Transport for NSW
Level Crossing Strategy Council, Yearly Report 2013/14

December 2014

Transport
for NSW

Contents

Front Cover – Upgraded level crossing controls at Summerland Way, Nammoona

Glossary

Active Control	Lights, bells, boom gates regulate motorists
	Lights, bells, booms, and locking swing gates regulate pedestrians
ALCAM	Australian Level Crossing Assessment Model
ARTC	Australian Rail Track Corporation
CRC	Country Rail Contracts (and its predecessor Country Rail Infrastructure Authority (CRIA)). CRC is a branch of the Transport Services Division of TfNSW.
CRN	Country Regional Network (the part of the NSW Rail Network that is owned by CRC). The CRN is owned by TfNSW.
DDA	Disability Discrimination Act 1992 (Commonwealth)
IPWEA	Institute of Public Works Engineering Australasia
ITSR	Independent Transport Safety Regulator
JHR	John Holland Rail
LCCWG	Level Crossing Communication Working Group
LCIP	Level Crossing Improvement Program
LCSC	Level Crossing Strategy Council
LCWG	Level Crossing Working Group
LGNSW	Local Government NSW
ONRSR	Office of the National Rail Safety Regulator (ONRSR)
Passive Control	STOP or GIVE way signs regulate motorists
	Signs warn pedestrians
	Pedestrian maze control and signage regulate pedestrians
RailCorp	Rail Corporation NSW
Red Man	A flashing warning sign of a 'Red Man', warns pedestrians of oncoming trains
RMS	Roads & Maritime Services (and its predecessor Roads and Traffic Authority of NSW (RTA))
TfNSW	Transport for NSW (and its predecessor Department of Transport)

Glossary

1. Year in Review: 2013/14

In 2013/14, rail and road agencies invested a total of $21.27 million on level crossing safety initiatives in NSW, $7.60 million of which was provided through the NSW Level Crossing Improvement Program (LCIP). The LCIP is managed by Transport for NSW (TfNSW) and provides funding to accelerate improvements to level crossings at priority sites across NSW, raise community awareness of level crossing safety issues and promote new technology to improve level crossing safety. It is additional to the funds that rail and road agencies spend on maintaining and upgrading level crossings on their networks.

During 2013-14, the LCIP commissioned 7 level crossing major upgrades at Summerland Way, Nammoona; Phillips Street, Gloucester; Nash Street, Parkes; Dandaloo Road, Narromine; Whitton Street, Narrandera; Kooringal Avenue, Griffith and Burrington Road, Moree. Development work for upgrades in future years formed a major part of the 2013/14 LCIP, with concept and detailed designs prepared for 2 projects and detailed designs prepared for another 2 projects. Minor construction works were completed at 24 locations.

In addition to infrastructure works, the LCIP also funded a number of other level crossing safety initiatives during the year including:
- the level crossing awareness and education campaign, "Don't rush to the other side"
- five level crossing police enforcement campaigns in regional NSW
- Australian Level Crossing Assessment Model (ALCAM) data collection for 174 sites
- the assessment and trial of Low Cost Level Crossing Warning Devices
- level crossing strategy and policy development.

TfNSW has allocated $21.90 million ($7.30 million per annum) for the LCIP between 2012/13 and 2014/15. This allows for the planning and completion of future priority level crossing upgrades.

The following subsections provide an overview of all level crossing improvements delivered by rail and road agencies in 2013/14 (including LCIP funded projects).

Appendix A provides a summary of all projects funded under the LCIP in 2013/14 and Appendix B sets out the expenditure on level crossing upgrades funded through the Level Crossing Improvement Program and by rail and road agencies from 2008/09 to 2013/14 in NSW.

1.1.   Agency Level Crossing Activities

In addition to the LCIP, Sydney Trains, the Australian Rail Track Corporation (ARTC), the Country Rail Contracts (CRC) and John Holland Rail (JHR), Roads and Maritime Services (RMS), and NSW Trains implemented their own programs of level crossing safety improvements.

Sydney Trains

In 2013/14 Sydney Trains completed a passive to active level crossing upgrade at Mullers Lane, Berry and undertook design works for two pedestrian level crossing upgrades at Burke Street and Moray Street, Richmond and a road level crossing upgrade at Darkes Road, Dapto. All 3 sites are scheduled to be commissioned in 2014/15.

ARTC

During 2013/14 ARTC undertook works in the order of $8.17 million to enhance or eliminate level crossings across its network in NSW. Of this, $5.5 million was spent on grade separation at Lochinvar on the Hunter Valley Network. Other works included upgrading road surface, active crossing equipment and signage.

CRC and JHR

CRC and its contracted rail infrastructure manager, JHR undertook level crossing safety improvements at 9 sites on the Country Regional Network (CRN) at a cost of $3.24 million in 2013/14, with works including improvements to train detection system and signalling technology and pedestrian level crossing upgrade. This was in addition to CRC/JHR's ongoing program of inspecting, maintaining and improving sighting distances at various level crossings through vegetation control, removal of obstructions such as embankments and signalling upgrades.

RMS

During 2013-14 RMS continued to assist councils and rail infrastructure managers with the upgrade of level crossings across NSW. Apart from the sites noted in this report, RMS also provided advice to councils on appropriate safety management measures for level crossings.

Works undertaken by RMS that were not part of the LCIP were limited to the Troy Junction site in Dubbo NSW.

- In 2013-14 $464,000 was spent on the continued development and commencement of construction of the upgrade of Troy Junction in Dubbo.
- The RMS funding commitment to the project is $3 million over three years and is due for completion in 2015. The total value of the project is $4.2 million.
- The desired intention of the project is to improve access to the Dubbo sale yards and industrial area.

NSW Trains

NSW Trains, as the rail operator of NSW intercity and regional passenger trains, influences and supports infrastructure, awareness, research, education and enforcement campaigns, and records and investigates incidents at level crossings on their operating network. 2013/14 was the first full year of operation for NSW Trains during which time the organisation was an active member of the Level Crossing Strategy Council (LCSC).

