

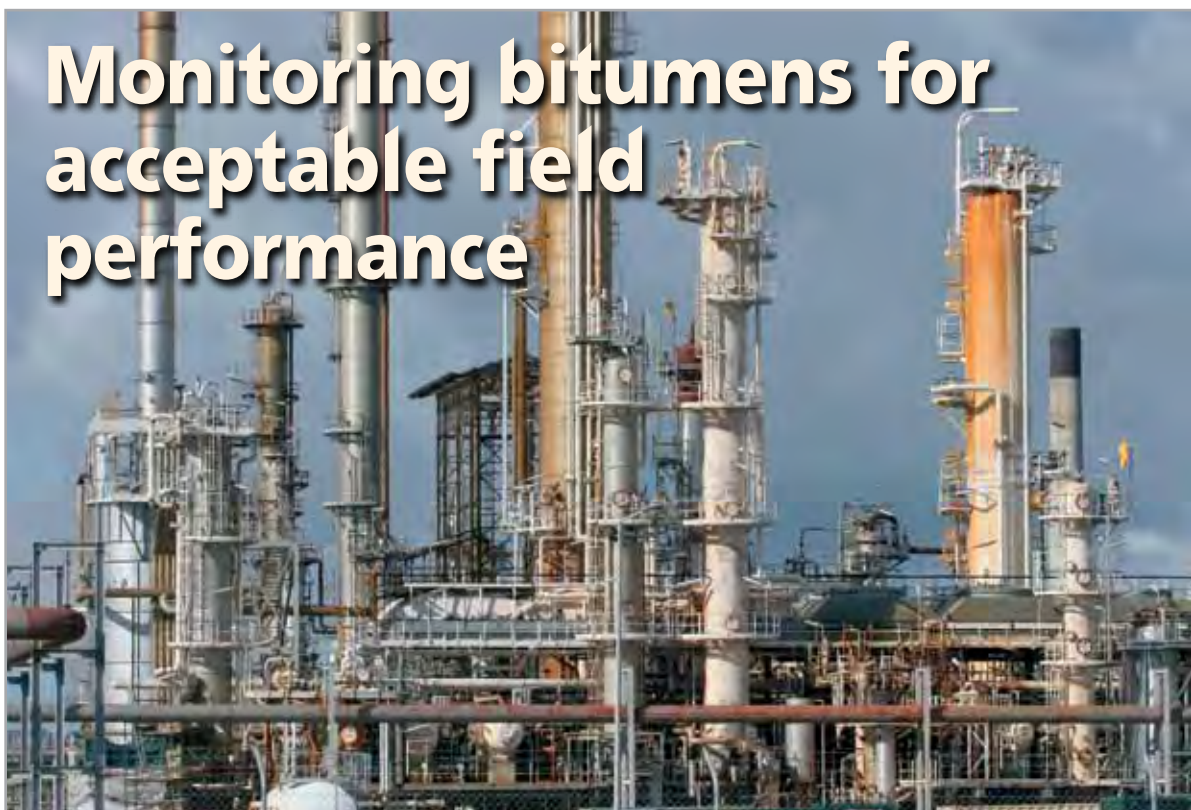
Historically, Australian bitumens have been manufactured in local refineries using crude oils almost exclusively from the Middle East. Increased bitumen importation and changes in refining processes due to refinery closures and the use of crude from other sources potentially pose concerns to the road construction industries not only to Australia but also in South Africa and New Zealand.

Imported bitumens may perform differently to the 'traditional' local bitumens. Overseas bitumens are predominantly specified according to penetration grading at 25 °C as opposed to Australian viscosity grading at 60 °C. Overseas bitumens are almost exclusively manufactured for use in asphalt whereas, in Australia, our strongest focus is on sprayed sealing. The performance of low cost, sprayed seals is likely to be more affected by any changes in bitumen property than hot-mixed asphalt.

ARRB has an extensive database of bitumen samples dating back to 1956. To continue building the database of bitumen properties relating to specification and field performance, ARRB has collated test results for bitumens used across different states in Australia.

In the current survey eleven bitumen (Class 170 and Class 320) samples were subjected to a range of routine test procedures. These included: viscosity measurement at 25 °C, 45 °C, 60 °C and 135 °C on both untreated and Rolling Thin Film Oven Test (RTFOT) treated samples. Untreated samples were also tested for durability, mass loss after RTFOT and chemical fractionation using an latroscan. The Gaestel index (an indication of the chemical make-up of the bitumen) and a Temperature Susceptibility Parameter (TSP₆₀₋₂₅) were then derived.

Monitoring bitumens for acceptable field performance



Test results were compared with the previously developed database of properties of Australian bitumens of acceptable field performance. The major conclusions were:

- Overall, all bitumens complied with specifications with the exception of two samples that were slightly above the specified limit for viscosity.
- The TSP₆₀₋₂₅ and durability results for C170 bitumens were generally lower than previous results from 1956 to 2007. The results suggest the current batch of C170 bitumens should provide satisfactory field performance where performance is influenced by temperature susceptibility but, shorter seal lives in terms of durability.
- The TSP₆₀₋₂₅ results for C320 bitumens were not significantly different from results for the earlier surveys.

The Gaestel index for all C170 and C320 bitumens fell within the range of satisfactory performance. However, the Gaestel index only indicates a risk of failure. The outcome

in the field is influenced by other variables, such as construction practice and ageing.

It is anticipated that a more comprehensive geographical coverage will be achieved from the next batch of bitumen samples to be tested in 2010/11.

