

Highway Design, Stormwater Planning, Local Waterways and Multiple Benefits

Stormwater Victoria Conference 2019
Marysville 4-5 June 2019



Collaborative Partnership Agreement



Seeking environmental excellence, not step change.

Not all initiatives will make it through, but importantly they are all pitched.



Things we learned along the way...



Transport Integration Act 2010 is our friend.

Legislation is not the blocker.

Division 2—Transport system objectives

- | | |
|----|--|
| 7 | Transport system objectives |
| 8 | Social and economic inclusion |
| 9 | Economic prosperity |
| 10 | Environmental sustainability |
| 11 | Integration of transport and land use |
| 12 | Efficiency, coordination and reliability |
| 13 | Safety and health and wellbeing |

10 Environmental sustainability

The transport system should actively contribute to environmental sustainability by—

- (a) protecting, conserving and improving the natural environment;
- (b) avoiding, minimising and offsetting harm to the local and global environment, including through transport-related emissions and pollutants and the loss of biodiversity;
- (c) promoting forms of transport and the use of forms of energy and transport technologies which have the least impact on the natural environment and reduce the overall contribution of transport-related greenhouse gas emissions;
- (d) improving the environmental performance of all forms of transport and the forms of energy used in transport;
- (e) preparing for and adapting to the challenges presented by climate change.

Time to flip the approach?

To meet objectives
of *Transport
Integration Act 2010*

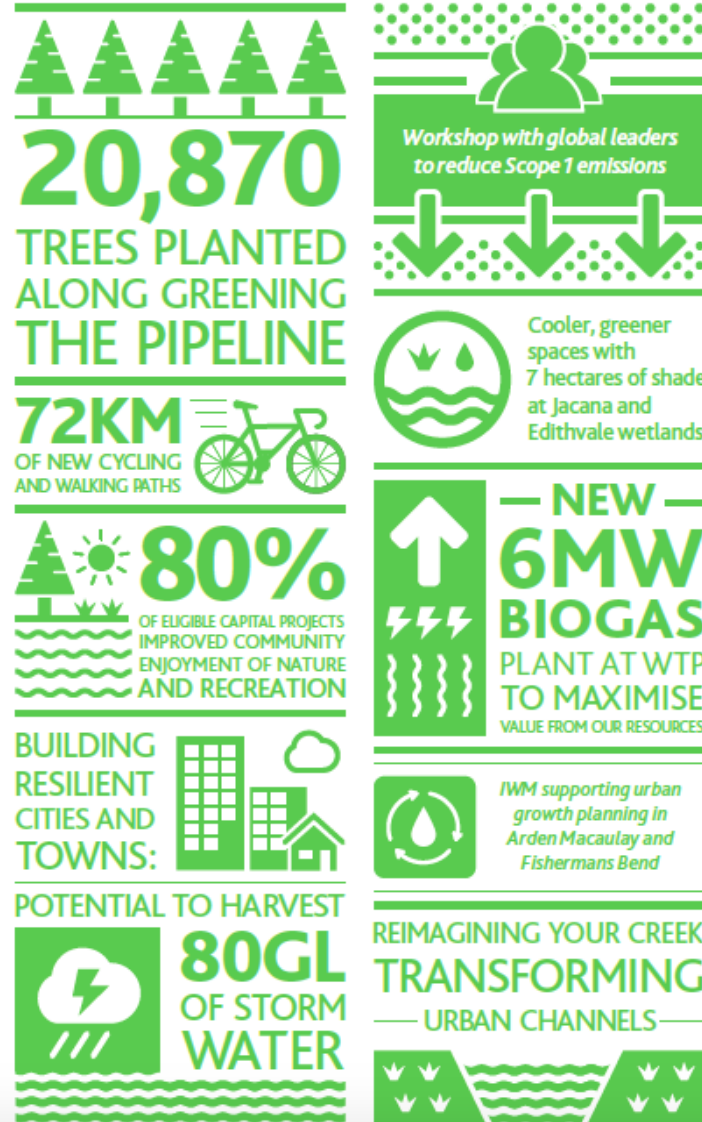
VicRoads as Public Land Manager
with a primary purpose of connecting communities safely

Leadership in Sustainable Asset Management
beyond compliance

80,000 hectares

**MRPV Road Design &
Construction**
for Environmental Excellence

We've seen this before...



Environmental Stewardship

We will co-create a sustainable region through innovative resource recovery and reducing our emissions. Through improved sustainable business practices and operations, Melbourne Water aims to achieve balanced financial, environmental and social outcomes.



