# 10 year performance review of in-situ stabilised unsealed roads

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# Outline

- Introduction and background
- Research goals
- About the trial sites
- Performance at 10 years
- Recommendations
- Summary

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# But first – what is stabilisation?

- Pavement stabilisation involves the introduction of an additional material to the existing pavement material to improve its engineering properties
- Stabilisation can be applied to roads, airfields and other pavements



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# Benefits of stabilisation

- Stabilisation helps preserve natural resources by recycling
  and improving unsuitable existing pavement materials
- Property improvements include:
  - Increased strength
  - Lower permeability
    – reduces water ingress
  - Reduced wear of unsealed pavements
- Dust suppression is not stabilisation!

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# Introduction

- AustStab members work with rural local government engineers to develop long-term cost-effective solutions that
  - Minimise dust generation, and
  - Reduce the maintenance frequency of unsealed low volume roads
- Prudent spending of limited road maintenance funding is paramount to local government and beneficial to rate payers and the wider public users of these roads
- In-situ stabilisation of unsealed roads is not new – evidence from 3 decades ago
- Very little technical guidance available

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# There is evidence that it works!

A non-stabilised unsealed pavement after rain

An adjacent lime-stabilised section after rain

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# Introduction

- Federal Government expressed interest in assisting industry with funding of research into low volume road design and construction
- In 2007 AustStab sought funding
  - Department of Infrastructure, Transport, Regional Development and Local Government application
  - Conduct and monitor four trials of in-situ stabilisation of unsealed roads


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# Research goals

- Substantially reduce dust generation from unsealed roads
- Reduce maintenance frequency and hence maintenance costs for LG
- Provide safe all-weather access on unsealed roads
- Incrementally improve the structural strength of the road pavements

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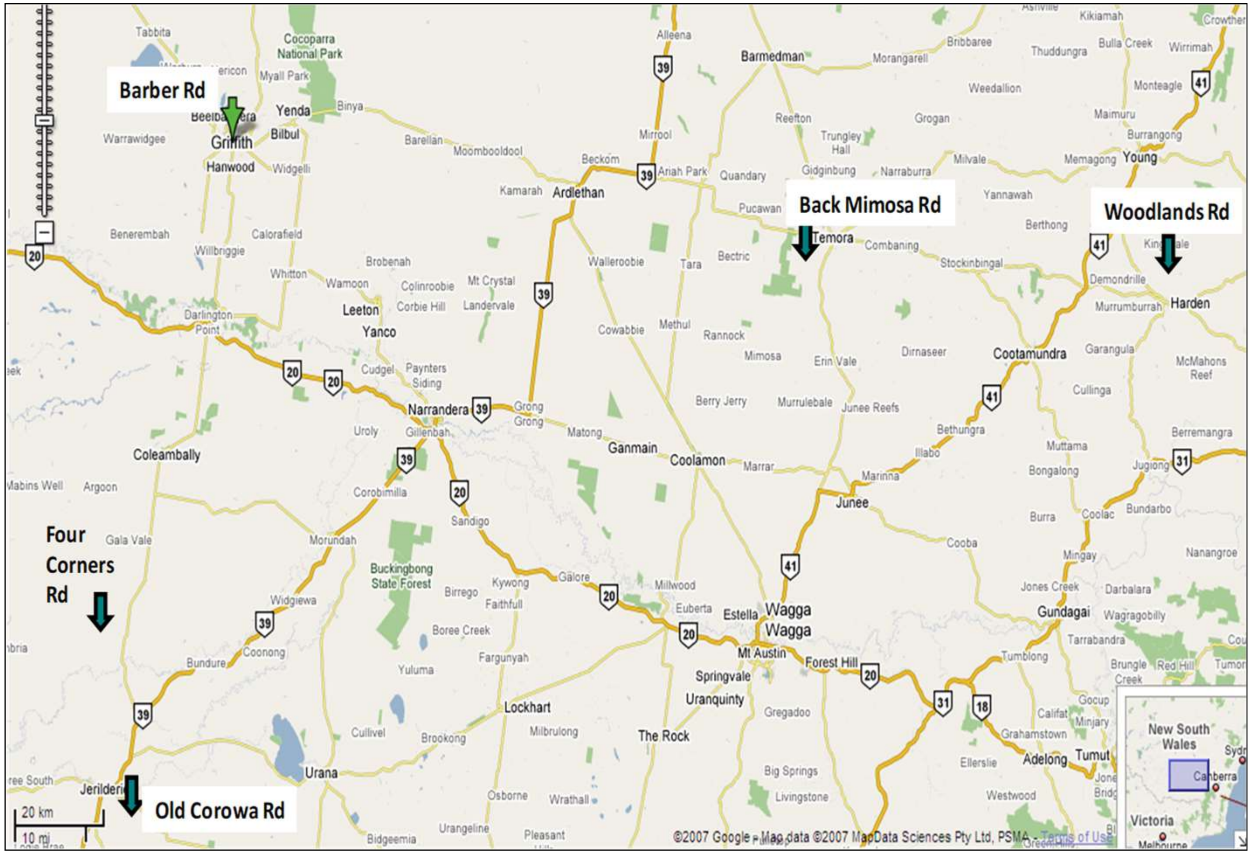
# Location of the trial sites