2. Level Crossings in New South Wales

Rail and road agencies are responsible for managing risks at level crossings in NSW. Safety regulatory oversight is provided by the Office of the National Rail Safety Regulator (ONRSR)[1] for railway operations and infrastructure and the road/rail interface. Enforcement of road laws is undertaken by the NSW Police Force.

2.1.   Level Crossing Strategy Council

The Level Crossing Strategy Council (LCSC) is a NSW interagency forum which promotes coordination between agencies regarding level crossing safety. It is made up of senior executive level representation from:

- Transport for NSW (Chair)
- Roads and Maritime Services (RMS)
- Country Rail Contracts (CRC)
- John Holland Rail (JHR)
- Sydney Trains
- NSW Trains
- Australian Rail Track Corporation (ARTC)
- Office of the National Rail Safety Regulator (ONRSR)
- NSW Police Force
- Local Government NSW (LGNSW).

The LCSC is supported by the Level Crossing Working Group (LCWG) and Level Crossing Communication Working Group (LCCWG) which comprise officer level representatives from member agencies. Transport for NSW provides secretariat support and assistance to the LCSC, LCWG and LCCWG, coordinates the implementation of Level Crossing Improvement Program (LCIP), and manages the application of the Australian Level Crossing Assessment Model (ALCAM) in NSW.

2.2.   Level Crossing Improvement Program

Under the *Rail Safety National Law (NSW)*, rail and road infrastructure managers have an obligation to manage risks at level crossings. Funding under the LCIP is supplementary to the existing capital and maintenance programs of rail and road agencies to improve and maintain safety at the level crossings on their networks.

The LCIP funds a range of level crossing safety initiatives in NSW. This includes safety improvements at level crossings, media awareness and police enforcement campaigns in regional NSW, and data collection to ensure accurate information is available on the status of NSW public level crossings.

The projects funded under LCIP each year are developed by TfNSW, with the assistance of LCWG, and approved by the LCSC. The LCWG monitors program delivery and promotes collaboration and consultation between delivery agencies.

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[1] The Office of the National Rail Safety Regulator (ONRSR) was established in 20 January 2013 replacing the Independent Transport Safety Regulator (ITSR)

A methodology is in place to determine the level crossings eligible for funding under the LCIP and the priorities for improvements. This methodology, commonly known as the LCIP (Infrastructure Works) Eligibility Criteria, has been revised in 2013/14 to ensure available funding is effectively applied for level crossing safety improvements. The revised methodology is being used for the development of the LCIP 2014/15 to 2017/18, and will be reviewed after this four year period.

In the first instance the methodology distributes the LCIP funding across the following three categories:

- upgrading level crossings controlled by flashing lights to boom gates and flashing lights (approximately 33.5% of upgrade funding)
- upgrading level crossings controlled by passive signage (e.g. give way or stop sign) to boom gates and flashing lights (approximately 53.0% of upgrade funding)
- minor works at passively controlled level crossings (approximately 13.5% of upgrade funding).

A prioritisation process is then used to identify the crossings to be upgraded within the first two categories. This process firstly uses ALCAM ranking to generate a shortlist of sites. This shortlist will then be refined through consultations with relevant stakeholders to nominate sites required for major upgrades. Consultations involve a review of level crossing incident data for NSW and consideration of local knowledge from rail and road agencies and other relevant stakeholders.

Separate criteria are used to determine which passively controlled crossings are eligible to receive LCIP funding for minor works.

2.3. Level Crossing Behaviours Workshop

In April 2014, TfNSW hosted a Level Crossing Behaviours Workshop with the support from LCSC. The Workshop included representation from TfNSW, JHR, the trucking industry, NSW Trains, ARTC, NSW Police, research/academia, ONRSR and the Australian Transport Safety Bureau. The objectives of the Workshop were to understand current strategies in NSW in addressing motorists' non-compliant behaviours at level crossings; and to identify how to further enhance the effectiveness of these strategies, or introduce new strategies, to encourage more compliant motorist behaviours.

The Workshop identified a list of potential initiatives and sought to prioritise the ideas in terms of their potential effectiveness (or impact) and feasibility regarding implementation. These were considered within the major control measure groups: engineering, enforcement and education. The Workshop also noted that Human Factors considerations should be considered in all treatments aimed at improving motorist behaviour at level crossings. This is important particularly in the design phase of any initiative.

Outputs from the Workshop will be used to inform the delivery of future initiatives by the LCCWG.

2.4.   Australasian Railway Level Crossing Safety Forums

The first Australasian Railway Level Crossing Safety Forum was held in March 2014. This involved government, joining the rail industry, police, road user groups and research bodies to share knowledge on programs and experiences in level crossing safety work. The Forum was attended by 90 representatives from 40 different organisations. During the Forum, TfNSW in conjunction with NSW Police facilitated the Enforcement Stream workshops and presented NSW's practices in level crossing enforcement and recent 'Pearly Gates' level crossing awareness and education campaign. One of the key outcomes of the Forum was agreement of the need to establish a national level crossing safety committee.

2.5.   Level Crossing Closures

The only means of completely eliminating risk at a level crossing is to close that crossing. The closure of public and private level crossings is pursued, where appropriate, by LCSC member rail and road agencies.

Thorough inspection and detailed assessment of crossings, including alternative means of access, is considered before closure. Consultation with the relevant local council, adjacent landowners, the community, the RMS, emergency services and other rail and road users is also conducted prior to recommending closure.   Under Section 99B of the Transport Administration Act 1988, the Minister for Transport is required to approve level crossing closures.

Since 2002 a total of 161 level crossings have been gazetted for closure, most of which are on private property. In 2013/14, one public road level crossing in the Hunter Valley and ten private road level crossings on the North Coast Corridor were approved for closure.

2.6.   Level Crossing Incident Data

Of the 1,373 public road level crossings in NSW, 382 have active traffic controls; 171 have flashing lights and bells and 211 have flashing lights, bells and boom gates. The majority of other crossings are controlled by "give-way" or "stop" signs.

