

The background features a city skyline with various skyscrapers and buildings, overlaid with a network diagram consisting of white lines and circular nodes. The overall color scheme is a gradient of blue and teal.

# NTRO

NATIONAL  
TRANSPORT  
RESEARCH  
ORGANISATION

## ***Sustainable Pavements for Future Generations***

Michael Caltabiano

Chief Executive NTRO

# NTRO

NATIONAL TRANSPORT  
RESEARCH ORGANISATION



## 1960-2023

The NTRO is the source of independent expert transport knowledge, advising key decision makers on our nation's most important challenges.



### Our Vision

An Integrated Mobility Future which is safe, sustainable and a driver of economic well-being.



### Our Values

Transformative, Collaborative, Energy and Passion, Integrity



GLOBAL RESEARCH LABORATORY

# NTRO Home of Transport Innovation - Global Partners

NTRO is one of 7 Global Research Laboratory Organisations and has active relationships with each of our partners.

1. Research Institute of Highways Beijing, China (RIOH)
2. Transport Research Laboratories London, UK (TRL)
3. BAST Cologne, Germany
4. IFSTTAR Nantes, France
5. National Road and Transport Research Institute Stockholm, Sweden (VTI)
6. Transport Research Board, Washington, USA (TRB) & FHWA



Transport  
Canada



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# Australian Road Research Board

A Conference of State Road Authorities of Australia which met in Perth in October, 1958, decided that for the better development of its research work, action be taken to set up an Australian Road Research Board. A decision was reached following discussions with the Chief Executive Officer of C.S.I.R.O., Dr. S. H.

The objectives of the Road Research Board will be to co-ordinate, encourage and arrange research work into such problems as cheaper and better road surfaces, traffic flows, road safety, planning to meet future needs and the economics of road transport.

The proposal envisages the setting up by the Board of an Australian Road Research Advisory Council to advise the Board on research programmes.

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# NTRO Business Group Structure

Asset Performance

Safer Smarter Infrastructure

Structures and Certification

Mobility Futures

Data and Technology

Infrastructure Measurement

Sustainability and Materials Performance

ROAD. RAIL. PORTS. AIRPORTS.

## SOLUTIONS

- Integrated
- Impactful
- Integrity



NTRO

The image features a large, light blue circle in the center containing the text 'NTRO'. The background is a teal-to-blue gradient with a faint image of a survey vehicle. The vehicle has 'NTRO' and 'SURVEY UNIT' written on it. There are also some faint geometric lines and circles overlaid on the background.

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***Sustainable Pavements for  
Future Generations***

# Department of Transport and Planning Victoria

Case Study - Flood Recovery Response  
May 2023



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# Asset performance assessment – using iPAVe



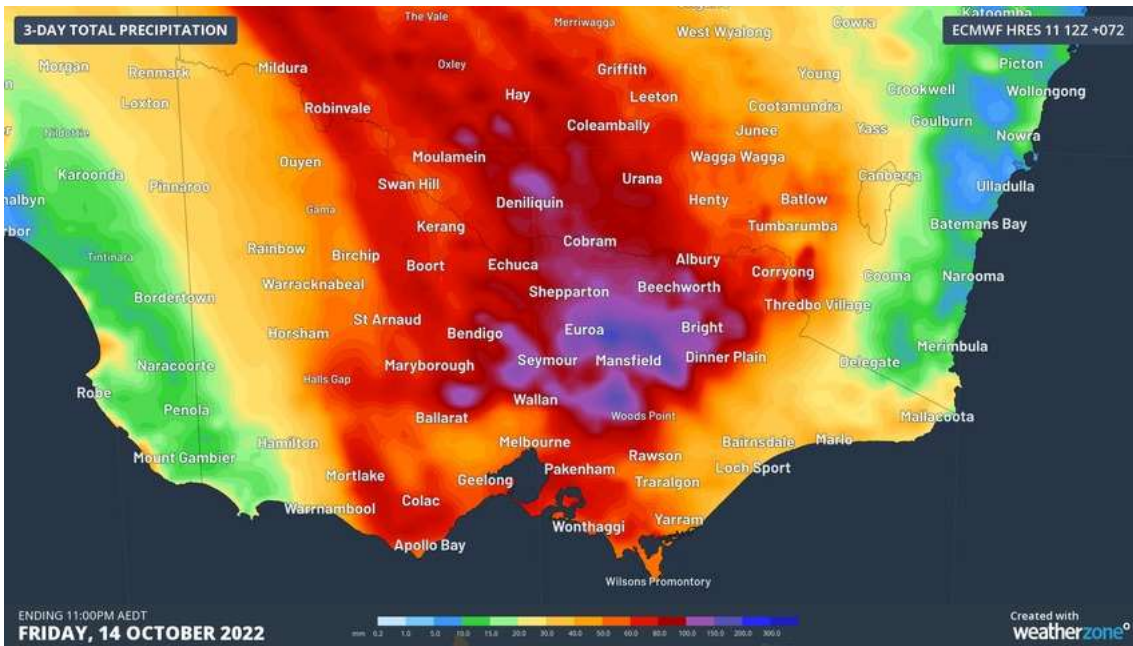
NTRO engaged for Victorian State network wide surveys in **2021 and 2022**