- Barber & Griffith Roads, Griffith
- Old Corowa Road, Jerilderie
- Four Corners Road, Jerilderie
- Back Mimosa Road Temora
- Woodlands Road, Wombat

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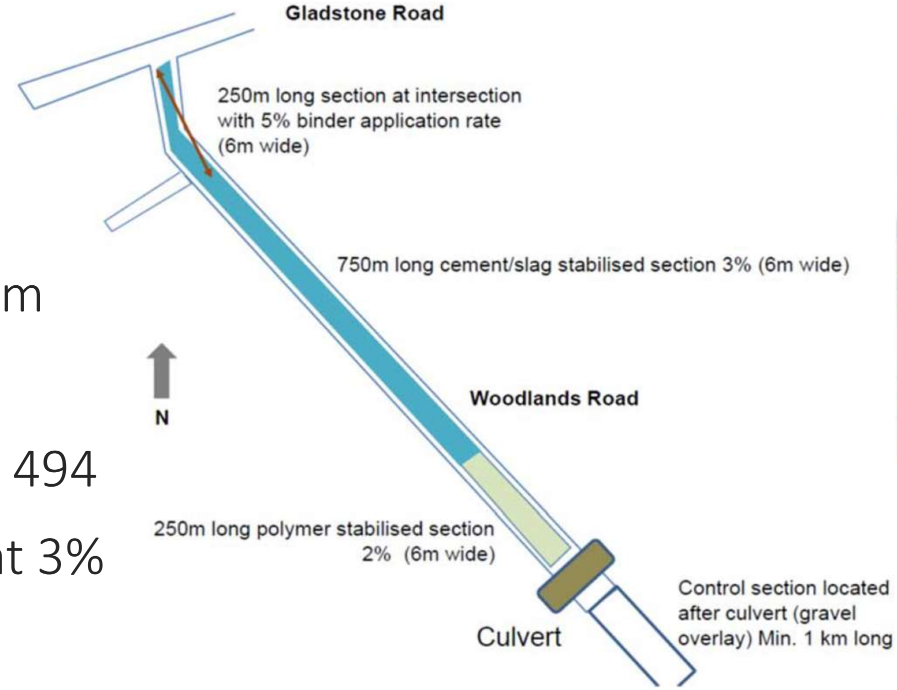
# Woodlands Road, Wombat

- Constructed: June 2008
- Length: 1250 m
- Mean annual rainfall: 606 mm
- Average annual rainfall: 675 mm
- Vehicles per day: > 40
- Pavement material: PI 12, WPI 494
- Binders: cement/slag (70:30) at 3%
- Polyroad PR11L at 2%

