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STAYSAFE COMMITTEE
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RECEIVED

To: Mr Ian Faulks
Director
STAYSAFE Committee

From: The Hon John Watkins MP
Minister for Transport

Date: 4 September 2006

STAYSAFE COMMITTEE – QUESTIONS ON NOTICE

(1). The research projects commenced, completed or otherwise in progress over the period 2000-2005 commissioned by or involving the agencies within the Transport portfolio which concern road safety issues or which have major implications for road safety organised under subcategories of:

- **Brief title of the research project;**
- **The terms of reference of the research project;**
- **Background notes to inform the STAYSAFE Committee of the information or events which led to the research project;**
- **A status report of the current position and any proposed actions so that the STAYSAFE Committee is aware of the intended direction of the research project;**
- **Any report(s) of the project submitted to or drafted within, the Roads and Traffic Authority;**
- **The resources required for the research project;**
- **The project manager within the Roads and Traffic Authority; and**
- **The consultant (if any).**

Please see attached table for details on research projects.

(2). Details of surveys of vehicle movements, surveys of public attitudes, knowledge of beliefs about road safety issues, and surveys of road and road infrastructure over the period 2000-2005, not otherwise mentioned as research projects in Question 1.

I am advised as follows:

RailCorp commissioned a survey of public attitudes to pedestrian level crossing safety in 2005 (attachment 1).

In 2005 RailCorp commenced collecting and validating data on all 1500 public level crossings across NSW. This is not strictly a research project but rather an

information improvement process to assist RailCorp to better understand and respond to the challenges associated with level crossing management.

(3). Bibliographic details of monographs, reports, chapters, journal articles, or pamphlets on road safety, or safety related topics that were written by officers of agencies within the Transport portfolio or consultants contracted to agencies within the Transport portfolio that were published over the period 2000-2005. Please supply a hard copy of each of these monographs, reports, chapters, journal articles, or pamphlets.

The Ministry of Transport's predecessors (Transport NSW) issued Level Crossing Project Yearly Reports for 2001/02 and 2002/03 (attachments 2 and 3). These reports have previously been provided to the STAYSAFE Committee. A combined report for 2003/04 to 2005/06 is under development. No monographs, reports, chapter, journal articles or pamphlets were prepared by officers of the department. The work of the department was fully canvassed in the Level Crossing Project Yearly Reports.

(4). Details of standards, codes of practice, or guidelines associated with road safety issued by agencies within the Transport portfolio over the period 2000-2005.

While the Ministry of Transport regulates safety aspects of several road related industries, including certain driver accreditations, the Transport portfolio is not the lead portfolio for developing or enforcing road safety rules.

On 1 July 2005, the Ministry of Transport introduced a new Bus Operators Accreditation System aimed at improving passenger safety within the NSW bus industry. A key element of the reforms was a requirement that operators implement a Safety Management System that complies with the Ministry's Guidelines.

The Safety Management Guidelines consist of 8 elements jointly developed by the Ministry, the Independent Transport Safety Rail Regulator and the bus industry on 25 November 2005 (Copy attached).

Under the Passenger Transport Act 1990, it is a condition of a bus operator's accreditation that it develops and implements a drug and alcohol program that complies with the Guidelines established by the Director General of the Ministry of Transport. The Ministry's requirements are set out in Passenger Transport (Bus Operator) Drug and Alcohol Program Guideline. The Passenger Transport (Drug and Alcohol Testing) Regulation 2004 sets out the legal requirements for the conduct of drug and alcohol testing.

The Passenger Transport (Drug and Alcohol Testing) Regulation 2004 is in the process of being amended to achieve:

- The implementation of a Waterfall Special Commission of Inquiry recommendation for mandatory post incident testing.
- Better alignment of drug and alcohol testing arrangements with Australian Standards.
- The simplification of various administrative requirements including the authorisation of persons to oversee drug and alcohol testing.

In addition, the Ministry is amending the Drug and Alcohol Testing Guidelines and producing a Drug and Alcohol Program Handbook.

The State Transit Authority operates vehicles to comply with road safety rules as determined by the Roads and Traffic Authority.

RailCorp is similarly not a lead agency for developing or enforcing road safety rules and has advised that it did not provide codes of practice or guidelines associated with road safety. However, RailCorp has issued standards which impact upon level crossing road safety during the period 2000-2005.

The Engineering (signaling and design etc) standards have not been provided (with three exceptions provided below) as these technical standards are presumed not to be the focus of this request for documentation. A list of standards is provided (attachment 4), together with:

(i) RailCorp Infrastructure Engineering Standard – Signalling; Signal Design Principles – Level Crossings. ESG 100.18 Version 1, Issue Date March 2006 (attachment 10).

(ii) RailCorp Signalling Engineering Standard – Signal Construction Specification AX 07 60 00 00 SP Version 4.1, Issue Date June 2005 (attachment 11).

I am further advised that RailCorp's "Rolling Stock Standard RSS 01, RSU 530 [5.3] and Appendix I Reflective Delineators" has required implementation of visibility enhancement on all rolling stock in NSW (reflective strips on all rolling stock and or increased running lights) since 2003; increasing the visibility of trains to motorists. A copy of the standard is provided at attachment 8.

(5). Details of papers, seminars and speeches delivered by officers employed by agencies within the Transport portfolio or consultants contracted to agencies within the Transport portfolio over the period 2000-2005 that addressed topics of road safety.

Staff of the Ministry of Transport have from time to time participated in various forums regarding transport policy but not, so far as records indicate, addressing road safety. This remains the principal responsibility of the Roads and Traffic Authority.

I am advised that RailCorp Officers provided the following presentations over the period 2000-2005:

- Presentation to the Institute of Public Works Engineering Australia (IPWEA) Conference May 2005: Level Crossings in NSW, Assessing Safety and Prioritising Works (attachment 5).
- Presentation to the District Emergency Management Officer (DEMO) Conference 28 April 2005: Level Crossings (attachment 6).
- Presentation to the North American Level Crossing Conference 2005: Human factors and railroad grade crossings, presented on behalf of Ian Faulks, StaySafe Committee (attachment 7).

(6). A summary of the road safety curriculum development activities undertaken by officers employed by agencies within the Transport portfolio, or consultants contracted to agencies within the Transport portfolio, over the period 2000-2005, not otherwise identified in Question 1.

All operational service agencies within the Transport portfolio are required to periodically review and improve their employee training. This work does not, however, relate to curriculum in the context of general community standards for driver licensing or training which is the purview of the RTA.

State Transit advises that relevant activities include Traineeship, and the Driver Skills Maintenance Program. 'Curriculum development activities' are principally training programs related to development of drivers so as to ensure safe driving practices.

(7). General summary of road safety community awareness activities undertaken by officers employed by agencies within the Transport portfolio, or consultants contracted to agencies within the Transport portfolio, over the period 2000-2005, including policy and campaign launches, speaking engagements etc.

I am advised that RailCorp has undertaken the following road safety community awareness activities:

- In December 2000 Rail Access Corporation ran a direct mail campaign to improve the knowledge of rural residents regarding road safety and level crossings.
- Over the period 2001 – 2005 RailCorp and its rail corporation predecessors (Rail Infrastructure Corporation and Rail Access Corporation) contributed funds to the RTA's motorist level crossing awareness campaign, but delivery of this project remained a responsibility for the RTA.

State Transit has implemented the Seniors Program to educate seniors on safe bus travel including boarding, traveling and disembarking.

(8). General summary details of the circumstances where officers of agencies within the Transport portfolio have provided formal advice on:

(i) the development of national road transport rules;

(ii) other proposed legislation (including regulations) discussion papers, etc., over the period 2000-2005.

The subject of road transport rules is regularly examined by intergovernmental bodies in which both the Minister for Transport and the Minister for Roads participate. In this context, Transport agencies provide advice to the Transport Minister regarding road related issues that fall within the jurisdiction of bodies such as the Australian Transport Council.

While Transport agencies may provide advice to the Minister for Transport regarding new proposals in this context, it is usual for the Roads Minister to lead the NSW position on matters relating to road rules. In preparing such advice the Ministry of Transport is generally guided by advice from the RTA.

Similarly, the Ministry advises the Minister regarding legislative and regulatory proposals by his colleague the Minister for Roads. The Ministry takes an ongoing interest in all legislation and regulation that affects the operation of public transport services.

(9). What were the operating budgets for the road safety area for the agencies within the Transport portfolio over the period 2000-2005?

This is more appropriately a question for the Roads Minister as the Roads and Traffic Authority is responsible for road safety issues.

(10). What were budgets for agencies within the Transport portfolio for road safety advertising, publicity and community relations activities over the period 2000-2005.

Responsibility for road safety advertising, publicity and community relations lies with the Roads portfolio and the Roads and Traffic Authority.

Nevertheless, I am advised that RailCorp and its rail corporation predecessors (Rail Infrastructure Corporation and Rail Access Corporation) contributed funds to the RTA's motorist level crossing awareness campaign as follows:

- 2000 $10,000 (estimate) Rail Access Corporation ran a low key direct mail campaign targeting rural residents in December 2000 prior to the development of the RTA's campaign.
- 2002 $100,000 Rail Infrastructure Corporation (run in November 2002)
- 2004 $100,000 Rail Infrastructure Corporation (run in June 2004)

- 2005 $40,000 RailCorp and $40,000 Rail Infrastructure Corporation (run in June 2005); the Australian Rail Track Corporation, with the largest rail network in NSW also contributed $40,000 in 2005.

(11). What, if any, formal mechanisms were in place over the period 2000-2005 to provide for consultation with non-government organisations?

All agencies within the portfolio have a range of working groups, consultative processes and standing committees that enable the public and NGOs to participate in policy and service development within the portfolio. Most of these inquiries only tangentially addressed road safety but some, in particular the School Bus Safety Working Group, were concerned with public safety outcomes.

The Parry, Unsworth and Cook inquiries each received hundreds of submissions from individuals and groups including pensioners, parents, disabled travelers, local government and transport advocacy groups. School bus safety and wheelchair accessible taxi services have been examined by working parties including NGOs. Policy reviews including the review of transport concessions have actively sought the views of NGOs.

I am advised that through its access arrangement, RailCorp is required to consult with all rail operators on its network in regard to changes in rolling stock standards and network rules. For example: The 2003 implementation of visibility enhancement on all rolling stock in NSW (reflective strips on all rolling stock and or increased running lights are required through RailCorp's "Rolling Stock Standard RSS 01, RSU 530 [5.3] and Appendix I Reflective Delineators" (attachment 8).

The Local Government Association and Shires Association is a member of both the NSW Level Crossing Strategy Council and the Level Crossing Working Group. These forums provides for consultation across all members. The member agencies are:

- Australian Rail Track Corporation
- Independent Transport Safety and Reliability Regulator
- Local Government Association and Shires Association of NSW
- Ministry of Transport
- NSW Police
- Rail Infrastructure Corporation
- RailCorp
- NSW Roads and Traffic Authority

(12). Are there further significant matters relevant to the roads safety situation in New South Wales over the period 2000-2005 that have not been addressed in the preceding questions? If so, please provide a summary of each issue or matter.

I am advised that there are over 3800 railway crossings in NSW; over 1500 of which are public road crossings. Incidents are low probability however of potential high consequence in terms of possible mass casualty and/or hazmat incidents.

Railway level crossings represent one of the major risks to the safe operation of rail networks. The local community impact of fatal level crossing incidents can be devastating.

The LCSC member agencies are:

- Australian Rail Track Corporation
- Independent Transport Safety and Reliability Regulator
- Local Government Association and Shires Association of NSW
- Ministry of Transport
- NSW Police
- Rail Infrastructure Corporation
- RailCorp
- NSW Roads and Traffic Authority

Individual road and rail infrastructure owners are responsible for the management of safety at their railway level crossing assets. The LCSC is an interagency initiative that provides the forum to ensure coordination between these agencies in their level crossing safety improvement initiatives.

Level crossing safety requires a multi-entity co-operative approach with key stakeholders including rail and road authorities, regulatory authorities and the community. The collaborative efforts extended beyond the funding arrangements with the construction of the works also being undertaken jointly.

LCSC member agency co-ordinated safety improvements include:

- Engineering improvements: includes major upgrades (eg road realignment, lights and boom barriers) and minor upgrades (eg line marking and signage).
  - The RTA Level Crossing Safety Improvement Program provides funding each year for safety upgrades at level crossings around NSW. Prior to 2003/04 an allocation of around $2 million was made available annually under the Program. In March 2003 the Government approved additional spending, more than doubling the allocation of $10 million to $23 million over four years (2003/04 to 2006/07).
  - Since 2001/02 safety improvements have been made to over 200 level crossings (49 major and 160 minor upgrades) at a value of over $26 million.
  - Site improvements should fulfil the requirements of the stakeholders (including safety) and provide a long term improvement to community access.

- The Safety Improvement Program is primarily used as the basis for the allocation of funding provided by the RTA. The RTA is responsible for management of the program including changing to allocations as required.
- Individual road and rail authorities are responsible for determining the configuration of, and managing the delivery of, level crossing safety treatments for their respective assets.
- The RailCorp Level Crossing Unit oversees program delivery and provides advice and assistance as required on level crossing issues.
- RailCorp was tasked with developing and implementing an improved design of pedestrian facilities in NSW. Standardisation and therefore replicability of these facilities will be achieved by the adoption of this design in the revision of the Australian Standard AS1742.7 for level crossings.

- On average ten crossings have been closed each year over the period 2001/02-2004/05.

- Assessment Tools: the Australian Level Crossing Assessment Model (ALCAM) has been developed and endorsed nationally. ALCAM provides the basis for the prioritisation of sites for engineering improvements.

- Education: RailCorp advises me that the behaviour of motorists is a major causal factor in level crossing incidents within NSW and nationally. The RTA's motorist level crossing awareness campaign (funded by NSW road and rail agencies) has been run in 2002, 2004 and 2005, and will continue.

John Watkins MP
Deputy Premier
Minister for Transport

10 SEP 2006

Drivers at danger in railroad grade crossings – the "fail safe" signal

- "Active protection" equipment at railroad grade crossings is designed to "fail safe" signalling principles: signals activate if a failure occurs.
- Aim is to prevent use of the railroad grade crossing when signal is faulty, creating a closed corridor for train movements and blocking road movements.
- Inappropriate for motorists, who experience a "false alarm": a traffic environment indicative of a train approaching the crossing, but without this event actually occurring.

Human factors at railroad grade crossings

- Major problems for a road user appear to be complacency, and late detection of hazard.
- Complacency is associated with attributions (beliefs and knowledge) about the road transport network, schedules of rail movements, and the timing and operation of railroad grade crossing signals.
- Late detection arises because of lapses or errors, and is the most critical problem faced by a road user. Without detection there can be no processing of information, and no decision process as to the most appropriate response.

Human factors at railroad grade crossings

Speed perception and looming

- There is little information available to drivers about the speed and distance from the railroad grade crossing of an approaching train. This appears, for straight railroad track, to result from a lack of detectable change of the target relevant to the peripheral field of vision and the absence of binocular cues.
- Looming effects in the last few seconds of train approach, described as a "lunging" or "pouncing" effect

Human factors at railroad grade level crossings

Change blindness

- Change blindness – people's blindness to scene changes. If you don't notice the motion of a change in a scene, or are otherwise briefly distracted from looking at a scene, then you will often fail to see quite radical changes to the scene (the presence or absence of an object, a change in the colour of an object)

Human factors at railroad grade crossings

"Looked but failed to see"

- Commonly thought to occur in crashes between drivers of motor vehicles and pedestrians, bicyclists and motorcyclists, and more recently, crashes associated with use of mobile telephones while driving.
- There has been little research into "looked but failed to see" crashes for drivers at railroad grade crossings.

Human factors at railroad grade crossings

Inability to determine location of hazard

- Concept of "sensory orientation confusion": inability of a driver to localise the direction of a detected sound (e.g., train horn) and looking in the wrong directions (cf. localising the direction of approach of emergency vehicles – police, ambulance, fire engines – that can be quite large in size)

Human factors at railroad grade crossings

Fatigue, monotony and hypovigilance

- Drowsiness and hypovigilance frequently occur during highway driving.
- The approaches to railroad grade crossings may not be sufficiently salient to a driver within a monotonous road environment (even when a train is present on the crossing).