In 2013/14, no fatalities were recorded between trains and road vehicles or pedestrians at level crossings in NSW. There was one crash between a train and road vehicle during the year, at a crossing with passive controls. Overall, the number of crashes between a train and a road vehicle has decreased over the past 25 years in NSW. The Figures 1 to 4 show the number collisions and fatalities at level crossings from 1989/90 to 2013/14.

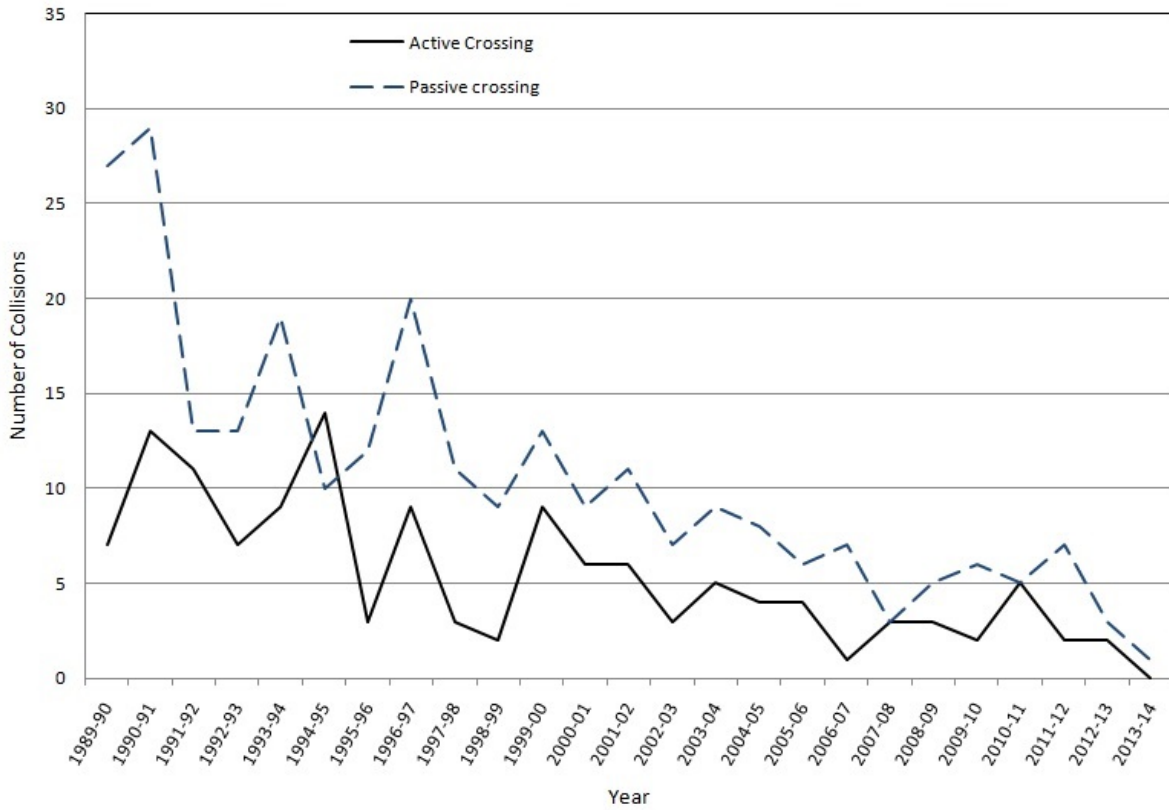Figure 1 – Train Collision with Road Vehicle at Level Crossing, 1989/90 to 2013/14 in NSW