Continual monitoring of the properties of bitumens used in Australia is necessary to further develop the database and establish knowledge on bitumens of acceptable and known field performance. The database will provide a benchmark for future bitumens and assist in investigating any problems that arise. As more Australian refineries close, the proportion of fully imported bitumen will increase and it will be necessary to ensure that the new product will provide satisfactory performance, particularly in sprayed seals.

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Melbourne
10 – 12 October 2010



Melbourne
12 - 15 October 2010

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Published by ARRB Group Ltd
ISSN 1328-7206



Managing a network

Melbourne Water is responsible for the management of an extensive portfolio of assets, including a large network of sealed and unsealed roads.

They are interested in assessing its current condition as well as implementing robust pavement management practice to ensure the network can be sustainably managed into the future.

Melbourne Water approached ARRB to deliver a pilot project at the Eastern Treatment Plant that is aimed at providing data, information and tools required for effective pavement management.

Key tasks delivered to date include:

- a gap analysis of existing pavement management practice
- the creation of a definitive location reference for the total road network

- a current status survey of:
 - condition using the ARRB network survey vehicle
 - pavement construction and strength.

Future activities are focused on delivering a report and presentation to key stakeholders about the current condition of the ETP road network.

Potential also exists to work in collaboration with Melbourne Water to educate/implement pavement management practice at other facilities, thereby building the overall pavement management capacity of Melbourne Water.

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New road safety auditor register website

VicRoads has commissioned ARRB to provide road safety auditor accreditation services in Victoria for three years.

The first stage of the project is for ARRB to develop a new internet based register website of Victorian road safety auditors. When launched, the website will enable anyone to search for details of auditors and to verify their accreditation level and relevant fields of experience. Auditors will also be able to log in to update their information and recent experience.

The new website and processes are expected to be operational by December 2010. From that time, individuals who complete the approved VicRoads course, or have qualifications from other jurisdictions, will submit their credentials to ARRB for assessment via the new website. Once approved their details will be made available for public viewing.

The register website and new processes will address common issues with road safety auditor accreditation, such as ensuring completion of approved training courses and maintaining currency of experience appropriate for the level of accreditation.

ARRB will also periodically update the auditor details to ensure currency of the register.

Until the launch of the register website, Kenn Beer at VicRoads (+61 3 9854 2711) will remain the main public contact for road safety auditor enquiries.

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New Business Manager in SA

Rita Excell commenced on 30 August as Business Manager – SA in our Adelaide Office.

As a Civil Engineer, Rita has significant local government experience (Port Adelaide Enfield) and a past member of the IPWEA SA Executive Committee. More recently has worked for the Automobile Associations both in SA (Manager of Traffic & Safety and Business Transformation Manager) and in a recent stint as Acting Chief Executive for the Automobile Association of the Northern Territory.

Rita was key spokesperson for the RAA and AANT on issues pertaining to road user safety, community safety, regulatory

and legal obligations of road users, transport planning and road funding.

Rita was instrumental in the integration of the AusRAP initiative within South Australia and has also represented the Australian Automobile Association in the promotion of AusRAP internationally.

In her most recent role at the RAA, Rita's responsibilities included:

- identifying and leading business transformation objectives for the Association
- negotiating with management and staff to ensure acceptance and ultimate success of transformed processes

- managing alignment of the Strategic Plan across all major projects undertaken within the RAA

Rita has been a longstanding client of ARRB and a vocal industry advocate in SA with a strong local profile and networks.

Rita has a Bachelor of Engineering in Civil Engineering from the University of South Australia and an Associate Diploma in Civil Engineering and is also a qualified Senior Road Safety Auditor.

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Recycling projects in SA

The ARRB South Australian office has, over the past five years, been involved in a number of industry development projects associated with the construction and demolition waste resource recovery and recycling industry. The projects have also been supported by the State Government through Zero Waste SA.

In association with Resourceco, higher value uses for recycling old asphalt by crushing and screening the asphalt prior to plant mix bitumen emulsion stabilisation to produce a commercial product BITUMIX TM was undertaken as a product development project.

Detailed laboratory mix designs, trial commercial manufacturing processes

and field trials were undertaken over a two year period. The final product was marketed as a part structural replacement for intermediate layer hotmix asphalt in thick asphalt pavements, full depth pavement in residential streets, industrial container facilities, bikeways and walkways. Since its release in 2007, the product has been readily accepted into the market.

In 2008 ARRB was awarded a contract to assist the resource recovery and recycling industry to provide increased market awareness and confidence. As a result, Sustainable Aggregates South Australia (SASA) was formed as a Resource Recovery and Recycling (RR&R) industry initiative co-funded by the State Government through Zero Waste SA. Its role is to inform, develop and promote the use of recycled aggregates sourced from inert hard wastes such as concrete brick, asphalt and rubble.

Managed by ARRB, participating organisations include Resourceco, Adelaide Resource Recovery and Zero Waste SA. Details are provided at www.sustainableaggregates.com.au

SASA development policies include:

- providing a cooperative and consultative link between the RR&R industry and its stakeholders
- recognising high benchmark standards of manufacture and product certification branding within the industry
- promoting the factual technical capabilities of recycled products and environmental benefits
- establishing an applied research and development program through industry-stakeholder consultation focusing on market development and new product initiatives
- providing an information reference and retrieval portal (website) to disseminate technical developments in the recycling field nationally and internationally
- providing education and information technology transfer forums.

Other recycling-related projects completed by the SA office include:

- Development of specifications for recycled glass (National Packaging Forum)
- Development of specifications for footpaths and shared paths using recycled materials (Municipal Association of Victoria).

