



Pavement Delivery System Review

Workstream 5: Quality of Project Delivery

PDSR authors

1 November 2022

V1 Final

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Waka Kotahi NZ Transport Agency
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If you have further queries, call our contact centre on 0800 699 000 or write to us:

Waka Kotahi NZ Transport Agency
Private Bag 6995
Wellington 6141

This document is available on Waka Kotahi NZ Transport Agency's website at www.nzta.govt.nz

Document Control

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V1 – Final 21 November 2022	Janice Brass	

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1.0 Purpose of this Report

The ‘Review of State Highway Pavement Delivery’ report was communicated to the New Zealand Pavement Industry by Waka Kotahi in March 2020. This holistic and collaboratively sourced review examined the steps Waka Kotahi and the wider industry could take to improve their collective performance in the end-to-end delivery of new and rehabilitated pavement construction in New Zealand. The review was guided by Waka Kotahi’s value for money investment principle; *“the delivery of the right outcomes, at the right time, at the right cost and financed at the right level of risk.”*

Whilst the review was not expected to generate a fundamental change to systems and processes, it did identify areas where further focus, refinement and discipline would improve design, delivery and reliability confidence. Opportunities to improve, clarify and supplement existing pavement specifications, design processes and construction delivery were also highlighted. These opportunities were summarised within nine recommendations that were subsequently endorsed by Waka Kotahi. The recommendations of the Report are summarised in Figure 1.

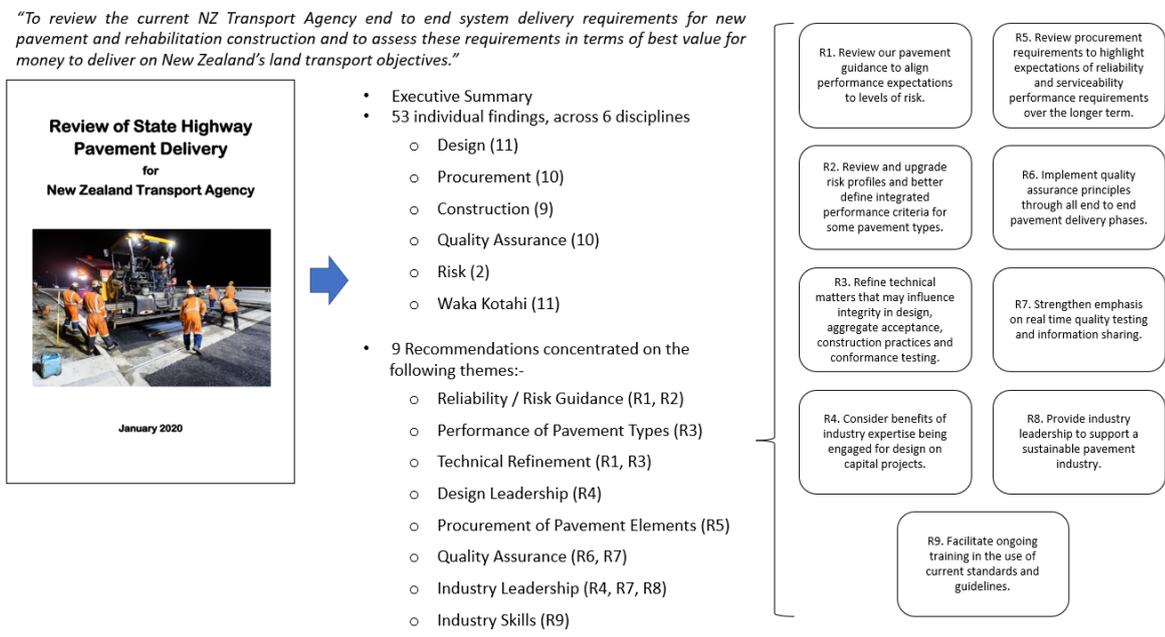


Figure 1: A summary of the outputs from the ‘Review of State Highway Pavement Delivery’ report.

An Industry Steering Group was then established to plan, resource and enable the implementation of the nine recommendations. The Industry Steering Group, shown in Figure 2, is chaired by Janice Brass of Waka Kotahi and is supported by senior industry representatives across its targeted workstreams.

