



Pavement Delivery System Review

Workstream 1: Technical Matters

PDSR Authors

November 2022

V1 Final

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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.

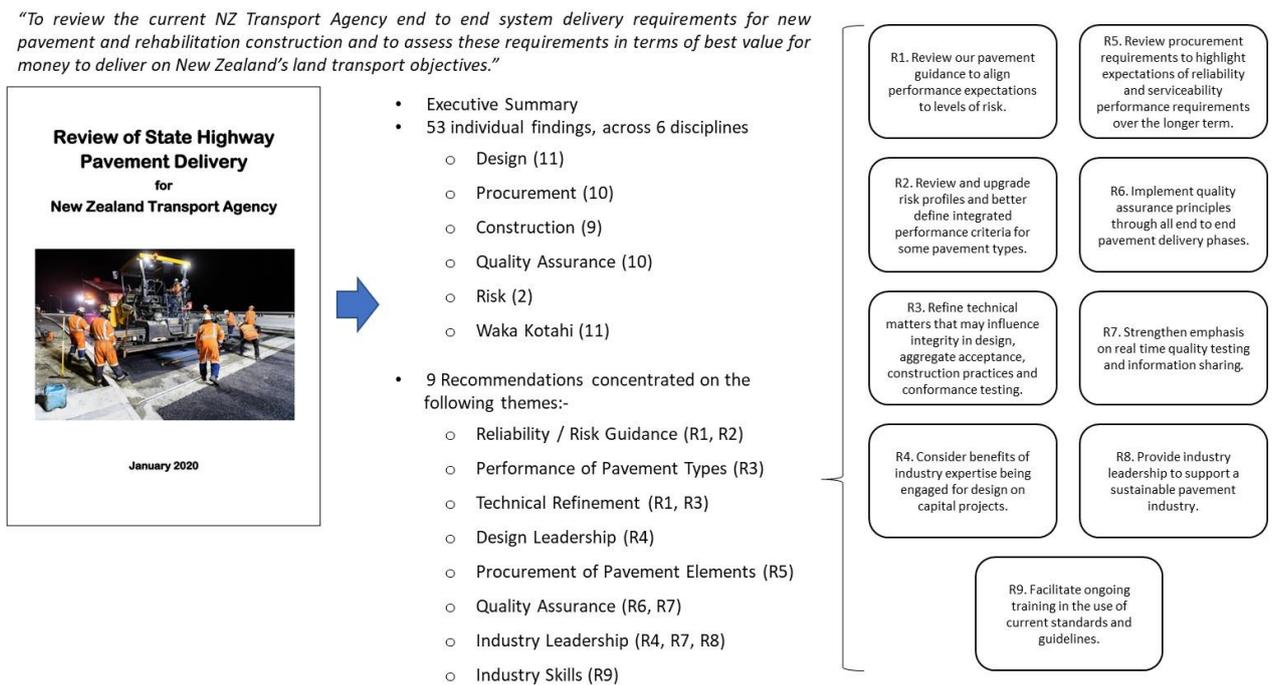


Figure 1: A summary of the outputs from the ‘Review of State Highway Pavement Delivery’ report.

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.