Our *Environmental Stewardship Strategy* enhances the value of our natural and cultural assets by ensuring resource availability and service provision for future generations. We also have a responsibility to protect and enhance the natural environment and support biodiversity through a range of activities (see Enhancing Biodiversity on page 29).



Things we learned along the way...

Ararat to Stawell Western Highway Upgrade



Beyond Compliance

Net
Environment
Benefit

Greenhouse Positive – less emissions than before project

Ecosystems Positive – healthier habitats than before

Water Positive – healthier water bodies than before

Air Quality Gain – healthier air quality than before

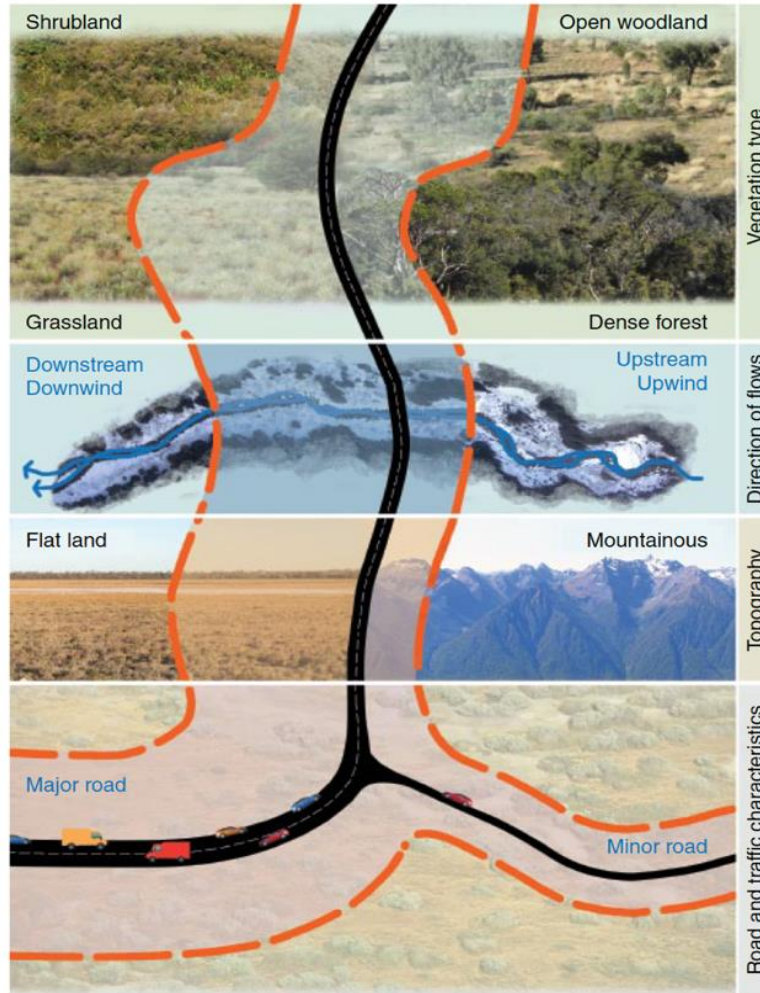
Net Soil Quality Gain – healthier soils than before

Less Resource Extraction – less damaging than otherwise



Legacy for Local Community

Things we learned along the way...



The 'road-effect zone'

Source: Image by Zoe Metherill in van der Ree, Smith & Grillo (eds)
2015 Handbook of Road Ecology, Wiley Blackwell, UK.

Environmental Effects Statements are too site-based

Road planning needs to be landscape planning

Go beyond the road to account for the landscape and community
Habitat fragmentation, indirect impacts, cumulative effects.

Policy conundrum...

Roadsides are important (and critical) sites for ecological restoration.

However roadside habitats may act as ecological traps inviting fauna to get closer to vehicles.