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Reducing crashes at railway level crossings in Thailand



ARRB has been working with the transport consultant TransConsult (Thailand) for the Office of Transport and Traffic Policy and Planning in the Ministry of Transport to investigate ways of reducing crashes at railway level crossings in Thailand. The study area covered the 4 major railway lines radiating some 200 km out of Bangkok, where there are 454 level crossings, 245 of which are active crossings and the remaining 209 crossings are passive, including 38 unauthorised crossings.

Most accidents occurred at passive crossings, with the unauthorised crossings having a particularly high incidence of crashes. An interesting feature of the study was an attempt to assess the Australian Level Crossing Accident Model (ALCAM) as a possible way of summarising risk factors in a Thai setting.

ARRB summarised best practice in the management of level crossing safety, to assist with the initial crash analysis, and to assist the TransConsult team in coming to grips with the ALCAM model. During this time, ARRB staff accompanied the Transconsult team on some of their site visits. The contrast with practice in Australia was interesting.

Provision at the active crossings is at a higher level than in Australia, with a safe condition indication, directional indication of the next train, and a wheeled,



manually operated back-up barrier in case of signal failure. However, the treatment at passive crossings usually leaves much to be desired, with minimal indication of the crossing, signs in poor condition or hidden by vegetation, and sign supports made from old rails which could do real damage to errant vehicles.

The project recommended safety improvements in six areas:

- physical improvements ranging from sight distance clearance or improvement of traffic control devices to grade separation
- greater use of active crossing treatments and trials of intelligent crossing controls
- education programs, aimed both at the general public to improve crossing behaviour and at local government to dissuade them from proceeding with unauthorised crossings
- legislation and enforcement, including a pilot of photo enforcement
- systematic research and evaluation
- the development of an operation and management plan, covering all aspects from inspection of facilities to improved emergency responses.



The ALCAM model was tested on 15 hazardous crossings. Although it showed promise, it needed to be modified to take into account factors such as large numbers of motorcycles and different driver behaviour. Further development of the model to suit Thai conditions was included in the recommendations.

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2009-10 ARRB report to Austroads

The sixth annual report on ARRB research activities carried out under the Austroads Technical Research Agreement in 2009-10 has been released.

During 2009-10 the technical research program involved 39 research projects resulting in the production of 23 research and technical reports and the publication of 37 Parts of the new Austroads Guides. Results of the research program were disseminated to 1250 delegates at 41 workshops and training courses and presentation of 19 papers at international and local conferences.

A significant milestone was the launch of 93 Parts of the Austroads Guides at ARRB in July 2009 and the celebration of Austroads 20th anniversary.

The Agreement is facilitating the rebuilding and maintenance of ARRB's research capabilities encompassing technical expertise and research facilities. In doing so it is adding



valuable knowledge in the areas of asset management, bituminous surfacings, pavement technology and road safety engineering.

These four areas are critical to two of the highest priorities in the National Transport Policy Framework; more productive road infrastructure and safer road systems. This research is also critical as Austroads members are responsible

for road assets valued at over \$200b with recurrent expenditure of over \$6 billion on maintenance and because freight operations on Australian and New Zealand roads contribute close to \$20 billion to the gross domestic products of the two nations.

Through Austroads support for the research program, ARRB continues to develop both high-level expertise through doctoral studies by experienced staff and motivated and talented transport research professionals through its graduate development and summer intern programs.

Free copies of the report can be obtained from booksales@arrb.com.au or downloaded from www.arrb.com.au

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3rd International Road Surface Friction Conference **Safer Road Surfaces – Saving Lives**

15-18 May 2011, Hyatt Regency Sanctuary Cove, Gold Coast QLD



Registrations opening soon

ARRB Group is hosting the 3rd International Road Surface Friction Conference (15 – 18 May 2011) on the Gold Coast, Australia in association with New Zealand Transport Agency and WDM®.

The 2011 conference aims to build upon the technical quality and après conference enjoyment and camaraderie of the previous conferences in Christchurch, New Zealand (2005) and Cheltenham, UK (2008).

The overarching theme for the conference is: Safer Road Surfaces – Saving Lives, and has been specifically chosen to reflect the undoubted contribution that effectively managing road surface friction can make to achieving positive road safety outcomes.

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THE 3RD INTERNATIONAL ROAD
SURFACE FRICTION CONFERENCE IS
BEING RUN IN ASSOCIATION WITH:



NZ TRANSPORT AGENCY
WAKA KOTAHU

Submit abstracts and find more information at: www.friction2011.com.au



How heavy vehicles impact road maintenance expenditure



Recent ARRB research strongly suggests that the best predictor of periodic maintenance costs, (in terms of \$/lane-km/year), is the heavy vehicle road use variable, equivalent standard axles (ESA)/lane/year, for both the national highways and arterial roads.

It has been found that on the basis of average annual heavy vehicle traffic usage, that some 50 to 60% of the periodic maintenance cost is directly attributable to heavy vehicles.

Investigation by ARRB of the link between road maintenance expenditure and heavy vehicle road use began in 1990 as part of the development of a road track cost allocation process that underpinned the then proposed national uniform heavy vehicle charging scheme.

A maintenance expenditure and associated heavy vehicle road use database of 255 arterial road samples across Australia was initially established for the then National Road Transport Commission (NRTC) which is now the National Transport Commission (NTC). This database was subsequently updated twice by ARRB for the NTC so that it contained 14 continuous years of time series expenditure and heavy vehicle road use data.

ARRB, through Austroads and NTC funding on Austroads Project *Establishment of a new pavement maintenance database*, has now built a substantial database of maintenance expenditure, heavy vehicle road use and road condition on 279,000 national highway and arterial road samples from

Queensland, New South Wales, South Australia and Victoria. Data from Western Australia and the Northern Territory was not used because it was incomplete.