Figure 2 – Fatalities: Train Colliding with Road Vehicles at Level Crossing, 1989/90 to 2013/14 in NSW
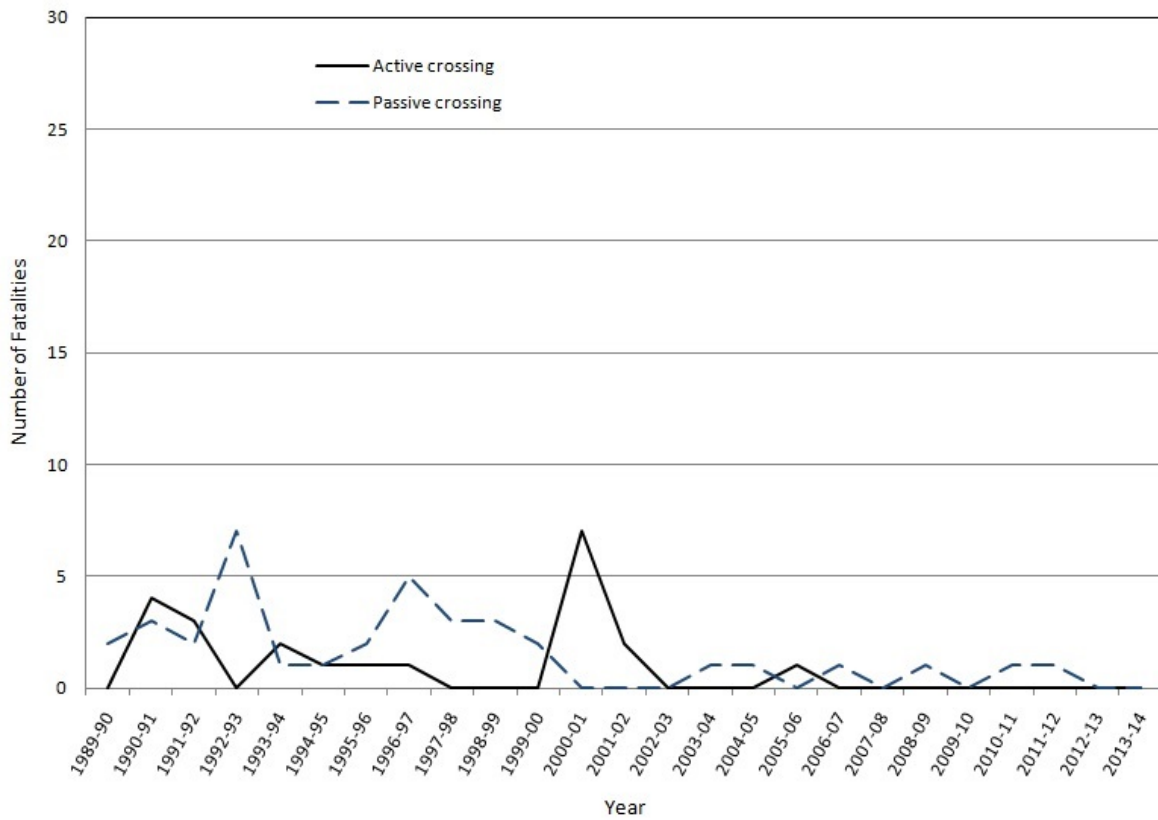
Figure 3 – Train Colliding with Person at Level Crossing, 1989/90 to 2013/14 in NSW
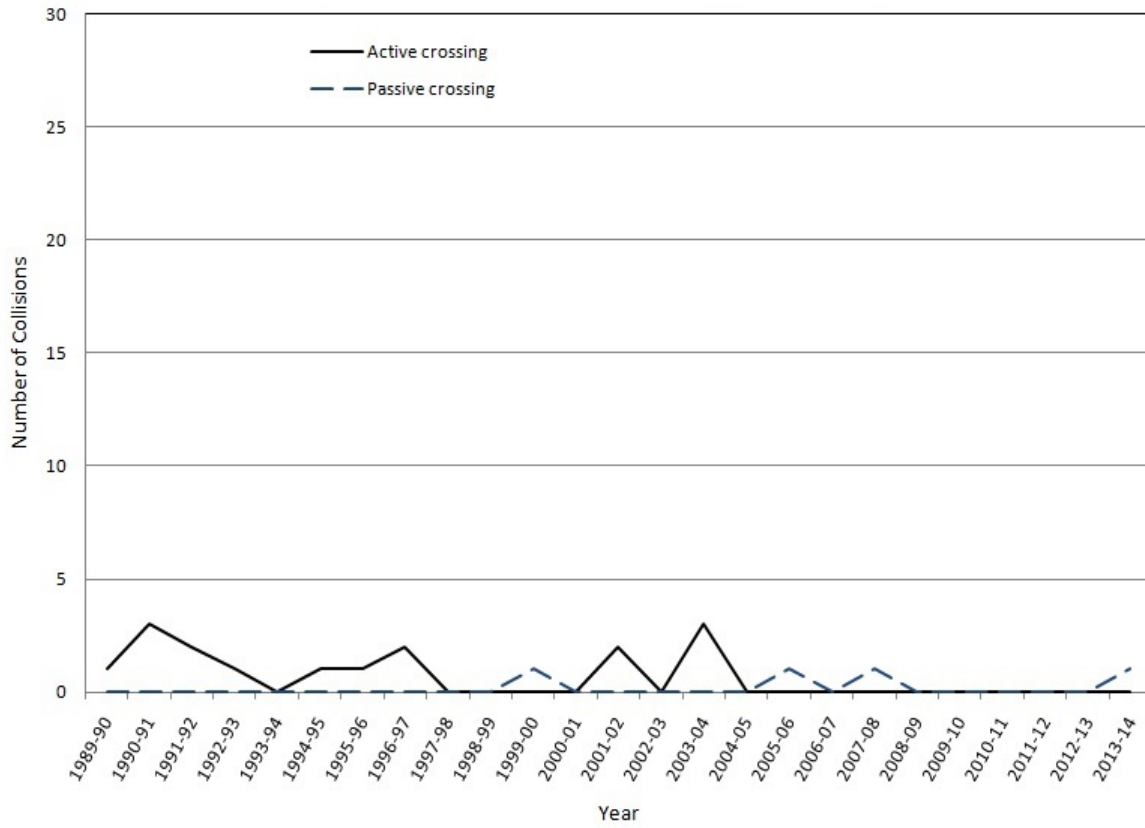
Figure 4 – Fatalities: Train Colliding with Person at Level Crossing, 1989/90 to 2013/14 in NSW
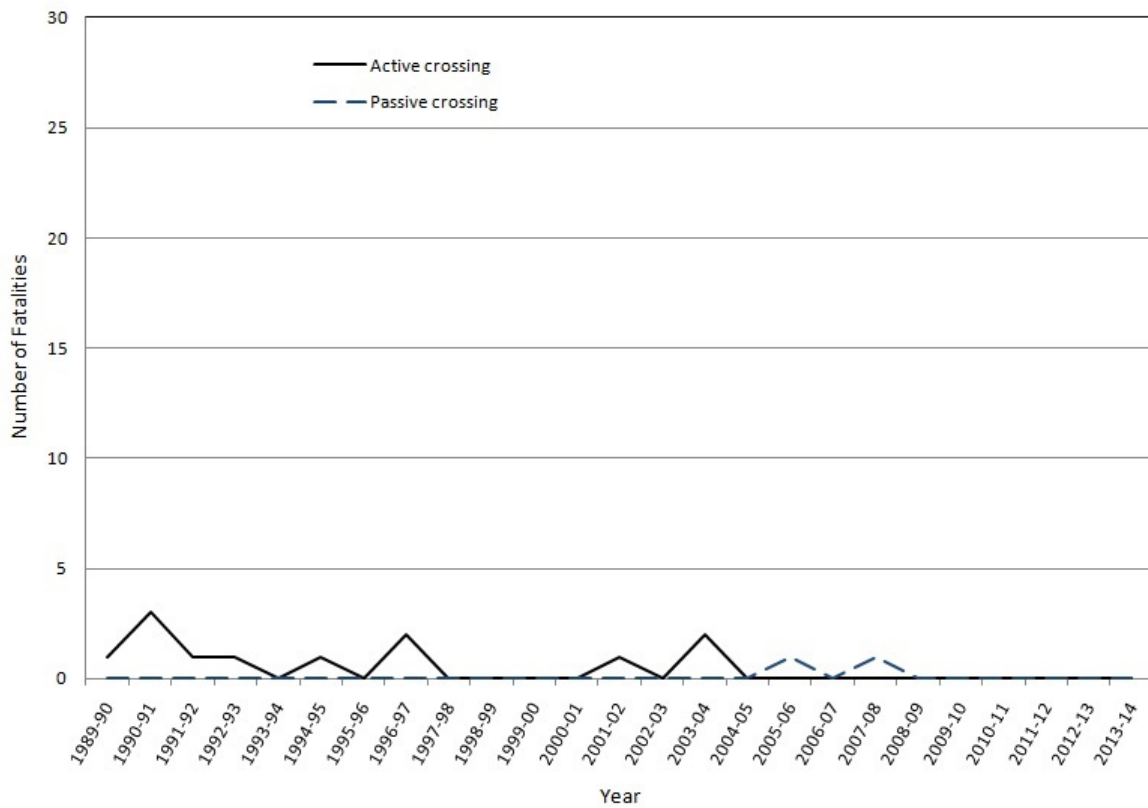
3. Level Crossing Improvement Program 2013/14 (LCIP) - Infrastructure Works