- Workstream 1 – Technical Matters
- Workstream 2 – Whole of Life
- Workstream 3 – Procurement
- Workstream 4 – Strategic Risks
- **Workstream 5¹ – Quality of Project Delivery**
- Workstream 6 – Industry Capability
- Workstream 7 – Cross Industry Communications

¹ In June 2022, the Steering Group agreed to combine the outputs of a separate workstream, targeting improved awareness of Z01 and Z08 quality related documentation, into the scope of Workstream 5 – Quality of Project Delivery.

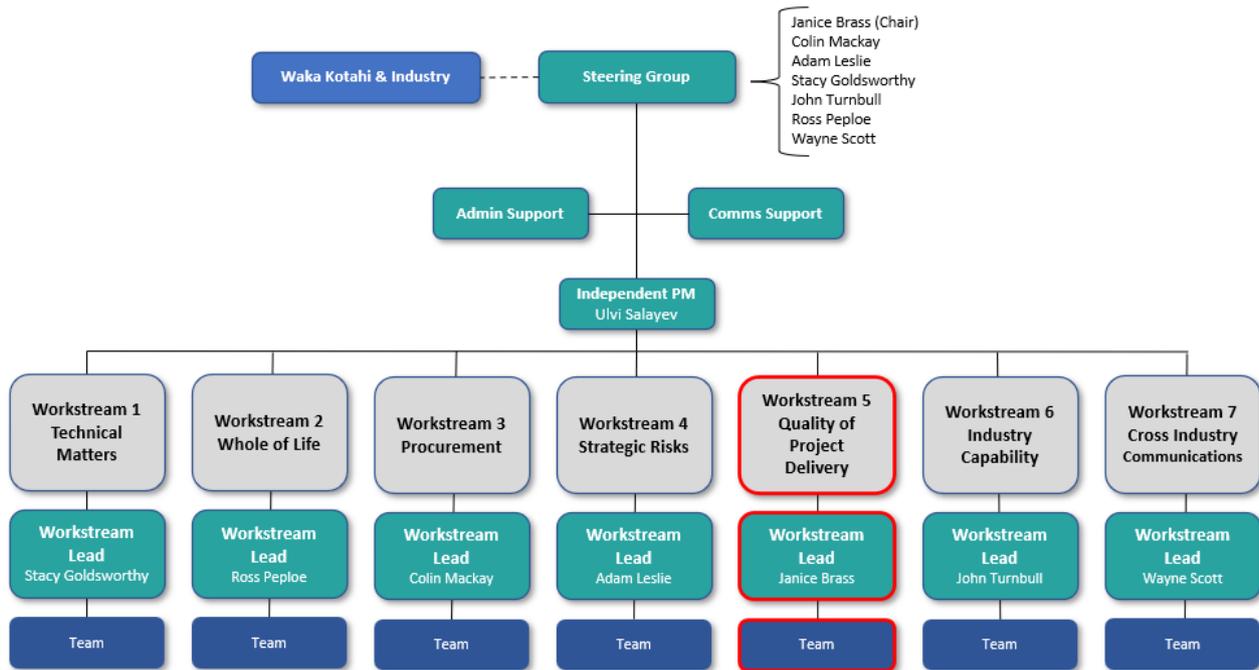


Figure 2: The structure of the Industry Steering Group, showing the Workstream 5:Quality of Project Delivery

The Workstream 5 Team were tasked to consider the Report’s Recommendations that targeted improvements related specifically to the awareness and project implementation of Quality Assurance principles, these being:

Ref.	Report Recommendation
R6	<p>Implement quality assurance principles through all end to end pavement delivery phases.</p> <p>Recommendation statement from page 5 of the Report:</p> <p>Quality Assurance: <i>Extend Quality Right processes, complemented with mitigated risk evaluation, as an end to end process through all pavement delivery phases and apply Quality Right as a highly preferred assurance discipline to include both new projects and rehabilitated pavements (i.e., NOC contracts).</i></p>
R7	<p>Strengthen emphasis on real time quality testing and information sharing.</p> <p>Recommendation statement from Page 5 of the Report</p> <p>Quality Assurance: <i>Review and incorporate the findings of Austroads “Review of the Delivery of Quality Assurance in Road Construction (2019)” to strengthen and extend Quality Right with particular emphasis on real time QC information and control action.</i></p>
R9	<p>Facilitate ongoing training in the use of current standards and guidelines.</p> <p>Recommendation statement from Page 5 of the Report</p> <p>Industry Skills: <i>Facilitate ongoing training in the use of the current Guides and Standards to raise the holistic capability industry wide (i.e., design to construction) and encourage technology and innovative methodologies, which contribute to the opportunity of efficient construction control, quality and productivity and adherence to best practice.</i></p>

There are two primary documents that combine to provide the theory to Waka Kotahi's Quality Assurance approach. These are titled:-

1. Minimum Standards for Quality Management Plans, reference NZTA Z01.

When the 'Review of State Highway Pavement Delivery' report was completed, the Z01 document used by the pavement industry was Version 3.0, dated October 2017. Since the Reports completion, the document has been revised and is currently at Version 5.0, issued in May 2021.