Human factors at railroad grade level crossings

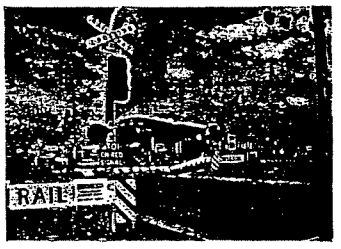
Distraction

- Recognition of distraction as important issue in driving
- In-car distractions include mobile telephones, entertainment systems, navigation systems, passengers, smoking, food consumption
- External-to-the-car distractions include billboards, complex traffic situations, even the railroad grade crossing environment itself ...

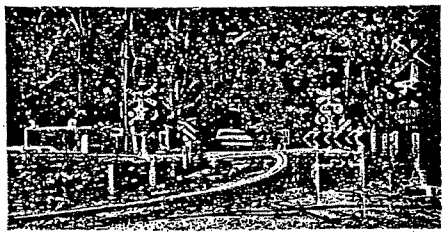
Human factors at railroad grade crossings

- Railroad grade crossings can be complex and very challenging visual environments

Human factors at railroad grade crossings



Human factors at railroad grade crossings



Human factors at railroad grade crossings

Behaviour in hazardous situations

- Don't have a good understanding of how road users behave in potentially high risk situations
  - Panic behaviour
  - Panic driving manoeuvres
  - Freezing (immobility)

Human factors: Older road users

- Implications of an ageing population
  - Doubling of persons aged 65+ years over the next five decades
  - Physical and cognitive issues (restricted movement, cognitive impairment)
  - Older road users have reduced sensitivity to direction of motion, discrimination of speed, and detection of inward or outward radial motion
  - Driver distraction is more likely to occur at intersections
  - Older drivers are more likely to report that they are prone to external-to-the-vehicle distractions

Human factors and motor vehicles

- Concerns with driver behaviour and motor vehicles:
  - Driver comfort technologies (e.g., air conditioning, entertainment systems) might limit capacity to hear audible train warnings
  - Design issues (e.g., placement of A and B pillars in motor vehicles) might limit the driver's field of view

Investigation of railroad grade crossing crashes in NSW

- Reliable data about crashes at railroad grade crossings concerns fatal crashes – in NSW, coronial inquiries, Office of Transport Safety Investigation
- But not all fatal crashes at railroad grade crossings are subject to detailed investigation and public reporting (particularly pedestrian deaths)
- Larger pool of non-fatal crashes and incidents involving motor vehicles at railroad grade crossing crashes that have the potential to be fatal crashes, but about which we know much less

Research and investigation

- There is a need for better research and investigation about incidents and crashes at railroad grade crossings:
  - "Near miss" incidents, including better use of confidential reporting systems for train crew and for road users
  - Surviving road users: Nine out of ten road users survive the collision with a train at a railroad grade crossing; cannot find any systematic study of their experience and recollection
  - On-the-spot and in-depth crash analyses across the range of crash types (not just motor vehicles)

Managing railroad grade crossings in NSW

- Level Crossing Strategy Council
  - NSW government agencies:
    - Transport Services portfolio
    - Roads and Traffic Authority
    - NSW Police
  - Local councils
  - Commonwealth agencies
  - Non-governmental organisations
- Involvement in national strategies and programs

Managing railroad grade crossings in NSW

- Australian Rail Track Corporation (ARTC) leases the New South Wales mainline interstate corridors, Hunter Valley Coal Rail Network and Regional Rail Network corridors

Road user safety education about use of railroad grade crossings

- Public education: Railroad grade crossing awareness campaign for drivers across rural NSW using radio, brochures, school-based materials

Enforcement at railroad grade crossings

- Enforcement of appropriate road user behaviour at railroad grade crossings is very limited, typically related to action associated with crashes.
- Enforcement can play an educative and deterrent role, but the difficulties in enforcement arise where train movements occur at intervals (timetabled or otherwise), and the coincident presence of a road user cannot be predicted.
- Automated enforcement has been poorly explored, but may be appropriate (e.g., red light cameras).

The future

- The immediate future will likely see:
  - Improvements in the road environment at railroad grade crossings (signals, gateway treatments)
  - Improvements in driver education and awareness
  - Improvements in train conspicuity
  - New technologies for train detection, activation of railroad grade crossing signals, driver navigation alert, etc.

The future

- Australasian Railway Association held the inaugural National Railway Level Crossing Behavioural Workshop, April 2005, with the intention to develop long-term national plan to improve railroad grade crossing safety by changing road user behaviour
- Implementation of the National Railway Level Crossing Strategy, endorsed by the Australian Transport Council, August 2003
- Research into driver behaviour at railroad grade crossings through the Rail Cooperative Research Centre for Railway Engineering and Technologies, Central Queensland University

Thank you

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The Australian Level Crossing Assessment Model

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Risk Manager, Level Crossing Strategy Council, NSW, Australia

Summary

The Australian Level Crossing Assessment Model (ALCAM) has been developed as a direct impact of the need to ensure there is a rigorous defensible process in place to prioritise the treatment of disparate level crossings according to their comparative safety risk.

ALCAM is an assessment tool designed to prioritise level crossing safety improvement works as well as assisting in the determination of the most effective treatments at these sites, in consideration of factors including cost. The model is a complex scoring algorithm which considers each sites physical properties (characteristics and controls) as well as related human factors (driver/pedestrian behaviour) to provide the sites "Risk Score". This score is then multiplied by the sites "Exposure Rating" (a factor of Vehicles, Trains & Consequence) which enables the comparison of the relative Total Risk Exposure Score across level crossings within a given jurisdiction.

ALCAM has been designed for both road and pedestrian level crossings. It produces both an overall comparative risk score for each site as well as highlighting where specific risks exist. It utilises "triggers" or limits as a preliminary means of determining where treatment is required at a site. ALCAM then allows the determination of proposed treatments to address these risk areas, as well as consideration of the cost verses risk reduction of these proposed treatments. The overall ALCAM process then uses outputs from the model in addition to stakeholder review, which includes site specific risks, to ensure that the optimal solution is implemented at the site. An easy to use front end has been provided to allow the effective management of a large volume of crossings through a database system which can be used stand alone, across a network or potentially on the Internet.

In excess of 100 individuals, primarily from Australia's road and rail jurisdictions, with expertise collectively covering the areas of level crossing safety, have been involved in the development of ALCAM from its conception in 1999 through to its continuing development and use in 2006.

This paper outlines the elements which feed into ALCAM and the process of weightings & calculations utilised to determine the model outputs and the risk principles adopted in processing the data. It also looks at the overall process adopted in collecting and inputting data, analysis of the results and utilising these results to support strategies for level crossing safety improvement works.

Introduction

In Australia each state and territory is responsible for road and rail transport regulation in its jurisdiction. Each state and territory has a strategy group comprising high-level management representation from both road and rail entities. These state based committees are chartered with the continuing improvement of safety at level crossings within their jurisdiction. The major difficulty in addressing risks at level crossings is the determination of how to achieve the optimal results with the available resources. A tool, which consistently assesses the characteristics at each level crossing, was required to effectively determine priorities when addressing safety risks at these sites. A project team was formed to establish such a tool, which has now undergone a variety of improvements to reach the stage it is at today. See table 2 (pg: 8)

The Australian Transport Council of Ministers (ATC) and the Standing Committee of Transport (SCOT) have approved the Australian Level Crossing Assessment Model as the national standard for assessing the risk at level crossings. ALCAM is currently applied across all Australian states and territories and is overseen by a committee of representatives from these states and territories to ensure its consistency of development and implementation.

Risk

Risk (the chance of something happening that will have an impact on objectives) is widely known and accepted as the combination of both the likelihood (probability or frequency) of the occurrence of an event and the resulting consequence (outcome or impact) of that event once it has taken place. The risk management process as outlined in the Australian Standard and New Zealand Standard (AS/NZS 4360:2004, which is similarly represented in other international standards, follows a simple series of steps as outlined below (Figure 1):

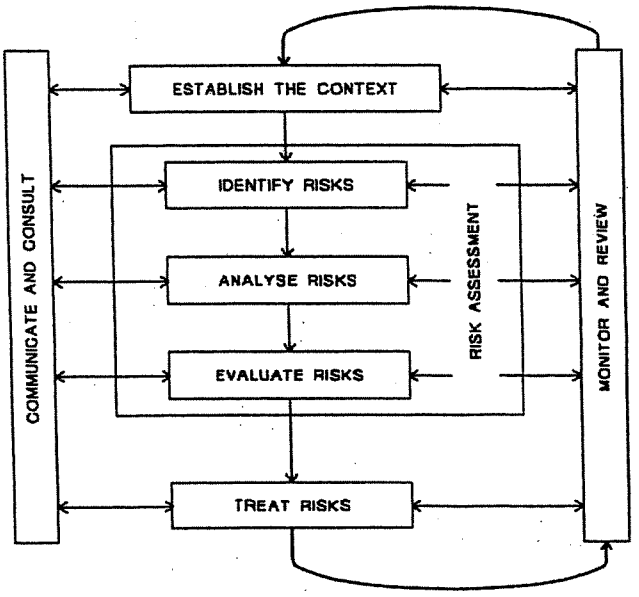

Figure 1 – Risk Management Process

ALCAM and the ALCAM process considers all elements outlined in AS/NZS 4360:2004. It involves communication and consultation with a wide range of technical experts as well as the local stakeholders at individual sites. The context is well established as the safety risks relating to the potential of a collision at the at grade intersection of a roadway and railway. It identifies, analyses and evaluates the risks inherent at level crossings as well as giving determination of the adequacy of proposed treatments for the risks. Finally the model and the results produced from the model are regularly monitored and under a process of continual review and improvement.

In line with safety risk modelling principles ALCAM looks at risk from the viewpoint of consideration of loss (negative consequence) only as opposed to risk and reward (loss and gain).

The model considers both qualitative and quantitative characteristics as well as assessing the impact of physical elements and human behaviours (pedestrian/driver behaviour) at level crossings. It looks at the likelihood of a collision as well as the consequential effects resulting from that collision. The model allocates weightings to each characteristic in relation to how it would contribute to a collision and assesses what impact the existing controls would have on these characteristics.

ALCAM Mechanics

In simple terms ALCAM is a mathematical tool which considers physical characteristics and controls in existence at both road and pedestrian level crossings. It considers these elements as well as the predicted driver/pedestrian behaviour at the site to provide a "Risk Score" and "Total Risk Exposure Score" for each level crossing which enables the comparison of relative risk across all level crossings within a giving jurisdiction. The ALCAM Mechanics as outlined on the following pages have been illustrated graphically in Figure 4 (pg: 7) and as examples in Appendix A & B (on pages 10 and 11).

ALCAM Mechanics - Accident Mechanisms, Characteristics & Controls

The main calculation engine within ALCAM involves a matrix of weightings relating to how much the nominated characteristics at the level crossing influence the potential accident causal factors (accident mechanisms). The model also determines the impact the existing controls would have on these accident mechanisms. All significant and practical accident mechanisms, characteristics and controls have been considered and included through a process of seeking expert opinion through a series of workshops and interviews. A full listing of characteristics, controls and accident mechanisms for both road and pedestrian level crossings can be found in Appendix C and D respectively (on page 12 & 13).

Accident Mechanisms include all significant and practical accident causal factors associated with a collision between a vehicle/pedestrian and a train. They have been determined based on experience of accident history as well as expert knowledge.

Mechanisms may be broadly grouped into the following categories:

- Mechanisms where the level crossing user is **unaware** of the dangerous situation.
- Mechanisms where the level crossing user is **unable to avoid** the dangerous situation.
- Mechanisms where the level crossing user is **unwilling** to recognise the dangerous situation.

Each of these mechanisms is then weighted based on a six by six responsibility and likelihood matrix. A mechanism's weighting is calculated as the product of the responsibility rating and the likelihood rating (weighting score between 1 and 36).

- **Responsibility** - is the extent to which the road or rail infrastructure owner is responsible for the mechanism occurring.
- **Likelihood** - is an assessment of how likely it is that the mechanism causes an accident.

A characteristic is defined as a physical feature of a roadway or railway, or of a level crossing user, which may to some degree contribute to each of the accident mechanisms occurring. Characteristics include items such as sighting, speed of trains, potential for queuing or short stacking.

Controls are devices installed or implemented to improve the safety risk profile of the site and can included devices such as flashing warning lights, boom gates, signage, improved road alignment and through the effects of education and law enforcement campaigns.

ALCAM Mechanics - Matrix

A matrix has been constructed to represent the effect each characteristic would have on each accident mechanism. Some characteristics may have no causal effect on a particular accident mechanism, where some may have a partial effect. If a Characteristic is the only contributor to a given mechanism then the percentage weighting will be 100%. The total percentage effect for each mechanism must be 100%.

The final output from the Matrix is a Risk Score which is used to determine whether or not a site will be recommended for safety improvement works.

Since the development of the original matrix, several workshops have been held to both add and remove accident mechanisms, characteristics and controls. The need for these changes has generally risen from concerns / recommendations raised by regular users of the model.

The current version of the matrix produces results which have been shown to quite accurately reflect the current risk profile at each site. This has been determined through a detailed analysis of the results of a number of sample sites across each of the major Australian States.

ALCAM Mechanics - Sensitivity

A combination of both the weighted percentages and mechanism weightings result in each of the accident mechanisms having a different impact on the overall risk score at any particular level crossing. There are particular characteristics which have a greater influence on the overall risk profile at each site. These characteristics include limited sighting of trains (at passive sites), limited approach sighting, queuing and short stacking, proximity to shunting yards and stations, high percentage of heavy vehicles and a hump or dip across the tracks.

It is these highly sensitive accident mechanisms which have the greatest influence on whether or not a site will be prioritised for safety improvement works.

ALCAM Mechanics – Exposure Rating (Consequence / Vehicles or Pedestrians / Trains)

An exposure rating is calculated for each site made up of three factors. These factors being the consequence score (C) the actual road traffic volume (V) or the pedestrian volume (P) and train volume (T). The result of which is either a VTC for road level crossings or a PT for pedestrian level crossings.

Currently ALCAM utilises a relatively simple methodology for the determination of a consequence based on the information shown in the table below (Table 1). The consequence score is determined as a relationship between an environmental factor and a train speed factor.

This table recognises & represents the likely outcome once a collision has occurred. It considers both a train speed factor and an environmental factor. The combination of these two elements result in a modification factor (Consequence), which is applied to the VT of a level crossing. For example, where there is a situation which involves very low train speeds and minimal exposure to life the VT would be reduced by a factor of 10 (Consequence factor = 0.1). At the other extreme where there are high train speeds and the potential for high exposure to human life (passenger train, or bus) the VT is increased by a factor of 10 (Consequence factor = 10).

Factors affecting consequences		Speed				
		0 - 60	61 -80	81 - 100	101 - 120	> 120
Environmental Factors	Index	1	2	3	4	5
Curve within stoping distance & Points in direction of travel	1	4	10	10	10	10
Road under bridge or river bridge	2	4	10	10	10	10
Steep embankment 3m +	3	4	4	10	10	10
Multiple track	4	3	4	10	10	10
School bus route	5	3	4	10	10	10
High proportion of heavy vehicles using the crossing +10%	6	0.1	3	4	10	10
Tunnel within the stopping distance	7	0.1	3	3	10	10
Medium embankment	8	2	3	3	4	4
Curve within stopping distance & No other environmental concerns	9	1	2	3	3	3
Straight track + passengers	10	1	1	3	3	3
Straight track + freight only	11	0.1	1	1	3	3

Table 1

Consequence effects are only relevant to vehicle level crossing incidents, as pedestrian incidents are limited in their effect to the pedestrian involved in the collision and there is no real likelihood of infrastructure damage. In the pedestrian matrix, the exposure rating is a factor simply based on the trains and pedestrian.

The system of consequence modifiers has been developed to have the effect of inflating or deflating the exposure score for the level crossing by up to a factor of 10, as a means of recognising the potential human life impact of a collision.

