

The Road Safety Risk Manager – A software tool to help practitioners prioritise, manage and track road safety engineering issues.

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Abstract

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.

The Road Safety Risk Manager provides users with simple wizards, look-up tables and help functions to assess the risk associated with hazards and treatments, and ultimately calculate a Risk-Cost Ratio that can be used to prioritise treatments. Based on extensive research that commenced in 1998 the system is user friendly and suitable for use 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 state-wide or federal program such as the 'black-spot' initiatives. 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 assist road safety managers demonstrate a responsible approach to managing road safety risk.

Introduction

Managing road safety risk is now, more than ever, a critical function of road asset owners. 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 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 road safety trauma reductions 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 ARRB Transport Research / Austroads **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 (see Figure 1). 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.

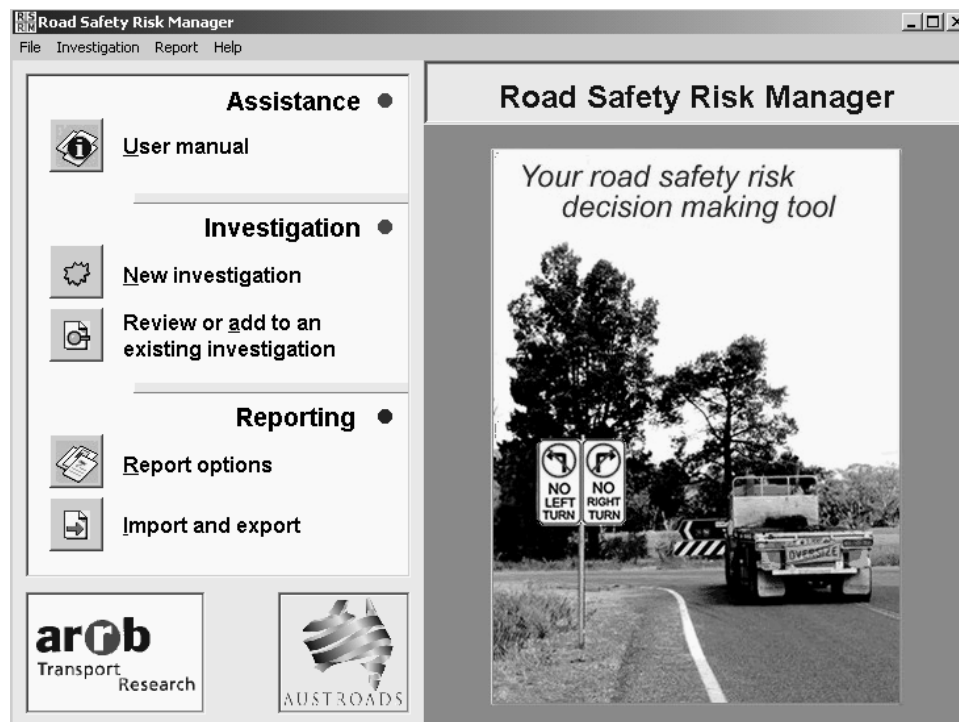


Figure 1: The Road Safety Risk Manager software

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

- information on the site, assessor and other project details

Exposure

- the number of vehicles that are exposed to the hazard and associated treatment

Likelihood

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

Severity

- the severity of a crash if it does occur.

Treatment Cost and Risk Cost Ratio

- the initial, ongoing and any salvage costs associated with the treatment
- calculation of the risk cost ratio of the treatment

Action Taken

- details on the status of the issue (eg pending / completed)
- actual works planned or undertaken

Reporting and Budget Analysis

- a budget analysis tool to assess changes in treatment order
- different reporting and ranking options suitable for technical review through to management summaries

Exporting and Importing

- the ability to transfer records between users for overall program management

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 state-wide 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 2 for a sample report from the Road Safety Risk Manager).

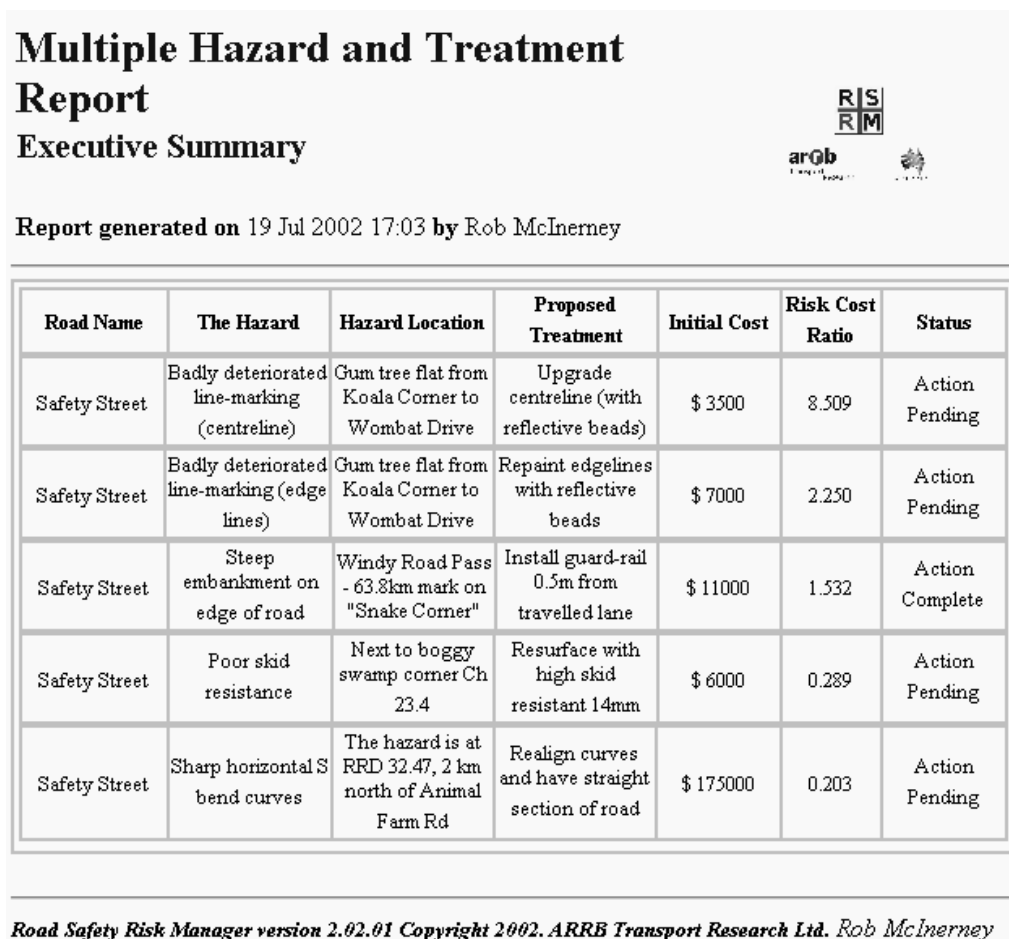


Figure 2: A sample report from the Road Safety Risk Manager

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.

Summary

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.

References

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