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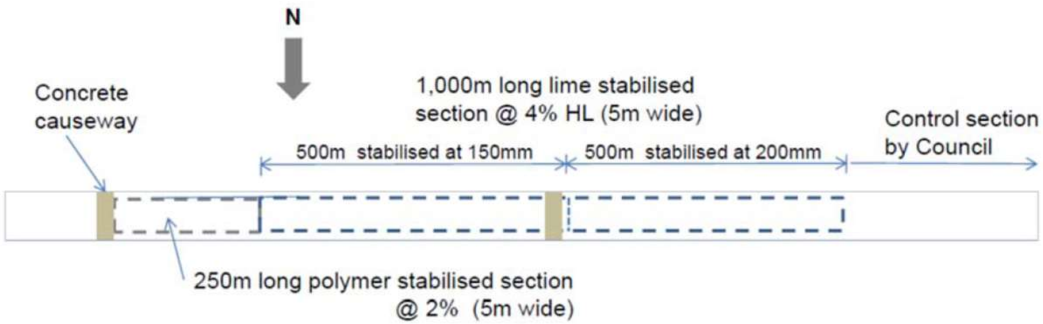
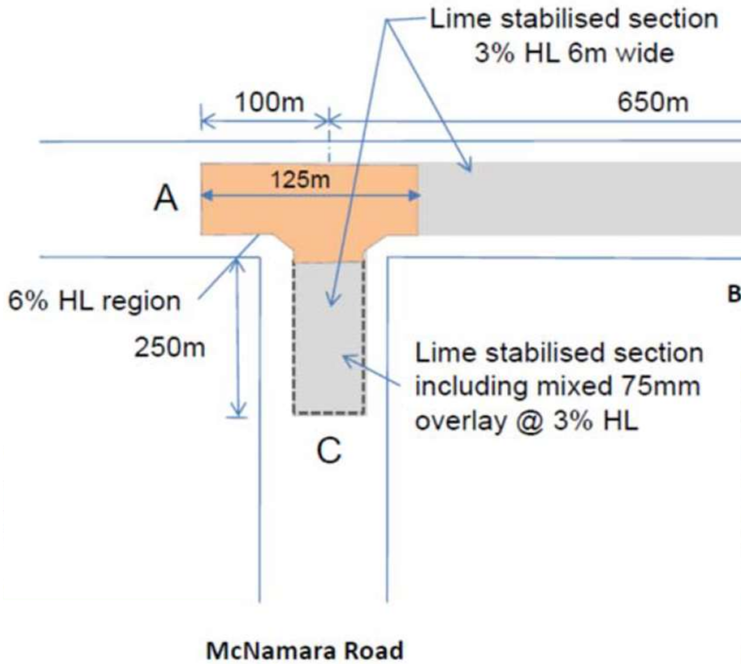
# Back Mimosa Road, Temora

- Constructed: September 2008
- Length: 1250 m
- Mean annual rainfall: 521 mm
- Average annual rainfall: 494 mm
- Vehicles per day: > 20
- Pavement material: PI 6, WPI 192
- Binders: hydrated lime at 4%
- Polyroad PR11L at 2%



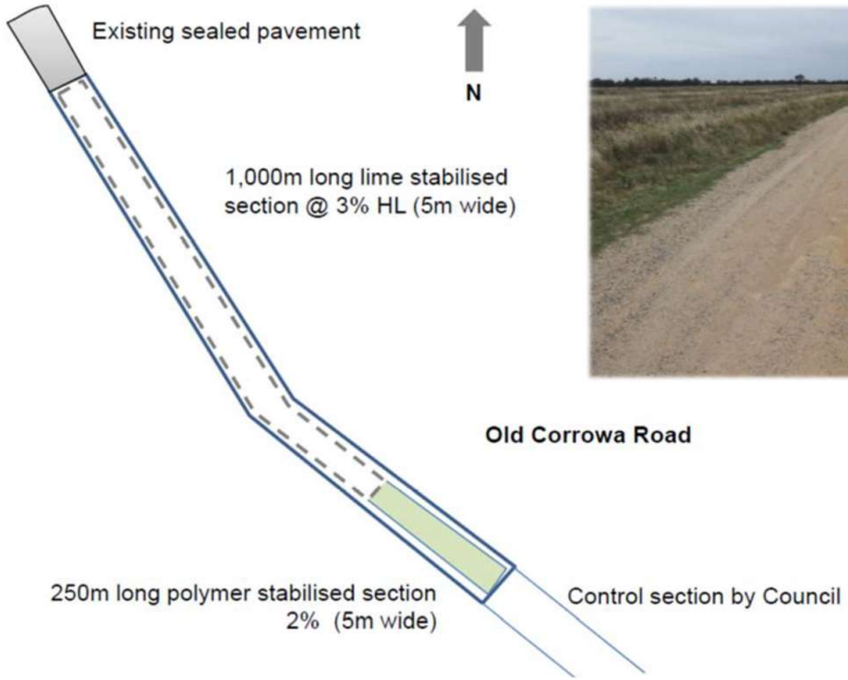
# Barber & Griffith Roads, Griffith

- Constructed: May 2008
- Length: 1000 m
- Mean annual rainfall: 401 mm
- Average annual rainfall: 433 mm
- Vehicles per day: > 40
- Pavement material: PI 2, WPI 74
- Binder: hydrated lime at 4%