The database was analysed by means of an innovative data mining technique called minimum message length to firstly identify the factors that influence maintenance expenditure and then select the data suitable for analysis to establish relationships between maintenance expenditure and heavy vehicle road use.

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Planning pavement renewal

It is essential for local authorities to demonstrate prudent expenditure of ratepayer funding. Hence, pavement managers are required to implement a robust pavement management approach that is focussed on achieving best value over the long term.

ARRB has recently completed a review of Goulburn Mulwaree Council's approach

to pavement renewal planning. The objectives were to enable Council to:

- make sound management decisions
- transparently justify the needs for funding
- achieve best value for monies spent.

Taking account of Council's needs and limited resources, ARRB delivered a customised solution which included the provision of pavement data and information, simple Excel and MapInfo based tools and updated processes.

Key tasks completed in the delivery of this project included:

- a pavement condition and inventory survey
- a gap analysis of current pavement renewal practice

- the establishment of a definitive network reference
- the production of customised candidate selection tools that can be used to produce five year strategic renewal plans
- prioritisation of pavement sections for renewal
- creation of thematic maps displaying network condition
- validation of outcomes via a process of site investigation
- a set of recommended actions to ensure continual improvement of the road network.

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Structural assessment of flexible pavements

The RTA engaged ARRB between 2004 and 2010 for the development, calibration and validation of pavement structural models for application in network infrastructure management.

Based on careful calibration against a very large detailed dataset, the developed models can henceforth interpret FWD deflection data to provide an instantaneous estimate of pavement strength, type, capacity and life, thus bringing effective structural analysis into the realm of the infrastructure manager.

The structural capacity of pavements is a critical component of both their current condition and future performance. Although pavements are designed and constructed in accordance with structural principles, insufficient consideration is given to these aspects when the pavement is subsequently managed, with more attention being paid to surface condition and performance.

Such an approach can result in a misrepresentation of condition and valuation, and the misallocation of funding for technically and/or economically inappropriate treatments. In contrast, a reasonable assessment of pavement structural capacity can greatly assist sustainable pavement management, through the reporting of network structural condition, structural performance indicators, asset valuation, and the selection of appropriate and cost-effective treatments for road maintenance and rehabilitation.

The RTA methodology relied on the measurement of pavement deflection using a falling weight deflectometer (FWD). An innovative back-analysis system was developed to estimate the material type, strength and layer thickness within a generic four layer pavement model (its

'configuration'), at each of thousands of test points concurrently.

Seasonal adjustments were made to transform the material strengths in each layer from values at the time of testing to form annually representative pavement configurations for each test point. The methodology then input these estimates into a newly developed relationship between pavement nature (type, strength and stiffness) and capacity to estimate at each test point the remaining structural capacity (and, if traffic loading rate was known), life in years.

The need for these types of models was identified after extensive investigations of international and Australian practice under a series of projects funded by QDTMR, VicRoads and Austroads, with original prototypes trialled by ARRB with the NTUA (National Technical University of Athens) on pilot networks in Greece. The models were enhanced, and calibrated for applicability for the RTA, driven by the results at some 1,500 test points across NSW, covering a full range of surfaced flexible pavement types, different conditions, climates and traffic loadings.

The data and tests at each trial point included FWD deflection, a logged geotechnical core down to 1 m at the FWD d_0 point, traffic data, climate data and an independent site inspection, including field estimation of the remaining structural life. The data was complemented by finite element model based analyses, for both the derivation of moduli for each material layer, and estimates of remaining loading capacity.

The asphalt temperature effects models were based on work led by the Danish DRI and guidance by Shell, calibrated against instrumented pavements in

Canberra and Brisbane. The moisture effects models were initially calibrated against MRWA data, and then with RTA seasonal deflection data at 25 sites, 3 monthly over 6 years. Research by SA DTEI was used to build asphalt layer load protection models.

The overall calibration outcomes were clear, with the data supporting separate pavement configuration models for each RTA Region, and the capacity models showing a distinct grouping of calibrations into the coastal Regions, and the inland

Regions. Interestingly, the calibrations indicated very good performance for some high deflection spray sealed pavements, of which the photograph shows an example where the FWD deflection approached 2 mm.

The methodology has been implemented in two research level tools:

- STEP (Structural Testing Evaluation of Pavements), which produces single value (static) estimates of pavement configuration and remaining life as of 'now', assuming unchanging climate, traffic loading rate, and upkeep of surfacing maintenance. These results can be used to characterise the current structural status of a network, including identification of pavement type (especially asphalt thickness), and remaining life, in parallel with traditional surface indicators.
- PLATO (Pavement Life-cycle Analysis Treatment Optimisation), which takes the STEP output and models incrementally into the future, both the structural and surface effects, allowing the manager to dynamically assess the outcome on technical and economic performance, of changes in traffic loading, climate and maintenance regimes.

This ground breaking work will usher in a new era of network management when it is applied in conjunction with the TSD (Traffic Speed Deflectometer), trialled in NSW and Queensland earlier this year (see Briefing 126, June 2010), providing potential for continuous real-time structural analysis at highway speed.

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Austroads road safety engineering risk assessment project



the development of network based assessment tools, including NetRisk, AusRAP and iRAP.

The information has also been used to better inform road safety engineering practice, and to that end, a number of standalone reports have now been published through this program that will be of use to those involved in road safety. The following provides an overview of each of the program reports.

Part 1: Crash risk and geometric design standards

Information was reviewed to derive 'best' estimates of the relationships between the various elements and risk. Information is provided on the relationships between crash risk and standards for:

- lanes and shoulders
- horizontal curve radius
- vertical grade
- sight distance on crest vertical curves
- roadside design.

