Enhanced Road Condition Project: Final Performance Report

Department of Transport and Main Roads

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Executive Summary

Background

The Enhanced Road Condition Project (ERCP) was an initiative of the Department of Transport and Main Roads (DTMR) (formerly known as the Department of Main Roads) and Queensland Treasury to demonstrate the perceived benefits of alternative strategies for the planning and delivery of programmed maintenance and rehabilitation of road pavements.

The key concept involved up-front funding and bulked-up, large-scale rehabilitation and maintenance works on a trial network in the South Burnett Region. The majority of works was carried out in the first two years in a single contract over a 10 year study period, instead of the traditional schedule of works that DTMR (i.e. the agency) would have undertaken over the same 10 year period. The main purpose was to trial the benefits of early intervention in the pavement deterioration cycle (“a stitch in time saves nine”). The concept and project aimed at achieving real benefits:

- in efficiencies due to bulking up at works;
- in lower whole-of-life costs due to early intervention;
- by experimenting in new technology for broader application; and
- for road users through reduction in road user costs.

Purpose

The purpose of the Enhanced Road Condition Project: Final Performance Report is to:

- review the economic costs and benefits of the project (Part 1)
- review the pavement condition performance of the project (Part 2)
- assess the successes/failures of the design/construct delivery model (Part 3)
- provide feedback on the performance of the project from key stakeholders (Part 4)

Key Findings

In Part 1 four project scenarios were compared: Do Nothing Case, DTMR Base Case, Boral ‘Predicted’ Case and Boral ‘Actual’ Case. An incremental analysis was conducted where agency costs and economic benefits derived from each project scenario were compared to the Do Nothing Case. The Do Nothing Case reflects the circumstances in absence of programmed maintenance. It only assumes provision of routine maintenance and patching only, with no rehabilitation works.

The key conclusions from Part 1 are:

- Total agency costs (discounted at 6%) at the end of the 10 year study period for the DTMR Base Case, Boral ‘Predicted’ Case and Boral ‘Actual’ Case were comparable ($23.395 million, $22.298 million and $23.004 million respectively). This means that in implementing the ERCP (represented by the Boral ‘Actual’ Case) instead of the traditional programme of works that the agency would have undertaken (DTMR Base Case) total savings of $0.391 million were made. This was $0.706 million less than predicted.
• The NPV was -$4.156 million for the DTMR Base Case, $3.702 million for the Boral ‘Predicted’ Case and $3.506 million for the Boral ‘Actual’ Case. The DTMR Base Case resulted in a net present cost due to higher net discounted agency costs of $14.182 million relative to net discounted benefits of $10.026 million. In comparing the Boral ‘Predicted’ Case to the Boral ‘Actual’ Case, economic benefits were $0.196 million less than predicted. This resulted from slightly underestimated predicted agency costs. Similarly, the BCR for implementing the Boral ‘Actual’ Case was 1.25 as opposed to 0.71 for the DTMR Base Case and 1.28 for the Boral ‘Predicted’ Case.

• Overall, the ERCP was economic as indicated by a BCR of 1.25 and savings of $7.66 million were achieved by implementing the Boral ‘Actual’ Case over the DTMR Base Case. This comprised of $7.27 million savings to the community through reductions in road user costs and $0.39 million savings in agency costs.

The key conclusions from a review of pavement condition performance in Part 2 are:

• Roughness was significantly improved. An overall roughness of 68 NRM was achieved in the final year of the project.

• The project achieved a road network with greatly improved seal width characteristics;

• The rutting and cracking results were generally less than desirable. The works failed to achieve rutting performance criteria in the 10th year. This suggests that the original program of works was dedicated to smoothening the road network as opposed to creating a durable (structurally sound) road network;

• The full depth BTB rehabilitation works were successful, and performed best on all indicators reported. Maintenance staff have reported that seals often fail on these sites due to difficulties with determining bitumen application rates; as a result, stripping and bleeding is common. It is not known if skid resistance is a problem on these surfaces. It is recommended that deflection and material testing of the BTB sites be carried out in order to provide further confidence for ongoing use of the treatment.

• Regional staff have suggested that the selection of sites for BTB treatment may have been misdirected somewhat by the requirement of rehabilitation and widen being the selection criteria for treatment. Some greater need sites missed rehabilitation because of an adequate existing seal width.

• The asphalt overlays were successful at reducing roughness but have not performed to expectations in other respects. Fatigue cracking is a problem, particularly on sites that have not been treated with a seal. The failures have been reported to have been caused by variability in placement depth of the overlay to correct for shape and cross fall deficiencies. This has lead to asphalt placed in thickness vulnerable to fatigue stress.

• The condition data results need to be viewed in the context of maintenance carried out after the initial construction years. Significant “non-scheduled” works were carried out to address structural defects that have arisen from the project works. For instance all sites treated with a 75-mm BTB treatment failed soon after construction and required remedial works to correct. A significant amount of in situ stabilisation works were carried out on Road Section 44A from chainage 8.0 to 16.0 to correct the poor performance of asphalt overlays.

• The contractor modelling of the program of works carried out by BMC Consortium proved to be accurate in relation to roughness and seal width predictions but less so for rutting and cracking. This may be due to the premature failures of asphalt related works.
• Overall the project was successful at achieving a condition better than the base case. There were some premature failures of treatments, asphalt overlays and half depth BTB treatments that resulted in poor performance at the end of the project and this was due to improper design.

• The program of works was directed at achieving a pavement with a high pavement serviceability standard and this was achieved. The overall level of rutting, cracking and roughness deterioration in the network implies that a better result would have been achieved if resources and program of works was balanced more towards improving the structural deficiencies.

The key conclusions from Parts 3 and 4 are:

• Key conclusion from stakeholder feedback is that the project was successful.

• Innovative product and processes were developed and implemented.

• However 10 years have passed before the Queensland Government ventured into this style of works again, the Accelerated Road Rehabilitation Programs (ARRP), and this was pure coincidence. This is at least in part due to the lack of focus on measurement of project success/failure, documentation of project learnings, and dissemination into key government and industry forums.

• “DMR should take advantage of coming out of infrastructure boom to do another accelerated rehabilitation project” (Kev McCullough – Boral Resources).

• The other key conclusion focuses on innovation, Main Roads is seen as not readily accepting of innovation. A process to better develop innovations, and get them accepted in Main Roads specifications is required. Bitumen Treated Base, a very successful overlay product, has been virtually unused in the intervening 10 years, and of the innovations identified in this project only Paveset has been readily accepted by industry.