## Primary assessment parameters:

- Roughness
- Rutting
- Cracking
- Strength (deflection)
- Profile



# Flood event Victoria, October 2022



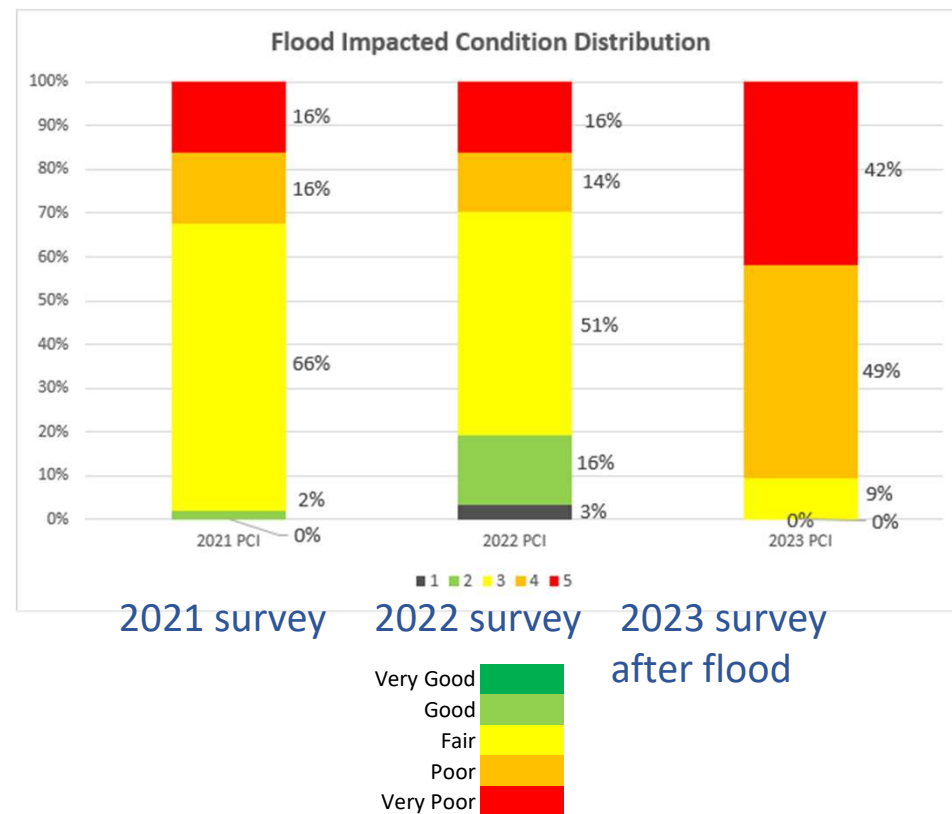
8400 km of state roads flood affected

# iPAVE Survey 2023

## Snapshot of findings

- Road structural assessment indicated *significant reductions* in remaining life
- Areas with significant change in the need for and cost of pavement works were identified as flood damaged
- Of the 8,400 km surveyed 707 km were flood affected
- The cost associated with the additional pavement intervention works was \$290m
- The predominant trigger was the reduction in remaining life based on change in **structural** condition

## Pavement Structural Condition





# Next Generation Laboratory

Australia's Single Source of Truth

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RESEARCH ORGANISATION

# The Laboratory



# SUSTAINABILITY & MATERIALS PERFORMANCE

The Sustainability & Materials Performance Business Group is Australasia's thought leader in the fields of innovative materials research and infrastructure sustainability.

The work we do is making us global pioneers in implementing sustainability, innovation and safety in transport systems.



Our focus is on increasing the use of upcycled, recycled and sustainable materials; on minimising whole of life sustainability impacts; and adapting to climate change. Our outputs lead to safe, community minded, economical and environmentally friendly solutions.

Whether collaborating with government or industry, in partnerships or in consultation, our ground-breaking research provides today's decision makers with the tools to build a resilient, sustainable future for our cities and regions.