Part 2: Crash risk migration

This project examined how the implementation of safety improvements may change risk exposure on the surrounding road network due to traffic redistribution. Some evidence of crash risk migration was identified in the literature. The research resulted in a list of possible treatments where this phenomenon should be considered before installing such treatments.

The Safe System approach to road safety has been adopted by each Australian jurisdiction. This approach suggests (amongst other things) road users will make mistakes, and that they have a limited tolerance for surviving such events, or avoiding serious injury. Improved road infrastructure is seen as a key way to help deliver a Safe System, but in order to do this there is a need to improve our knowledge relating to road and roadside risk.

To assist member authorities to manage road based crash risk, a major Austroads research program has been undertaken to assess risk involving road, traffic and roadside infrastructure. The research began in 2002 on a relatively limited scale, but has formed a substantial part of the Austroads road safety research program since 2004.

The initial program was aimed at developing a basis for prioritising the treatment of deficiencies identified by road safety audits. ARRB used the results to develop the Road Safety Risk Manager (RSRM), a software package to assist in the prioritisation of road safety treatments.

Later research was aimed at better defining the relationship between road elements and crash risk, and providing methods, tools and information to better address risk on the road. Aside from the development of the RSRM software package, the research has also led to





Part 3: Best practice in crash database design

All Australasian jurisdictions have crash database systems, but all differ in the analysis tools they provide. Based on a review of Australasian and international crash databases, information was provided on potentially useful features for analysing crash risk.

Part 4: Treatment life for road safety measures

There has been much research to determine the safety benefits of treatments, but little on the expected life of these treatments. This study provides information on possible treatment life values for safety schemes. It was concluded that currently-used treatment life values may be underestimates, and that in some cases, longer values should be used.

Part 5: Review of crashes on unsealed roads

This study involved a literature review and internet search, crash data analysis, workshop and site inspections of a number of unsealed road crash locations. The study confirmed that a significant proportion of crashes occur on unsealed roads (14% in Australia, and 5% in New Zealand), and a number of solutions were provided for addressing crashes in these locations.

Part 6: Crash reduction factors

Forty-seven countermeasures were assessed, including installation of roundabouts, delineation devices, street lighting and road surface improvements. Crash reduction values were derived for most of these based on previously published research from Australia and overseas. Around 100 crash reduction factors were provided.

Part 7: Crash rate databases

An extensive crash database was created which spans seven jurisdictions and a sample of local government areas. It allows comparison of relative crash risks for different types of roads and intersections in different environments. Examples of practical applications of the results were presented, including safety performance functions, crash rate functions, specific crash type prediction models and other uses.

Part 8: Rural head-on crashes

Rural crashes make up a large proportion of all crashes in Australia and New Zealand. This report is based on a review of previous literature, a crash analysis using Australian and New Zealand data, and site visits to locations where this crash type was prominent. Information is provided on the incidence of this crash type, crash causation factors, and ways to address this crash type.



Part 9: Rural intersection crashes

Crashes at intersections are common in rural areas. This report takes a similar approach to Part 8, assessing previous literature, crash data and site information to determine the incidence, causation factors and solutions available for this type of crash.

Part 10: Rural run-off-road crashes

Run-off-road crashes are the major crash type on rural roads. This report takes the same approach as Parts 8 and 9, assessing previous literature, crash data and site information to determine the incidence, causation factors and solutions available for run-off-road crashes.

Part 11: Road safety and maintenance

The objective was to explore the links between road safety management and road maintenance. Information is provided on various road assets (including road surface features, signs, and linemarkings) regarding the increase in risk relating to the deterioration of that asset. Recommendations were made regarding the integration and exchange of information between road safety and pavement and asset management practitioners and policy makers.

The above reports are available as free downloads from the Austroads publications website. The findings within each report may be used in a standalone manner to enhance the way in which crash risk may be measured, while also providing valuable information to practitioners related to key road safety areas. The findings are also being used to create a nationally accepted risk assessment model, through Austroads. It is expected that a working prototype of this model will be developed in the coming year.

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ARRB welcomes RIOH China

ARRB recently hosted delegates from the Research Institute of Highways (RIOH) China, at our Melbourne offices. The RIOH group was led by the President, Mr. Zhou Wei and joined by Ms. Xie Suhua, Director/Professor of the Western Transport Project Management Center.

Delegates from RIOH visited ARRB for discussions on various safety related topics, which included treatment of crash locations, risk assessment tools and highway design, as well as investigating

potential cooperative opportunities between ARRB and RIOH.

RIOH China has a long history of cooperation with ARRB Group, which is expected to continue in 2010 and well beyond.

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RIOH delegates with ARRB Systems representatives

Hawkeye 1000 Series receiving worldwide interest

ARRB has recently developed a new line of lasers and video cameras which,

in addition to providing new technical benefits, significantly reduce the size and cost of its road profiling equipment.

(in both MPD and SMTD formats) and provides fully linked video images, all at highway speeds.



Hawkeye 1000 Digital Laser Profiler and processing case

ARRB's latest releases include the Hawkeye 1000 DUO System which is generating great interest from countries around the world due to its unique combination of a digital laser profiler and video camera in a portable format.

The system is capable of collecting longitudinal profile, roughness (IRI) and macro-texture

In addition, the Hawkeye 1000 Digital Laser Profiler (DLP) offers single or dual combinations of these new lasers in a small, self contained, transferable package. It also offers longitudinal profile, roughness and macrotexture.

The introduction of these products provides new opportunities to organisations requiring accurate road condition data at a fraction of the cost of conventional, large scale survey vehicles.

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Building on 20 years of road data collection services

As part of its original charter ARRB has continued to pursue research into better management of Australia's road network. This has led to the development of a range of equipment and services that are now in wide use in Australia and overseas.