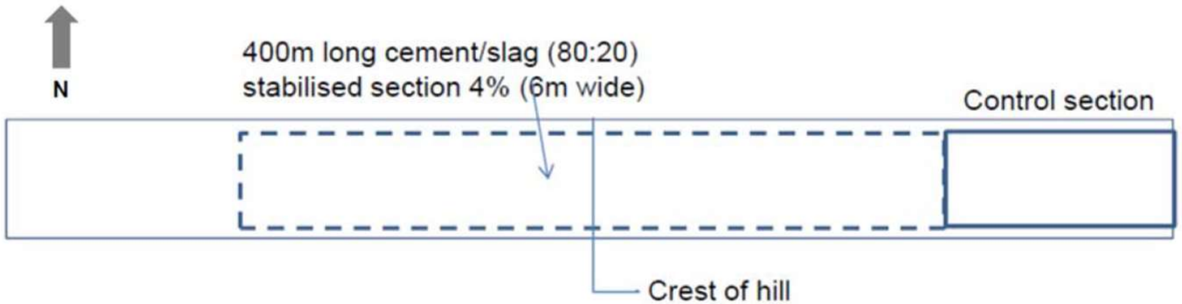

# Old Corowa Road, Jerilderie

- Constructed: July 2008
- Length: 1250 m
- Mean annual rainfall: 374 mm
- Average annual rainfall: 386 mm
- Vehicles per day: > 20
- Pavement material: PI 9, WPI 522
- Binders: hydrated lime at 3%
- Polyroad PR11L at 2%




# Four Corners Road, Jerilderie

- Constructed: July 2008
- Length: 500 m
- Mean annual rainfall: 374 mm
- Average annual rainfall: 386 mm
- Vehicles per day: > 20
- Pavement material: PI 12, WPI 494
- Binder: cement/slag (80:20) at 3%

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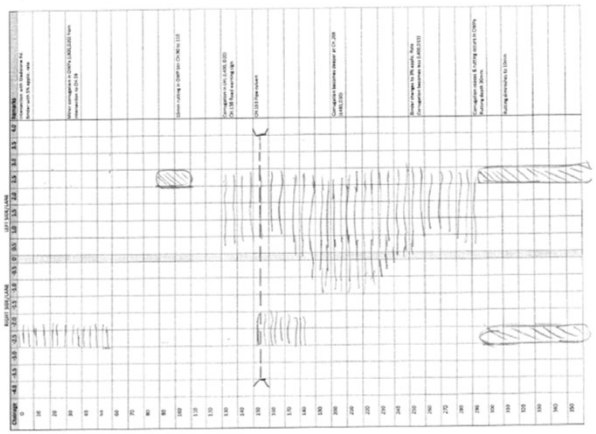
# Performance assessment at 10 years

- Sites inspected at 3-monthly intervals in the first 18 months
- All test sites were altered to some degree by the local shire – except the Four Corners Road site north Jerilderie
- All sites inspected in February 2018 – at approximately 10 years of service life
- Inspection consisted of:
  - Defect mapping
  - Photography, and
  - Video recording of dust emission



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# Woodlands Road, Wombat

- Binders: cement/slag & Polyroad PR11L
- Scouring from 2010 heavy rainfall event in OWP on steep area of trial section
- Corrugation at curved section and breaking area
- No potholes
- Minor rutting of OWPs


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# Back Mimosa Road, Temora

- Binders: hydrated lime & Polyroad PR11L
- Polyroad had severe rutting after 2012 floods
- Lime stabilised section performing well given a few flooding events
- Central lane loose surface material for 75% of trial section due to edge gravel migrating to stabilised area
- Minor rutting in OWPs
- Small potholes from false pavement after trimming and compaction

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# Barber & Griffith Roads, Griffith

- Binder: hydrated lime
- Shire graded northern section of Barber Road in 2009 – however no documentation nor evidence that this was required
- Loose gravel across the road with three distinct ruts formed
- Corrugation at breaking areas at intersection

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# Old Corowa Road, Jerilderie