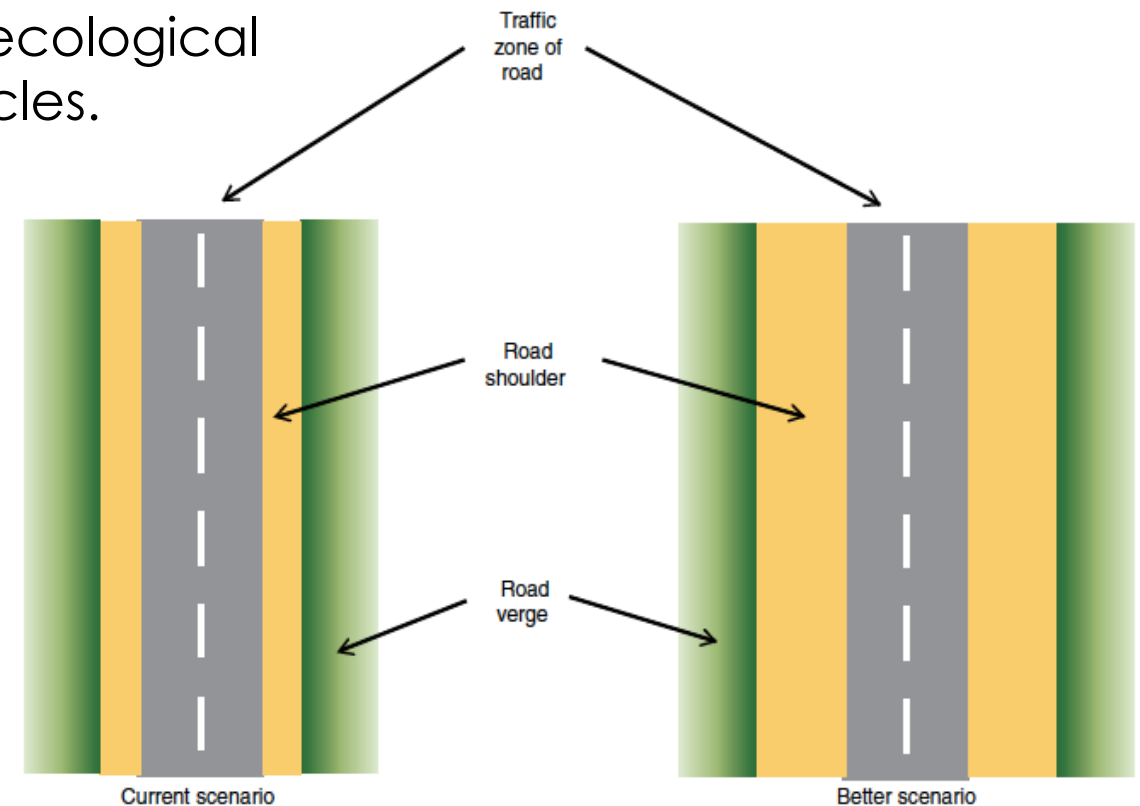


Figure 47.5 Increase the widths of water-shedding road shoulders (shown in yellow) to draw animals away from the traffic zone of the road and improve peripheral vision for drivers. Source: Illustration by E. Lee.

Things we learned along the way...

Fauna protection is strongly values-based.



SPECIES	CONSERVATION STATUS (0-5 Rating) 5pts – Fed/State Sig 3pts – Local Sig 1pts – Abundant, not of conservation concern but protected 0pts-introduced species	LIKELIHOOD OF OCCURRENCE IN PROJECT AREA (0-5 Rating) 5pts – Confirmed occurrence along road 3pts – Likely to occur 1 pts – definitely not likely to occur	ABUNDANCE / DISTRIBUTION / SCALE OF OCCURRENCE (0-5 Rating) 5pts – occurs in very few locations and/or in unknown locations and/or very small population sizes 3pts – patchily distributed along length of project, and/or general idea of where it occurs and/or moderate population size 1pts – occurs along entire length of project, and/or in known locations, and/or in large numbers	ECOLOGICAL CONSEQUENCES OF IMPACT (on species at a population or conservation level, not individual level). 5pts – High impact on population 3pts – medium impact on population 1pts – low impact on population 0pt – no impact on population	SOCIAL CONSIDERATIONS AND SOCIAL IMPACTS (0-5 Rating) 5pts – High social impacts/consideration 3pts – medium social impacts / consideration 1pts – low social impacts/consideration 0pt – no social impacts	OVERALL RISK SCORE/ MITIGATION PRIORITY NEED
Eastern Grey Kangaroo	1	5	1	0	5 (serious damage to car)	12
Brushtailed Phascogale	5	3	3	5	3 (local people love phascogales)	19
Amphibian X	3	5	3	3	1	15
Amphibian Y	5	1	3	4	5 (logo/emblem for local school, focus of town reveg works)	18
All snakes or snake X	1	5	3	3	1	13
Wedge-tail eagle	3	3	1	5	3	15
Squirrel Glider	5	5	3	3	3	19
Woodland birds (could do them as a group, perhaps?)	5	5	1	3	2	16
Golden Sun Moth	5	3	5	1	1	15
Raven	1	5	1	1	0	8
etc						

Sample Fauna Impact Scoresheet

Things we learned along the way...