Work is currently under way to utilise event tree modelling to better represent the potential outcomes of a collision at a level crossing. This will result in consequence factors, which more accurately reflect the potential outcomes of the collision, as they will be based on actual statistical data rather than the current expert opinion.

ALCAM Mechanics - Intervention & Installation Limits

The Intervention and Installation limits in ALCAM are used to determine the extremities at which either treatment is or is not required at a particular site. To identify whether an existing level crossing requires treatment, or whether proposed controls at a level crossing are adequate, ALCAM compares the risk score with the following cut off limits:

- The ***Installation Score*** indicates a level below which the level crossing risk is *likely to be within acceptable limits* and remedial work to address the identified risks is not recommended. The installation score is indicative of the risk score that should be achieved if a new level crossing was being installed at the particular location.

- The ***Intervention Score*** indicates a level above which there is *likely to be safety hazards* that require priority attention to mitigate the level of risk to road and rail users. This may require short-term and long-term actions to reduce the identified risks.

The diagram below (Figure 2) indicates at what point action takes place in relation to the intervention and installation limits. For an existing level crossing, where the risk score is greater than the intervention limit, treatment is recommended. Such treatment should be effective enough to reduce the proposed risk score to a level lower than the installation limit. For a new level crossing the risk score should be lower than the installation limit and should consider the future road/rail traffic volumes for the foreseeable future.

For a level crossing with a risk score between or equal to the Intervention and Installation limits, a further assessment should be carried out to determine if there are treatments which can be employed which are cost effective.

Finally a level crossing with a risk score below the installation limit, in most cases, will be sufficiently safe from an overall risk perspective to not require any remedial works. A review of the risk factors should be carried out on a regular basis on these sites to ensure there has been no significant change to the risk profile and that there are no specific individual risks which require urgent attention (such as standards compliance).

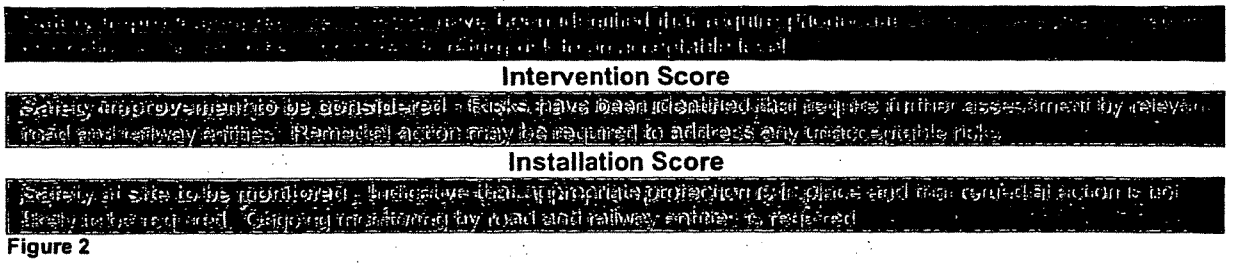

Figure 2

These limits are defined on a scale dependant on the risk exposure rating (VTC or PT). As the exposure rating decreases, the acceptable limits will increase. This recognises the situation whereby the community and/or authorities are prepared to accept a lesser standard of protection at lower trafficked level crossings opposed to that of higher trafficked level crossings. This variation in limits also recognises the "black spot" situation where a level crossing may have many accidents because it has high traffic volumes, not because it is unsafe in relation to other level crossings. Figure 3 shows an example of the general shape of the Intervention and Installation Limit curves.

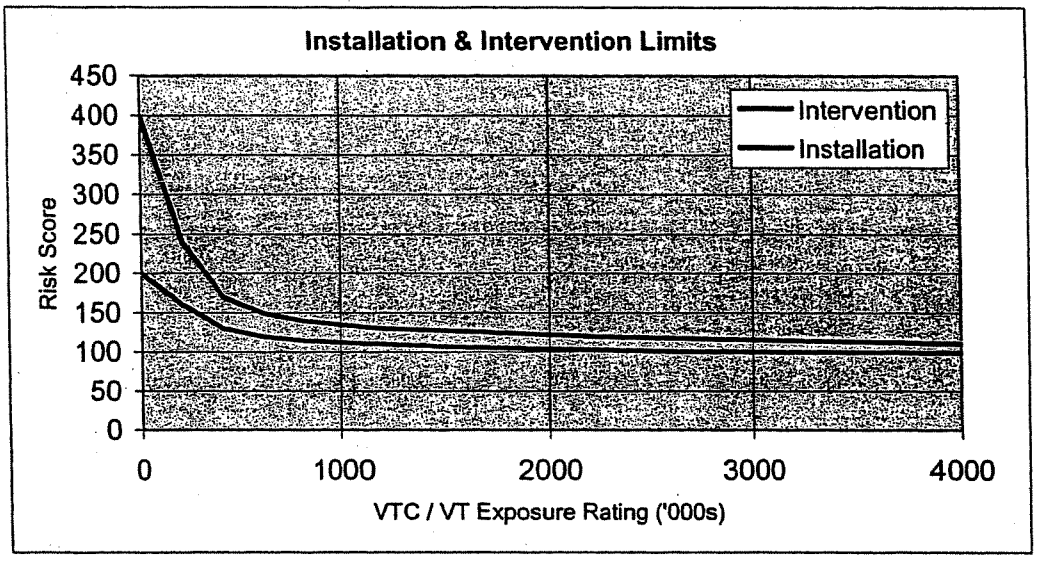

Figure 3

ALCAM Mechanics – Total Risk Exposure Score

The final overall comparative score which is produced by ALCAM is called the "Total Risk Exposure Score" (TRES). This figure is a combination of the Exposure Rating and Risk Score, and is the figure used to compare each level crossing against all other level crossings within a given jurisdiction. By sorting level crossings in relation to their TRES a priority listing is created which can then be used to develop safety improvement programs.

ALCAM Mechanics - Flags

There are particular risks at sites, which for various reasons need to be identified regardless of whether a site has had safety improvements recommended. This is to ensure that areas which although have a low likelihood of occurrence may result in a level of risk which is intolerable are not overlooked. This may be through particular risk areas or through standards compliance. ALCAM flags such areas of concern to allow further assessment to ensure these areas of high risk are not left unconsidered.

ALCAM Mechanics - Treatment

Once the particular risk profile has been calculated at a site the suitable treatments / safety improvement works can be determined. ALCAM allows the user to run various proposed solutions to the highlighted safety risks and consider the theoretical reduction in overall and specific risk.

It must be understood that active protection is not always the answer. The proposed risk treatment must address the specific risks particular to each site. For example, at a site where queuing has been identified as a risk factor, the introduction of active protection or boom gates may reduce the overall risk at the site, however, it will not address the queuing risk, and may actually add to the risks associated with vehicles queued on the tracks. A more suitable solution may involve changes to road infrastructure on the departure side of the level crossing or interfacing with adjacent road traffic signals.

It is also very important to ensure that all stakeholders associated with the particular level crossing are involved with the determination of the final recommended treatment. Although ALCAM is a comprehensive tool for the assessment of level crossing risks, it cannot make assessment of unique risks particular to each site. An on site meeting of all relevant stakeholders is recommended at each site to ensure any unique risks are identified and treated as required. A sites incident history is also considered at this stakeholder meeting and treated as required.

ALCAM Mechanics - Cost Benefit

As a part of the determination of the optimal treatment to be implemented at an individual site ALCAM provides an analysis of the reduction in risk of a proposal verses the estimated cost of that treatment. This then allows the comparison of a number of options in relation to their cost benefit. This information is then used at the stakeholder meeting to assist in the determination of the optimal solution.

ALCAM Process

The ALCAM process involves the collection of data through a combination of site surveys and train and vehicle information from the respective rail and road authorities. Each level crossing must be assessed uniformly using a standardised procedure to gather level crossing data. This requires a simple yet explicate processes for the determination of quantitative information in combination with detailed instructions on the determination of qualitative information. Once the data is collected and entered into ALCAM, reports can be run to produce a priority listing, which can be used as the basis for safety improvement programs. An easy to use front end has been provided to allow the effective management of a large volume of level crossings through a database system which can be used stand alone, across a network or potentially on the Internet.

Proposed treatment options are pre-determined through the use of ALCAM and a treatment report is prepared. The proposals as outlined in this report are then discussed at an on-site stakeholder meeting, where the highlighted risks and treatments are combined with any site specific risk and treatments. This process ensures that sites are both addressed on a consistent priority basis and that all safety risks have been addressed.

The ALCAM process is represented graphically in the chart below (Figure 4). It shows the flow of information through from data collection, input, the model calculations, road and rail volumes, consequence and limits through ALCAM itself and on the outputs and how these feed into the stakeholder review and eventually to the finalisation of proposed safety improvement works.

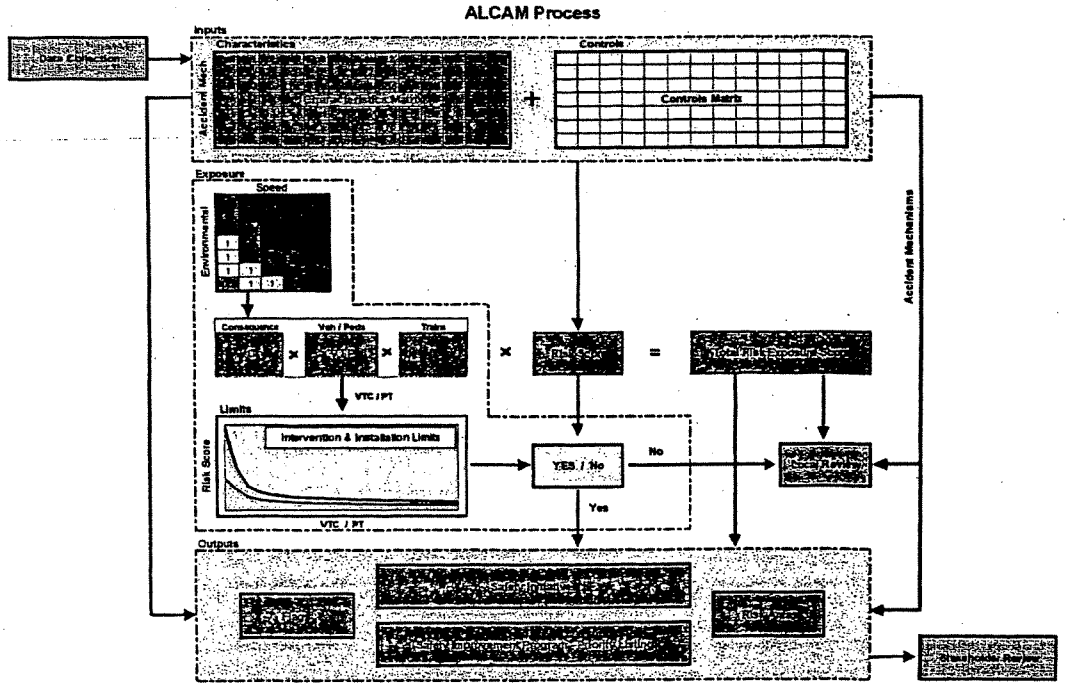

Figure 4

The History of ALCAM

1999	A project team was commissioned, part of its role was to establish a tool and technical guidelines for the assessment and treatment of level crossings and oversee the development of a database for level crossings. Prior to this project there was little evidence of a standard process whereby all level crossings were assessed in a consistent manner. The processes included a search of existing level crossing assessment tools which found a number of simple formula methods (eg The Warren Henry Formula) which considered elements such as road / rail traffic volumes, number of tracks, road grade / curvature, adjacent intersections, sun glare, etc. Accordingly, the project team developed a risk scoring system referred to as the "Risk Scoring Matrix". This system provided a process for evaluating the risk score of a level crossing based on its existing characteristics and controls. It also enabled the identification of improvements to the risk score due to the implementation of selected controls and changes to characteristics.
2002	The project team identified that some modifications were required to improve the outputs of the Risk Scoring Matrix. A national committee was established to ensure that the Risk Scoring Matrix was used consistently and uniformly across the nation. The matrix was re-named the Australian Level Crossing Assessment Model (ALCAM) and the committee as the ALCAM Group. Part of this committee's brief was also to develop a database that would enable the model to be used by all ALCAM members in the risk assessment of their level crossings. The ALCAM Technical Committee was commissioned as a sub-committee of the ALCAM group to further develop and improve the current risk assessment tool and to produce the first version of a national level crossing assessment tool.
2003	The ALCAM group initiated major reviews of both the vehicle and pedestrian assessment matrices by the ALCAM technical committee. In February an independent review of the processes used to review ALCAM took place. During 2003 Australian Transport Council (ATC) and SCOT (Rail Group) sanctioned that the ALCAM be adopted nationally. In addition, the Australian Railway Level Crossing Safety Implementation Group (ARLCSIG) was authorised to overview the ALCAM process of setting the standard for the Vehicle and Pedestrian matrices within ALCAM..
2004	Following a number of enhancements a new version of the ALCAM was released in May 2004. A MicroSoft Access database was developed (Level Crossing Management System – LXM) as a useful tool for maintaining data and running assessments. It was adopted as a formal part of the national ALCAM strategy.
2005	A Pedestrian level crossing matrix was added to ALCAM and issued May 2005 and was incorporated in the LXM system.
2006	Development of ALCAM is continuing with further updates expected in early 2007.

Table 2 – The history of ALCAM development

The Future of ALCAM

ALCAM continues to be developed with fine-tuning of weightings, introduction of new level crossing control technology and most recently the commencement of refinement of the consequence factor. The development occurring in relation to the consequence factor is incorporating the principles of Cause – Consequence modelling through the use of event trees. An event tree is used to analyse a sequence of possible events which will result in a certain outcome. Each final outcome in the tree can have a value allocated to it and a corresponding likelihood of it occurring.

Acknowledgments

I would like to thank the following entities and individuals for their dedication to level crossing safety improvements across Australia and for their continued input and support in relation to the development of the Australian Level Crossing Assessment Model.