3.1. Major Works Completed

During 2013/14 seven major construction projects were commissioned across the NSW rail network as part of the LCIP. These are set out in Table 1 and described in more detail below.

Table 1 – LCIP Major Construction Works Completed in 2013/14

Street	Location	Network
Dandaloo Road	Narromine	ARTC Lease
Summerland Way	Nammoona	ARTC Lease
Nash Street	Parkes	CRN
Burrington Road	Moree	ARTC Lease
Phillips Street	Gloucester	ARTC Lease
Whitton Street	Narrandera	CRN
Kooringal Avenue	Griffith	CRN

3.1.1. Dandaloo Road, Narromine

The level crossing was upgraded from flashing lights and bells to flashing lights, bells and retro-reflective boom gates with high intensity (LED) lights. The upgrade was commissioned on 1 June 2014, at a total cost of $570,733.

Figure 5 – Dandaloo Road, Narromine

Dandaloo Road, Narromine (Before)

Dandaloo Road, Narromine (After)

3.1.2. Summerland Way, Nammoona

The level crossing was upgraded from flashing lights and bells to flashing lights, bells and retro-reflective boom gates with high intensity (LED) lights. The upgrade also included minor road works and new road line marking and signage. The upgrade was commissioned on 14 October 2013, at a total cost of $681,836.

Figure 6 – Summerland Way, Nammoona

Summerland Way, Nammoona (Before)

Summerland Way, Nammoona (After)

3.1.3. Burrington Road, Moree

The upgrade included the installation of flashing lights, bells and retro-reflective boom gates with high intensity (LED) lights. The upgrade also included the widening and resurfacing of road approaches, new signage, and line marking for both the rail and roadway. The upgrade was completed on 27 June 2014, at a total cost of $809,813.

Figure 7 – Burrington Road, Moree

Burrington Road, Moree (Before)

Burrington Road, Moree (After)

3.1.4. Phillips Street, Gloucester

The upgrade included the installation of flashing lights, bells and retro-reflective boom gates with high intensity (LED) lights. The upgrade also included the widening and resurfacing of road approaches, new signage, and line marking for both the rail and roadway. The upgrade was completed on 27 June 2014, at a total cost of $1,187,706.

Figure 8 – Phillips Street, Gloucester

Phillips Street, Gloucester (Before)

Phillips Street, Gloucester (After)

3.1.5. Nash Street, Parkes

The existing passive stop signs at Nash Street Parkes were upgraded to active controls. The upgrade, jointly funded by the LCIP and CRC, included the installation of flashing lights, bells, retro-reflective boom gates with high intensity (LED) lights. The upgrade also included road approach enhancements, new signage, and line marking for both the rail and roadway. The upgrade was completed on 27 June 2014, at a total cost of $1,775,000 including a contribution of $824,368 from the LCIP.

Figure 9 – Nash Street, Parkes

Nash Street, Parkes (Before)

Nash Street, Parkes (After)

3.1.6. Whitton Street, Narrandera

The upgrade included the installation of flashing lights, bells, retro-reflective boom gates with high intensity (LED) lights. The upgrade also included road approach enhancements, new signage, and line marking for both the rail and roadway. The upgrade was jointly funded by the LCIP and CRC under the new LCIP contribution funding agreement. The upgrade was completed on 20 June 2014, at a total cost of $1,660,000 including a contribution of $688,000 from the LCIP.

Figure 10 – Whitton Street, Narrandera

Whitton Street, Narrandera (Before)

Whitton Street, Narrandera (After)

3.1.7. Kooringal Avenue, Griffith

The existing passive stop signs at Kooringal Avenue Griffith were upgraded to active controls. The upgrade included the installation of flashing lights, bells, retro-reflective boom gates with high intensity (LED) lights. The upgrade also included an enhancement to the pedestrian crossing, road approach enhancements, new signage, and line marking for both the rail and roadway. The upgrade was jointly funded the LCIP and CRC under the new LCIP contribution funding agreement. The upgrade was completed on 29 June 2014, at a total cost of $1,188,000 including a contribution of $688,000 from the LCIP.

Figure 11 – Kooringal Avenue, Griffith

Kooringal Avenue, Griffith (Before)

Kooringal Avenue, Griffith (After)

3.2. Development Work Undertaken

Development work for upgrades in future years formed a major part of the 2013/14 LCIP, with concept and detailed designs undertaken for 2 sites (Table 2) and detailed designs for another 2 level crossings (Table 3).

Table 2 – LCIP Concept and Detailed Designs Completed in 2013/14

Street	Location	Network
Bruxner Highway	Casino	ARTC Lease
Mangoola Road	Mangoola	ARTC Lease

Table 3 – LCIP Detailed Designs Completed in 2013/14

Street	Location	Network
Wheelers Lane	Dubbo	CRN
Goondah Road	Bowning	ARTC Lease

3.3. Minor Works

In 2013/14, LCIP funded minor construction works at 24 level crossings (Table 4) in regional NSW.