## PORTFOLIOS



Safe and Sustainable Development



Materials Performance and Testing



Lifecycle Evaluation and Economic Assessment



Environmental Management



Community Safety and Resilience



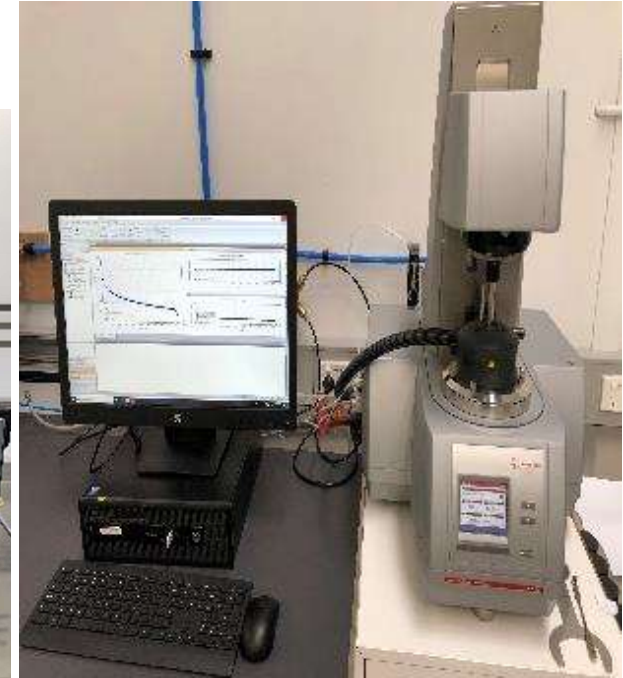
# What sets us apart?

- The best equipped laboratory in the country
- Interaction and collaboration with the foremost subject matter experts in the country



# What sets us apart?

- Ability to manufacture and test polymer, waste plastic and crumb rubber binder formulations
- Flexibility to undertake testing to Australian and international methods



# Accelerated Loading Facility (ALF) Pavement Test Data





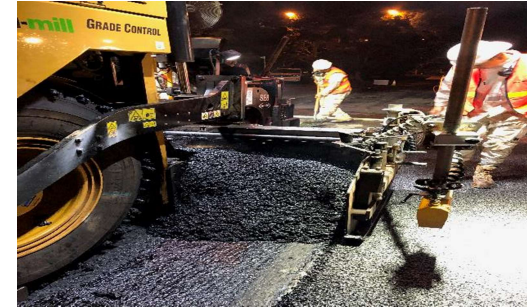
# Achieving 100% recycled roads

## Making better, data driven decisions for our Road assets

Evaluation of local recycled material streams – type of materials, potential applications and their current and ongoing availability.

Currently all roads are 100% recyclable we must keep it that way

- Applications can be:
  - Rehabilitation of existing pavements
    - Bitumen insitu stabilisation
    - Foamed bitumen stabilisation
    - Lime stabilisation
    - Cement stabilisation
  - Ground improvement (stabilisation and reinforcement) of subgrades
  - Base and sub-base layers (granular and treated)
  - Bedding and embankment fill
  - Road Surfaces (asphalt, sprayed seals and high friction surface treatments)
  - Bike lanes, shared paths and footpaths
  - Car parks



This assessment will inform research and development opportunities and highlight where initial opportunities to implement recycled materials may be applicable immediately.

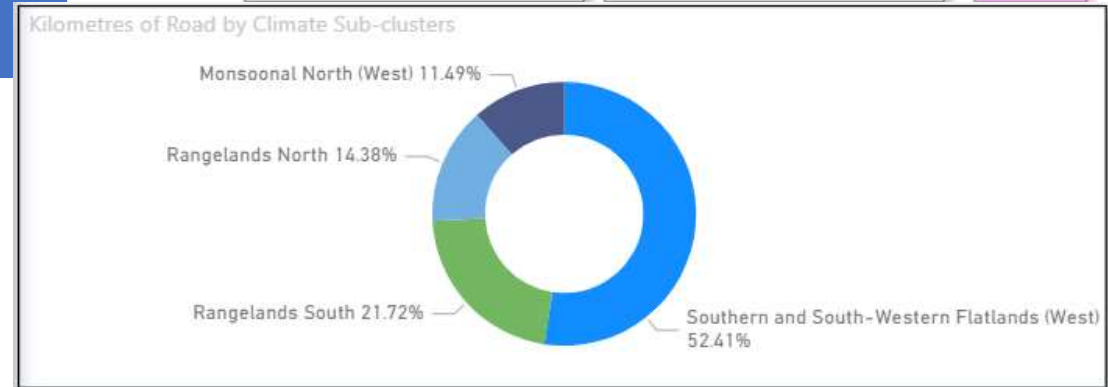
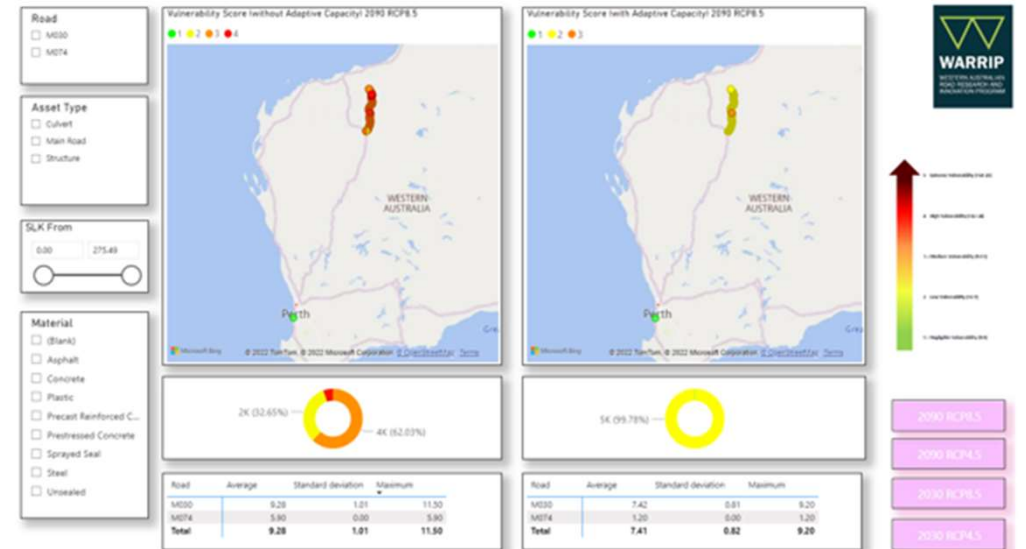
- Initial design of recycled material applications, such as, asphalt and pavement mixes or roadside infrastructure.
- These designs will focus on maximising the use of recycled materials. Dependent on the end application and type of materials used it is possible to reach up to 100% recycled content especially if granular materials solutions are considered.
- Consideration and support of circular economy principles and environmental benefits such as greenhouse gas emissions savings will also be employed.

