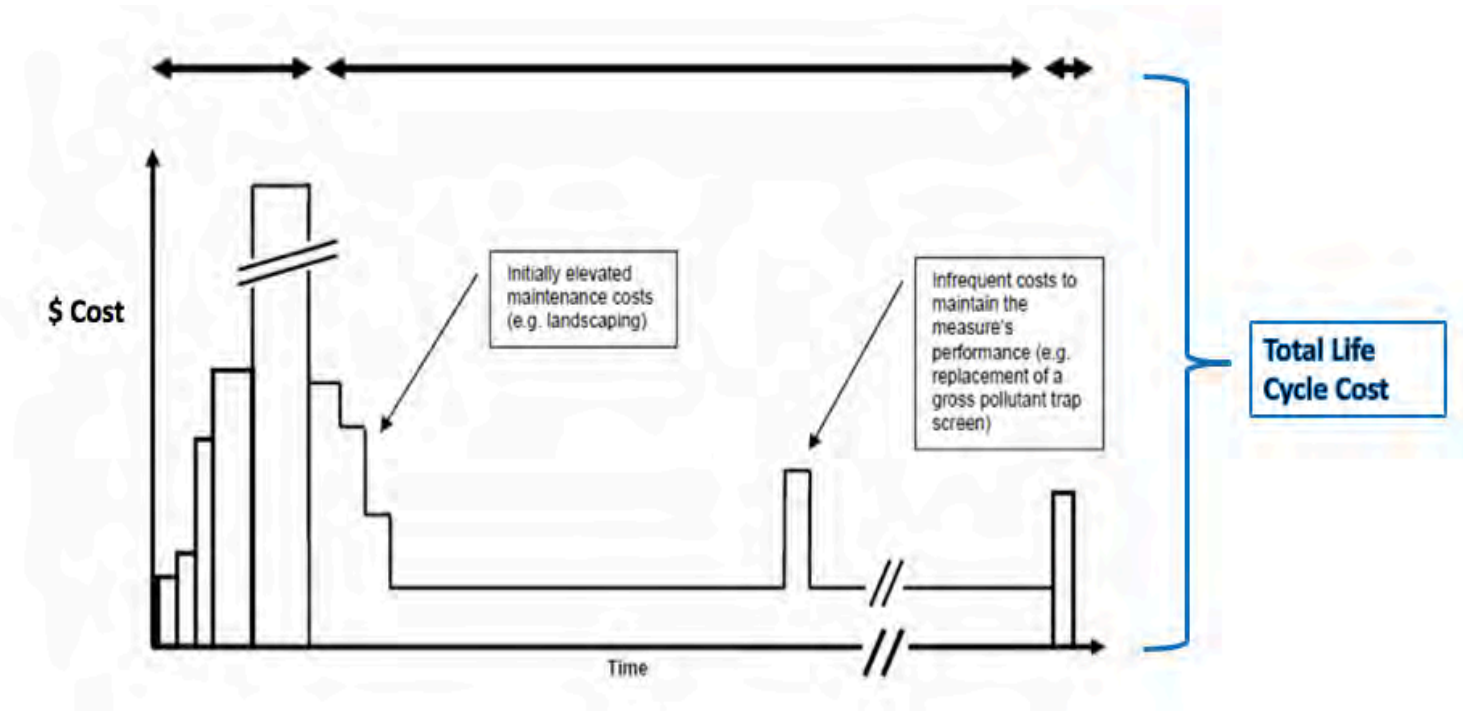


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# Understanding the full costs of WSUD