Table 4 – LCIP Minor Construction Works in 2013/14

Street / Location	Scope	Network
Boat Harbour Road, Kundabung	Widened road approaches, installation of guideposts, improved signage, replaced concrete edge beams and panels with steel track panel and removed non-frangible material	ARTC Lease
Carr Street, Grafton	Widened road approaches, installation of guideposts, improved signage and road markings and removed non-frangible material	ARTC Lease
Barker Street, Grafton		ARTC Lease
Drake Street, Grafton		ARTC Lease
Broad Street, Grafton		ARTC Lease
Pine Street, Grafton		ARTC Lease
Camira Creek Yard , Camira Creek	Upgraded signage, posts and fencing, installation of guide posts and removed non-frangible material	ARTC Lease
Leeville Station Road, Leeville		ARTC Lease
Brooker Road, Casino		ARTC Lease
Vouts Road, Casino		ARTC Lease
Hillyard Road, Kyogle		ARTC Lease

Street / Location	Scope	Network
Andrew Street , Kyogle	Cutting of embankment to improve level crossing sighting distance, widened road approaches, installation of guideposts, improved signage, installed steel track panel and removed non-frangible material	ARTC Lease
Golf Club, Kyogle	Installed no access signage, lockable gates and wing fencing	ARTC Lease
Cedar Getters Road, Loadstone	Upgraded signage, installation of guideposts, moved non-frangible material and re-fencing.	ARTC Lease
Cobbora Road / Golden Highway, Beni	Retrofitting high intensity LED level crossing flashing lights, the installation of Active Advance Warning Lights and removal of non-frangible material	ARTC Lease
Cobbora Road / Golden Highway, Dubbo	Retrofitting high intensity LED level crossing flashing lights and removal of non-frangible material	ARTC Lease
Castlereagh Highway, Birriwa		ARTC Lease
Castlereagh Highway, Mendooran		ARTC Lease
Station Street, Gulgong		ARTC Lease
Golden Highway, Dunedoo		ARTC Lease
Castlereagh Highway / Racecourse Road, Dunedoo		ARTC Lease
Castlereagh Highway / Liamena, Dunedoo		ARTC Lease
Segenhoe Road, Aberdeen	Installation of road cross hatching and signage to reduce queuing on the level crossing	ARTC Lease
Norah Creek Road, Molong	Replaced non frangible fencing and posts with rural style fencing and access gates for security to rail corridor access roads and Signal Hut	CRN

4. Level Crossing Improvement Program 2013/14 (LCIP) - Awareness and Enforcement Campaigns

4.1. Level Crossing Awareness and Education Campaign

The 'Don't rush to the other side' level crossing campaign, which provides a timely reminder to drivers that level crossings should not be approached with complacency, continued to run throughout 2013/14 on behalf of the LCSC.

The campaign targeted both light vehicle drivers who live within 10 kilometres of a level crossing in regional NSW and heavy vehicle drivers.

Seven public relations road show events, featuring the 'Pearly Gates' and a crashed car which had been involved at a level crossing incident, were held across NSW to help raise the profile of level crossings and generate talkability.

The events included:
- Rail Safety Week – August 2013
- Henty Machinery Field Days – September 2013
- Australian Bus and Coach Show – September 2013
- Australian National Field Days – October 2013
- Maitland Steamfest – April 2014
- NSW Mining Health & Safety Conference – May 2014
- International Level Crossing Awareness Day – June 2014

The campaign was exhibited at the Maitland Steamfest by NSW Trains with support from TfNSW and ARTC. The event was attended by around 65,000 people, and coincided with awareness and enforcement campaigns in the Hunter region.

The paid advertising campaign was in market in regional NSW at key times during 2013/14. This included November 2013 to coincide with harvest season when there are increased vehicles and trains on the road as well as May/June 2014 during the traditional peak in level crossing collisions. The campaign consisted of television, print, outdoor, radio and online advertising.

During 2013/14, five additional localised campaigns ran in Wagga Wagga, Moree, Dubbo and the Hunter region to support local Police enforcement operations. Letterbox flyers were also distributed to residents and businesses within 10 kilometres of the targeted crossings.

Campaign tracking research carried out in December 2013 by an independent research agency showed the campaign is performing well. A summary of the results is outlined below:
- 86% of regional drivers and 83% of truck drivers surveyed saw the campaign.
- 92% of regional drivers and 84% of truck drivers found the campaign believable.

- The motivation of truck drivers to drive safely after having seen the campaign was 64% (an increase from 45% in July 2013). The motivation of regional drivers remained consistent from July 2013 at 53%.
- 86% of regional drivers and 87% of truck drivers agree the advertisement reminded them that dangerous behaviour at level crossings can lead to negative consequences.
- 81% of regional drivers and 86% of truck drivers agree the advertisement reminded them they should not ignore the signals at level crossings.

It is proposed to continue the 'Don't rush to the other side' campaign throughout 2014/15 with a more tailored approach for heavy vehicle drivers.

Figure 12 – TfNSW level crossing safety exhibitions at NSW regional field days

Henty Machinery Field Days (Henty)

Australian National Field Days (Borenore)

4.2. Level Crossing Police Enforcement Campaign

The Level Crossing Police Enforcement Campaign continued into 2013/14 with TfNSW, RMS and NSW Police Force conducting five level crossing campaigns in regional NSW. These campaigns were held in Wagga Wagga, Moree, Dubbo and the Hunter (2 campaigns) region and involved a public awareness campaign supported by Highway Patrol enforcement at selected level crossings.

For the Dubbo campaign, NSW Police Force released video footage of a "near-hit" between a freight train and a semi-trailer that had occurred a few months earlier at one of the target level crossing sites. This footage attracted widespread media interest and featured on the nightly news on Channel Seven Sydney as well as regional Prime TV news broadcasts. NSW Police Force also placed the video on its website.

Figure 13 – Still image showing the truck near the centre of screen passing in front of the path of the freight train to the left of the screen

NSW Police Force is responsible for the enforcement of the Road Rules 2008 including level crossing offences. Legal actions (Table 5) for level crossing offences (driving) have now been trending upwards for three years due a heightened awareness of level crossing safety brought about through the Level Crossing Awareness and Enforcement Campaign.

