

# THE ROAD SAFETY RISK MANAGER – A TOOL TO HELP SUSTAIN LIVES

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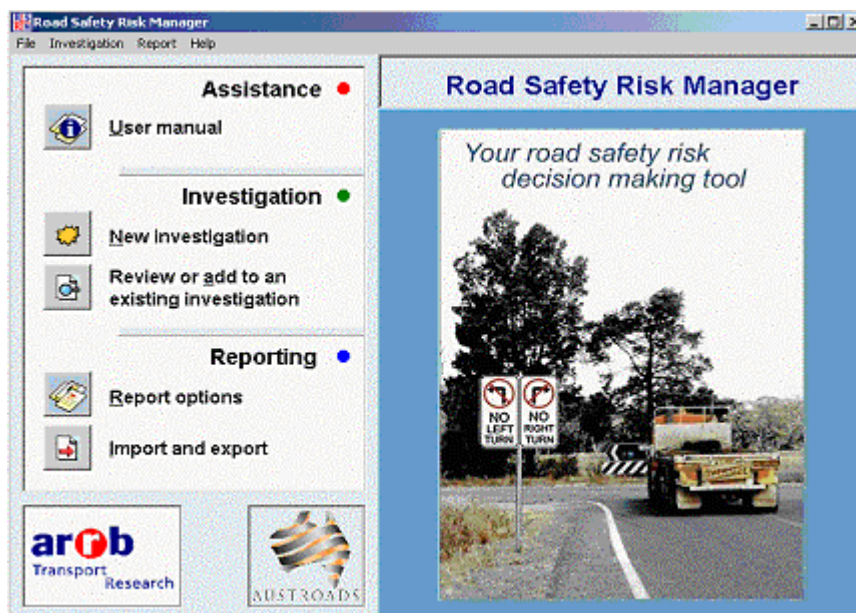
## Abstract

Local government road authorities are under increasing pressure and necessity to manage road safety related issues under their control. With the High Court decision in May 2001, it is now critical that authorities adopt a proactive approach to managing road safety risk.

The ARRB Transport Research and Austroads developed Road Safety Risk Manager will provide authorities with a powerful tool to manage, prioritise and track the status of road safety issues on their networks.

The focus of the software is to provide road safety professionals with a tool to proactively assess road safety hazards and treatments for the purpose of prioritising actions. With limited budgets available authorities can have greater confidence that their expenditure and road safety engineering programs will maximise risk reduction and sustain more lives.

The software also provides a simple way to track the status of any issue or record any actions taken, allowing traceability and transparency in decision making, and assisting road safety managers demonstrate a responsible approach to managing road safety risk.



**Key Words:** Road Safety, Risk, Ranking, Prioritisation, Audits, Software, Liability.

## Introduction

To manage a sustainable transport system, we must do all we can to ensure that we sustain the health and lives of the people using the road.

The Road Safety Risk Manager, developed by ARRB Transport Research in association with Austroads, will provide authorities with a powerful tool to manage, prioritise and track the status of road safety issues on their networks.

The Australian High Court decision in May 2001 to overturn the long established highway rule or nonfeasance provisions, has focussed the attention of road authorities to better monitoring and managing the safety performance of their road networks.

Significant levels of expenditure are dedicated to improving the safety of road infrastructure using engineering countermeasures. Most authorities implement a range of initiatives to improve road safety. The challenge faced by asset managers is where to direct funding so that the maximum reductions in road safety trauma are achieved and the risks associated with road use are minimised.

The first task is to ensure that measures are in place to enable the identification of safety concerns on the network. These may include black-spot identification, mass-action programs, road safety audit activities, regular inspections and feedback from the community. The latest best practice guidelines for auditing are reflected in the new publication "Road Safety Audit" (Morgan, Epstein and Drummond, 2002) released by Austroads in February this year.

When road safety concerns have been identified the authority requires a systematic method to prioritise the treatments identified. A difficulty facing many authorities is that available budget provisions will often not allow for the completion of all the outstanding

issues. How then can an authority plan, manage and take action to maximise the road safety return from their budget?

## The Road Safety Risk Manager

The Road Safety Risk Manager software has been developed to meet these needs. The focus of the software is to provide road safety professionals with a tool to proactively assess road safety hazards and treatments for the purpose of prioritising actions.

The tool adopts a risk management approach, with the ultimate aim of maximising the risk reduction on the road network for a given budget. The software also provides a means to track the status of outstanding issues and provide managers with user friendly reporting options.