# Climate change adaptation and infrastructure resilience

NTRO is Australia's trusted provider of infrastructure measurement, data collection, data analysis and solution development.

Our expertise brings sustainability, asset management and network operations disciplines together with climate change risk assessment.

International best practice and expert knowledge have been applied to the development of tools including strategic assessment for network vulnerability, and developing resilience solutions.



# Sustainability Assessment Tool InfraCalc

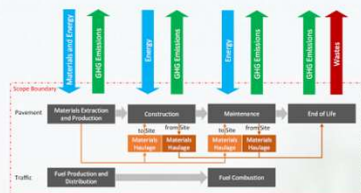


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### Sustainability Assessment Tool



The Sustainability Assessment Tool has been developed under a joint WARRIP-NACOE project for both Main Roads Western Australia (Main Roads) and the Queensland Department of Transport and Main Roads (TMR).



The Sustainability Assessment Tool delivers consistent and reliable lifecycle sustainability and economic comparisons for case pavement options.

[Go To My Projects](#)

## NTRO TOOLS

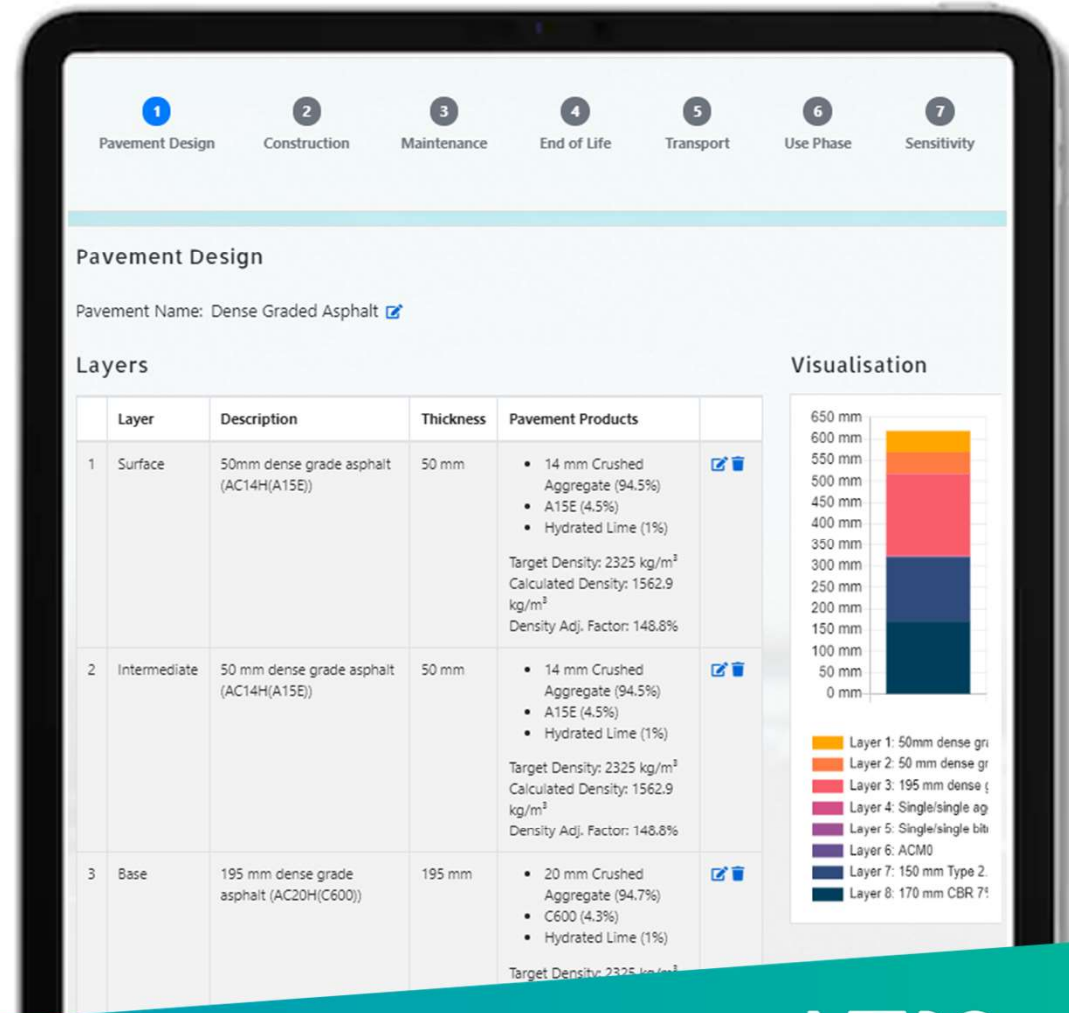
# NTRO Sustainability Assessment Tool - InfraCalc