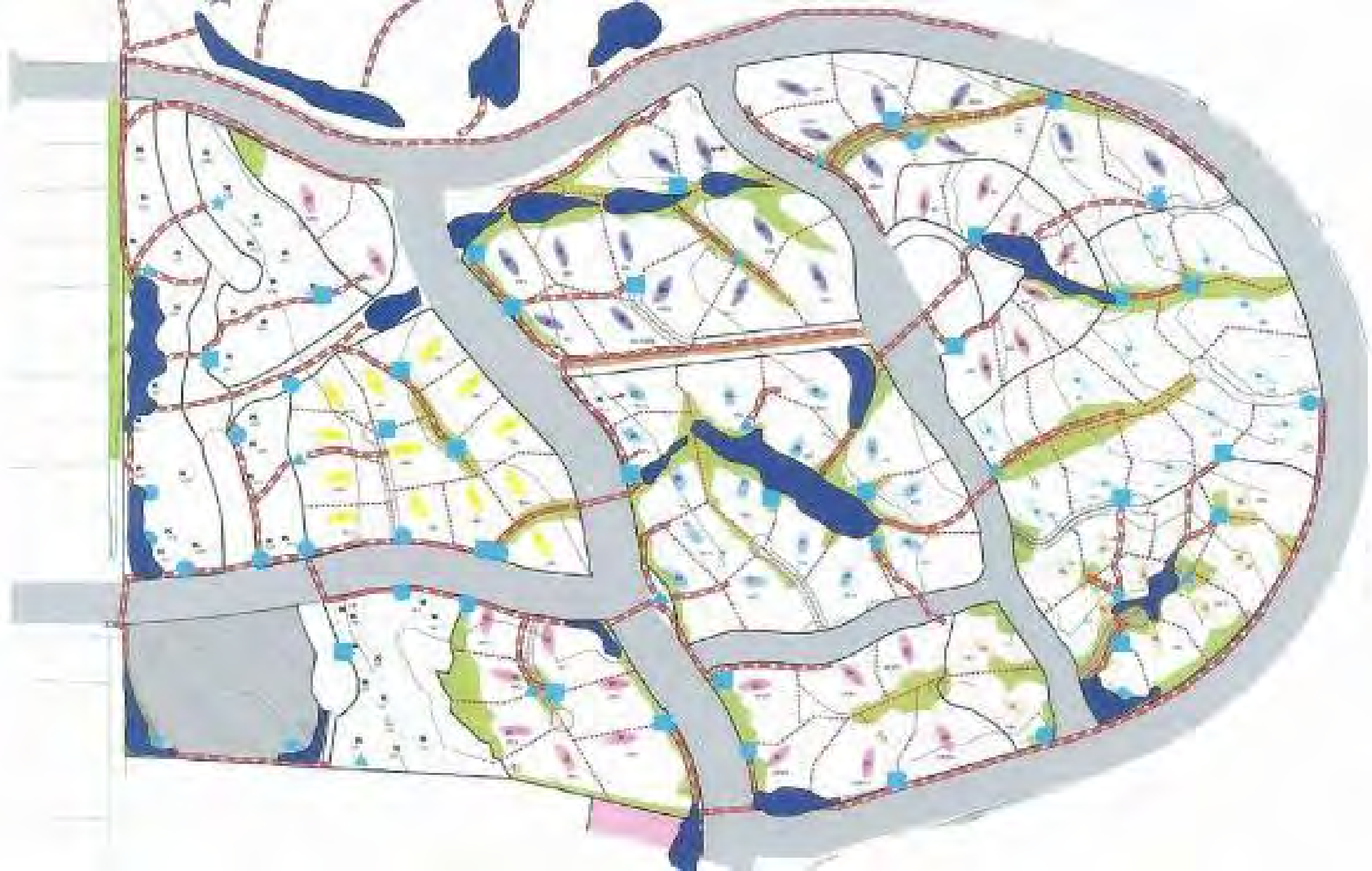
- Life cycle cost analysis
- Cost comparisons
- Cost benefit analysis
- Avoided costs
- Cost efficiency