Aquatic habitats could be much more integrated part of integrated water management.

Continue to yell this into the wind

Keep roads as far away from streams as possible.
Avoid stream crossings.

Keep designing for this

Large natural or semi-natural buffer between the two.

Insist on this

Long span floodplain bridges to allow for natural stream dynamics



If we must have culverts or short span bridges design them to simulate the natural channel.

This means the aquatic and riparian processes can function without interruption and helps support all life stages (oh, and it will also help with flood conveyance).

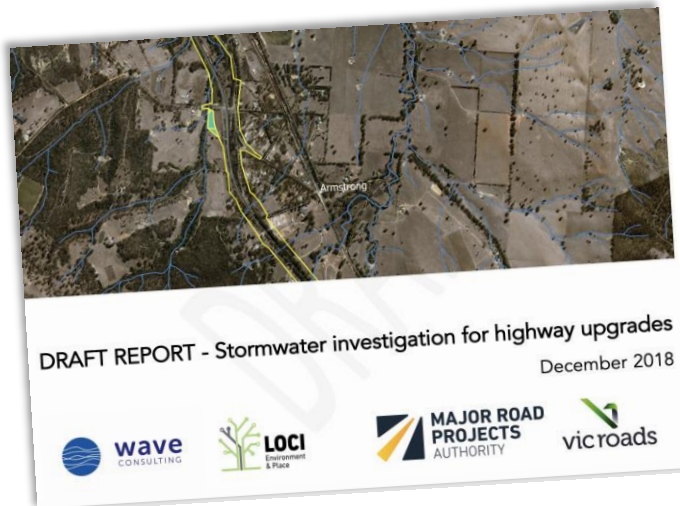
Van der Ree, R. Smith DJ & Grillo C (2015) Handbook of Road Ecology. Wiley Blackwell



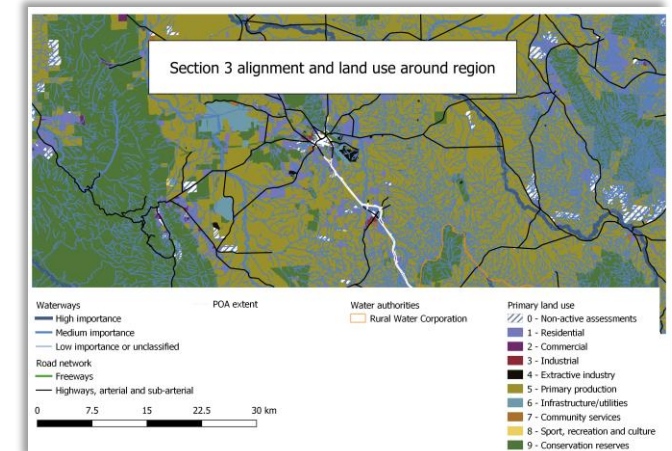
Things we learned along the way...



A highway upgrade project can 'leave local waterways healthier than before'