The process is based on the measurement of risk as a function of exposure, likelihood and severity, and provides users with the ability to analyse the hazard risk and the treatment risk reduction for 57 different types of deficiencies, across a variety of different road types and severity outcomes. Following inclusion of treatment costs, the derived risk reduction cost ratio forms the basis of prioritising the proposed works.

Application of the Road Safety Risk Manager is well suited to a wide range of safety issues. As an example, the findings of a road safety audit can be assessed, potential treatments prioritised and a program of works developed within the budget constraints of the authority.

Other areas where the Road Safety Risk Manager may provide assistance are:

- The prioritisation of a mass action program of works (eg guardrail; line marking; right turn lanes)
- Assessment and prioritisation of safety related routine maintenance and routine inspections

- Assessment and prioritisation of safety projects as part of a wider blackspot program
- In tracking the status of any safety issue and recording of any action taken (closing the loop)

## **The Key Components of the Process**

The key components of the software include recording and analysis of:

*Investigation Details* - including information on the site, assessor and other project details (see Figure 1 in Appendix).

*Exposure* - including the number of vehicles that are exposed to the hazard and associated treatment.

*Likelihood* - which includes consideration of the length of the hazard and associated treatment, an assessment of the general crash risk at the location; an assessment of the risk posed by the hazard and associated treatment and an assessment of the degree to which other factors (eg weather, skid resistance) influence the risk at the site.

*Severity* – requiring an analysis of the severity of a crash if it does occur.

*Treatment Cost and Risk Reduction Cost Ratio* – an assessment of the initial, ongoing and any salvage costs associated with the treatment and calculation of the risk reduction cost ratio of the treatment.

*Action Taken* – where details on the status of the issue (eg pending / completed) and any comments can be recorded including actual works planned or undertaken.

*Reporting and Budget Analysis* - different reporting and ranking options suitable for technical review through to management summaries are provided. The budget analysis tool allows users to assess the impact of changes in the order of works to be completed.

*Exporting and Importing* – to enable users to transfer records.

The individual hazard and treatment summary (see Figure 2 in Appendix) provides information of all the key data entered in the hazard and treatment assessment. The appropriateness of the data entered can be reviewed from this form, and any updates to action taken recorded. All assumptions made as part of the assessment can also be documented.

## **Application of the Road Safety Risk Manager**

These components are built into the Road Safety Risk Manager with simple wizards, look-up tables and help functions to provide a user-friendly system that can be used by auditors, investigators, project managers and asset owners.

Following the collection of site information, the tool allows the assessment of individual hazards and treatments in 5-10 minutes. With the reporting and budget analysis tools provided, the software can meet the specific needs of risk identification, risk management and the development of remedial treatment programs.

Exporting and importing functions also allow the development of local area programs at the regional level, which can be easily incorporated into a statewide or federal program such as the 'black-spot' initiatives. This allows the comparison and prioritisation of actions in a consistent manner across the program, providing a targeted approach to funding those engineering treatments most likely to maximise the reduction in road trauma. The software also provides a simple way to track the status of any issue or record any actions taken.

The road authority is primarily interested in treating the hazard by a range of methods including a reduction in the exposure, removing or limiting the impact of the hazard, or reducing the severity of the crash if it should occur. The cost of treatment is also an important consideration in the analysis.

The process developed provides a means of assessing the risk of the hazards before and after treatment thus providing a RISK

SCORE prior to treatment and a RISK SCORE after treatment.

In essence, the desirable treatment for a road authority to undertake is that which will provide the greatest reduction in risk for each dollar spent. Projects are ranked from those that provide the greatest reduction in risk per dollar spent, to those where the risk reduction per dollar spent is minimal (refer Figure 3 for a sample report from the Road Safety Risk Manager).

## **The Research and Development Background**

The research underlying the process commenced in 1998 and involved the following activities:

- A review of current methods for prioritising works resulting from road safety audits within Australia and New Zealand.
- A review of road safety audit literature from around the world. Consideration of the risk management approaches utilised in non-road industries such as health, defence and nuclear power generation.
- The analysis of completed audits from around Australasia to determine the range of deficiencies identified in the road safety audit process.
- Investigation and analysis of the various methods and approaches to estimating risk, based on the range of deficiencies identified.
- Development and testing of a theoretical framework for prioritising works.
- Completion of two workshops with Australasian road safety experts to refine and confirm the theoretical process developed.
- An extensive literature review of road safety related crash countermeasures and their effect on crash reductions. This

information was used to develop the risk profile for each deficiency type.