# Kirimoko Park case study





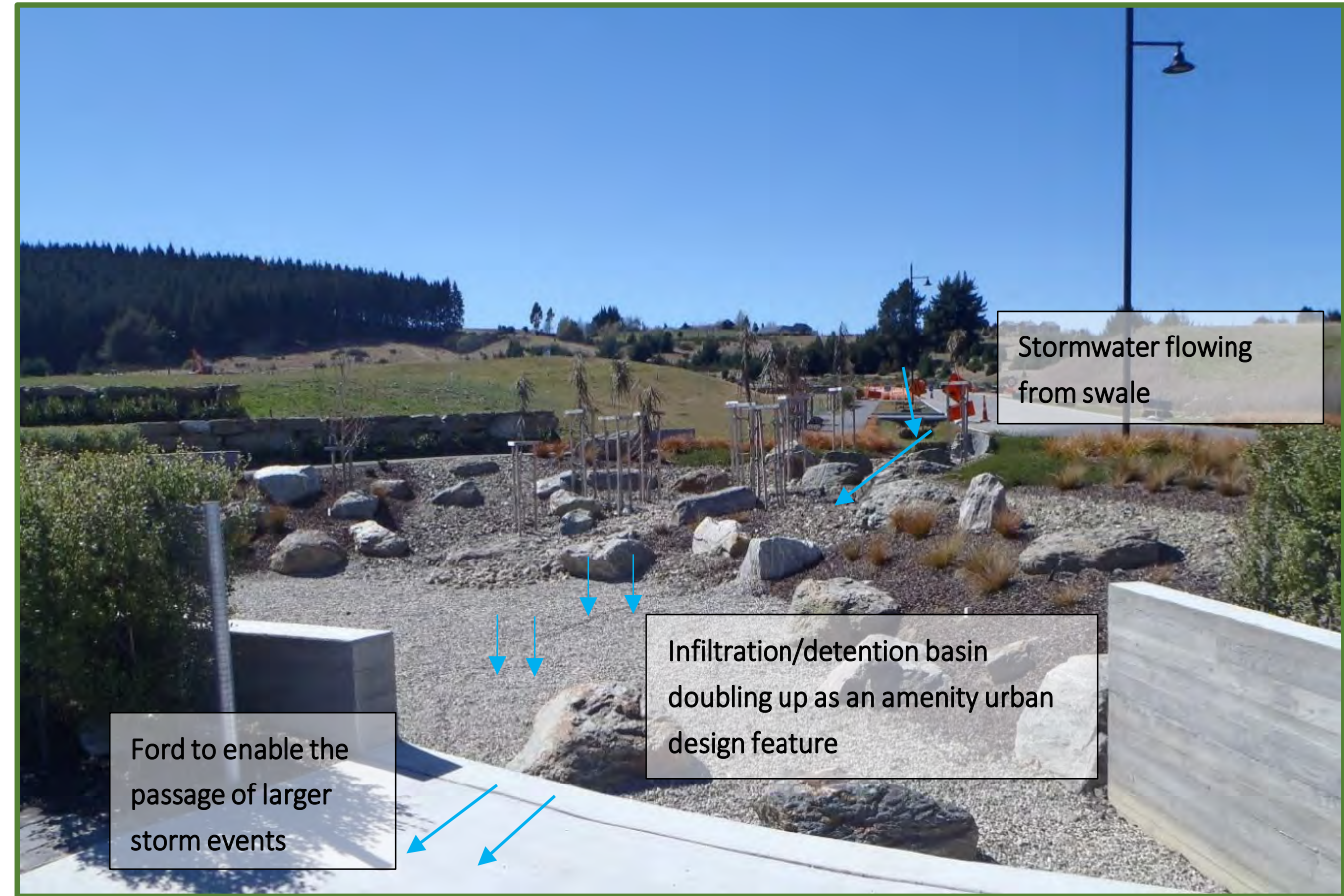
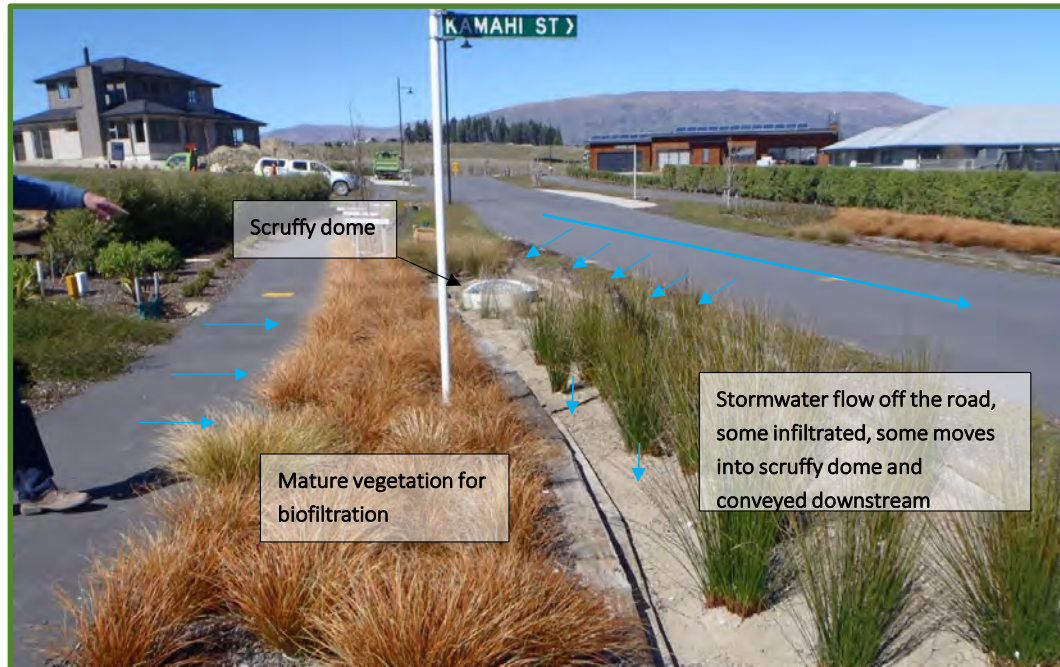