- ALCAM Group & ALCAM Technical Committee
- Standing Committee on Transport – Rail Group (SCOT Rail Group)
- The Australian Transport Council of Ministers (ATC)
- Level Crossing Strategy Council (LCSC) and Level Crossing Working Group (LCWG), NSW
- Queensland Transport Risk Scoring System Project Team (Peter Hughes, Neal Costello, Brett McClurg, Garry Marling)
- Vince Graham, CEO RailCorp, NSW
- Derek Williams, Manager Level Crossing Unit, Chair ALCAM Group, NSW
- Peter Furnell, Level Crossing Unit, Department of Transport, South Australia
- Glen Beutel, Senior Strategist, Network Engineering Division, Queensland Rail
- Ken Ryan, Department of Planning, NSW
- Michael Deegan, National Transport Commission, Australia

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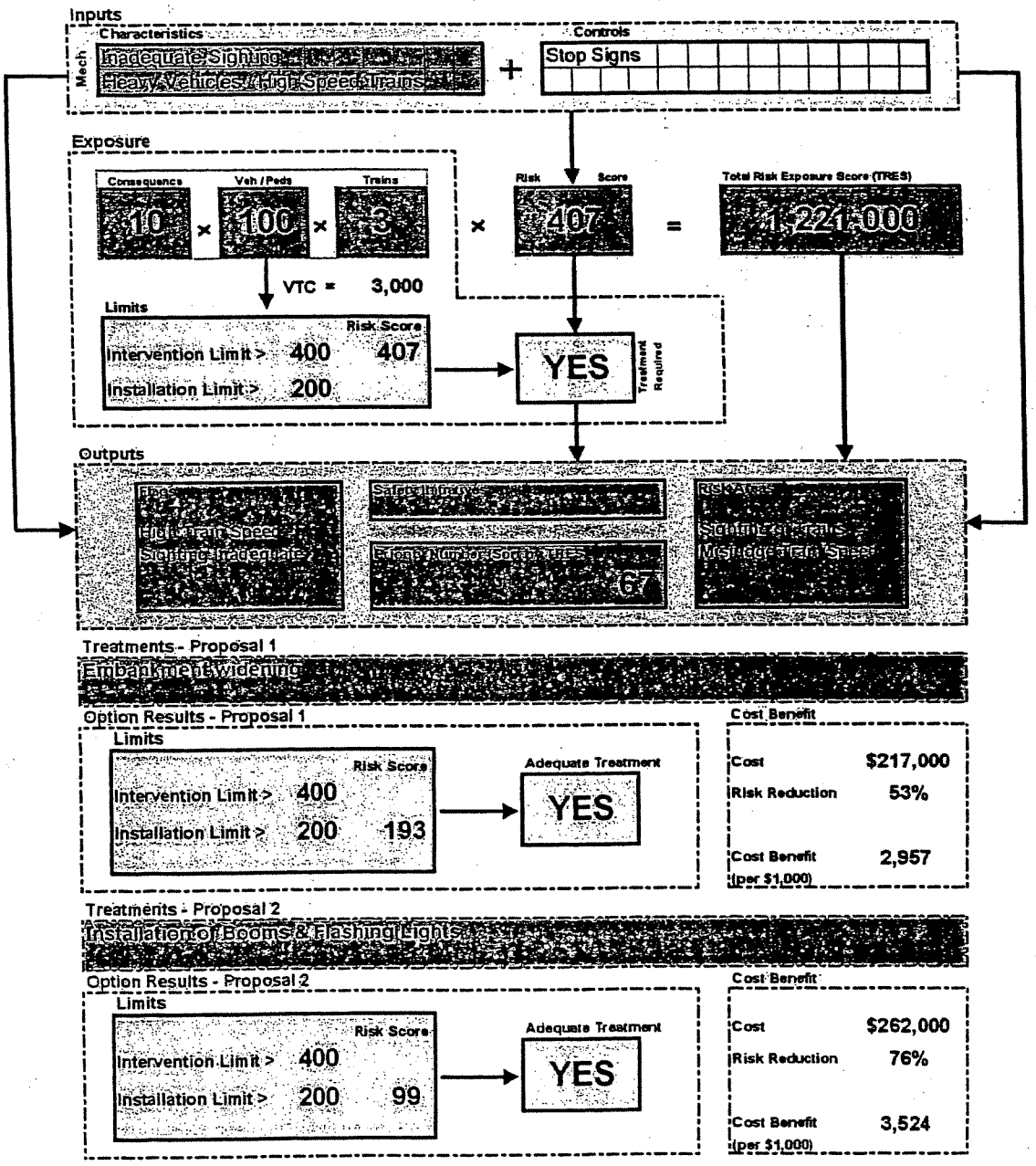
1. Peter Hughes, Neal Costello, Brett McClurg, Garry Marling, Queensland Level Crossing Risk Scoring System.1999.
2. Peter Hughes. A Risk assessment system for passive level crossing. Seventh International Symposium on Railroad – Highway Grade Crossing Research and Safety. 2002.
3. Peter Cairney, Thanuja Gunatillake, and Eirk Wigglesworth. Reducing collisions at passive railway level crossings in Australia. Number AP-R208/02. Ausroads Incorporated, Sydney, Australia, 2002.
4. Australian / New Zealand Standard – Risk Management (AS/NZS 4360:2004) & Risk Management Guidelines - Companion to AS/NZS 4360:2004 (HB 436:2004)
5. Risk & Reliability – An Introductory Text (6th Edition), Richard Robinson & Gaye Fransis, Melbourne, Australia, 2006.
6. Australian National Committee On Large Dams Incorporated (ANCOLD) – Guidelines on Risk Assessment, 2003

APPENDIX A

The diagram below illustrates the flow of information for a typical passive level crossing site. It shows a selection of the main inputs and outputs of the site as well as the critical figures which make up the comparative Total Risk Exposure Score. It also shows 2 proposals and their effects on the ALCAM outputs as well as their cost benefit. The diagram follows the process as described on pages 3 to 7 of the main text.

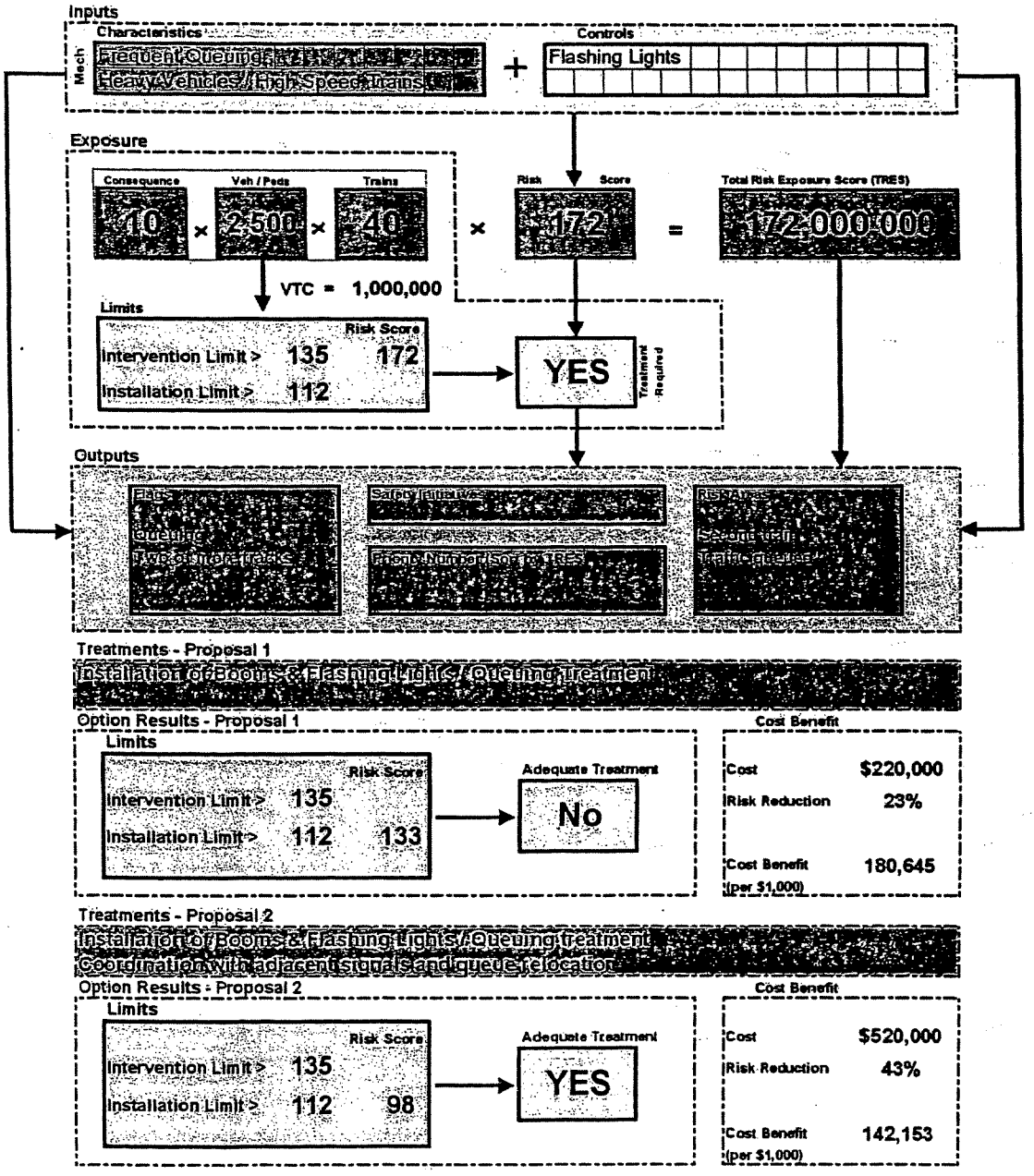
ALCAM Example - Typical Passive Site



APPENDIX B

The diagram below illustrates the flow of information for a typical active level crossing site. It shows a selection of the main inputs and outputs of the site as well as the critical figures which make up the comparative Total Risk Exposure Score. It also shows 2 proposals and their effects on the ALCAM outputs as well as their cost benefit. The diagram follows the process as described on pages 3 to 7 of the main text.

ALCAM Example - Typical Active Site



APPENDIX C

Road Crossings – Characteristics, Controls & Accident Mechanisms

Crossing Characteristics

- Frequency of equipment inspection
- Longest approach warning time
- Proximity to intersection control point, siding/shunting yard, station
- Possibility of short stacking or queuing from adjacent intersections
- Frequency of crossings along the road
- Number of lanes
- Vulnerability to road user fatigue
- Presence of adjacent distractions
- Condition / Visibility of traffic control at crossing
- Distance from advance warning to crossing
- Conformance with Australian Standards
- Heavy vehicle proportion
- Road traffic volume - two way
- Road traffic speed (approach speed 85th percentile)
- Train volume - two way (high / low)
- Seasonal / infrequent train patterns
- Slowest train speed at crossing (typical)
- Longest train length at crossing (typical)
- High Train Speed on approach to crossing
- Number of operational rail tracks
- Condition of road surface on immediate approach/departure (not Xing panel)
- Crossing panel on a hump, dip or rough surface
- S1 - advance visibility of crossing from road
- S2 - approach visibility to train (vehicle approaching crossing)
- S3 - visibility to train (vehicle stopped at crossing)
- Road / Rail effected by sun glare
- Temporary visual impediments - sighting of crossing / sighting of train

Crossing Controls

- Active protection - Half boom, flashing lights / Half boom, flashing lights (Duplicated)
- Active protection - Full boom, flashing lights
- Active protection - primary flashing lights / primary flashing lights (Duplicated)
- Passive protection - stop signs / stop signs (Duplicated)
- Passive protection - give way signs / give way signs (Duplicated)
- Passive protection - position markers only
- Rail operated gates at crossing
- "Do Not Queue" signs and cross hatching of crossing
- Backing boards / LED lights
- Hump / dip advisory sign to road user
- R6-25 signage (confederate flag)
- Train speed advisory sign to road user
- Overhead mounted (mast arm) traffic control
- SINGLE / DUPLICATED train activated advance warning (eg. flashing lights)

Crossing Controls (cont)

- SINGLE / DUPLICATED large passive advanced warning
- ADDITIONAL passive advanced warning (W7-4, W7-7)
- Vehicle activated advance warning (eg. strobe lights)
- Passive tactile advance warning (eg. rumble strips)
- Rail-X pavement marking
- Localised public education strategies / enforcement
- Red light camera
- CCTV surveillance
- Hand signallers (flagmen)
- Public response phone number
- Reschedule train to avoid conflict
- Whistle board / location board for train
- Reduce train speed sign (to achieve S2 & S3)
- Street lighting at crossing
- Maintenance program for vegetation etc
- Create extra lanes over crossing - to address queuing
- Central barrier posts/median on road approach
- Address short stacking – infrastructure / alternate access
- Vehicle escape zones
- Control of crossing (CCTV or on-site)
- Road traffic signals (active) / Coordinate with adjacent traffic signals
- Sign (active) for second train
- Detectors in crossing conflict zone
- Healthy state monitoring
- Queue relocation

Accident Mechanisms

- Competing stimuli (at the crossing)
- Could not see traffic control
- Could not see train from road approach (S2)
- Could not see train from at crossing (S3)
- Vandalism
- Failure (wrong side) of active protection
- Failure (right side) of active protection
- Shunting
- Simultaneous trains from both directions
- Crossing protection is ambiguous
- Fatigue
- Road standard / road driver expectation
- Unable to stop in time
- Vehicle stuck on tracks (infrastructure)
- Vehicle stopped on tracks (vehicle / driver behaviour)
- Traffic queued on tracks
- Long vehicle overhangs on tracks
- Racing train or misjudged train speed
- Driving through passive control without looking
- Driving through flashing lights
- Driving around boom gates

APPENDIX D

Pedestrian Crossings – Characteristics, Controls & Accident Mechanisms

Crossing Characteristics

- Frequency of equipment inspection
- Longest approach warning time
- Shortest approach warning time
- Presence of adjacent distractions (visual)
- Proximity to intersection control point, siding/shunting yard, station
- Proximity to licensed establishments / special event venue
- Proximity to school, playground aged care facility
- Ambient noise level / Audibility of alarm
- Conspicuity / Visibility of traffic control at crossing
- Volume of pedestrians
- Percentage of cyclists / wheelchairs
- Percentage of children
- Percentage of physically / sensory / intellectually impaired
- Train Volume
- Seasonal / infrequent train patterns
- Highest Train Speed at crossing (typical)
- Longest train length (typical)
- Number of operational rail tracks
- Pathway surface type
- Angle of crossing / width of flange gap
- Condition of crossing (fencing / path surface)
- Trains stand across crossing
- gradients, widths and manoeuvring space of pathway/maze
- Path approach alignment
- Conformance to Australian Standards
- Visibility of train from crossing
- Trains effected by sun glare
- Temporary visual impediments - sighting of train
- Masking of trains

Crossing Controls

- Swing gates
- Boom gates
- Manual Gates
- Maze
- Path only
- Visual alarm
- Audible alarm
- Visual and Audible alarm
- Signs only
- Adjacent boom gates and audio
- Adjacent visual and audio
- Adjacent boom gates and lights
- Adjacent lights
- Emergency egress with latch
- Emergency egress without latch
- No emergency egress
- Hand signallers

Crossing Controls (cont)

- Control of crossing (CCTV or on-site)
- Healthy state monitoring
- Police enforcement
- Public education strategies
- Public response phone number
- Supervision of children
- CCTV monitored
- Signage advising train speed
- "Do not stop on tracks" sign
- Signage "Crossing unsuitable for mobility devices"
- Sign (active) for second train
- Holding line (painted only)
- Delineation line marking (painted only)
- Tactile ground surface indicators (TGIS)
- Path lighting of crossing
- Maintenance program for vegetation etc
- LED's / Target boards
- Whistle boards
- Pavement marking of crossing
- Wing / funnel / guide fencing
- Funnel pathway
- Adjacent corridor fencing / four quadrant booms
- Advanced warning signs
- Change pathway alignment
- Increase path width and trafficability
- Train lights
- Reduce train speed sign to achieve sighting requirements

Accident Mechanisms

- Distracted
- Did not see train
- Did not hear train
- Incapable of recognition
- Did not see crossing
- Vandalism
- Failure (wrong side) of active protection
- Failure (right side) of active protection
- Simultaneous trains from both directions
- Misjudge where train would stop
- Shunting of trains
- Unable to stop in time
- Skylarking
- Caught in tracks
- Unable to cross quickly enough
- Trapped between automatic gates
- Racing train or misjudged train speed
- Ignoring warning signals / signs
- Crawling under / over wagons

Level Crossing Strategy Council
Yearly Report 2002/03

RAILINFRASTRUCTURE CORPORATION

RTA

MINISTRY OF TRANSPORT

Local Government Association of NSW

Shires Association of NSW

Chairman's Report

The LCSC has built on the achievements of the 2001/02 level crossing upgrade program by reducing safety risk at 137 level crossings in 2002/03. Over $4.9 Million was spent on level crossing safety during the year, not counting in-house staff or cost of grade separation.

2002/03 saw the Government commit to an acceleration of the level crossing upgrade program, with an additional $13 Million allocated over 4 years until 2007/08. It should be noted however, with over 3,800 level crossings in NSW, many of them on interstate track, the LCSC will continue to argue in national forums that the Commonwealth needs to contribute to quickly bring all level crossings into the twenty-first century.

2002/03 major achievements include the risk assessment of all public road / public rail level crossings (over 1400 sites), the establishment of a dedicated level crossing closures team (with 14 closures facilitated), and the successful continuation of the public press, billboard and radio education campaign to alert locals, especially in country areas, to the dangers of complacency when using level crossings.

While there were no fatal road accidents at NSW level crossings during the year, the LCSC was greatly assisted by the recommendations from two Coronial Inquiries and a NSW Parliamentary Staysafe Committee. The LCSC is indebted to these broad community efforts to investigate and understand how safety of road users and rail passengers can be improved. The LCSC is committed to implementing all the recommendations to the best of its ability

The LCSC has taken note of incidents interstate, with particular interest in the traffic queuing issues associated with the level crossing accident at Salisbury in Adelaide and the review of pedestrian requirements (particularly persons with disabilities) arising from incidents in Victoria.