- Binders: hydrated lime & Polyroad PR11L
- Polyroad initially slippery and treated with 20 mm road base
- Centre area hard from lime stabilisation
- Loose material on edges
- Minor rutting in OWPs
- Two depressions in lime section

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# Four Corners Road, Jerilderie

- Binder: cement/slag
- Thick layer of loose fine gravel covers the whole pavement surface
- Loose material forms both rutting and corrugations
- Hard stabilised material under the loose material
- Need to remove the material to measure any defects in the stabilised layer

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# Dust emissions

- Loose material less than 0.075 mm contributes to most of the airborne dust
- Dust generation is a function of:
  - Amount of loose material
  - Vehicle speed
- Video filming gives a qualitative comparison of dust emissions
- 2018 trails site inspections:
  - Video recording from SUV
  - Travelling at 40 and 60 km/h

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# Dust emissions – Woodlands Road

40 km/h

60 km/h

# Dust emissions – Back Mimosa Road

40 km/h

60 km/h

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# Dust emissions – Barber Road

40 km/h

60 km/h

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# Dust emissions – Old Corowa Road

40 km/h

60 km/h

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# Dust emissions – Four Corners Road

40 km/h

60 km/h

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# Assessment recommendations

- Increase the stabilisation width from 6 to 7m (or greater)
- Prepare road camber to 6% before stabilisation, and
- Target 3 to 4% camber at final trimming
- At intersections, increase depth by 50 mm and increase binder rate by 1 to 2%
- Trim the pavement after stabilisation and compact from the crown to shoulders
- Undertake further mix design research to optimise binder type and application rate
- Conduct further research into the effective stabilisation of coarse sand

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# Summary

- Laboratory testing needed in the selection of the binder and application rate
- Many of the sites had no loose material on the stabilised pavement for the first twelve months
- The loose material migrated from the sides – need to increase the width of stabilisation
- Grade any build-up of loose material at 3 to 5-year intervals
- At the start of the project the expected design life before requiring maintenance or rehabilitation was unknown
- A low percentage of pavement defects observed provides confidence that the design life will be 10 years and beyond

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# Acknowledgements


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- Mark Crisp and Linda Woods, Hilltops Council
- Rob Fisher, Temora Shire Council

** In 2008, David Tamlyn worked at Jerilderie Shire Council*


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# References by AustStab

- Recycling unsealed roads to reduce dust & maintenance using in-situ stabilisation - Inception Report, 2007
- Laboratory investigation and construction reports for the in-situ stabilisation of unsealed road trials using lime, cementitious and polymers binders, 2009
- Inspection and Assessment Report – 10-year performance review of in-situ stabilised unsealed roads, 2018
- Vorobieff, G, Middleton, A and Young, S – A sustainable construction practice for unsealed roads, 20th ARRB Conference, Melbourne 2010

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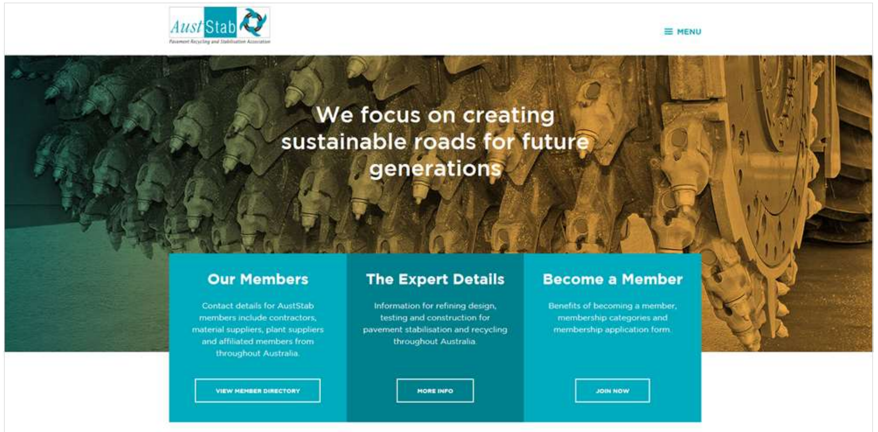
# Resources

- ‘10-year’ report is available at www.auststab.com.au/10-year-perfomance-report/
- Guides, Tech Notes, Trial Reports, etc. also on the AustStab website
- Stabilisation Fundamentals course – available through CPEE

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