# Kirimoko Park – design principles

- Minimisation of earthworks and maintaining existing natural drainage patterns and hydrology.
- Avoidance of pipes wherever possible.
- Promotion of biofiltration and infiltration.
- Maximising the visibility of stormwater as an amenity.
- Utilisation of stormwater for the protection and enhancement of remnant and new planted areas.
- Promotion of dispersed flow patterns.
- Use of urban design elements to slow runoff.
- Fulfillment other urban design and engineering functions.
- Integration with architecture & landscape.
- Building a resilient (sustainable) system



# Kirimoko Park – green infrastructure

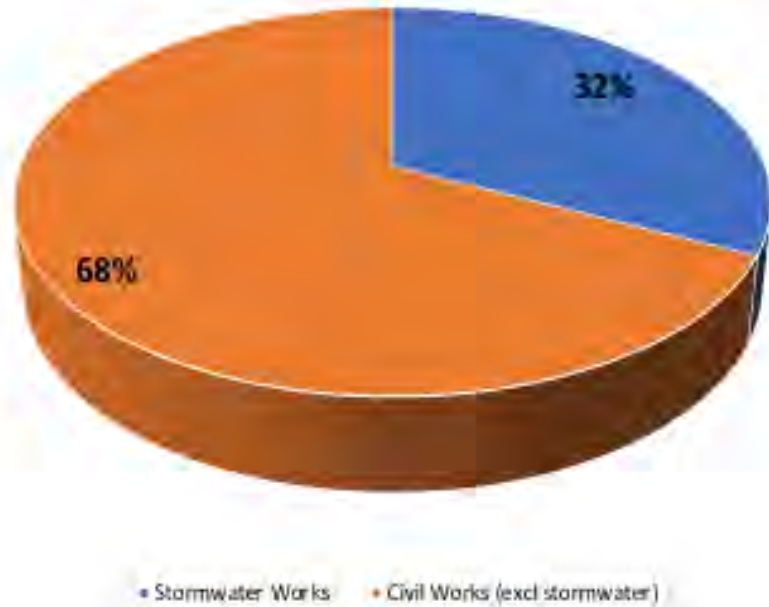


# Kirimoko Park – Construction Cost

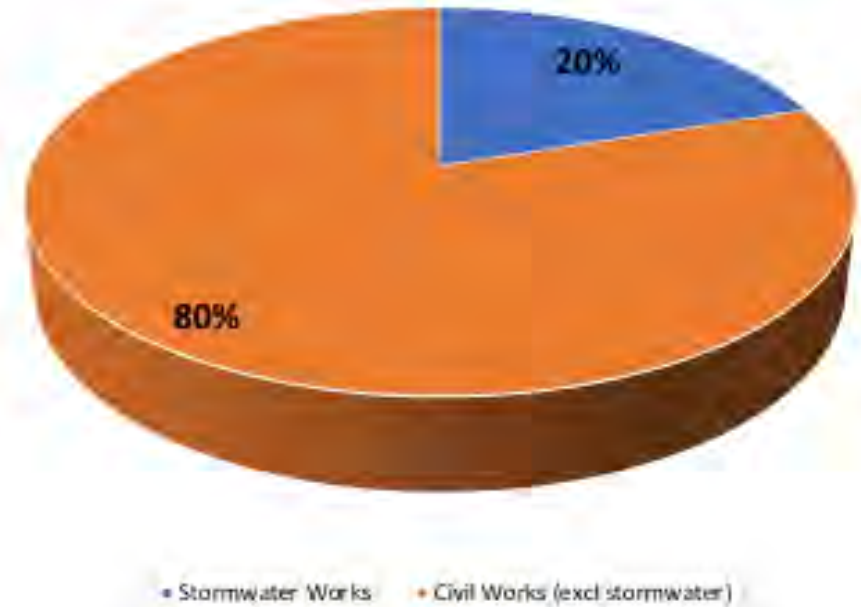
- Construction of Stage 2 –  
23% cost savings over a  
traditional approach.
- Construction of Stage 3 –  
17% cost savings