NSW has achieved world's best practice by basing its risk reduction program on a model that prioritises where resources can best be deployed. This means that taxpayer dollars are targeted at the level crossings where there will be the greatest safety benefit.

The key to the success of the LCSC is that it ensures that State and local agencies responsible for level crossings speak and act collectively. That this simple arrangement generated such an impressive safety achievement is in large part due to the leadership of Michael Deegan who chaired the LCSC for the first nine months of the year.

JOHN LEE
Chairman

Content

Upgrade to Type-F Active Protection - Upper Burringbar West (Upper Burringbar Road)

Report prepared by the NSW Level Crossing Upgrade Project

Project Manager:	Derek Williams	(M) 0418 270 421
Risk Manager:	Chris Lees	(M) 0411 154 327
Construction Manager:	Godwin Camilleri	(M) 0418 117 365

Highlights

- 123 Sites Safety Upgraded
- 14 Level Crossings Closed
- Risk Assessments Carried Out
- ALCAM Group Formed
- LCAM Adopted Nationally
- Public Education and Awareness Program
- Staysafe Report
- Dedicated Closure Team
- Pedestrian Level Crossing Strategy
- Queuing Treatment

Highlights

123 sites safety upgraded	• 11 Major Upgrades. • 11 Advanced Warning Upgrades. • 101 Minor Upgrades. • Various levels of upgrade: from passive (Stop / Give Way signs) to active, from flashing lights to booms, installation of advanced warning lights, improved signage, LED retrofits, sighting improvements, other minor works. • Further 25 sites commenced in 2002/03 for completion in 2003/04.
14 level crossings closed	• Various locations across NSW. • Based on sites identified by RIC / SRA.
Risk assessments carried out on all public road / public rail level crossings in NSW	• LCAM (Level Crossing Assessment Model) priority listing established using available data. • 1,467 crossings assessed. • List now in use to determine the future program of works.
ALCAM group formed	• National group (Australian LCAM group) with a focus on the standardisation of risk assessment of level crossings nationally as well as a coordinated approach to the ongoing improvement of the LCAM. • Representatives from Queensland, New South Wales, Victoria, South Australia, Tasmania, and Northern Territory.
LCAM adopted nationally	• LCAM model endorsed by the Standing Committee on Transport (SCOT) and adopted nationally by the Australian Transport Council (ATC).
Public education and awareness program	• Funded and prepared jointly by RTA and RIC. • Aimed at improving awareness of risks at level crossings and changing driver behaviour.
Staysafe report	• 40 recommendations covering the management of level crossings in NSW. • Monitor progress on recommendations with review in 2007.
Dedicated closures team	• Joint RIC / DOT Team with a focus on the closure of level crossings. • Formal process introduced including community consultation.
Pedestrian level crossing strategy	• Development of the pedestrian LCAM commenced. • Consideration of disability standards for assessable public transport. • Initial report and database compiled of pedestrian crossings in NSW.
Queuing treatment development and implementation	• Motor vehicles queuing across level crossings has been identified as a high risk. • Queuing treatment consisting of signage and pavement marking developed by RTA. • Treatment implemented at 9 high-risk queuing level crossings across NSW.

Upgrade Program

- Upgrade Summary
- Upgrade Map
- Photo Gallery

Upgrade Program – Summary

The following maps illustrate the location of level crossing safety improvements carried out in the 2002/03 financial year along with a brief scope of works for each site. A summary table and description of improvement types is also included for ease of reference.

Summary of 2002/03 level crossing safety improvements

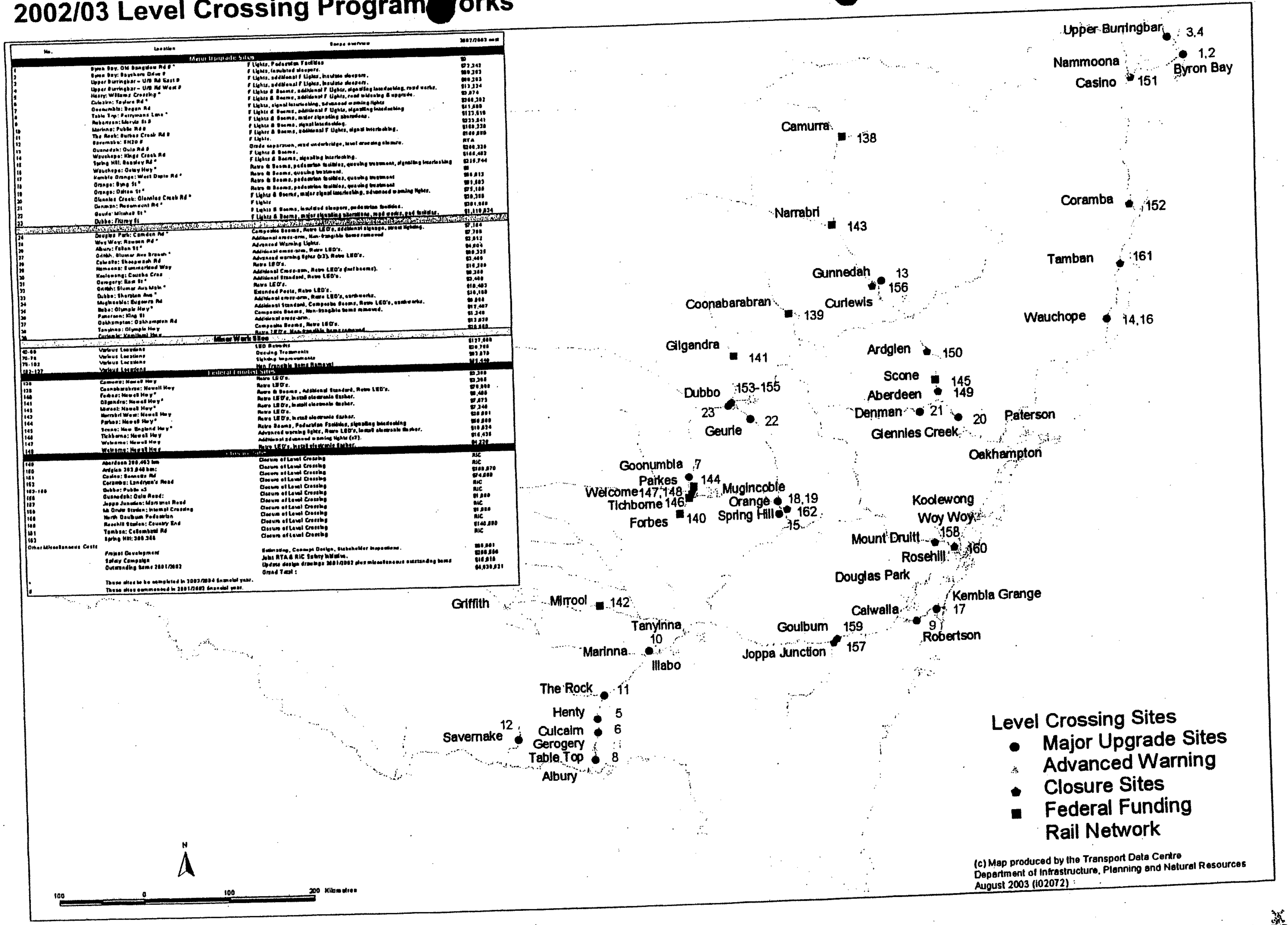
	Number of Sites Completed in 2002/03	Number of sites commenced in 2002/03 due for completion 2003/04	Dollars spent in 2002/03
Active Upgrade Sites	11	9	$3,613,213
Advanced Warning Sites	8	8	$196,478
Minor Works Sites	98	-	$305,877
Federal Funded Sites	6 (3 advanced warning / 3 minor works)	5 (2 major upgrade, 1 advanced warning, 2 minor works)	$227,372
Closure Sites	14	-	$316,070
TOTALS:	**138**	**25**	**$4,939,621**

Descriptions of Upgrade Types referred to on maps.

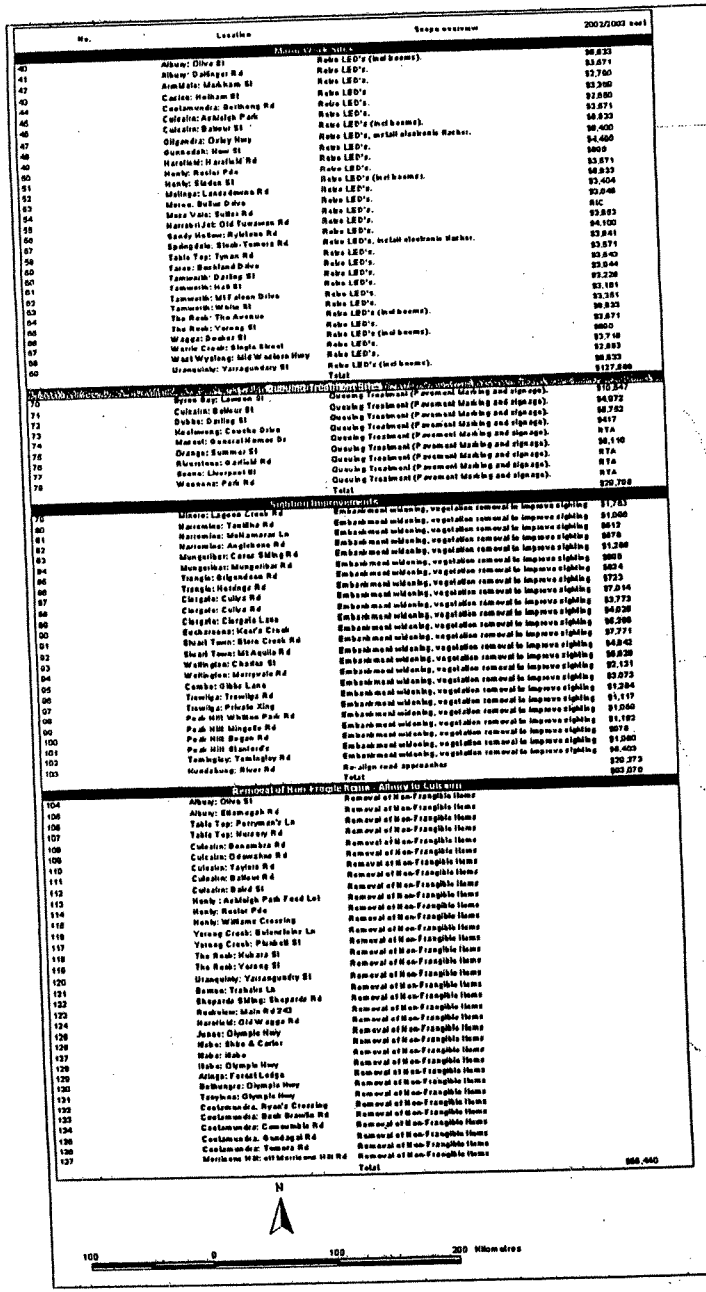
F Lights & Booms:	Type-F Flashing Lights and ½ Boom Barriers.
F Lights:	Type-F Flashing Lights.
Pedestrian Facilities:	Installation of / or improvements to pedestrian facilities adjacent to the road crossing.
Insulated Sleepers:	Installation of insulated steel sleepers or insulating biscuits as required for train detection on active level crossing upgrades
Signal Interlocking:	Signalling works to allow active crossing protection to interface with adjacent signal interlocking (eg. turnouts, loops, other crossings etc).
Road Works:	Road works in association with level crossing upgrade (eg road widening, new crossing track panel etc).
Advanced Warning Lights:	Train activated flashing amber lights positioned on the approach to the level crossing for the purpose of improving visibility of the level crossing active warning operation particularly on approaches with curves and/or other sighting constraints.
Additional Cross-arm	Additional set of red flashing lights on an existing light post to improve sighting of active protection from side street or curved approach.
Retro LED's	Change out of existing incandescent lamp units and replacement with high intensity Light Emitting Diode units providing improved visibility of the crossing in operation.
Queuing Treatment	Yellow crosshatched pavement marking on the crossing road surface in combination with "Keep Clear" signs.
Composite Booms	Replacement of existing ½ boom barrier arms with new composite boom arms.
Extended Post	Install extended post to allow for additional cross-arm.
Sighting Improvements	Embankment widening and vegetation removal to improve sighting of approaching trains for vehicles at the crossing.
Non-frangible Items Removal	Removal of non-frangible (rigid eg rail line post) items to reduce the risk of vehicles being crushed after impact with a train.
Closure of Level Crossing	Closure of level crossing to road vehicles.
Install Electronic Flasher	Installation of an electronic flasher unit to allow the installation of LED lamp units.
Realign Road Approaches	Realignment of road approaches to allow improved sighting of approaching trains for vehicles at the crossing.

2002/03 Level Crossing Program Works

No.	Location	Scope overview	2002/2003 cost
	Major Upgrade Sites		
1	Byron Bay: Old Bangalow Rd # *	F Lights, Pedestrian Facilities	$0
2	Byron Bay: Bayshore Drive #	F Lights, insulated sleepers.	$72,342
3	Upper Burringbar – U/B Rd East #	F Lights, additional F Lights, insulate sleepers.	$89,383
4	Upper Burringbar – U/B Rd West #	F Lights, additional F Lights, insulate sleepers.	$88,363
5	Henty: Williams Crossing *	F Lights & Booms, additional F Lights, signalling interlocking, road works.	$13,334
6	Culcairn: Taylors Rd *	F Lights & Booms, additional F Lights, road widening & upgrade.	$3,874
7	Goonumbla: Bogan Rd	F Lights, signal interlocking, advanced warning lights	$368,382
8	Table Top: Ferrymans Lane *	F Lights & Booms, additional F Lights, signalling interlocking	$11,600
9	Robertson: Mervin St #	F Lights & Booms, major signalling alterations.	$127,610
10	Marinna: Public Rd #	F Lights & Booms, signal interlocking.	$233,841
11	The Rock: Burkes Creek Rd #	F Lights & Booms, additional F Lights, signal interlocking.	$180,338
12	Savernake: SH20 #	F Lights.	$100,000
13	Gunnedah: Quia Rd #	Grade separation, road underbridge, level crossing closure.	RTA
14	Wauchope: Kings Creek Rd	F Lights & Booms.	$260,320
15	Spring Hill: Beasley Rd *	F Lights & Booms, signalling interlocking.	$166,483
16	Wauchope: Oxley Hwy *	Retro & Booms, pedestrian facilities, queuing treatment, signalling interlocking	$215,744
17	Kembla Grange: West Dapto Rd *	Retro & Booms, queuing treatment.	$0
18	Orange: Byng St *	Retro & Booms, pedestrian facilities, queuing treatment	$6,813
19	Orange: Dalton St *	Retro & Booms, pedestrian facilities, queuing treatment	$81,883
20	Glennies Creek: Glennies Creek Rd *	F Lights & Booms, major signal interlocking, advanced warning lights.	$75,100
21	Denman: Rosemount Rd *	F Lights	$30,300
22	Geurie: Mitchell St *	F Lights & Booms, insulated sleepers, pedestrian facilities.	$301,000
23	Dubbo: Fitzroy St	F Lights & Booms, major signalling alterations, road works, ped facilities.	$1,119,834
	[illegible]		
24	Douglas Park: Camden Rd *	Composite Booms, Retro LED's, additional signage, street lighting.	$7,164
25	Woy Woy: Rawson Rd *	Additional cross-arm, Non-frangible items removed	$7,788
26	Albury: Fallon St *	Advanced Warning Lights.	$2,812
27	Griffith: Blumer Ave Branch *	Additional cross-arm, Retro LED's.	$4,804
28	Calwalla: Sheepwash Rd	Advanced warning lights (x2), Retro LED's.	$9,335
29	Nammoona: Summerland Way	Retro LED's.	$3,460
30	Koolewong: Coucha Cres	Additional Cross-arm, Retro LED's (incl booms).	$14,380
31	Gerogery: East St *	Additional Standard, Retro LED's.	$9,388
32	Griffith: Blumer Ave Main *	Retro LED's.	$3,400
33	Dubbo: Sheraton Ave *	Extended Posts, Retro LED's.	$18,483
34	Muginecoble: Eugowra Rd	Additional cross-arm, Retro LED's, earthworks.	$16,180
35	Bobo: Olympic Hwy *	Additional Standard, Composite Booms, Retro LED's, earthworks.	$9,814
36	Paterson: King St	Composite Booms, Non-frangible items removed.	$17,467
37	Oakhampton: Oakhampton Rd	Additional cross-arm.	$1,340
38	Tanyinna: Olympic Hwy	Composite Booms, Retro LED's.	$13,870
39	Curlewis: Kamilaroi Hwy	Retro LED's, Non-frangible items removed.	$18,850
	Minor Work Sites		
40-69	Various Locations	LED Retrofits	$127,600
70-74	Various Locations	Queuing Treatments	$28,788
75-102	Various Locations	Sighting Improvements	$83,879
103-137	Various Locations	Non Frangible Items Removal	$41,440
	Federal Funded Sites		
138	Camurra: Newell Hwy	Retro LED's.	$3,398
139	Coonabarabran: Newell Hwy	Retro LED's.	$3,388
140	Forbes: Newell Hwy *	Retro & Booms, Additional Standard, Retro LED's.	$70,000
141	Gilgandra: Newell Hwy *	Retro LED's, install electronic flasher.	$8,406
142	Mirrool: Newell Hwy *	Retro LED's, install electronic flasher.	$7,873
143	Narrabri West: Newell Hwy	Retro LED's.	$7,340
144	Parkes: Newell Hwy *	Retro LED's, install electronic flasher.	$28,891
145	Scone: New England Hwy *	Retro Booms, Pedestrian Facilities, signalling interlocking	$60,000
146	Tichborne: Newell Hwy	Advanced warning lights, Retro LED's, install electronic flasher.	$10,834
147	Welcome: Newell Hwy	Additional advanced warning lights (x2).	$16,430
148	Welcome: Newell Hwy	Retro LED's, install electronic flasher.	$4,270
	Closure Sites		
149	Aberdeen 288.463 km	Closure of Level Crossing	RIC
150	Ardglen 383.840 km:	Closure of Level Crossing	RIC
151	Casino: Bennetts Rd	Closure of Level Crossing	$188,870
152	Coramba: Landrigan's Road	Closure of Level Crossing	$74,000
153-155	Dubbo: Public x3	Closure of Level Crossing	RIC
156	Gunnedah: Quia Road:	Closure of Level Crossing	RIC
157	Joppa Junction: Marsmai Road	Closure of Level Crossing	$1,800
158	Mt Druitt Station: Internal Crossing	Closure of Level Crossing	RIC
159	North Goulburn Pedestrian	Closure of Level Crossing	$1,800
160	Rosehill Station: Country End	Closure of Level Crossing	RIC
161	Tamban: Cellambul Rd	Closure of Level Crossing	$140,000
162	Spring Hill: 300.348	Closure of Level Crossing	RIC
Other Miscellaneous Costs			
	Project Development	Estimating, Concept Design, Stakeholder inspections.	$85,881
	Safety Campaign	Joint RTA & RIC Safety Initiative.	$288,566
	Outstanding Items 2001/2002	Update design drawings 2001/2002 plus miscellaneous outstanding items	$18,818
		Grand Total :	$4,038,831
*	These sites to be completed in 2003/2004 financial year.		
#	These sites commenced in 2001/2002 financial year.		