Table 5 – NSW Police Level Crossing Legal Actions between 2010/11 and 2013/14

Financial Year	Legal Actions
2010/11	219
2011/12	281
2012/13	306
2013/14	371

In March 2014, Senior Sergeant Michael Timms spoke at the Australasian Railway Level Crossing Safety Forums in Melbourne regarding the Level Crossing Awareness and Enforcement Campaign which was identified as an example of national best practice.

5. Level Crossing Improvement Program 2013/14 (LCIP) - ALCAM Development and Data Collection

The Australian Level Crossing Assessment Model (ALCAM) is used to assess potential risks at level crossings and to assist in the prioritisation of safety improvements at level crossings according to their comparative safety risks.

ALCAM is currently applied across Australia and in New Zealand, and is overseen by the National ALCAM Committee.

5.1. National ALCAM Committee

The National ALCAM Committee comprises representatives of all Australian states and territories and New Zealand. The role of the Committee is to manage development of the ALCAM and to ensure consistency in its application. Currently, NSW is represented on the National ALCAM Committee by TfNSW.

The National ALCAM Committee has been undertaking significant redevelopments of both the ALCAM methodologies and the ALCAM LXM (Level crossing Management) database over the last few years.

5.1.1. Redevelopment of ALCAM Model

The new ALCAM model comprises of three separate components: the Infrastructure Model, the Exposure Model and the Consequence Model. Each of these models has a single 'factor' as an output that, when combined, produces a risk score for each level crossing. Some of the key benefits of the new ALCAM model include:

- It is an evidence based model, which was validated against 10 years of Australian and New Zealand level crossing crash data;
- It provides better identifications of site specific risk, with an improved weighting and scoring algorithm;
- It offers better correlation between traffic flow and level crossing crash risk, by adopting Peabody-Dimmick formula with adjustment factor;
- It takes account of the whole range of possible outcomes (including both direct and escalation) of a level crossing crash as well as the associated probabilities, by using comprehensive event tree approach;
- It provides a fine balance between the impact of likelihood and that of consequence on ranking level crossing for safety improvement;
- The outputs from the new ALCAM model are in common quantitative terms (probability and fatalities), which enables cost-benefit analysis.

5.1.2. Redevelopment of ALCAM LXM Database

The ALCAM LXM database redevelopment project is in its final testing phrase. The project is developing a web-based database to store ALCAM level crossing data and run ALCAM risk calculations. Currently, these functions are achieved through a Microsoft Access database. The project is managed by VicTrack on behalf of the National ALCAM Committee. The estimated cost of the project is $1.6 million over five years. These costs

are being shared between Australian and New Zealand jurisdictions; with NSW contributing through the Level Crossing Improvement Program.

Both the new ALCAM model and the new ALCAM LXM web-based database are expected to be officially released by the National ALCAM Committee in late 2014 or early 2015.

5.2. NSW ALCAM Data Collection

Details on traffic controls, crossing characteristics and other related risks are currently collected on all public level crossings on a cyclical basis over a five year period in NSW. These details are loaded into the ALCAM database to update the characteristics and risk profiles for level crossings in NSW.

During 2013/14, data was collected for 174 level crossings in NSW. Of those, 131 were completed by using a new data collection template developed by TfNSW. This new template captures some additional risk factors required by the new ALCAM model.

6. Level Crossing Improvement Program 2013/14 (LCIP) – New Technology

6.1. Trial of Low Cost Level Crossing Warning Devices

The Cooperative Research Centre for Rail Innovation, major Australian railways, government transport departments and Australian universities are evaluating low cost warning systems at sites in New South Wales, Queensland, and Victoria as part of a national low cost level crossing trial.

Three suppliers were selected to participate in the national trial programme, each installing their trial waning system at three sites hosted by ARTC, Queensland Rail and V/Line.

As the trial systems are not fully assured, appropriate precautions have been taken in order to minimise risk. Shadow-mode testing is one such method of reducing risk and involves testing the trial systems parallel to an existing type-approved level crossing warning system. Shadow-mode refers to the installation of the trial warning systems without the road user interface, where the power demand of the flashing lights is simulated.

This methodology allows the trial systems to be tested in the operating conditions of a live level crossing without affecting the safety of road users or the railway. A comparative logging system installed at each site captures the operating performance of the trial systems compared with the existing baseline system.

Environmental monitoring equipment has also been installed at each site to capture environmental parameters such as temperature, humidity, rainfall, solar radiation, wind speed and wind direction. Environmental monitoring ensures that the range of environmental conditions the trial systems have been exposed to are captured, allowing for correlation of deviations in performance or unexpected events with environmental conditions. At the conclusion of the trial, the safety qualification data collected can be provided with an envelope of environmental conditions under which the equipment was known to have operated.

The trial sites in Queensland and New South Wales officially commenced data collection on 15th March 2014. The site in Victoria is expected to complete installation and commissioning in June 2014.

Figure 14 – Trial of Low Cost Level Crossing Warning Devices project
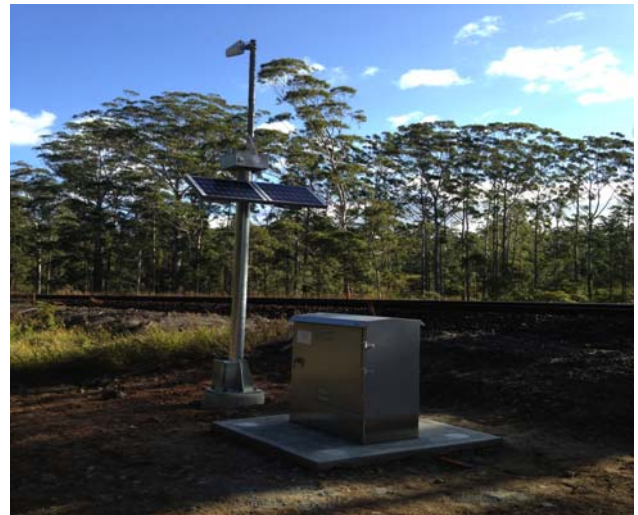

Comparative Logging Platform

Industry visit to Queensland Trial Site

Sice Pty Ltd level crossing warning system installation in NSW

KH1 Pty Ltd Schweizer level crossing warning system installation in NSW

KH1 Pty Ltd Schweizer level crossing warning system installation in NSW

Schweizer Control Location

ITS Innovations level crossing warning system installation in NSW

ITS Innovations Control Location

6.2.   Development of the Level Crossing Finder

The NSW Public Level Crossing Finder, developed by TfNSW, is a publicly available tool allowing the users to search for level crossings geographically and by the unique level crossing identifier. Each level crossing displays a summary page of detailed information about the level crossing, such as the intersecting road and railway line, the type of level crossing control and a Google Street View (if available) of the level crossing.