ARRB now produces a full line of professional road condition survey systems, with development driven by our clients. We are currently our own largest customer with six network survey vehicles collecting data Australia wide. ARRB's data collection services have grown to

be recognised as Australia's leading road data collection fleet.

We entered the international market in the late 1990s and are now regarded as a world leader in delivering technology and services to some of the fastest growing economies such as India, China and the Middle East.

Successful asset management relies on having a solid database of quality road information. In recent years ARRB has developed a range of equipment that integrates the various measurement parameters to provide this information.

It has also significantly reduced the complexity, size and cost of the equipment.

With over twenty years of professional level data collection experience, ARRB has a strong history in the development of the industry. As part of the 24th ARRB Conference, we will again focus on 'where we go next' with a round-table into the future of automated data collection.

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WA local government road funding arrangements reviewed

The Western Australian Local Government Association (WALGA) commissioned a review of the State Road Funds to Local Government Agreement, 2005–06 to 2009–10. The Agreement determines the allocation of vehicle licence fees for local roads funds.

A Project Steering Committee consisting of WALGA, MRWA, and ARRB representatives was tasked for this assignment. Key aspects included:

- a detailed review of the current Agreement, including available governance arrangements in the form of manuals and procedures
- an analysis of all available data contributing to the structure and functioning of the Agreement
- a simplified life cycle analysis of the LG road network to determine a 'needs'

benchmark in relation to the asset condition (service level) and possible crash reduction targets

- engagement of stakeholders (State and LG) through development and distribution of survey questionnaires and face-to-face focus group discussions
- development of recommendations for a new Agreement for the period to 2014–15.

The analysis undertaken to help gauge network funding needs, drew on the results of local road deterioration studies (funded by local governments), national and state based studies of surfacing lives and of the effectiveness of crash treatments, as well as a number of international studies.



In so doing, it demonstrated how research-based knowledge could be employed to good effect in providing an established needs-based underpinning to allocating scarce LG funds.

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ROMAN II project office opened

On 19 May 2010, the ROMAN II project office was opened. Representatives from the Western Australian Local Government Association (WALGA), ARRB Group, Main Roads Western Australia (MRWA), Opus International Consultants and various local government bodies of Western Australia attended.

ROMAN II is road asset management software designed to replace ROMAN, the software currently used by the majority of Western Australian local governments. The ARRB Group project team has developed an integrated software package which includes two software systems, RAMM (Road Assessment and Maintenance Management), developed by CJN Technologies and dTIMS asset modeling software developed by Deighton Associates.

The ROMAN II project team will provide WA local governments with user support, training services, assistance with data translation from ROMAN to ROMAN II, internet hosting for the software and data, as well as research and development.

The office will act as a base for not only the ARRB Group project team but also



Menno Hennevel, Managing Director of MRWA cuts the ribbon to mark the opening of the ROMAN II project office. (Left) Peter Damen, General Manager, Consulting, ARRB Group Ltd. and (right) Michelle Mackenzie, Executive Manager, Infrastructure, WALGA.

the other contributors from WALGA, IPWEA, MRWA and Opus International Consultants, hence fostering a strong ROMAN II support community.

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Around two-thirds of tram stops in Melbourne are kerbside stops which require passengers to board and depart trams by walking across a traffic lane and stepping up to/down from the tram step.

Platform style stops which are at the same level as the tram floor have proven effective in providing easy access to trams. However, the installation of traditional platform style stops at kerbside locations on dual carriageways would require the closure of the left lane at each tram stop location, causing significant congestion issues in many applications.

Consequently the Department of Transport Victoria is investigating trafficable designs which allow traffic to continue to utilise both lanes at the stop locations. ARRB was engaged to conduct a comprehensive field test program covering these issues.

As part of the evaluation and design process of the proposed trafficable easy access stops, DoT wished to analyse the interaction between a range of different vehicle types and four different ramp concepts before installation at trial locations within the network. The key areas of interest were maximum comfortable, adverse effects while braking and acceptable distance for parked cars either side of the ramp.

Testing was conducted on an ex-airfield. Four different platform designs were constructed. Each platform design had a different approach and departure length with all designs having a 6 m long level section at a height of 290 mm from the road surface in the right lane corresponding to the floor height of a low floor tram.

Four approach and departure ramp grades were tested.

The advantage of a steeper ramp is that the platform takes up less space and hence is less obtrusive to the surrounding environment (including reduction in parking spaces and obstruction of driveways). However, steeper ramps require vehicles to travel at lower speeds when driving over the platform in order to maintain occupant comfort.

There were two stages to the study. The first was concerned with measuring the physical effects of the different tram platform profiles on vehicle dynamics, focussing on the levels of vertical acceleration experienced by occupants at specified vehicle speeds. The second stage assessed feedback from drivers and bus passengers on the vertical accelerations imposed by the platforms at different speeds.

A range of vehicles were used:

- car
- bus
- B-double truck – laden
- B-double truck - unladen
- rigid truck – unladen
- motorcycle.

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Report from BAST

Adam Ritzinger's secondment to BAST, the Federal Highway Research Institute in Germany, is well underway. Adam has been involved in projects on testing tyres for noise emissions and rolling resistance and simulating the effects of partial loading on multi-trailer combinations.

He has also been heavily involved in a study on the effects of adapting the European Commission rules on the weights and dimensions of heavy commercial vehicles. The study seeks to investigate the socio-economic and technical aspects of possible changes to the directive, in terms of the effects of longer, heavier vehicles on road safety, infrastructure, the environment, and the economics of freight transport in the European Union.