2. Minimum Standard for Inspection, Sampling and Testing, reference NZTA Z08:2020

When the 'Review of State Highway Pavement Delivery' report was completed, the Z08 document used by the pavement industry was Version 4.0, dated October 2017. Since the Reports completion, the document has been revised and is currently at Version 5.0, issued in December 2020.

Whilst these two documents describe the theory of Waka Kotahi's Quality Assurance approach, the Steering Group were quick to recognise that a significant improvement in the practical application of Quality Assurance practices was also required at a project level, by all parties involved in the Pavement Delivery System.

In order to gather opinions and share views on this topic, a team was assembled comprising individuals from client, designer and contractor organisations. On the 10th June 2022, the team met at a facilitated Quality Workshop. The team were asked to consider: -

- What 'great' pavement delivery would actually look like?
- What does it look like now?
- What is getting in the way of delivering quality pavement construction?
- Where are these opportunities to improve?

The findings of the workshop, and the Required Responses for improvement that resulted, are presented in Section 3 of this report.

2.0 Structure of this Report

This report comprises three sections. The section titles and their contents are described in Figure 3 below:-

Section Title	Content
1: Purpose of this Report	Describes the creation and purpose of the Workstreams operating under the Pavement Design System Review (PDSR) Steering Group.
2: Structure of this Report	Demonstrates the structure of this report, typically comprising background information, headline findings and Required Responses.
3: Workstream Findings & Required Responses	A summary of the findings identified by the Workstream Team <i>WS5 – Quality of Project Delivery</i> , during their review, together with the Required Response that has been proposed to resolve the finding.
Appendices	Supporting information, typically used to provide either background to a finding, or an updated / new document that forms part of a Required Response.

Figure 3: Report structure

2.1 Prioritisation of Required Responses:

The Required Responses made by the Quality of Project Delivery Workstream are presented in this report.

Given that each of the separate workstreams described in Figure 2 is challenged to produce its own report, and recognising that some considerations between these workstreams overlap, the decision has been made by the Steering Group to consider and prioritise the Required Responses as a whole, once all reports are complete. The full list of prioritised Required Responses is provided within an overarching PDSR Steering Group Report, titled **PDSR Summary Report** which is accessible via this [link](#).

3.0 Workstream Findings

3.1 The performance of the Waka Kotahi 'Quality Right' initiative

The **Quality Right – No Defects** initiative was introduced by Waka Kotahi in 2017. It sought to improve pavement quality by reinforcing quality-based disciplines and increasing the Principal's confidence that quality pavements were being built as they were designed. Quality Right employed four major themes to achieve its aims:

1. **Improve Quality Management on site** by using Z01 and Z08 to introduce specific quality principles, place greater emphasis on the identification of non-conformance and improve the thorough compilation of quality focused inspection and testing data.
2. **Improve tender documentation and contract specifications** by (a) making pavement options more prescriptive; (b) including Quality Management within contract price schedules and (c) including the scoping of MSQA elements in tenders.
3. **Improve contract documents** by ensuring that all changes to designs and construction standards implemented during a project were fully documented and made available for review.
4. **Improve the resource level and skills of the Principal's site representatives** so as to provide better surveillance and analysis of all quality related data.

Finding 1: In practice, six existing projects were selected for trialling Quality Right. Whilst some gains were made, the use of existing projects for the trial caused challenges due to the fact that the roles, responsibilities and structure of the quality functions were already established on those projects.

Required Response WS5.1: Having considered its outcomes, it has been decided to end the promotion of the Quality Right approach as a stand-alone initiative, and instead embed the Quality Right principles into the Z01 document (May 2021, Version 5), so that all new projects can use the principles as consistent requirements when first determining their quality approach.

This Required Response has already been implemented.

3.2 Reviewing Z01 and Z08 as a foundation for Quality of Project Delivery

There is no doubting the important role that a well-structured Quality Management Plan (QMP) plays in achieving good quality outcomes. The QMP effectively describes how a successful quality outcome will be achieved, by examining the risks the project presents, describing how these will be managed and mitigated, and how, within its inspection and testing section, the evidence that will be collected to record and verify the compliant completion of the works.