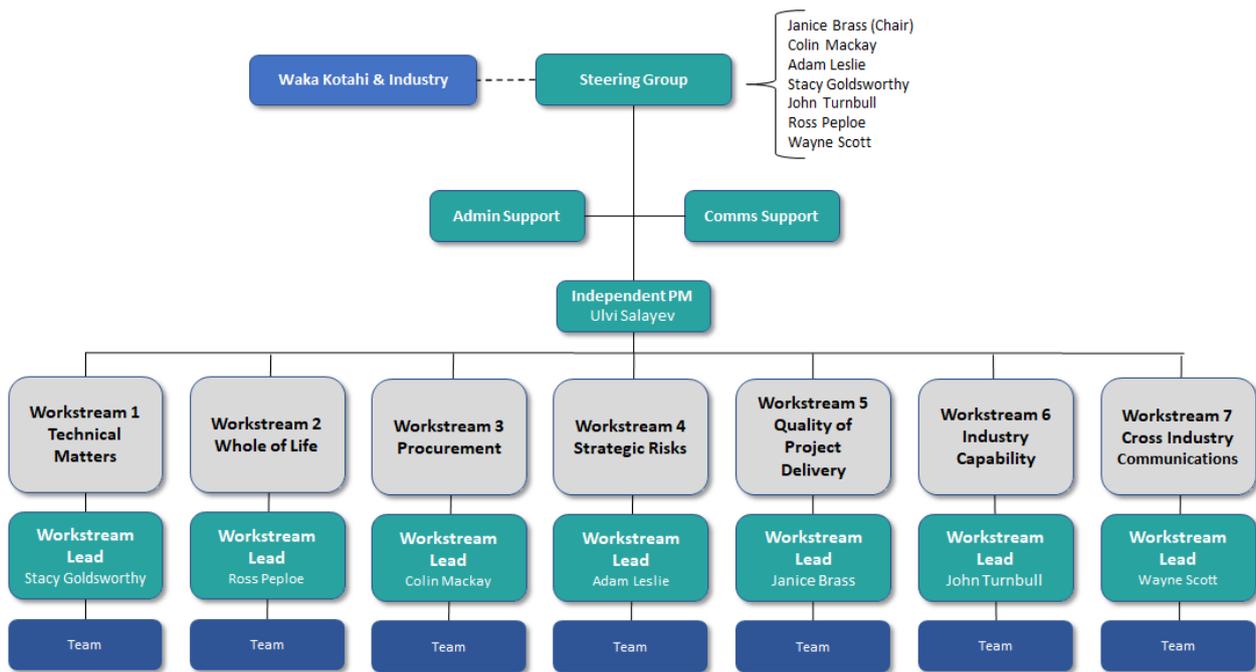


Figure 2: The structure of the Industry Steering Group, showing Workstream 1: Technical Matters

The Workstream 1 Team were tasked to consider the Report’s Recommendations that targeted improvements related specifically to the ‘Performance of Pavement Types’ and ‘Technical Refinement’, these being described in Table 2 below: -

Ref.	Report Recommendation: Taken from the Recommendation statement on page 5 of the Report.
R2	Performance of Pavement Types: Review and upgrade risk profiles and better define integrated performance criteria for current subgrade, pavement and surfacing compositions, especially, unbound, cement modified, foam bitumen and HILAB treatments and OGPA surfacing integrity, with specific consideration for environmental and climate, as well as traffic loading.
R3	Technical Refinement: Address and refine technical matters of concerns from this Review which are implied to influence integrity in design, aggregates, construction practices and conformance testing.

The Report highlighted that ‘Recommendations 2 and 3 should ideally be undertaken in collaboration with industry practitioners and the National Pavements Technical Group (NPTG).’

Table 2: The Report recommendations investigated by Workstream 1.

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 seven Workstreams operating under the Pavement Design System Review (PDSR) Steering Group.
2: Structure of this Report	Describes the structure of the report, typically comprising background information, headline findings and Required Responses.
3: Headline Findings and Required Responses	A written summary of the individual headline findings of the workstream team and the Required Responses they have determined, in order to achieve the level of improvement expected from this review.

Figure 3: Report structure

2.1 Prioritisation of Required Responses:

The Required Responses made by the Technical Matters 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, complete with the Implementation Plan describing their enactment, is provided within an overarching PDSR Steering Group Report, titled **PDSR Summary Report** which is accessible via this link.

3.0 Workstream Findings and Required Responses

3.1 Performance of Pavement Types

3.1.1 Exploring alternatives to TNZ M/4:2006 Basecourse Aggregate

Finding WS1.1
Australian practice and recent New Zealand research potentially indicates that rutting incidence is reduced if denser basecourse grading is used as an alternative to the M/4 specification grading. The use of dense graded basecourses is well established in Australia. There is a view that they could perform well in some basecourse applications here in New Zealand. No use of the Australian specification of denser basecourse grading has been used to date in New Zealand.
Current Status
The Aggregate and Quarry Association (AQA) has undertaken a literature search on Dense Graded Aggregate (DGA). This search highlights that these basecourses are successfully utilised in overseas jurisdictions that have similar environmental challenges to New Zealand. The AQA, through their membership, has committed to producing laboratory and plant produced DGA for pavement trials. Suitability assessment of this aggregate is ongoing.
Required Response WS1.1
The AQA Technical Committee is to investigate the use of dense graded basecourses in New Zealand.