A new user-friendly lifecycle assessment (LCA) tool supporting pavement innovation

## ABOUT THE TOOL

# NTRO's Transport Sustainability Tool - InfraCalc

- User-friendly interface
- Compare innovative pavement design options
- Tailored, flexible and customisable
- Factors that can be evaluated and compared:
  - Materials,
  - road geometry,
  - construction methodology,
  - maintenance regime,
  - rehabilitation / end of life options
- Detailed outputs

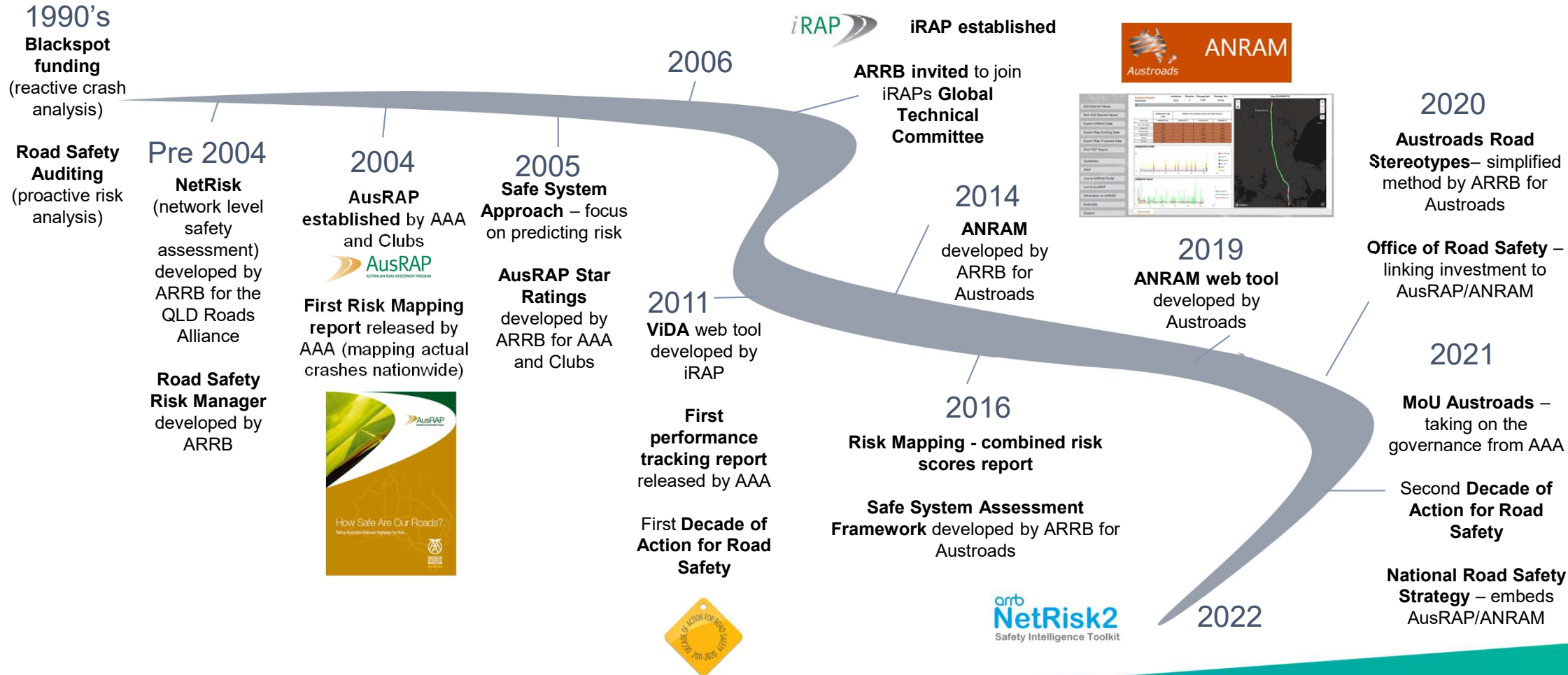


# Safer Roads NetRisk 2.0



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# NetRisk2 30 Years in the Making