The project brings experts from BAST together with their counterparts from road research bodies in European countries including the UK, France, Sweden and the Netherlands. Within the working group, Adam is providing expertise in areas including heavy vehicle dynamics and safety performance, operational risks, regulatory controls for road freight transport and vehicle simulation and modeling. Work on the project is ongoing, and will continue into 2011.

Adam has also taken the opportunity to attend some important events on the road research calendar, including the Transport Research Arena (TRA) conference in Brussels, which was held in June. The event showcased ARRB's recent contribution to the joint OECD/ITF transport research centre (JTRC) benchmarking study on the

safety and infrastructure performance of 39 vehicles from 10 OECD member countries, via several posters detailing the study which were presented at the conference.

Key OECD safety results

- Vehicle performance tends to be specific to the region of operation
- There is a positive effect on safety of using roll coupled vehicle units
- Higher and very-high capacity vehicles can offer similar levels of on-road safety when compared with typical workhorse vehicles.

Key OECD productivity and efficiency results

- New performance metric:

$$\text{Allowable payload mass [ton]} \times \text{volumetric capacity [m}^3\text{]} \times \text{vehicle CO}_2 \text{ emissions [kg/km]}$$
- Enables the effective differentiation in productivity performance amongst the three vehicle classes
- Results show performance improvements with increasing vehicle capacity.

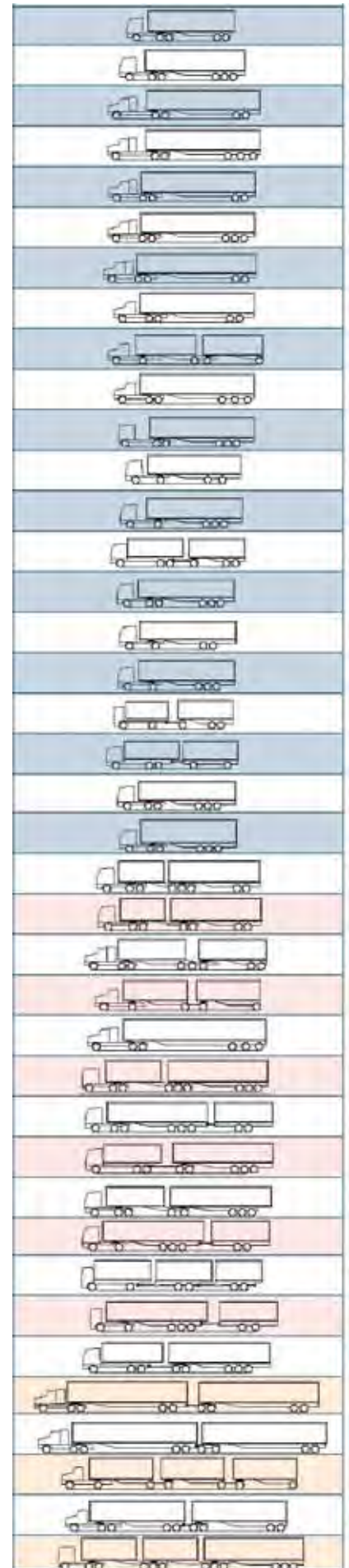
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Workhorse

Higher capacity

Very high capacity



Reproduced courtesy: BAST (2010), 3rd TRA Conference, Brussels, Belgium.

ALF is still rolling along

For over a year the Accelerated Loading Facility (ALF) has been conducting a series of experiments using new axle assemblies. For over 25 years ALF has always used a single axle to load test pavements. The new axle assemblies allow ALF to also apply (half) tandem and triaxle group loads.

As a major component of a large Austroads research project, ALF has been helping to assess the effects of the multiple axle load types on the performance of a typical Australian unbound granular pavement. The ultimate goal of the research work is to produce better procedures for assessing the impact of a spectrum of axle group types and load levels on Australian road pavement types. This is fundamental to many issues facing the road transport sector, and will assist:

- pavement designers through the development of improved procedures for the structural design of Australian road pavements
- asset managers to develop improved models for the management of the roads at the network level
- vehicle designers and operators in the development of more efficient heavy vehicles which will maximise payload without increasing the wear to established road infrastructure
- policy makers and planners in the development of improved methods for estimating future maintenance and



rehabilitation costs and a transparent method of defraying these costs to all stakeholders.

As part of the project, twelve identical test pavement sections have been constructed inside the ALF shed, and are comprised of a representative crushed rock base material overlying an average subgrade material. The pavements are surfaced with a double/double sprayed seal using a polymer modified emulsion binder. Over the last year, ALF has

conducted one single axle experiment, two tandem experiments and one triaxle experiment. Testing will continue for an additional year.

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Working towards a world free of high risk roads

The International Road Assessment Programme (iRAP) and ARRB Group have announced that they will cooperate to develop the first iRAP Centre of Excellence.

The Centre will support the ongoing development and implementation of iRAP to prevent road crash deaths and serious injuries and generate wider community benefits.

iRAP has identified infrastructure improvements that can prevent one in four deaths on rural and urban roads in developing countries. The plans target roads where pedestrians, motorcyclists, vehicle occupants and bicyclists are killed

and injured, and identify proven road safety measures that can prevent millions of deaths and save billions of dollars.

The agreement will see the benefits of the Austroads strategic research program applied to the technical development and application of iRAP, for the benefit of Australian and New Zealand road authorities, as well as iRAP's international partners. It will ensure that iRAP has access to ARRB's considerable technical resources.

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Co-operative research with Indonesia

Following a range of interactions including a visit by a delegation from the Indonesian Institute of Road Engineering (IRE) to ARRB in Melbourne during June, Barry Jan and Richard Yeo made a reciprocal visit to the IRE research laboratories in Bandung Indonesia in July 2010.