3.1.2 The use of cement modified basecourses

Finding WS1.2
Recent project based research has taken place into the medium to long-term performance of cement modified basecourses. These have traditionally been incorporated into a pavement design in order to provide initial strength and reduce moisture sensitivity. This research has highlighted that the longer-term performance of some cement modified pavements is not as expected. This is a concern as cement modification is a primary treatment for a number of pavements.
Current Status
Waka Kotahi is currently reviewing the content of a Technical Advice Note (TAN) that will limit the use of cement modification for new capital projects. Recent experience on the Roads of National Significance has highlighted that expected pavement life has not been achieved when chipseal has been placed over cement modified basecourses. Until this is understood in more detail, the risk of reduced pavement life associated with this treatment can be mitigated through robust controls, then this pavement type has been paused. It should be noted that this pause is only for capital projects. Cement treatment for maintenance operations still continues to be a viable option in many instances.
Required Response WS1.2
Waka Kotahi to complete research and produce guidance on best practice for specifying modified and bitumen treated pavement layers.

3.1.3 The use of HILAB basecourse pavements

Finding WS1.3
<p>The use of high strength, low fines aggregate (HILAB) basecourse pavements have supply and construction complexities which may adversely affect reliability integrity, risk and economic viability. They do not yet have an established long term performance history. HILAB pavements are now in-service in New Zealand and are continuing to be specified for some capital projects where the contract form and procurement strategy determines that this is the preferred pavement option.</p>
Current Status
<p>HILAB continues to be a pavement option for capital projects. Through the option selection process HILAB is being assessed against other robust pavement types.</p> <p>HILAB continues to be reviewed against long term performance expectations for projects that have utilised this pavement type. Waka Kotahi and industry are keeping a watching brief for any long term economic benefits afforded by this treatment.</p>
Required Response WS1.3
<p>Waka Kotahi to continue monitoring the performance of existing HILAB pavements and provide updated information as it becomes available.</p>

3.1.4 The use of OGPA

Finding WS1.4
<p>Evidence from research undertaken at the Waikato Expressway Cambridge to Tamahere Section, indicates that OGPA surfacing can present a reliability risk when it is used with modified basecourses. Research on the use of OGPA is continuing at the Canterbury Accelerated Pavement Testing Indoor Facility (CAPTIF).</p>
Current Status
<p>The use of OGPA over chipseals may present a risk to providing adequate waterproofing of the pavement surface. To date, Waka Kotahi is the only Road Controlling Authority that specify this combination of surfacing treatments. It will be for Waka Kotahi to continue to review this combination of surface treatments to determine if there is a latent risk.</p> <p>The CAPTIF research has yet to be completed and presented to industry.</p>
Required Response WS1.4
<p>The application of OGPA in New Zealand, as an application on thin surfacing's, has been solely undertaken on larger State Highway projects to date. Therefore, any perceived reliability risks should be considered by Waka Kotahi whenever this treatment is specified for future projects. Once CAPTIF have completed their research, the findings are to be presented to industry.</p>

3.1.5 The relationship between basecourse types and Reliability Factors

Finding WS1.5

An integral part of the pavement design process is an assessment of how well the outcome of the design, being the constructed pavement, will perform. The comparative risk relativities for different basecourse types that may be under consideration, are influencing the Reliability Factor. Further refinement of alternative basecourse properties may help mitigate risk, e.g., foamed bitumen versus cement modified layers.

The assessment of risk was included in two of the nine recommendations contained within State Highway Pavement Delivery Review Report, namely Recommendations R1 and R2. Whilst this Workstream 1: Technical Matters Report considers the risks associated with the Performance of Pavement Types (R2); the broader topic of pavement risk is covered in Required Response WS1.5 below.

Required Response WS1.5

Update the Waka Kotahi Design Guide to provide clearer definitions around the risk profiles of pavement treatment options.

3.2 Performance of the Technical Concern process

3.2.1 Process Improvement

Finding WS1.6

As part of their research, the Industry Steering Group have received feedback from the NPTG and other interested stakeholders, on the usability of the Technical Concerns process.

Through its research, the Industry Steering Group has concluded that there is a requirement for improvement in the overarching process that allows industry issues and ideas to be brought to the fore and then (as required) scoped, resourced and finalised to a point where the issue or idea is successfully resolved, with findings communicated back to the industry.

The significance of this requirement has led to the formation of the Workstream 7: Cross-Industry Communications team, who are challenged to review, revise and re-issue a new Technical Concern process.

A copy of the Workstream 7: Cross-Industry Communications Report, describing this new improved process, is accessible [here](#) – No additional Required Response to this finding is made in this Workstream Report.