Finding 2: Whilst the QMP that a contractor organisation develops for a large scale capital project will be created using a unique, project specific template, those QMPs developed for smaller scale projects have historically been created using the organisation's standard QMP template. Given the use of short tender periods and the limited availability of operational resources during the tender, a project specific QMP may not be created until after a contractor organisation is awarded the contract. It is therefore imperative that the Minimum Standards for Inspection, Sampling and Testing requirements are easily identified by the contractor organisation, so early requirements can be established and prepared for in advance of programmed work. This has not always been the case.

Required Response WS5.2: The Z08 document (Dec 2020, Version 5) has now been updated to provide far greater clarity over the minimum standards for inspection, sampling and testing. Appendix 1 of the document describes the test requirements and frequency of such tests, for the materials and component parts of the relevant construction process, allowing for easier identification and earlier planning.

This Required Response has already been implemented.

3.3 Assessing Performance: Aligning PACE and Internal Audit tools

Amendments have now been made to the Z01 and Z08 documents within their latest revisions. Improvements have also been made to: -

- The Waka Kotahi Supplier Quality Audit Standard ref. Q06
- The PACE Assessment process, in order to clarify quality requirements and related performance metrics.

These changes target the importance of the quality management information that is created, collated and presented by the contractor, to provide the construction evidence required of their own inspection and test plans (ITPs). An increased awareness of the Z01, Z08 and PACE requirements, will also provide the contractor with a catalyst for improving their own internal audit processes, so they too focus on the information that is seen as having significant importance to the Principal.

3.4 Talking Quality

Finding 3: The Review of State Highway Pavement Delivery report highlighted the need to create more collaboration between Waka Kotahi and its supply chain. Whilst suppliers have an obligation to review and understand their contract obligations in respect to quality, the availability of the new versions of both Z01 and Z08 documents, and the quality framework they reflect, provides an opportunity for Waka Kotahi to engage with its supply chain and communicate their quality focus within a workshop setting. Such engagement will also work to provide the opportunity for broadening the knowledge of the Principal's site representatives, in their understanding of how the contractor works to efficiently align contract requirements with programme, methodology and other related considerations.

It is apparent that there are now opportunities to create appropriate vehicles for this collaboration, such as the use of Quality Forums, where two-way feedback on good practice and lessons learned events can be discussed. Quality Forums would not only focus on sharing project specific information but could also be launched with Quality Management resources drawn from principals, designers and contractors nationally, with the purpose of improving standards as well as supplier competencies around quality aspects during pavement delivery.

Required Response WS5.3: Waka Kotahi will explore the creation of a suitable Quality Forum as a vehicle for engaging with industry groups, designers and contractors on quality matters, and raising the profile of quality across the pavement delivery system.

This Required Response has already been implemented.

3.5 Outputs from a facilitated Quality Workshop

As part of the implementation of Required Response WS5.3, a facilitated Quality Workshop took place on the 10 June 2022. Activities undertaken during the Workshop included: -

- The listing of key themes for success.
- The completion of a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis based on the current reality of pavement delivery.
- The listing of priority issues; these being noted as: -
 - Better achievement of quality standards
 - Improving the promotion of the sector
 - Greater availability of technical training
 - A more robust lessons learnt approach
 - Technology opportunities
 - Removing the 'she'll be right' bravado
 - Sustainability targets – being forced on sector
 - A greater acceptance of diversity
- The creation of further Required Responses for improvement.

A copy of the workshop outputs are provided as Appendix 1 of this report. The findings relating to the improvements required are listed below: -

Finding 4: There is a need to create a common 'theme' to pavement based training, educating practitioners on how to build pavements in accordance with Waka Kotahi requirements. Such training should be built around: -

- a) A formal competency framework - based on individual roles, including the Client role.
- b) The use (award) of unit standards, micro-credentials and NZQA credits, with appropriate certification.
- c) The use of practical success stories - promoting the benefits that came from doing things right.
- d) Recognition between the individual and their employer's Certified Tender Evaluation - so that a proactive approach to training by the employer is recognised by Waka Kotahi.

Required Response:

Given the similarity that exists between this finding, and the findings of the Workstream 6 Industry Capability team, it was decided to resolve this finding under the Required Responses WS6.3A and WS6.3B proposed by the Workstream 6 team. These required Responses are: -

WS6.3A: Under the facilitation of Waka Kotahi, all sectors are to collaborate on undertaking an assessment of the skills needed within the pavement delivery system.