2002/03 Level Crossing Program Works – Minor Works Sites



No.	Location	Scope overview	2002/2003 cost
	Minor Works Sites		
40	Albury: Olive St	Retro LED's (incl booms).	$8,833
41	Albury: Dalinger Rd	Retro LED's.	$3,671
42	Armidale: Markham St	Retro LED's.	$3,760
43	Casino: Canada St	Retro LED's.	$3,360
44	Castlemaine: Barthong Rd	Retro LED's.	$3,880
45	Culcairn: Ashleigh Park	Retro LED's.	$3,671
46	Culcairn: Balmoral St	Retro LED's (incl booms).	$8,833
47	Gilgandra: Oxley Hwy	Retro LED's, install electronic flasher.	$8,400
48	Gunnedah: New St	Retro LED's.	$4,400
49	Haroldsm: Harefield Rd	Retro LED's.	$800
50	Henty: Hester Pde	Retro LED's.	$3,671
51	Henty: Station St	Retro LED's (incl booms).	$8,833
52	Mellings: Lansdowne Rd	Retro LED's (incl booms).	$3,404
53	Moree: Butler Drive	Retro LED's.	$2,048
54	Moss Vale: Sutton Rd	Retro LED's.	$16
55	Narrabri Jct: Old Turrawan Rd	Retro LED's.	$3,883
56	Sandy Hollow: Rylstone Rd	Retro LED's.	$4,100
57	Springdale: Stock Yamess Rd	Retro LED's.	$3,841
58	Table Top: Tynan Rd	Retro LED's, install electronic flasher.	$3,671
59	Taree: Buckland Drive	Retro LED's.	$3,840
60	Tamworth: Darling St	Retro LED's.	$3,844
61	Tamworth: Hill St	Retro LED's.	$3,228
62	Tamworth: Mitchell Drive	Retro LED's.	$3,181
63	Tamworth: White St	Retro LED's.	$3,381
64	The Rock: The Avenue	Retro LED's (incl booms).	$8,833
65	The Rock: Yerong St	Retro LED's.	$3,671
66	Wagga: Docker St	Retro LED's (incl booms).	$800
67	Werris Creek: Single Street	Retro LED's.	$3,748
68	West Wyalong: Old Wyalong Hwy	Retro LED's.	$3,893
69	Uranquinty: Yarranguddy St	Retro LED's (incl booms).	$8,833
70	Byron Bay: Lawson St	Queuing Treatment (Pavement Marking and signage).	$137,800
71	Culcairn: Balmoral St	Queuing Treatment (Pavement Marking and signage).	$10,547
72	Dubbo: Darling St	Queuing Treatment (Pavement Marking and signage).	$4,972
73	Heathcote: Cronulla Drive	Queuing Treatment (Pavement Marking and signage).	$8,783
74	Muswellbrook: Bridge St	Queuing Treatment (Pavement Marking and signage).	$417
75	Orange: Summer St	Queuing Treatment (Pavement Marking and signage).	RTA
76	Riverstone: Garfield Rd	Queuing Treatment (Pavement Marking and signage).	RTA
77	Scone: Liverpool St	Queuing Treatment (Pavement Marking and signage).	RTA
78	Woonona: Park Rd	Queuing Treatment (Pavement Marking and signage).	$20,798
		Total	$210,547
	Sighting Improvements		
79	Diamond: Lagoon Creek Rd	Embankment widening, vegetation removal to improve sighting	$17,670
80	Narromine: Tomiha Rd	Embankment widening, vegetation removal to improve sighting	$1,000
81	Narromine: McNamaras Ln	Embankment widening, vegetation removal to improve sighting	$612
82	Narromine: Angledoore Rd	Embankment widening, vegetation removal to improve sighting	$878
83	Mungeribar: Cerar Siding Rd	Embankment widening, vegetation removal to improve sighting	$1,288
84	Mungeribar: Mungeribar Rd	Embankment widening, vegetation removal to improve sighting	$868
85	Trangie: Gilgandra Rd	Embankment widening, vegetation removal to improve sighting	$824
86	Trangie: Nolodgi Rd	Embankment widening, vegetation removal to improve sighting	$723
87	Clergate: Cullen Rd	Embankment widening, vegetation removal to improve sighting	$7,814
88	Clergate: Cullen Rd	Embankment widening, vegetation removal to improve sighting	$3,773
89	Clergate: Cullen Rd	Embankment widening, vegetation removal to improve sighting	$4,828
90	Clergate: Clergate Lane	Embankment widening, vegetation removal to improve sighting	$6,288
91	Euchareena: Kent's Creek	Embankment widening, vegetation removal to improve sighting	$7,771
92	Stuart Town: Stuart Creek Rd	Embankment widening, vegetation removal to improve sighting	$4,842
93	Stuart Town: Mt Aquila Rd	Embankment widening, vegetation removal to improve sighting	$5,828
94	Wellington: Chester St	Embankment widening, vegetation removal to improve sighting	$2,131
95	Wellington: Montpeate Rd	Embankment widening, vegetation removal to improve sighting	$3,073
96	Combo: Obbo Lane	Embankment widening, vegetation removal to improve sighting	$1,284
97	Trewilga: Trewilga Rd	Embankment widening, vegetation removal to improve sighting	$1,117
98	Trewilga: Private Xing	Embankment widening, vegetation removal to improve sighting	$1,060
99	Peak Hill: Whitton Park Rd	Embankment widening, vegetation removal to improve sighting	$1,192
100	Peak Hill: Mingelo Rd	Embankment widening, vegetation removal to improve sighting	$878
101	Peak Hill: Bryan Rd	Embankment widening, vegetation removal to improve sighting	$1,080
102	Peak Hill: Glanfords	Embankment widening, vegetation removal to improve sighting	$4,403
103	Tomingley: Tomingley Rd	Embankment widening, vegetation removal to improve sighting	$20,373
	Kundabung: River Rd	Realign road approaches	$63,870
		Total	$163,870
	Removal of Non-fragile Items - Albury to Culcairn		
104	Albury: Olive St	Removal of Non-Fragile Items	
105	Albury: Ellamogah Rd	Removal of Non-Fragile Items	
106	Table Top: Perrymans Ln	Removal of Non-Fragile Items	
107	Table Top: Nursery Rd	Removal of Non-Fragile Items	
108	Culcairn: Benambra Rd	Removal of Non-Fragile Items	
109	Culcairn: Gerrahae Rd	Removal of Non-Fragile Items	
110	Culcairn: Taylors Rd	Removal of Non-Fragile Items	
111	Culcairn: Balmoral Rd	Removal of Non-Fragile Items	
112	Culcairn: Baird St	Removal of Non-Fragile Items	
113	Henty: Ashleigh Park Feed Lot	Removal of Non-Fragile Items	
114	Henty: Hester Pde	Removal of Non-Fragile Items	
115	Henty: Williams Crossing	Removal of Non-Fragile Items	
116	Yerong Creek: Bolenbaker Ln	Removal of Non-Fragile Items	
117	Yerong Creek: Plunkett St	Removal of Non-Fragile Items	
118	The Rock: Hubatz St	Removal of Non-Fragile Items	
119	The Rock: Yerong St	Removal of Non-Fragile Items	
120	Uranquinty: Yarranguddy St	Removal of Non-Fragile Items	
121	Bomen: Tabalong Ln	Removal of Non-Fragile Items	
122	Shepards Siding: Shepards Rd	Removal of Non-Fragile Items	
123	Rockview: Main Rd 243	Removal of Non-Fragile Items	
124	Harefield: Old Wagga Rd	Removal of Non-Fragile Items	
125	Jones: Olympic Hwy	Removal of Non-Fragile Items	
126	Nobs: Shire & Carter	Removal of Non-Fragile Items	
127	Nobs: Nobs	Removal of Non-Fragile Items	
128	Nobs: Olympic Hwy	Removal of Non-Fragile Items	
129	Adelga: Forest Lodge	Removal of Non-Fragile Items	
130	Bethungra: Olympic Hwy	Removal of Non-Fragile Items	
131	Tarcylna: Olympic Hwy	Removal of Non-Fragile Items	
132	Castlemaine: Ryan's Crossing	Removal of Non-Fragile Items	
133	Castlemaine: Back Bramlia Rd	Removal of Non-Fragile Items	
134	Castlemaine: Castlemaine Rd	Removal of Non-Fragile Items	
135	Castlemaine: Gundagai Rd	Removal of Non-Fragile Items	
136	Castlemaine: Tumora Rd	Removal of Non-Fragile Items	
137	Merriwa NR: off Merriwa NR Rd	Removal of Non-Fragile Items	
		Total	$66,440

Upgrade Program – Photo Gallery

BYRON BAY
BAYSHORE DRIVE

Previous protection: Stop signs (urban area)
Upgrade: Type F lights
Road authority: Byron Shire Council
Comments:

UPPER BURRINGBAH
U/B ROAD EAST

Previous protection: Stop signs (rural area)
Upgrade: Type F lights
Road authority: Tweed Shire Council.
Comments:

- Modified bell installation as requested by community.

UPPER BURRINGBAH
U/B ROAD WEST

Previous protection: Stop signs (rural area)
Upgrade: Type F lights
Road authority: Tweed Shire Council
Comments:

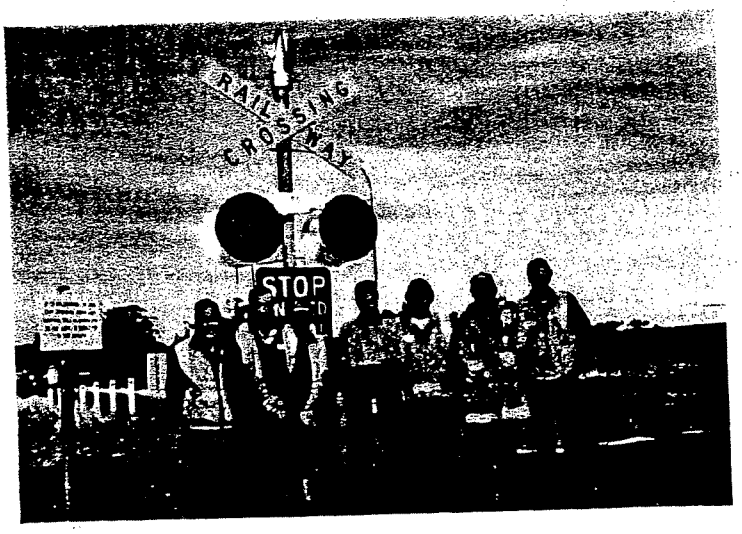
- Additional lights due to curved approach

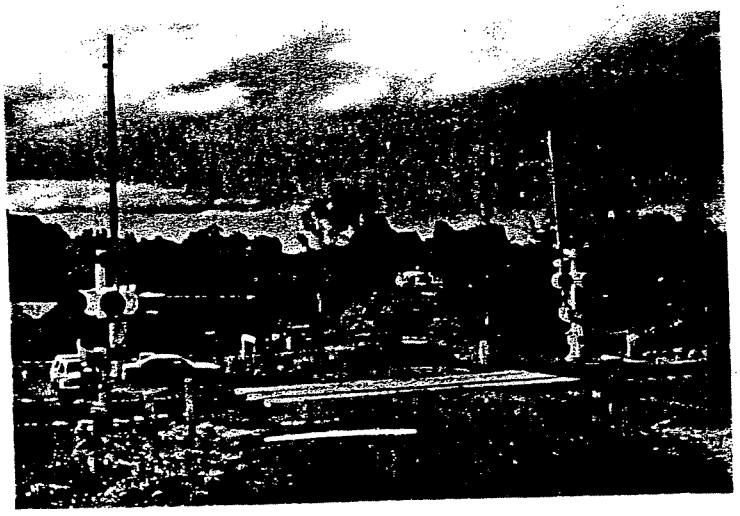
Upgrade Program – Photo Gallery

GOONUMBLA
BOGAN ROAD

Previous protection: Give Way signs (rural area)
Upgrade: Type F lights, booms, advanced warning lights.
Road authority: Parkes Shire Council
Comments:

- Solar power used
- Advanced warning lights installed due to road conditions (heavy vehicles, high speed) and occurrence of fog
- Funding contribution Jointly by Parkes Shire Council and Nth Parkes Mine.





ROBERTSON
MERYLA STREET

Previous protection: Stop signs (urban area)
Upgrade: Type F lights, booms
Road authority: Wingecarribee Shire Council
Comments:

- Previous fatality at the crossing.
- Half booms installed due to the occurrence of fog.

MARINNA
PUBLIC ROAD

Previous protection: Stop signs (rural area)
Upgrade: Type F lights, booms
Road authority: Junee Shire Council
Comments:

- Double Track / High Speed.
- First double track grade crossing predictor installed in NSW.
- Additional lights due to alignment of approach roads.

Upgrade Program – Photo Gallery

THE ROCK
BURKES CREEK ROAD

Previous protection: Stop signs (rural area)
Upgrade: Type F lights, booms
Road authority: Wagga Wagga City Council
Comments:

- High speed corridor
- Additional lights due to alignment of approach roads.