Concongella Creek is classed in 'moderate' condition,
Index of Stream Condition

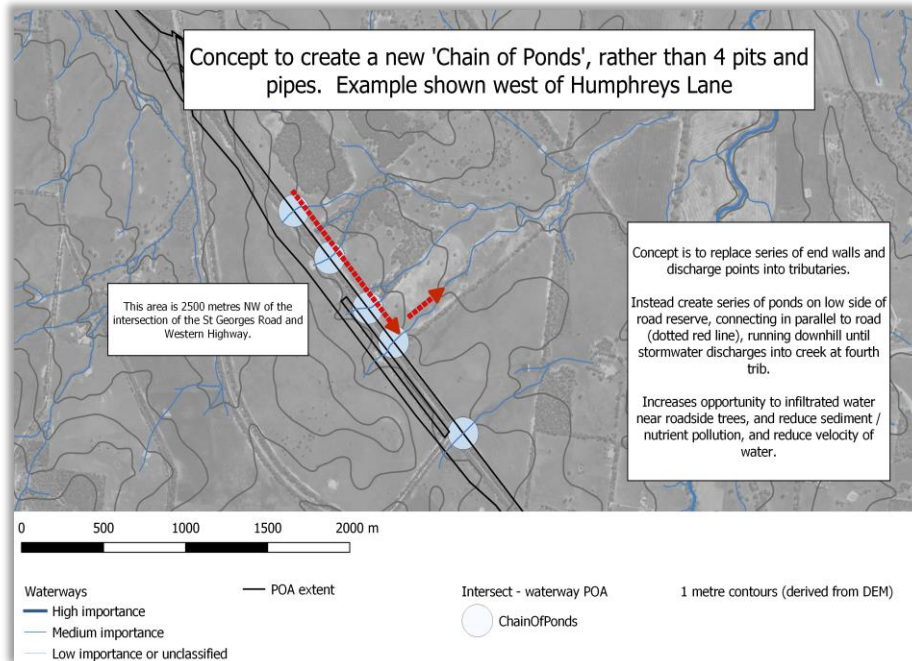


Western Highway Section 3 Upgrade may involve the laying of an:

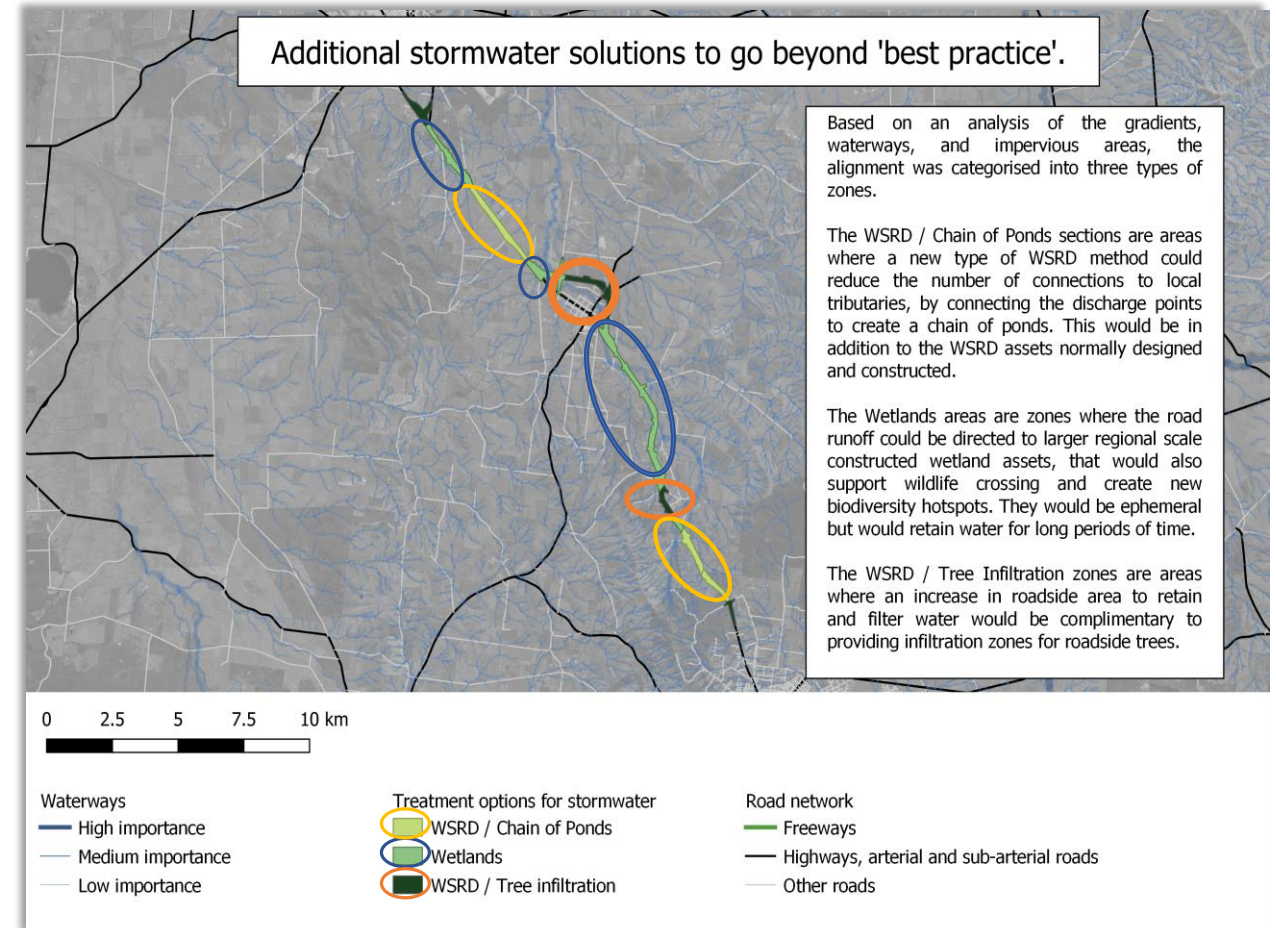
- additional 312 million square metres of impervious surfaces
- could generate approximately 100 gigalitres of water runoff
- 20-70% would flow to the network of local waterways and Concongella Creek.