WS6.3B: Armed with the list of skills developed under WS6.3A, a gap analysis should be completed, and skill set requirements for specific roles developed.

Finding 5: There is a need to regularly review and updated technical specifications and explore opportunities to adopt AustRoads standards and specifications.

Required Response: WS5.4: Update the contents of Technical Specifications and explore opportunities to adopt AustRoads standards and specifications.

Finding 6: Opportunities to explore the automatic generation of Inspection and Test Plans should be considered.

Required Response: WS5.5: Develop tools that enable the automatic generation of ITPs that are reflective of project specifications.

Finding 7: At a Principal level, we should consider the separation of responsibilities of monitoring quality control from that of commercial control.

Required Response: WS5.6: Implement the use of an independent REVIEWER to separate the monitoring of quality control from commercial control. Use this change to promote the greater awareness and higher performance of: -

- a) Contract requirements
- b) Quality Assurance based training
- c) Role definition for those responsible for project QA - including how these roles are presented / scored within procurement models
- d) Process, Standards and Testing management.

Finding 8: The pavement industry needs to improve its 'lessons learned' processes, so that both good practice and those practices that results in mistakes and poor performance can be collaboratively shared.

Required Response:

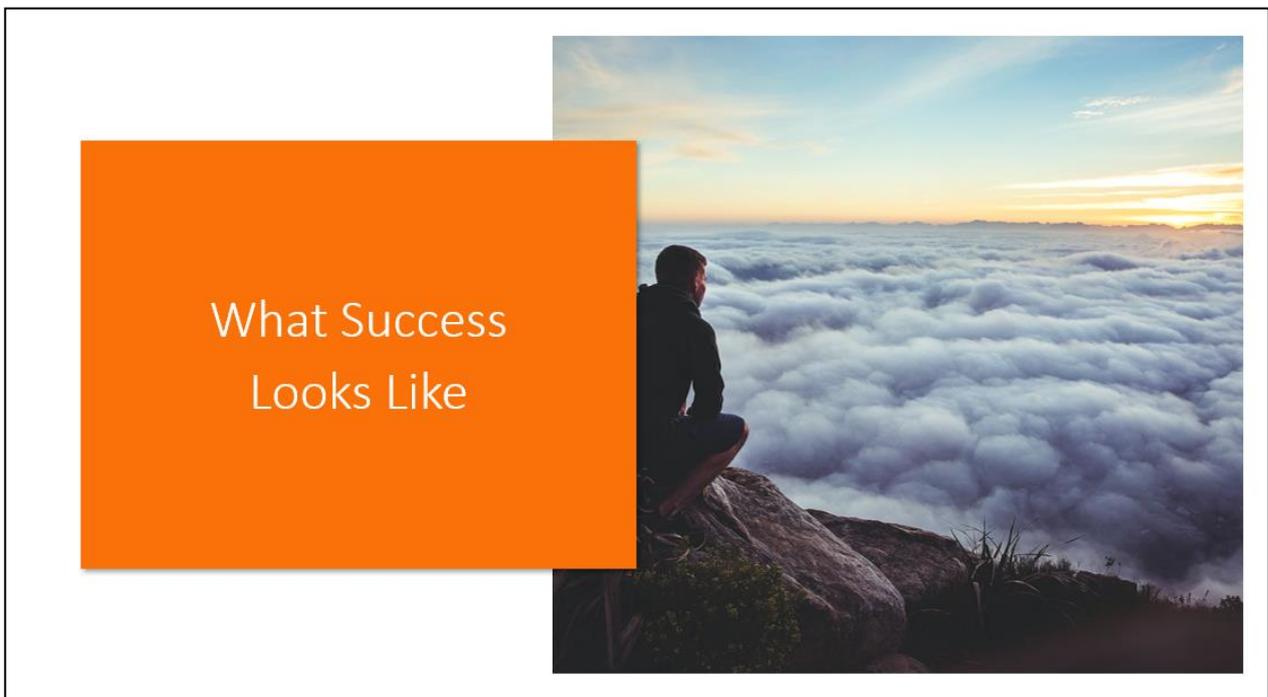
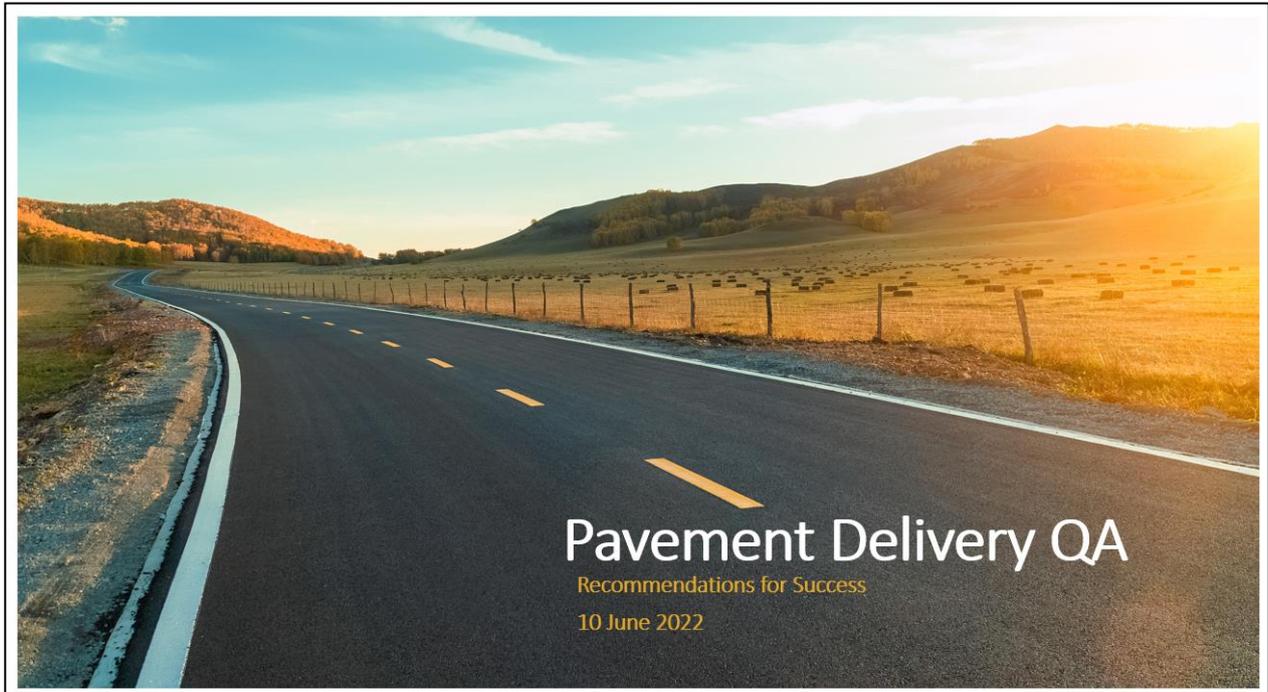
WS5.7: The pavement delivery industry is to improve its Lessons Learned processes - providing a sustained reflection on how we're doing, through the use of: -