- Investigation of state and national crash rates and valuations of crash costs to enable an appreciation of base-line crash risk and typical crash severity.
- Finalisation of the theoretical process, and calibration of the models developed.

To facilitate a trial of the process a spreadsheet-based prototype was developed by ARRB Transport Research and provided to Australian and New Zealand road authorities. This early version of the software provided a quick and simple means of applying the method to a particular road safety hazard or treatment. This version was trialed for a period of 18 months to ensure the risk-based approach was appropriate for the issues being considered. Feedback from these trials was incorporated into the method and comments on the prototype software used to help develop the final Road Safety Risk Manager software.

## **Conclusion**

Formal analysis of potential road safety treatments or audit recommendations in conjunction with sound management practices and well planned remedial programs will make a positive contribution to improving safety and may also assist authorities to meet their duty of care in a responsible and transparent manner.

The Road Safety Risk Manager represents a new and innovative approach to managing safety issues on the road network and prioritising a wide range of road safety treatments. With appropriate training and use the Road Safety Risk Manager will provide road safety professionals and asset owners with a highly useful operational and management tool enabling greater confidence in road safety decision making.

This will help focus the work of road asset managers to improve safety and ensure that the maximum reduction in road trauma is achieved from the investment in road infrastructure.

More details on the Road Safety Risk Manager can be obtained from ARRB Transport Research via email at [rsm@arrb.com.au](mailto:rsm@arrb.com.au).

## **References**

Morgan, R., Epstein, J., and Drummond, A (2002). Road Safety Audit. 2nd ed. AP-G30/02. (Austroads: Sydney).

## Appendices

Figure 1: The Investigation Summary provides key details relevant to the site being assessed.

Figure 2 – The Individual Hazard and Treatment Summary form provides a convenient summary of the assessment of an individual issue.

HAZARD		TREATMENT	
Length	3.20 km	Length	3.20 km
Exposure	4,500	Exposure	4,500
Likelihood	2.311	Likelihood	1.099
Severity	2.80	Severity	2.80
Hazard risk score	23,197	Treatment risk score	23,295
Hazard risk score /km	9,095	Treatment risk score /km	7,277
		Initial Cost	35,000
		Life	3 years
		Risk Reduction Cost Ratio	3.1

Figure 3 - A sample report from the Road Safety Risk Manager

# Multiple Hazard and Treatment Report

## Executive Summary



Report generated on 19 Jul 2002 17:03 by Rob McInerney

Road Name	The Hazard	Hazard Location	Proposed Treatment	Initial Cost	Risk Cost Ratio	Status
Safety Street	Badly deteriorated line-marking (centreline)	Gum tree flat from Koala Corner to Wombat Drive	Upgrade centreline (with reflective beads)	\$ 3500	8.509	Action Pending
Safety Street	Badly deteriorated line-marking (edge lines)	Gum tree flat from Koala Corner to Wombat Drive	Repaint edgelines with reflective beads	\$ 7000	2.250	Action Pending
Safety Street	Steep embankment on edge of road	Windy Road Pass - 63.8km mark on "Snake Corner"	Install guard-rail 0.5m from travelled lane	\$ 11000	1.532	Action Complete
Safety Street	Poor skid resistance	Next to boggy swamp corner Ch 23.4	Resurface with high skid resistant 14mm	\$ 6000	0.289	Action Pending
Safety Street	Sharp horizontal S bend curves	The hazard is at RRD 32.47, 2 km north of Animal Farm Rd	Realign curves and have straight section of road	\$ 175000	0.203	Action Pending

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## Author Biography



### **Rob McInerney BE (Civil)**

Since joining ARRB Transport Research in 1997, Rob McInerney has been heavily involved in the research and development of the Road Safety Risk Manager, a tool to assist the planning, prioritisation and management of road safety issues. He has been involved in projects to investigate motorcycle safety and enforcement issues, rank pedestrian, cycling and intersection treatments and in the evaluation of benefits achieved as a result of the road safety audit process in Australia. He also completed investigation of the relationships between skid resistance and crashes, review of ITS and traffic management state of the art practice, speed zoning and speed enforcement practices.

Prior to working with ARRB TR, Rob was with the Department of Transport in South Australia. His work included planning, design and construction of a number of road projects. He was also involved in the formulation of tactical and field management systems for both outback and sealed networks, and in the running of road maintenance contracts. In 1996 Rob successfully completed a Road Safety Auditors Course.

Rob's fields of expertise include:

- Road Safety
- Risk Management
- Traffic Engineering
- Road Maintenance

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