We need less large storm event flows from the road to reach the waterways as they are disruptive for aquatic habitat. Unless they arrive via subsurface 'baseflow'.

Stormwater treatment for biodiversity



Healthier roadside vegetation
Protecting aquatic habitats
Creating aquatic habitats
Drawing fauna away from roads



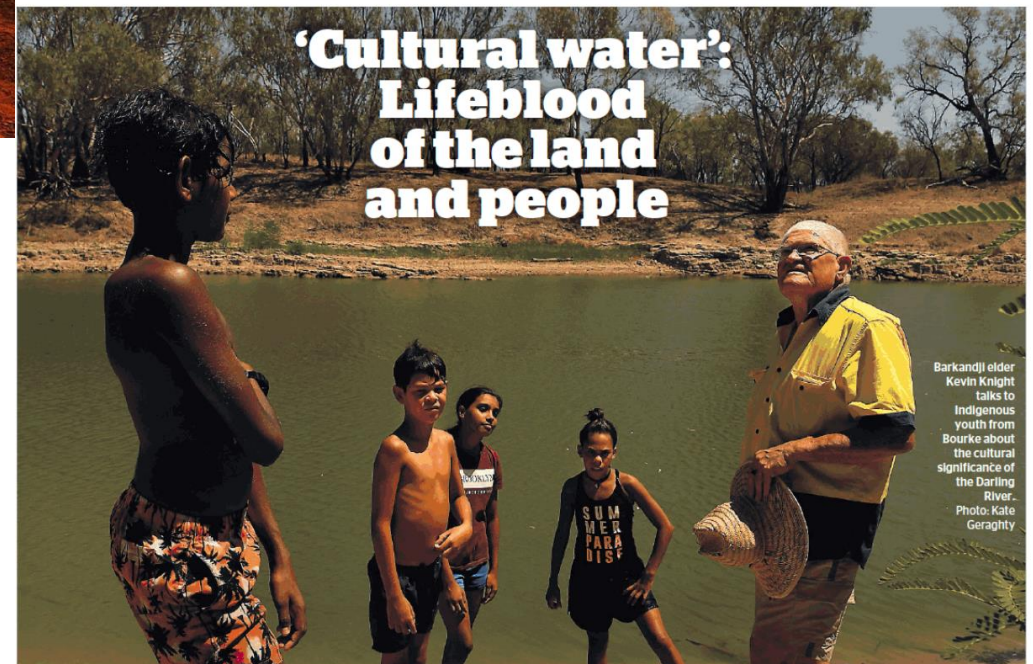
In the future: Roadsides to buffer agricultural runoff? Roadsides to support agricultural dams?

Rural communities are standing up for their farm water *and* waterways



SUNDAY AGE JANUARY 20, 2019

NEWS 15



Things we learned along the way...

The view from the perspective of the 'road designers' and 'engineers'.

Key policy positions are missing and when filled will help update technical specifications.

We can all play a part in making this happen.

Table 3 Gap Analysis: VicRoads/MRPV Environmental Policies and Guidelines (NB some additional work is needed to complete this gap analysis)