- a) established collaborative forums
- b) the faster promotion of key successes.

Appendices

Appendix 1: PowerPoint slide outputs from the Quality Workshop; 10 June 2022

The following slides were produced by Centre for Vision and Leadership, Level 9, Berl House, 108 The Terrace, Wellington 6143 NZ



TIME

NZ ACHIEVES
WORLDCLASS ROADS!!!

LONG TERM PAVEMENTS SAVING
THE PLANET. HOW WE NOW
RECYCLE & REUSE



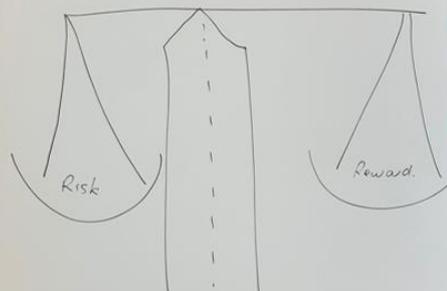
CONTRACTORS SAY NO MONEY IN
ROADS ^{PAVEMENT} MORE IN 3 WATERS

SECTOR COLLABORATION, DRIVING
THE NEW WAY OF WORKING.

WHERE HAVE THE
ROAD CONES GONE?

TIME

New Zealand Pavements



A Perfect Balance.

For Blocks active parties must accept numerous challenges.
Supply chain and regulatory challenges hindered to touch.
Industry tightness starts second half countdown.