ALTERNATIVE PIPED STORMWATER APPROACH: Kirimoko Park Stage 2: Percentage cost of stormwater works in relation to the total cost of developing the land

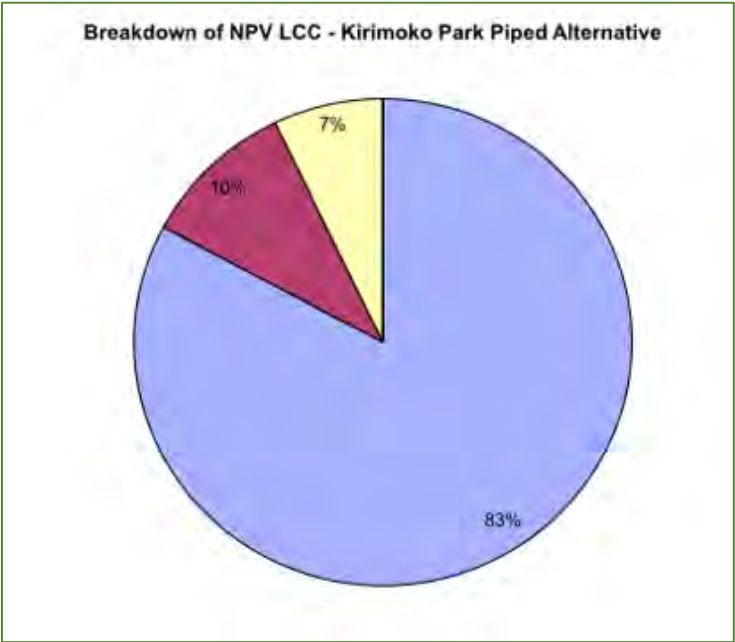
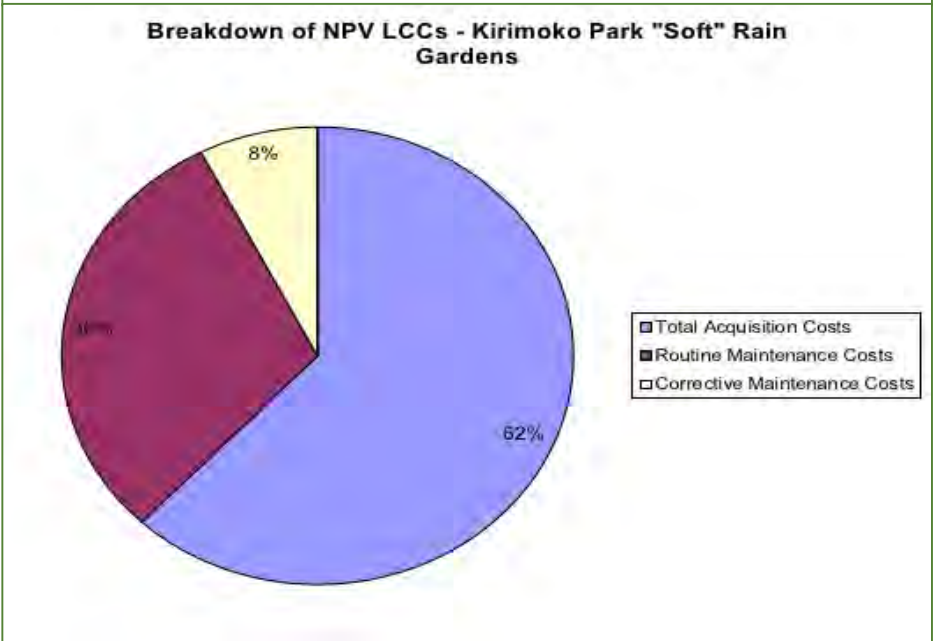
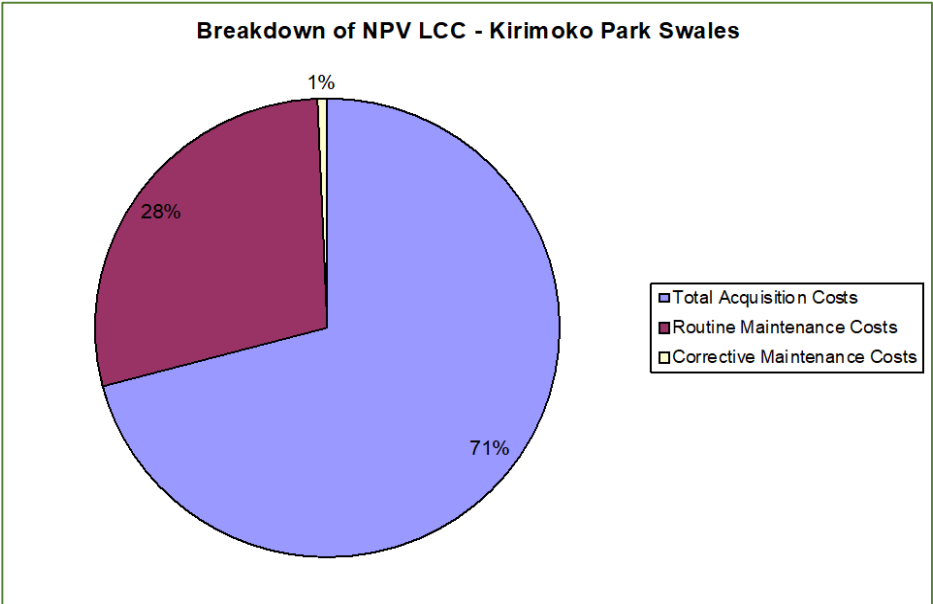