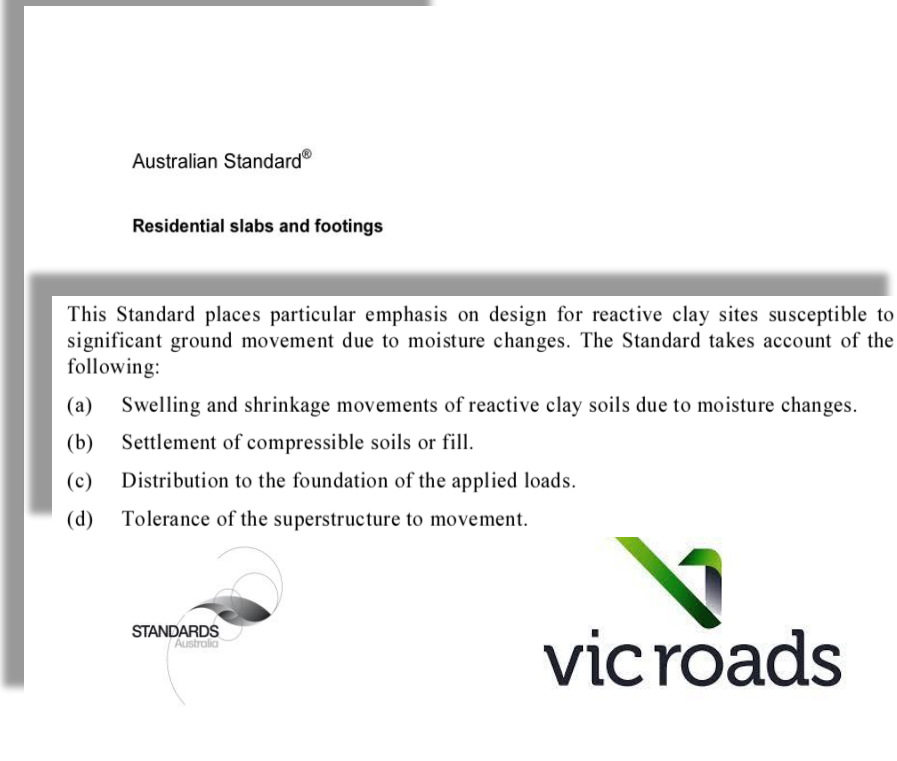
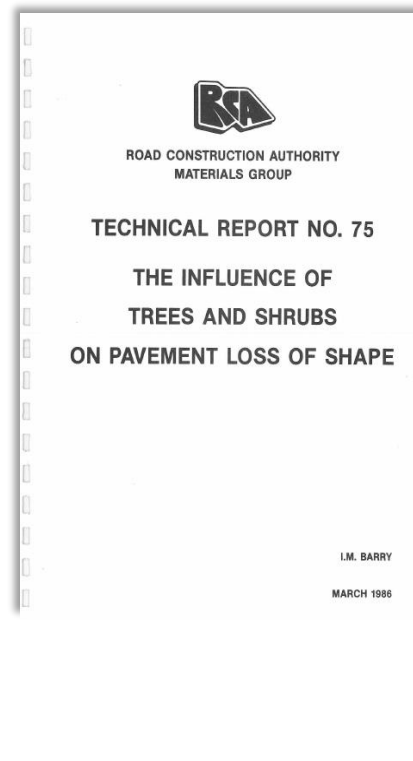
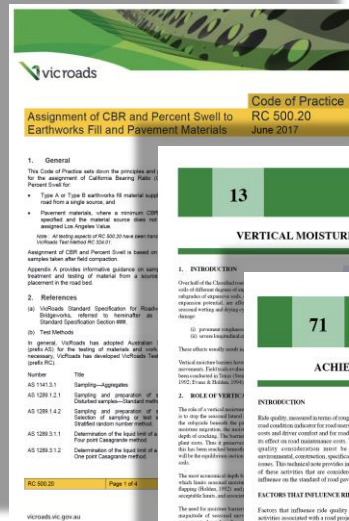
Theme	Flora & Fauna Protect and enhance biodiversity	Water Protect and enhance waterbodies and landscapes	Climate Change Prevent and adapt to climate change	Resource Use Reduce resource extraction and support circular economy
Legislation & Regulation Adopted National and State requirements	Catchment & Land Protection Act 1994 Planning & Environment Act 1987 Flora and Fauna Guarantee Act 1988 Wildlife Act 1975 Transport Integration Act 2010	Catchment & Land Protection Act 1994 Planning & Environment Act 1987 Environment Protection Act 1970 SEPP (Waters of Victoria) Flora and Fauna Guarantee Act 1988 Transport Integration Act 2010	Climate Change Act 2017 Transport Integration Act 2010	Environment Protection Act 1970
Policy Adopted VicRoads policy positions (MRPA7)	-No overarching policy position- VicRoads Tree Policy	-No overarching policy position-	VicRoads Sustainability and Climate Change Policy 2014	VicRoads Sustainability and Climate Change Policy 2014
Tech Notes Tech Notes set policy positions and guidelines for road design & management	VicRoads Supplement to Austroads Part 68 Roadside Environment TN71: Achieving Good Ride Quality TN13: Vertical Moisture Barriers TN75 - The Influence of Trees and Shrubs on Pavement Loss of Shape (Berry 1984) (GONE interesting)	VicRoads Supplement to Austroads Parts 5, 5A, 5B Drainage VicRoads Supplement to Austroads Part 68 Roadside Environment TN81: Alternative Water Sources for Roadworks TN27 - Porous Asphalt Base TN92 - Groundwater in Cut Excavations TN92: Drainage of Subsurface Water from Roads (GONE interesting)	More gap analysis needed here.	More gap analysis needed here TN107 - Recycled Materials in Road Construction RC 500.03 Code of Practice: Management of Quarry Reference Specimens
Strategy	VicRoads Sustainability and Climate Change Strategy 2010	VicRoads Sustainability and Climate Change Strategy 2010	VicRoads Sustainability and Climate Change Strategy 2010	VicRoads Sustainability and Climate Change Strategy 2010
Adopted Guidelines	VicRoads Fauna Sensitive Road Design Guidelines Offsets?	VicRoads Integrated Water Management Guidelines 2013 CEMP?	Renewable Energy Roadmap 2013	Sustainable Procurement Guidelines 2011
Missing Guidelines (including those not yet adopted)	Ecological Significance Guidance Matrix for Corridor Strategies Fauna Impacts Framework Tree Policy Decision Criteria Timber Reuse Guidelines Ecological Restoration Planning Seed Planning Guidance Matrix	VicRoads Water Sensitive Design Guidelines	Draft VicRoads Climate Change Risk Assessment Carbon Suggest Tool ISCA Rating Tool v2	
Templates for Project Briefs	Tree Survey RIG Habitat Hectare RIG Preliminary Biodiversity RIG Targeted Biodiversity RIG Management (Major)	Environmental Improvement Plan Template	Name these	Name these
Templates for Contract Specifications	Spec Section 720 Landscape Works Spec Section 201 Site Clearing Spec Section 177 Environment	Name these	Name these	Spec Section 812 Crushed rock for pavement base and sub base Spec 820: Crushed concrete for pavement sub-base and light duty base Spec 821: Cementitious treated crushed concrete for pavement sub-base.
Missing Templates (including those not yet adopted)	Weed Management Plans? Fauna Management Plans? Significant Species Conservation Management Plans? Fauna Crossing RIG Name these	Name these	Name these	Name these
Tools		Sedimentation Basin Design Tool		
Asset Management	VicRoads Roadside Management Strategy 2011	Name these	Name these	Name these