SAVERNAKE
STATE HIGHWAY 20

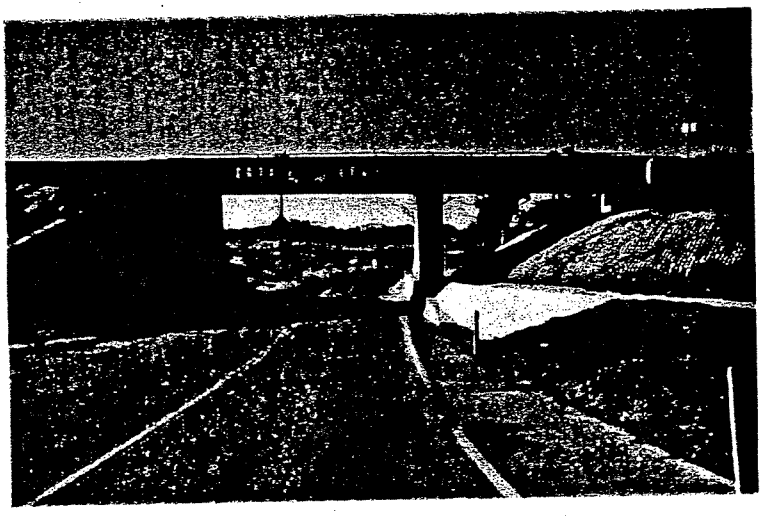
Previous protection: Stop signs (rural area)
Upgrade: Type F lights
Road authority: RTA
Comments:

- Broad gauge Victorian network.
- Constructed by VIC Track.

GUNNEDAH
QUIA ROAD

Previous protection: Stop signs (urban/rural area)
Upgrade: Grade Separation
Road authority: Gunnedah Shire Council
Comments:

- Road underpass upgraded.
- Quia Rd level crossing closed.



Upgrade Program – Photo Gallery

WAUCHOPE
KINGS CREEK ROAD

Previous protection: Stop signs (urban/rural area)
Upgrade: Type F lights, booms
Road authority: Hastings Shire Council
Comments:

- High speed corridor.
- Recorded near miss prior to installation of active protection.

DUBBO
FITZROY STREET

Previous protection: Stop signs, rail operated gates (urban area)
Upgrade: Type F lights, booms, road works
Road authority: Dubbo City Council
Comments:

- Multiple lines.

DOUGLAS PARK
CAMDEN ROAD

Previous protection: Booms (urban area)
Upgrade: Retro fit composite booms / install LED's
Road Authority: Wollondilly Shire Council.
Comments:

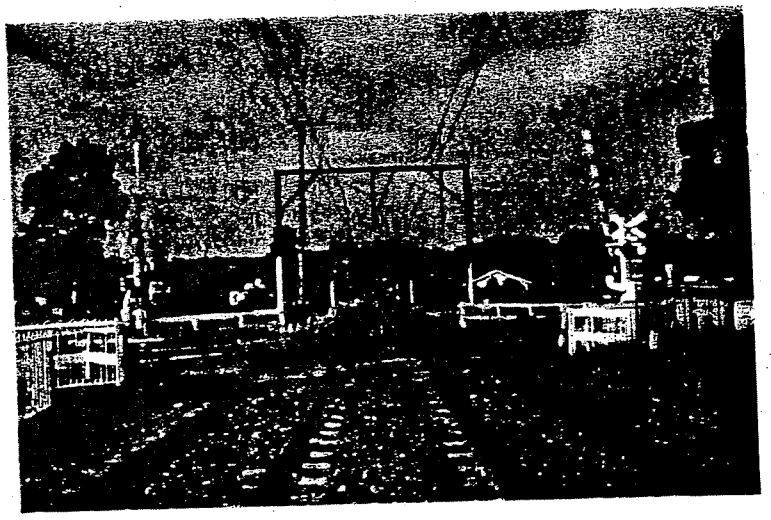
- Signage improvements.
- Queuing treatment to be installed in 2003/04.

Upgrade Program – Photo Gallery

WOY WOY
RAWSON ROAD

Previous protection: Booms (Metro area)
Upgrade: Install LED's , Additional lights
Road authority: Gosford City Council
Comments:

- High speed corridor



CALWALLA
SHEEPWASH ROAD

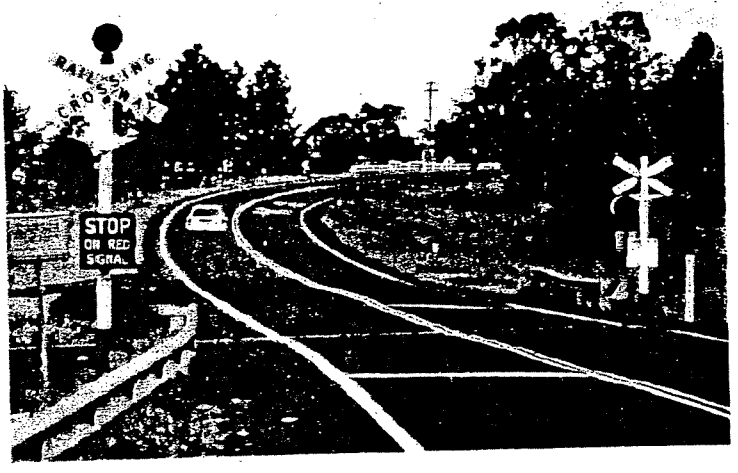
Previous protection: Type F (100km/hr area)
Upgrade: Advanced Warning Lights
Road authority: Wingecarribee Shire Council
Comments:

- High speed road.
- Susceptible to fog.

NAMOONA
SUMMERLAND WAY

Previous protection: Type F (100kmh area)
Upgrade: LED Upgrade
Road authority: RTA (Richmond Valley Shire Council)
Comments:

- Previous fatality
- Curved approach Northbound

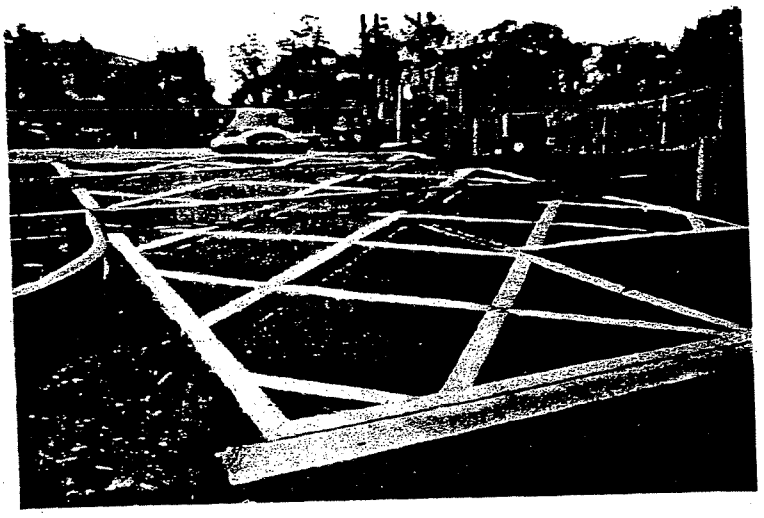


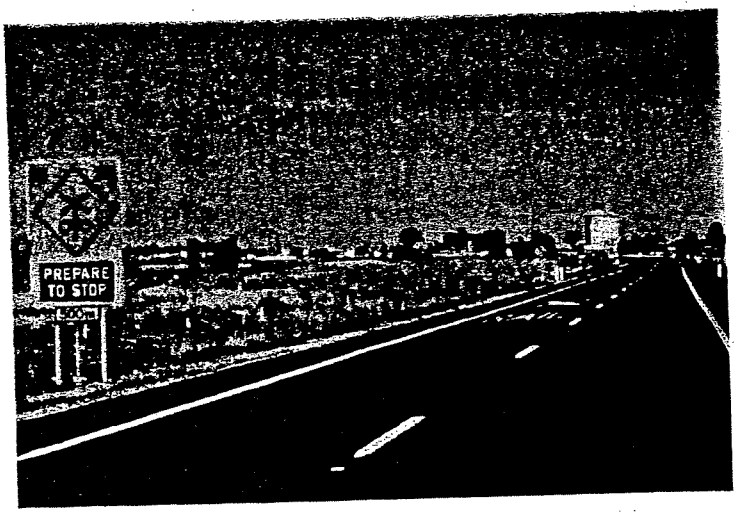
Upgrade Program – Photo Gallery

KOOLEWONG
COUCHE CRESENT

Previous protection: Booms (Metro area)
Upgrade: LED's, Queuing Treatment, Additional lights.
Road authority: Gosford City Council
Comments:

- Pedestrian and traffic improvements proposed in 2003/04.





TICHBOURNE
NEWELL HIGHWAY

Previous protection: Type F (100kmh area)
Upgrade: Additional Advanced Warning Lights
Road authority: RTA (Parkes Shire Council)
Comments:

- Significant level of heavy vehicles.
- History of incidents.
- High road speed.

WELCOME
NEWELL HIGHWAY

Previous protection: Type F (100kmh area)
Upgrade: Additional Advanced Warning Lights
Road authority: RTA (Parkes Shire Council)
Comments:

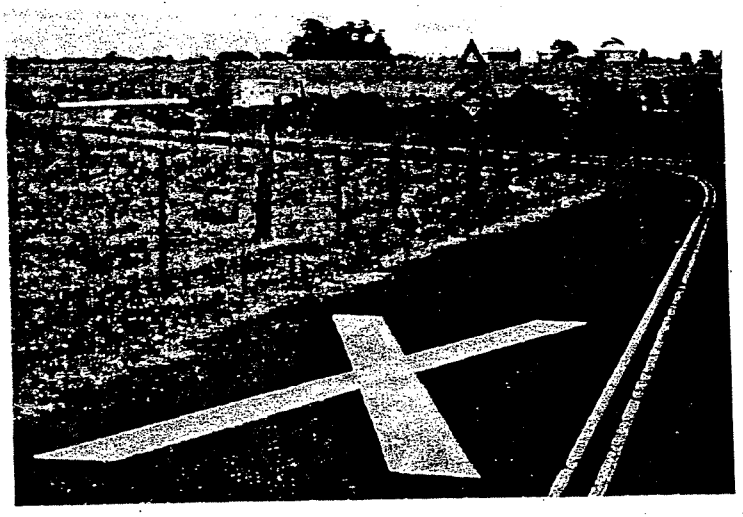
- Significant level of heavy vehicles.
- History of incidents.
- High road speed.

Upgrade Program – Photo Gallery

OAKHAMPTON
OAKHAMPTON ROAD

Previous protection: Type F (rural area)
Upgrade: LED's, Additional Lights.
Road authority: Maitland City Council
Comments:

- Curved road approaches



CURLEWIS
KAMILAROI HIGHWAY

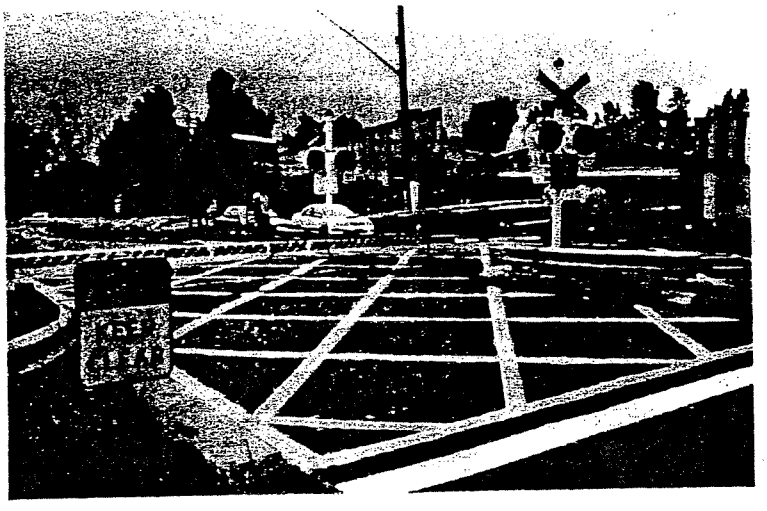
Previous protection: Type F (100kmh area)
Upgrade: LED's, Improved signage.
Road authority: RTA (Gunnedah Shire Council)
Comments:

- Curved road approaches

MASCOT
GENERAL HOLMES DRIVE

Previous protection: Booms (Metro area)
Upgrade: Queuing Treatment
Road authority: RTA.
Comments:

- High traffic urban site.

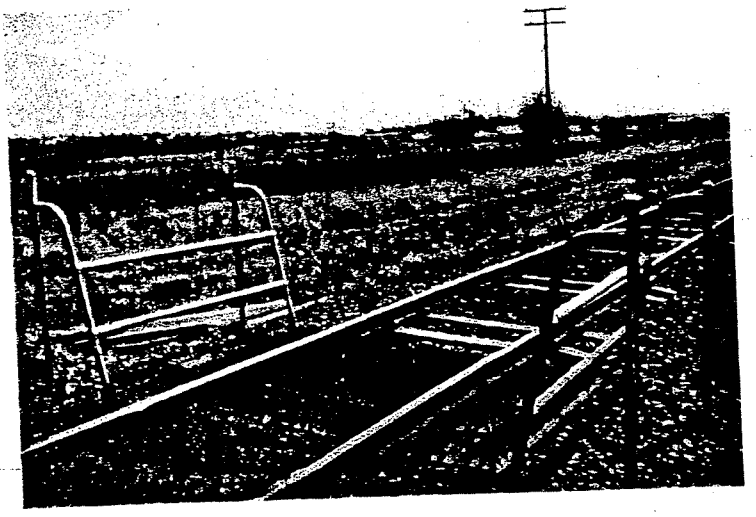


Upgrade Program – Photo Gallery

BOMEN
TRAHAIRS LANE

Previous protection: Stop signs (rural area)
Upgrade: Removal/Replacement of Non-Frangible Items.
Road authority: Wagga Wagga City Council
Comments:

- Previous rail post cattle grid hazard to motorists.
- High speed corridor.



TAMBAN LEVEL CROSSING CLOSURE

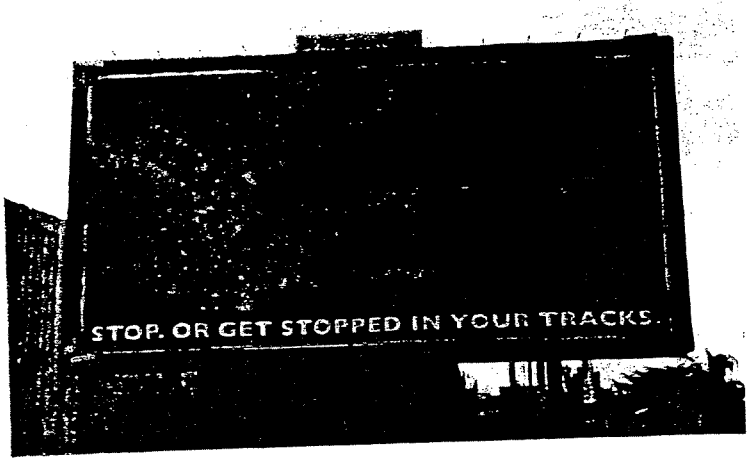
Previous protection: Stop signs
Closure: Crossing closed to road traffic
Comments:

- Alternated access provided.

PUBLIC EDUCATION STRATEGY

"Stop or Get Stopped in Your Tracks" Billboard and Radio campaign

- Joint RTA / RIC funding
- Proposed yearly campaign to reinforce message.