WSUD APPROACH (as constructed): Kirimoko Park Stage 2: Percentage cost of stormwater works in relation to the total cost of developing the land



EARTHWORKS	13%
ROADING/ CONCRETE WORKS	2%
PIPING	50%

# Kirimoko Park – life cycle costs



Stormwater Practice	LCC \$/m2/year
Stage 1 "concrete" edge rain gardens	\$44
Stage 2 and 3 "soft" infiltration rain gardens	\$12
Swales	\$9
Pipes	\$11

# Kirimoko Park – life cycle costs

- Cost efficiency:

	LCC \$/kg/yr TSS	LCC \$/g/yr zn	LCC \$/g/yr cu
<b>Swales/ Rain Gardens</b>	\$20 - \$50	\$120 - \$170	\$720 - \$770
<b>Catchpits and Pipes</b>	\$150	\$2,400	\$5,650

- Maintenance funded via the residents association – costed and budgeted as part of the residents association rules
- Use of native species in the green infrastructure and planting at the right time helps to reduce maintenance costs
- Kirimoko Code

*“The Kirimoko Park vision is about creating a vibrant, sustainable community where people love to live.”* John May – Developer

# Benefits

- Multi-use of open space for amenity and stormwater benefits
- Disconnects impervious areas from receiving water bodies
- Provides good treatment of water quality contaminants
- Reduced earthworking, pipes and impervious areas
- Beautification of subdivision through 'green infrastructure'
- More resilient than conventional piped systems in the long term.



# Conclusions / Learnings

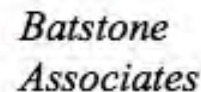
- The BAU is unlikely to meet NPS-FM targets - WSUD is an alternative to conventional forms of urban development which can help us achieve water quality goals.
- WSUD helps to break down silos.
- WSUD is likely to be more resilient than conventional piped systems in the long term.
- WSUD can lead to a cost saving of >20% during the construction stage.
- Careful design can reduce maintenance costs of green infrastructure.
- If our objective is to reduce contamination of our freshwater and marine receiving environments, then WSUD provides for a cost effective way of doing this.
- WSUD provides for significant benefits to local communities and ecosystems that are difficult to quantify using market values.



# Acknowledgements



- Building Better Homes, Towns and Cities National Science Challenge
- Andrés Roa (AR and Associates), Scott Edgar (Southern Land) and John Carter (Meridian Land Development Consultants) for information and assistance with the Kirimoko Park Subdivision case study
- John May (Southern Ventures) – developer for Kirimoko Park



# Disclaimer

Whilst every effort has been made to ensure the integrity of the data collected and its application through the COSTnz and UPSW models, the author does not give any warranty as to the accuracy, completeness, currency or reliability of the information made available in this presentation and expressly disclaims (to the maximum extent permitted by law) all liability for any damage or loss resulting from the use of, or reliance on the draft cost data.

Costs presented in this report are indicative estimates and are based on current available information and should be read in the context of the assumptions presented the accompanying draft report. Cost information has been gathered and modelled in order to gain an understanding of the relative difference in cost between green infrastructure solutions, not the actual cost of the solution itself.

Any decision that is made after based on this data must be based solely on the decision-makers own evaluation of the information available to them, their circumstances and objectives.