TIME



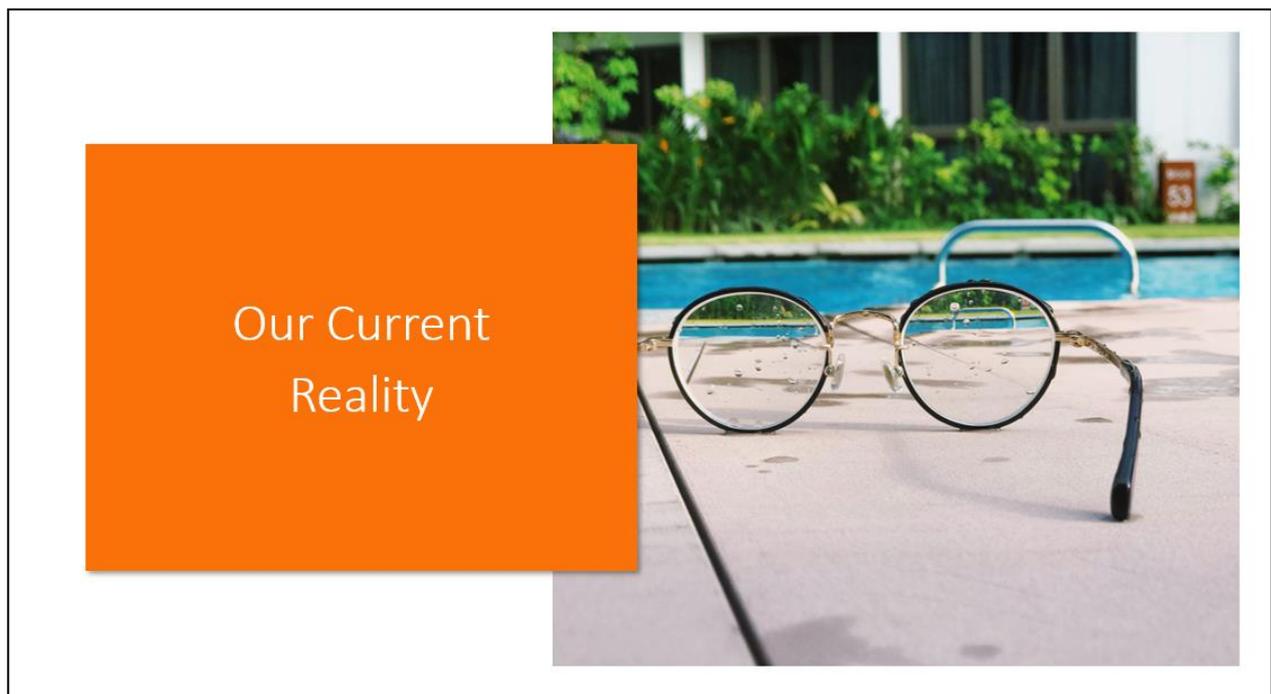
NZ LEADS
THE WORLD

No UNSCHEDULED ROAD MAINTENANCE
FOR 15 YEARS. RECORD LEVELS OF
JOURNEY RELIABILITY, SAFETY & QUALITY

- NZ Statehighway System Voted Best in World
- Government Maintenance Cost Record Low in OECD
- What the world can Learn from Aotearoa's road
- NZ's Carbon Free Journey to Sustainable Roads

Success: Key Themes

<p>SUSTAINABILITY</p> <ul style="list-style-type: none"> • Sustainable supply chain • Working effectively with the available resources • Sustainability • Maximum use of recycled materials • Sustainable solutions 	<p>PREDICTABILITY</p> <ul style="list-style-type: none"> • Planned maintenance • No (less) maintenance • Predictable process and outcomes – no surprises • Long life pavements the norm • No unscheduled maintenance • Only planned maintenance now needed 	<p>SECTOR COLLABORATION</p> <ul style="list-style-type: none"> • Leadership • It will require the whole industry • Clearly defined roles and responsibility • Working together will achieve best outcomes • We all have a part to play and need to know the whole game • Entire supply chain working together • Collaboration • Consistency of approach • Sector collaboration and success for each part of the sector • Industry wide approach underpinned by quality • Whole team needs to work together – client, designer, constructor • All parties working together • Sector capability – to be successful
<p>USER FOCUSED</p> <ul style="list-style-type: none"> • Improved user experienced • Road users notice less journey interruptions • What do road users want to see – success for them 	<p>QUALITY FOCUS</p> <ul style="list-style-type: none"> • Supply chain quality • Acknowledgement of good work • Quality across the value chain • We are pushing the bounds in design based on the demands we expect from pavements • Whole of life value for money is important 	
<p>BALANCE</p> <ul style="list-style-type: none"> • Balance risk = reward • Value (client) = Profit (contractor) 	<ul style="list-style-type: none"> • Looking backward, what's the vision forwards? 	