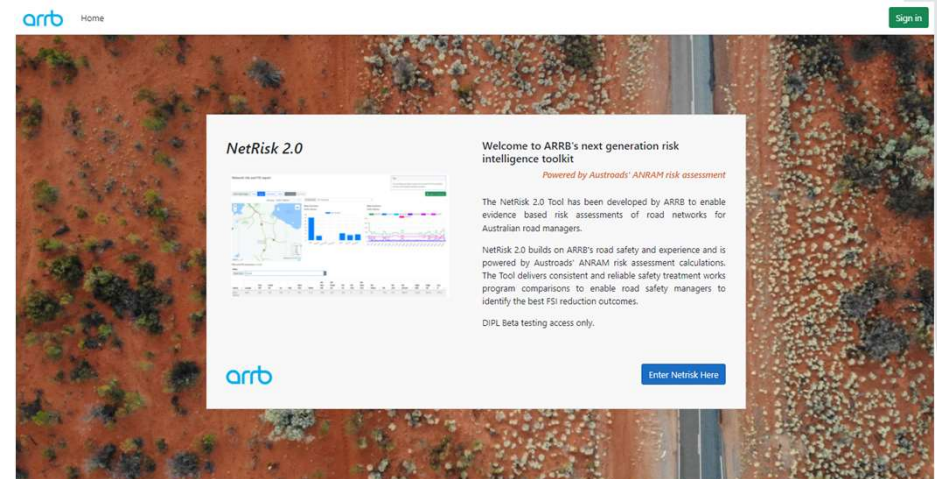
NTRO TOOLS

# NTRO's NetRisk2

- A web-based tool for infrastructure risk assessments.
- Allows road managers to:
- identify high risk locations on their network
- develop targeted and cost-effective interventions, using a data driven and evidence-based approach.
- Investment is targeted - ensuring a real impact on minimising road fatalities and serious injuries.

# arrb NetRisk2

## Safety Intelligence Toolkit



© 2021 ARRB - Safety Intelligence Reporting Tool - [Privacy](#)

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The image features a teal-to-blue gradient background with a network of white lines and circles. A large, semi-transparent circle is centered on the left side, containing the text 'NTRO Equipment'. In the background, a white truck with 'NTRO' branding is visible. The text 'NTRO' is in a large, bold, white sans-serif font, and 'Equipment' is in a smaller, white sans-serif font below it.

# NTRO

Equipment

# Infrastructure Measurement

If you don't measure it,  
you can't manage it.

Understanding the condition of your road network is vital to being able to manage it effectively. With the largest fleet of survey vehicles and expert staff in the Australia and New Zealand region, NTRO offers a full suite of data collection and analysis services.

We work with Councils, road agencies, all levels of government, and engineering contractors and consultants on cost-effective and efficient road network management.

Through our trusted data and insights, we provide the highest professional advice for the on-time management of road, rail, aviation, maritime and defence transport assets.



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### Ride Quality Test Vehicles

Measures the roughness of the road to test compliance with specified standards and can be used for maintenance and rehabilitation purposes.



### Falling Weight Deflectometers (Heavy)

Assesses pavement strength by measuring road deflection.



### Intelligent Pavement Assessment Vehicles

Measure the condition, maintenance, rehabilitation and lifecycle of your transport network by collecting pavement strength data as well as the full NSV data set.



## MEET THE FLEET

### Intelligent Safe Surface Assessment Vehicles

Measures surface friction and skid resistance and can also collect texture and rutting data and digital imagery.



### iLINE

Measures line marking retroreflectivity for the centre and edge line at traffic speed on your road network for AM and CAV readiness.



### Unsealed Roads Vehicles

Measures rural and regional unsealed roads to establish maintenance programs.



### Network Survey Vehicles

Surveying cracking roughness, rutting, texture and providing a visual rating of surface defects.