Achievements

- Table of Achievements

Table of Achievements

Level Crossing Assessment Model	• LCAM development under way with the aim of improving assessment outcomes. • Independent Verification of NSW LCAM carried out – minor improvements recommended. • Commencement of a national workshop to fine tune the LCAM and implement a standard national risk assessment model.
Working List	• Risk assessments carried out at all intersections between public roads and public rail (standard gauge) lines currently in use in NSW. • Priority order listing of all public roads/rail level crossings identifying existing characteristics and controls as well as proposed treatments and budgets used to manage the upgrade program and report to the LCSC.
Public release of LCAM Working List	• Details future upgrade sites based on priorities. • Proposed distribution to stakeholders.
Additional state funding	• Additional funding announced for level crossing upgrades of $13M over the next 4 years. • Total program funding now $23M over 4 years.
Federal funding	• Federal Funding of $270K in 2002/03 and $560K in 2003/04 for improvements on National Highways.
Public education and awareness program	• Development of a public awareness program targeting driver behaviour. • Program carried out with a billboard and radio campaign. • Focus group testing with Positive outcomes achieving the original goals.
Level crossing closures team	• Dedicated closures team introduced with the focus on level crossing closures. • 14 Level Crossings Closed.

Table of Achievements (cont)

Close-out process	• Process developed and implemented to ensure the close out of issues raised in relation to level crossing safety. • Close our register maintained by LCSC secretariat.
Pedestrian report	• Identifies issues associated with pedestrian crossings. • First cut database of pedestrian crossings in NSW. • Recommendations for future strategy.
Pedestrian disability issues	• SKM report to Victorian Department of Infrastructure. • Impact on design of pedestrian facilities. • Additional information being gathered.
Pedestrian level crossing standards forum	• Level of protection to be applied. • Impact of high speed lines. • Disability Issues.
Pedestrian assessment model	• Development commenced. • In conjunction with ALCAM group.
Queuing treatment	• Development by the RTA of a NSW Standard for the application of queuing treatment at level crossings, including road surface painting and associated signage. • Application of queuing treatment at 9 sites identified as potential queuing locations.
Culcairn Shire study	• Road/Rail study under way to review the requirements of rail crossings in the Culcairn Shire. • "Whole of Shire" strategy. • High speed closed corridor principles to be considered. • Options to be prepared for consideration by stakeholders.

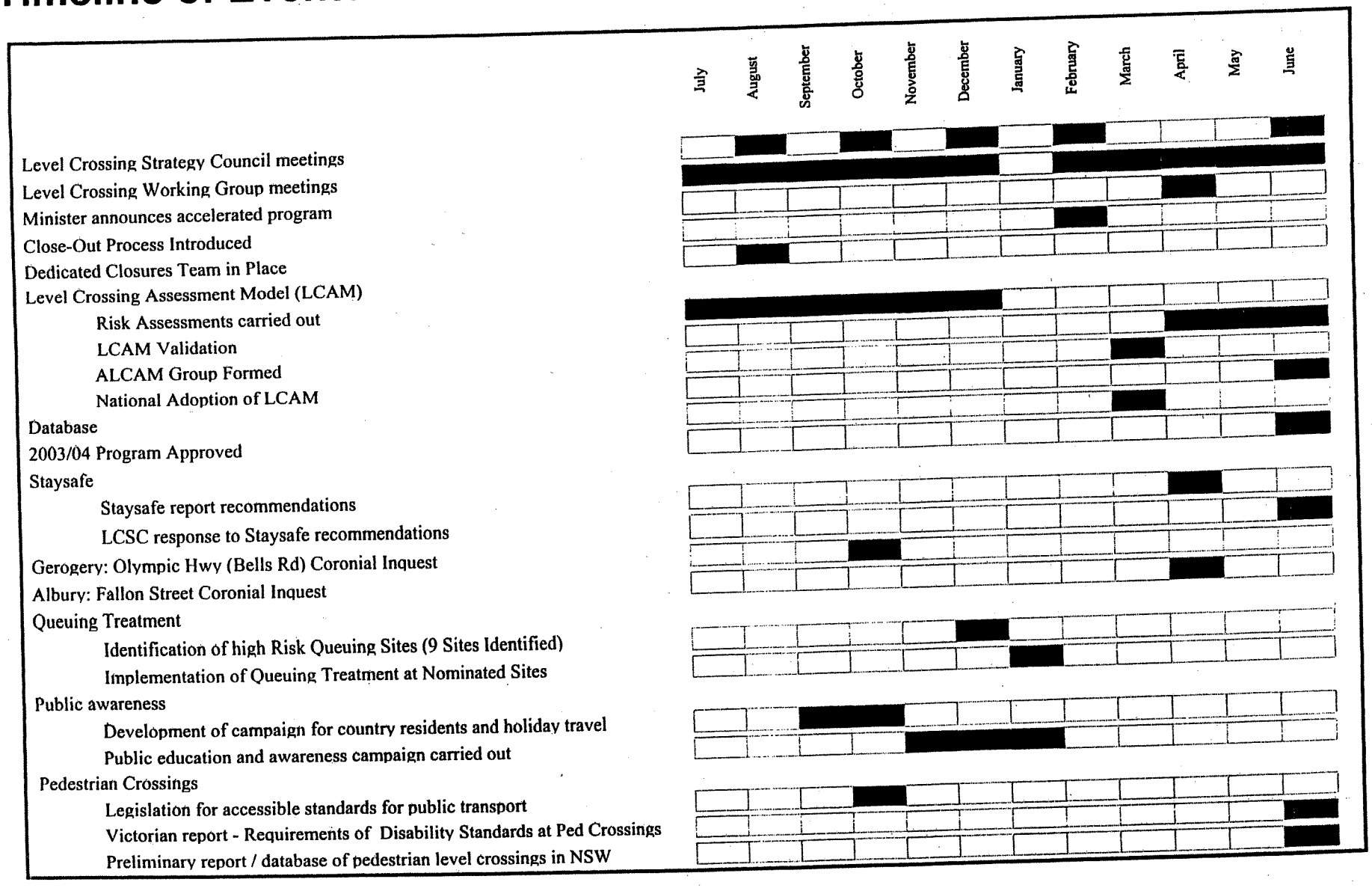
Table of Achievements (cont)

Corridor approach to improvements commenced	• LED installations completed Wagga to Albury. • Non-frangible items removed Cootamundra to Albury.
Program of minor works safety improvements	• An initiative to remove Non-Frangible Items in the section of track from Cootamundra to Albury on the Main South. • Implementation of a program of sighting improvements in the West involving embankment widening and the removal of unwanted vegetation to improve sighting of oncoming trains. • Upgrade of 30 Active crossing from incandescent lights to LED's to achieve greater visibility and reliability.
Gerogery Coronial Inquiry	• Submission to coronial. • Assessment and implementation of recommendations.
Albury Coronial Inquiry	• Submission to coronial. • Assessment and implementation of recommendations.
Review of guardrail use at level crossings	• RTA recognise safety issues with use of guard rails. • RTA / RIC working together to develop new guide post delineation treatment.
LCSC / LCWG co-operation	• Program activity supported by committee members. • Entities working together to deliver outcomes.
Outsourcing of Signal Design	• Used to supplement RIC resources. • Assists delivery of accelerated program.

Chronology

- Timeline of Events.

Timeline of Events



Annual Incident Report

- Fatal Train / RMV Collisions
- Minor Train / RMV Collisions
- RMV Driver Carelessness
- Vandalism
- Other Recorded Incidents

2002/03 Level Crossing Incident Summary

Issue:

- Level crossing incidents between 1 July 2002 and 30 June 2003

For information:

- Provide a summary of reported major level crossing incidents for the above period.

Important facts:

- 7Train/RMV collisions recorded (1 SRA XPT, 5 Freight, 1 RIC track machine)
  - only minor injuries reported
- 33 broken boomgate incidents caused by vehicles
  - 7 relate to Pine Road, Fairfield
- 29 "near miss" incidents
  - 5 incidents where RMV deliberately drove around boomgates (1 NSWFB)
- 1 incident where RMV "playing chicken"
- 4 incidents reported where vehicle blocking rail lines
- 34 vandalism incidents recorded

Comment:

- The blocked crossing, "near miss" and broken boom gate incidents are all potential collision occurrences.
- A disturbing aspect is the deliberate behaviour of driving around boom gates. All 5 incidents were reported in the Newcastle/Hunter region.
  - NSWFB have investigated the incident and suspended the driver
  - Penalty Infringements issued are to be obtained from the Infringement Bureau if data is available
- Due to the nature of the data, it has not been determined if these figures indicate trends or better incident reporting

Close out process:

- As indicated at the 19 June LCSC a number of actions proposed to the LCSC to address such occurrences are :
  1. Increased public awareness advertising
  2. Increased enforcement focus by all agencies to ensure prosecution, in line with the increased penalties introduced in January 2003

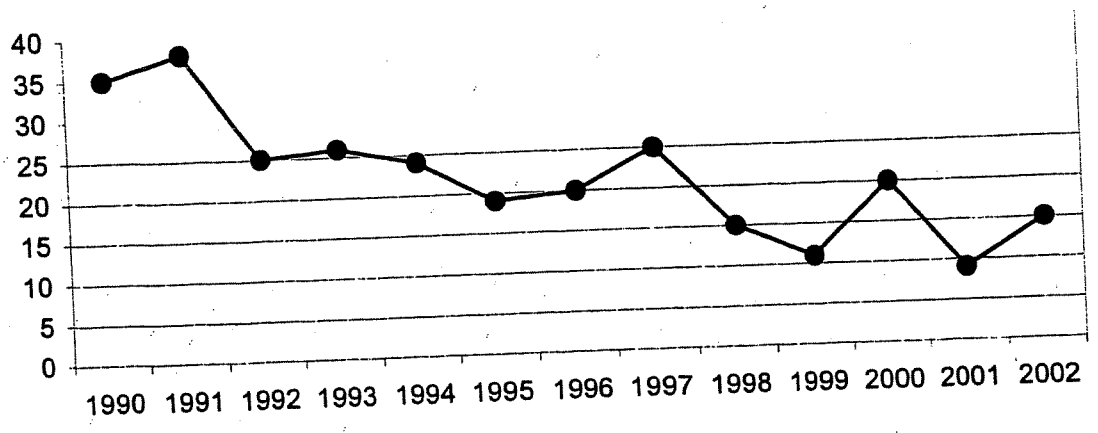
Prepared by: Steven Ford, Transport Safety Ph 9268 2986 25 August 2003

Accident Trends

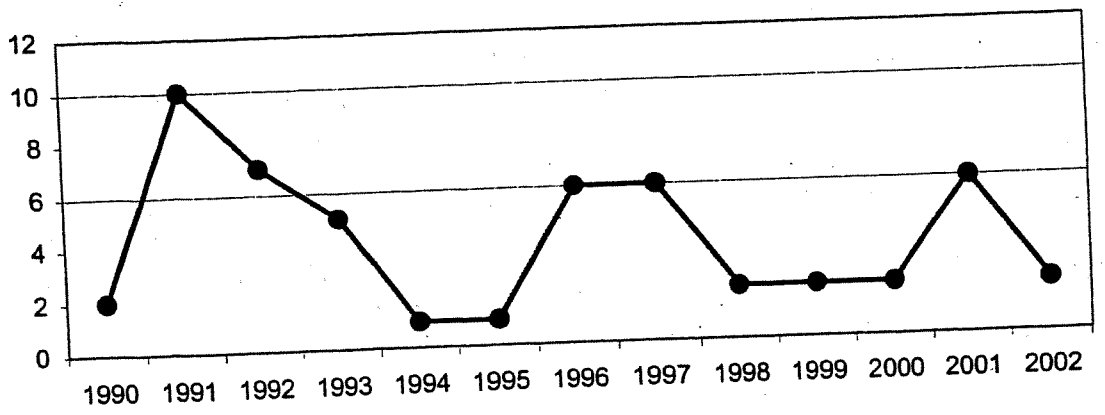
- Collisions at Level Crossing
- Fatalities at Level Crossing
- Fatalities per Accident

Accident Trends

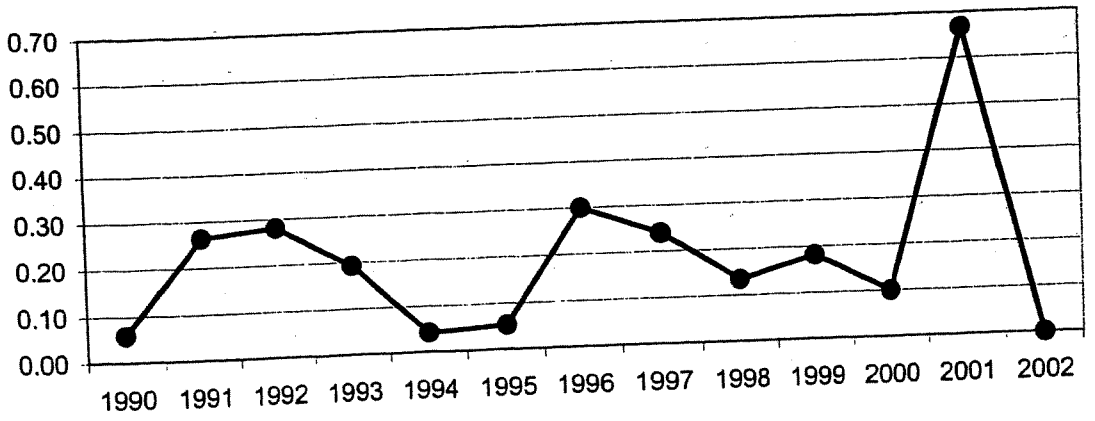
Collisions at Level Crossings by Year



Fatalities at Level Crossings by Year



Average Number of Fatalities per Collisions at Level Crossings by Year



Issues Encountered

- Local Government Support
- Pedestrian Crossings
- Compliance with AS 1742.7
- Closures

Issues Encountered

Funding for the current upgrade program	• Program based on the LCAM List. • Potential funding requirements over $70 million.
Funding for high speed closed corridor program	• On public road level crossings with rail speed greater than 120km/hr. • Potential funding requirements over $50 million.
Funding for pedestrian level crossing improvements	• Over 500 level crossings in NSW provide pedestrian access across the rail corridor. • A number of sites will require safety improvements and/or improvements in accordance with the accessibility standards for public transport. • Budget requirements yet to be determined.
Funding for private road level crossing improvements	• Over 2,000 private level crossings, with many on high-speed lines. • Budget requirements yet to be determined. • There is currently no LCSC funding allocated for safety improvements.
Local government funding contributions	• Limited availability and willingness for financial support from Local Government • Local Government agreement under preparation.
Pedestrian crossings standards	• Requirements at level crossings in relation to the Disability Standards for accessible public transport. • The design requirements of "Mobility Devices" at level crossing mazes are unresolved. • Requirements for pedestrian access on high-speed corridors (train speeds up to 160km/hr).
Local government compliance with as 1742.7 (signage and road markings for level crossings)	• Many Local Councils do not have regular audits or maintenance programs for level crossing approach signage and road markings.
Signalling design and construction resources	• RIC signalling design and construction resources are in short supply due to demands from major country resignalling works. • This has the potential to delay the upgrade program.
Opposition to level crossing closures	• Communities can be strongly opposed to the closure of level crossings. • Significant community consultation is required

Acknowledgments

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MEMBERS OF THE LEVEL CROSSING STRATEGY COUNCIL

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RTA Grafton Road Safety Managers and Officers
RTA Newcastle Road Safety Managers and Officers
RTA Parkes Road Safety Managers and Officers
RTA Wagga Road Safety Managers and Officers
RTA Wollongong Road Safety Managers and Officers

Byron Shire Council Road Safety and Engineering
Corowa Shire Council Safety and Engineering
Dubbo City Council Road Safety and Engineering
Dungog Shire Council Road Safety and Engineering
Gosford City Council Road Safety and Engineering
Gunnedah Shire Council Road Safety and Engineering
Hastings Shire Council Road Safety and Engineering
Junee Shire Council Road Safety and Engineering
Maitland Shire Council Road Safety and Engineering
Parkes Shire Council Safety and Engineering
Richmond Valley Shire Council Safety and Engineering
Tweed Shire Council Safety and Engineering
Wagga City Council Road Safety and Engineering
Wingecarribee Shire Council Road Safety and Engineering
Wollondilly Shire Council Road Safety and Engineering

RIC Bathurst Signal Construction Team
RIC Cootamundra Signal Construction Team
RIC Hamilton Signal Construction Team
RIC Rail Equipment Centre Staff
RIC Signal Design Staff
RIC Signalling Standards Staff
RIC Stores and Supply Managers and Staff
RIC Signalling Asset Engineers / Managers