Strengths

- Leading organisation in Waka Kotahi through standardisation and central control
- Focused technical groups collaborating – need more
- Good collaboration throughout industry
- Very good people across the industry, willingly contribute towards improvement
- Untapped technical capability in the supply chain
- Good technical standards
- Industry acknowledgement of need to improve
- Some skill training available (ILMM)
- Have good quality systems



Opportunities

- Design risks should be shared with constructors
- Focus quality management systems on early warning
- Refinement of grounded models
- Insufficient lead indicators in quality systems – too focused on defects
- Cross industry sector learning – e.g. rotation
- Engineer Rep capability defined and grow skillset
- Oversee designs applicable to NZ conditions
- Processes that are independent of personal
- Promotion of skillset required for road building
- Common ITP process and automated
- GPS on every roller
- Application of engineering judgement in such a way that it can be commercially applied
- Consider use of the old empirical pavement design charts – Transit / NRB
- Sector cooperation to develop a lasting outcome
- Draw on the sector technical groups – Geotech Forum, National Surfacing Group, pavements group...
- Find the right balance – time, quality, cost
- Clearly defining roles and responsibilities under different contract models M and V, Alliance, D and C, Construct
- Identifying where the risk is best managed/owned – client, designer, consultant, constructor, contractor
- Increase competence and knowledge of testing requirements and testing methods
- Identify new standards or changes to existing standards to provide guidance/ requirements for constructors
- Shift from low capital cost with high maintenance cost to a higher capital cost with lower maintenance cost model
- Removing loading demand on the network by increasing coastal shipping and rail

Weaknesses

- Inconsistencies in application of quality systems
- Shortage of specialised construction expertise
- Limited resources for competent engineers rep and engineer to contract
- Poor competence central / verification of construction staff
- Lack of field experience
- Lack of collaboration
- Culture of confrontation
- Culture of bravado
- Inconsistence of application and enforcement of standards
- Increasing traffic volumes and heavy vehicles vs weakening aggregators
- The way we procure contracts is contributing to poor quality
- Annual funding cycle is a weakness causing late season works creating poor quality
- Procurement models cause drive to poor outcomes and tension
- Poor contract models used
- Uncertainty around roles and responsibility – needs to review, recommendations, and outcomes delivered to create well defined roles and responsibilities
- Quality of materials – control is poor e.g. aggregates
- Quality often plays second fiddle to commercial drives

Threats

- Uncertainty around control a supply of bitumen
- Sustainability challenges being expected from Government
- Reluctance to recognise when to call in expertise when needed
- Resource challenge and competition between suppliers and overseers
- Pressure on funding available for roading – level of funding and fund pipeline
- Mobility of skilled people
- Severity of weather events increasing
- Loss of capability
- Ignorance of best practice
- Siloed approach to design vs construction



Priority issues

- Better achievement of quality standards
- Promotion of the sector
- Greater technical training availability
- Lessons learnt approach
- Technology opportunities
- Culture of bravado – both she'll be right and acceptance of diversity
- Sustainability targets – being forced on sector



Our Recommendations



Our recommendations

Training – Key Recommendation

- Establish a Training School
- Training – Identify key roles, apply competency test/certificate – unit standards, Certified tender evaluator, TC/STMS/ Engineers representative register, licenced building
- Industry wide training on how to build pavements in accordance NZTA requirements
- Promotion – rotation, career framework

Independence of Quality Function

- Segregate quality control from commercial control using a independent verified
- Quality states – roles and responsibilities, independent assurance
- Impence of quality function – contract requirements, training, role, monitor process standards/ tests

- Better defined roles and responsibilities across our procurement model. MSQA from technical – will come at a cost - 21 asks from an IR
- LLS – sustained reflection on how we are doing, establish safe forums, promotion of success, faster learners shared
- Update technical specs and where possible adopt Austrroads
- Remove competition pricing of pavements from procurement process
- Sustainability – reporting, consistent standards
- Auto generate ITP's with project specs
- Culture – more collaboration, education on behaviours, accept diversity, encouragement to call out the bad
- Knowledgeable risks/responsibility (Ensuring the right design in the right place and risks) – assignment of risk, accountability (PS2) of officers under health and safety, transfer and understanding of design and assumptions