# intelligent Pavement Assessment Vehicle (iPAVe)



## Pavement response under load

- **Velocity of deflecting road surface** → via Doppler lasers positioned ahead and behind loaded rear wheel

## Road surface characteristics

- Wheel-path roughness & texture → via point lasers
- Rutting & cracking → **Automatic 3D system**
- **Asset cameras**
- Positioning: **Gipsi-Trac inertial & RTK-GPS**



# Next generation iPAVe3

- Dual measurement beams
- Additional sensors & improved sensor technology
- Smaller reporting intervals
- Improved temperature control system
- Ground Penetrating Radar (GPR)

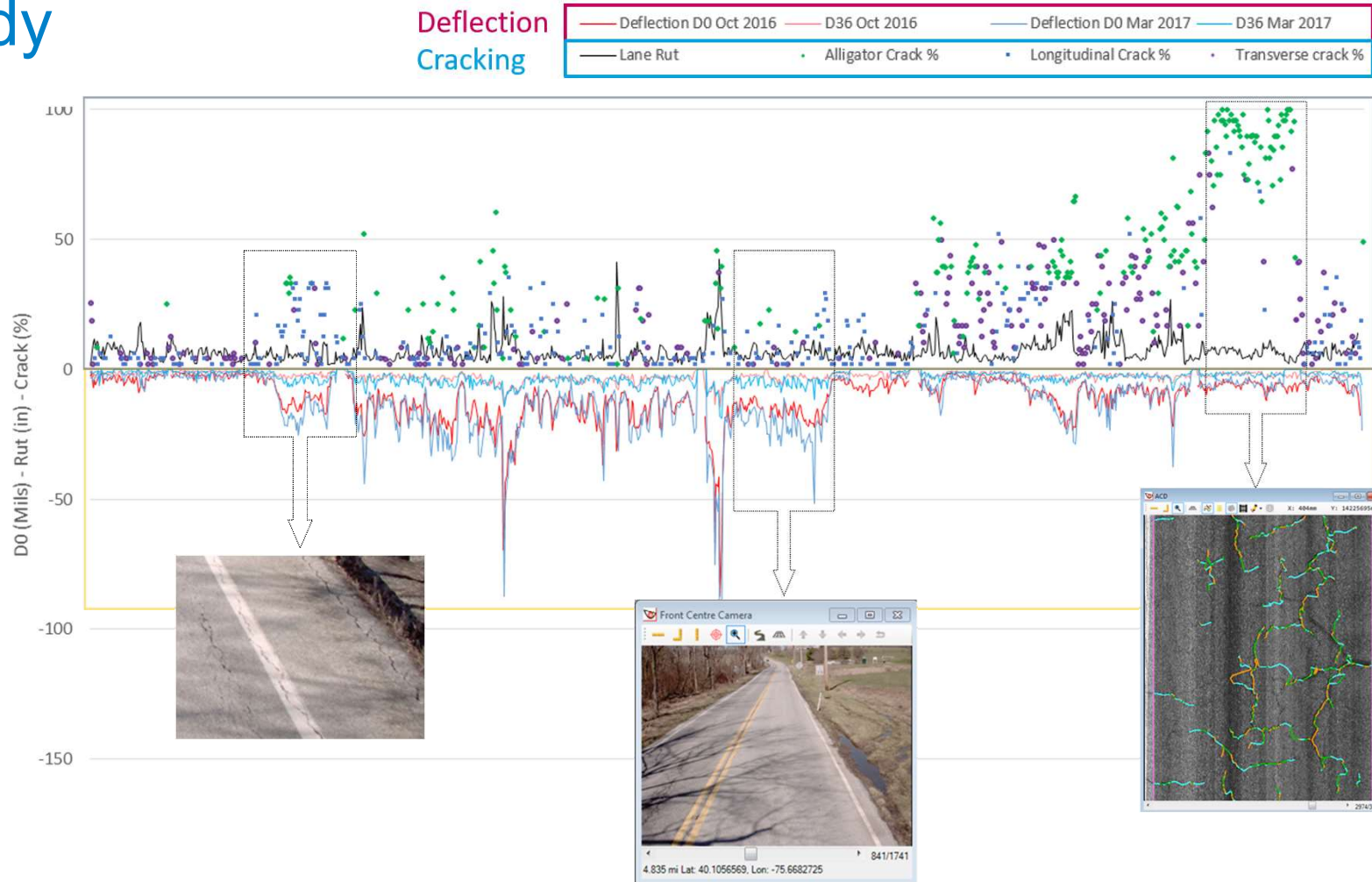




NTRO EQUIPMENT

# iPAVE Efficient Infrastructure Management Tool

# Case study



## PROJECT SPOTLIGHT

# Flooding Toolbox for Rail Embankments

### Project Description

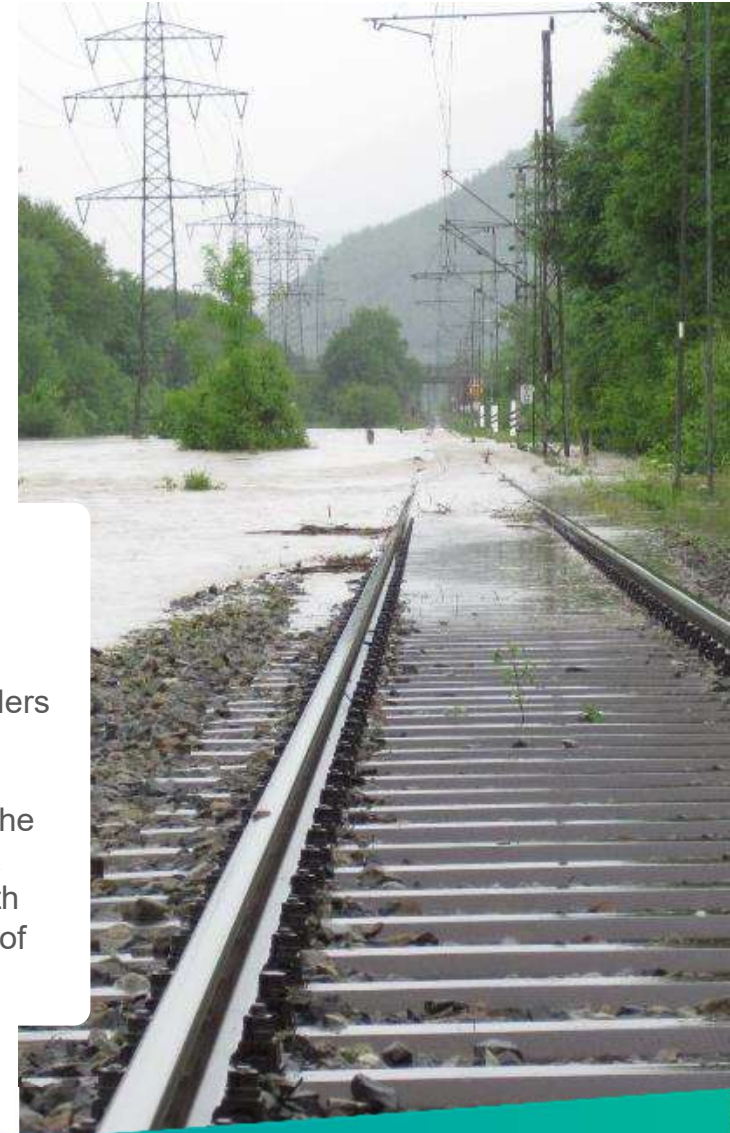
The flooding problem is complex due to the nature of the systems (mix of the effects of natural and man-made systems) that need to be considered.

### Project Partners

- University of Wollongong
- ACRI Participants User Assurance
- Queensland Rail Senior User
- National Transport Research Organisation

### Impact

Aid decision makers and stakeholders in understanding the nature of the flooding problem from various perspectives (to be selected from the toolbox). The project will develop a toolbox that provide customers with insight into likely future availability of the rail line.





# Automated assessment of WA Airports

## Two objectives for data collection

- **Correlation of structural deflection data between TSD and HWD data**
  - iPAVE collects continuous data much faster than HWD
  - No closure of assets required
  - Develop methodology to determine Pavement Classification Number (PCN) from iPAVE data
- **Condition report on airport assets**
  - iPAVE collects roughness, rutting, texture, cracking and visual data
  - Generation of maintenance plans from informed position