Trees and Pavements



Road designers avoiding roadside tree planting, landscaping and associated passive irrigation because they:

- have concerns for road maintenance concerns linked to soil moisture
- are applying existing standards that generally recommend limiting tree planting.



Trees and Pavements

What is the broader 'green infrastructure industry' saying?



Don Cameron, University of SA

Simple engineering guidelines to date developed based on damaged buildings.

More research and improved models for prediction of soil moisture re-distribution near trees needed.

Trees with a good water supply (replenished water storage in the soil) should not cause problems.

What soil moisture models are currently used by road designers? Can we work to improve these?

What plant species guidelines are used by road landscape architects re soil moisture?

What processes are in place to improve and apply this knowledge for VicRoads?

What defines a 'good water supply' as mentioned above by Don?

Are the 'water' and 'tree' people coming together on this?

Questions?

Thank you

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**Stormwater Victoria Conference 2019
Theme: Strategy, Policy and Education****Highway Design, Stormwater Planning and Local Waterways**

As a non-profit organisation seeking new sustainability planning and design solutions, Loci Environment & Place Inc., has been pleased to partner with VicRoads and Major Roads Project Authority to explore environmental excellence initiatives that can be applied in highway design. Our project is designed to ‘work beside’ the road organisations and confront the barriers for ourselves as we seek implementation of new sustainability solutions.

Loci, and its supporting specialists, worked to a multi-disciplinary brief to consider new approaches in integrated water planning alongside equally complex and intertwined issues including ecological restoration, wildlife movement, greenhouse emissions, materials reuse and sustainable transport challenges.

The project put us (the same people often thwarted by seemingly inflexible road design approaches) on the other side of these problems, which has enabled us to pinpoint and articulate the reasons why many of these challenges arise. It is clear that all of us in the industry continue to have a role in helping to address these issues as it is not just road engineering processes that are the problem. There are critical gaps across the spectrum of policy, processes, evidence, communication, asset management, maintenance and monitoring need to be addressed. Each issue is generally more practical than monumental in its ability to be resolved.

This presentation will share some of these insights, in particular using a case study from Western Victoria to explain how absent integrated water planning is from the regular approach, and the ways that this can be turned around for future road projects.