During this visit discussions were held on a range of research topics and a workshop was held to develop the basis for a Memorandum of Understanding (MOU) for research cooperation. A tour of the IRE library and research laboratories in Bandung followed.

ARRB and IRE have much in common. IRE is the national road and bridge research organisation under the Indonesian Government, Ministry of Transport. Their vision translates to: 'The realisation of an innovative, applicable and competitive technology for roads and bridges' and they have a long history spanning as far back as 1925. ARRB has a 50 year



history as the leading road and transport research organisation in Australia. The ARRB vision is to be the trusted advisor to road agencies for technical knowledge and solutions.

Collaboration between IRE and ARRB falls well within the respective vision statements of each organisation. ARRB has a long history of working with Indonesia and with the updated MOU expected to be enacted in the near future this tradition will continue on a firm basis.

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Barry and Richard with (centre) Mr. Jawali Marbun, Director IRE

New staff



Dr Didier Bodin joined ARRB on 1 October as a Senior Research Engineer in the Pavements Group. Dr Bodin was previously an engineer in LCPC's (Laboratoire Central des Ponts et Chaussées – France,

pavement department. His research interests are in the area of pavement material characterisation, pavement response, performance modelling/prediction and pavement design. He has a Bachelor in engineering and mathematical science and a Doctorate in Civil Engineering from Ecole Centrale de Nantes – France.



David Corcia has joined the Systems group as our new Business Manager. David comes to ARRB with extensive international business development experience in the telecommunications industry. He has a degree in telecommunications engineering and has spent the past 5 years working in Malaysia with Alcatel as a Business Development Manager. David will assist Barry Jan and with growing our international business.



Tawab Kazemi is the new Manager of our office located in Abu Dhabi. Tawab has over 14 years experience as a transport planning and traffic engineering

professional. Previously he was as Associate at Aurecon where he was employed for more than three years delivering masterplans and traffic impact studies in Dubai and Abu Dhabi for the DOT and the RTA. Tawab has a BSc Civil Engineering, a MSc Transport Planning and Engineering, and is a Graduate Member of ICE, MIHT.



Ian Reeves has been appointed to the position of Manager - Pavements Research Queensland. Ian has over 40 years experience in the roads industry and has previously been a Program Manager for Austroads.

Ian's former role was a Chief Engineer (Transport and Main Roads) a position that he held for some time. Ian has joined ARRB to help progress the structures and pavement research programs with TMR over the next 12 months.

2010 Knowledge transfer program

The Knowledge Transfer group has delivered over 70 training workshops this year so far in Australia and New Zealand, and is looking forward to a busy end to the year.

Look at what else is coming to your region:

NEW SOUTH WALES

- Mining roads: safety and design 26-27 October 2010, Sydney
- Mining roads: safety and design 7-8 December 2010, Singleton
- Basic geometric road design, late 2010, Sydney
- Traffic theory and applications 28-29 March 2011, Sydney

VICTORIA

- Unsealed local roads, early 2011, Victoria

QUEENSLAND

- Mining roads: safety and design 30 November – 1 December 2010, Mackay
- Basic geometric road design 7-9 December 2010, Brisbane
- Traffic theory and applications 31 March – 1 April, Brisbane

SOUTH AUSTRALIA

- Unsealed local roads 26-27 October 2010, Wudinna

TASMANIA

- Basic geometric road design, 2011, Hobart

NORTHERN TERRITORY

- Basic geometric road design, 23-25 November 2010, Darwin

AUSTRALIAN CAPITAL TERRITORY

- Traffic theory and applications, 6-7 December 2010, Canberra

NEW ZEALAND

- Traffic theory and applications 8-9

November 2010, Christchurch

- Traffic theory and applications 10-11 November 2010, Auckland
- Geotechnical investigation and design late 2010, Auckland
- Geotechnical investigation and design, late 2010, Christchurch
- Basic geometric road design, early 2011, Auckland
- Basic geometric road design, early 2011, Christchurch

Unsealed local roads workshop: A two day workshop on the latest practices in the management of unsealed roads based on the popular ARRB Unsealed Roads Manual. It will cover recent research findings, best maintenance techniques and case studies demonstrating how to get greater value from available funding. The workshop will be a practical hands-on presentation with group participation, worked examples, case studies and a field inspection of unsealed road sites.

Geotechnical investigation and design workshop: A two day training workshop to familiarise people with current best practice in geotechnical design considerations in road design, and case studies to learn how to identify important geotechnical issues that have an impact on road design.

Mining roads: safety and design: The development of this workshop has been initiated by an identified need for formalised training of mining personnel involved in planning, design, construction, maintenance or review of mining roads. This workshop is structured to provide the participants with practical and applicable knowledge in the areas of traffic safety/management and mining road design.

Traffic theory and applications: Analyses of traffic behaviour are essential to both traffic management and road design, and also have application in the

broader transport planning field. Such analyses draw upon many aspects of traffic theory, an appreciation of which greatly enhances the technical insights and capabilities of traffic engineers, road designers and transport planners. This workshop will present and explain the key areas of traffic theory, illustrate their application to various types of traffic analysis and provide participants with hands-on practice in identifying and undertaking the analyses appropriate to different situations.

Basic geometric road design: Good road design will achieve operational efficiency, be safe and cost-effective, and minimise the environmental impact. The role of the road designer is to produce the most appropriate design that achieves the specified functionality using the design inputs from all relevant disciplines. The design must provide for a safe and efficient road facility that takes into account all inputs from stakeholders and road users. This workshop will cover these principles so that delegates will obtain a clear understanding of the key geometric design requirements for road design.

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