The graphic features a teal-to-blue gradient background with a network of white lines and circles. A large, semi-transparent circle is centered on the left side. Inside this circle, the text 'NTRO' is written in a large, white, sans-serif font. Below it, the words 'Global Outreach' are written in a smaller, white, sans-serif font. In the background, there are faint images of white trucks with 'NTRO' logos on their sides. A smaller white circle is connected to the main circle by a line on the right side.

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Global Outreach

# NTRO GLOBAL TRANSPORT COLLABORATION

The National Transport Research Organization is planning the most influential transport industry event on the calendar for 2023, bringing together industry leaders and key government representatives to explore some of Europe's innovation and move beyond to a safer, more resilient, sustainable connected and automated future.

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## EUROPE 2023



# PROGRAMME HIGHLIGHTS

## PIARC World Congress – Prague,

It is predicted that 3,000 to 5,000 delegates, will attend the event, which will showcase the latest trends and innovations in the transport sector.

During the Congress, Transport Ministers from the association's over 130 member countries will convene to share their ideas and examine the problems faced by modernising their national road infrastructure.

Date: 2<sup>nd</sup> Oct 2023 to 4<sup>th</sup> Oct 2023



### PRAGUE

Czech Republic  
2<sup>nd</sup> Oct 2023  
to  
4<sup>th</sup> Oct 2023



### BERLIN

Germany  
5<sup>th</sup> Oct 2023  
to  
8<sup>th</sup> Oct 2023



### PARIS

France  
9<sup>th</sup> Oct 2023  
to  
10<sup>th</sup> Oct 2023



### LONDON

England  
11<sup>th</sup> Oct 2023  
to  
13<sup>th</sup> Oct 2023

## DATES

2<sup>nd</sup> Oct 2023 to  
13<sup>th</sup> Oct 2023

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