In 2013/14, the NSW Public Level Crossing Finder has been further developed for compatibility with tablets and smart phones. This online interactive map can be accessed at the link below:

https://appln.transport.nsw.gov.au/mapservices/proxy/levelCrossings/map.html.

7. LCSC Agency Level Crossing Initiatives

7.1. Sydney Trains Level Crossing Initiatives

7.1.1. Major Works

Mullers Lane, Berry

Mullers Lane Berry level crossing upgrade was commissioned on 10 November 2013 at a cost of $2.4 million. The level crossing upgrade works commenced in February 2013.

The existing passive stop signs at Mullers Lane Berry were upgraded to active controls. The upgrade included the installation of flashing lights, bells, retro-reflective boom gates with high intensity (LED) lights. The upgrade also included road widening, new signage, and road line marking.

The upgrade was completed by Sydney Trains in partnership with Shoalhaven City Council.

Figure 15 – Mullers Lane, Berry

Mullers Lane, Berry (Before)

Mullers Lane, Berry (After)

Darkes Road, Dapto

The Darkes Road Dapto Level crossing upgrade involves upgrading the existing flashing lights and bells to new high intensity (LED) flashing lights, bells and retro-reflective boom gates. The upgrade will also include road widening, new road line marking and signage. Detailed design is projected to be completed by August 2014. Construction of the main cable route commenced in February 2014 and final commissioning for the project is scheduled for May 2015. The upgrade works will be undertaken by Sydney Trains in partnership with Wollongong City Council.

Bourke Street & Moray Street, East Richmond

East Richmond Level Crossing Upgrade project involves upgrading the existing pedestrian mazes at Moray Street and Bourke Street with three new automated swing gates crossing with 'Red Man' LED flashing lights and audible pedestrian warning. The upgrade will also

include DDA compliant ramps and walkways, road widening and centre road medians and new pedestrian lighting.

Detailed design of the upgrade was undertaken in 2013/14. The project shall be commissioned in three stages with each pedestrian maze to be commissioned separately to minimise the effect of the upgrade on local community. The upgrade works will be undertaken by Sydney Trains in partnership with Hawkesbury City Council.

7.1.2. Design Works

In 2013/14 Sydney Trains undertook design work for a number of sites, as detailed in Table 6.

Table 6 – Sydney Trains Design Works in 2013/14

Name and Location	Scope of Works
Bourke Street & Moray Street, East Richmond	Installation of: Flashing lights and boom gates DDA compliant pedestrian swing gates Backup power supply Improvements to road width, kerbs and road medians.
Darkes Road, Dapto[2]	Installation of: Flashing lights and boom gates Backup power supply Improvements to road width, kerbs and road medians. Detailed design to be completed by August 2014

7.1.3. Minor Works

In 2013/14 Sydney Trains funded minor works at the following pedestrian level crossing locations as shown in the Table 7:

Table 7 – Sydney Trains Minor Works in 2013/14

Name and Location	Scope of Works
Fairy Meadow, Faulconbridge, Linden, Bellambi and Unanderra	Cyclic change out of all Pedestrian Swing gate mechanism
All Pedestrian Crossings	Reliability Improvement - Began upgrade of 12V DC Pedestrian Gate Detection circuit to 50V DC

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[2] This design work was jointly funded by Sydney Trains and the LCIP.

7.2. ARTC Level Crossing Initiatives

During 2013/14 ARTC undertook work to the value of $8.17 million to enhance or eliminate level crossings across its network in NSW. As shown in Table 8, $5.50 million was spent on grade separation at Lochinvar including closure of an existing level crossing. Other works as listed were undertaken on road and pedestrian crossings.

Table 8 – ARTC Level Crossing Projects in 2013/14

Location	Cost	Sites	Project Scope
Killawarra – Taree	$72,308	10	Level crossing closure (carryover 12/13)
Nammoona – Kyogle	$16,390	1	Level crossing maintenance
Nambucca Heads – Bonville	$42,007	2	Lamp upgrades
Lochinvar	$5,500,000	1	Grade separation
Muswellbrook - Gulgong	$48,583	1	Level crossing maintenance
Whittingham-Muswellbrook	$214,400	2	Level crossing maintenance
Dartbrook - Murrulla	$332,099	4	Level crossing maintenance
Murulla - Werris Creek	$104,400	1	Level crossing upgrade
Watermark- Gunnedah	$573,609	3	Level crossing upgrades
Goobang Junction to Troy Junction	$35,000	1	Level crossing road surface upgrade
Scone	$400,000	1	Level crossing road surface upgrade
Parkes to Broken Hill	$202,951	3	Level Crossings upgrades
Albury - Macarthur	$629,300	5	Level crossing upgrades including discrete pedestrian
Total	$8,171,047	35	

7.3. CRC and JHR Level Crossing Initiatives

CRC and JHR continued to improve level crossing safety on the CRN with a combination of upgrades, sighting distance improvements and major maintenance works to ensure compliance with standards and improved signalling technology. Table 9 lists the level crossing projects funded by CRC in 2013/14.

Table 9 – CRC and JHR Level Crossing Projects in 2013/14

Location	Cost	Sites	Project Scope
Nyngan to Cobar (Mitchell Highway, Barrier Highway and Bourke Road)	$1,244,000	3	Upgrade level crossing to axle counter detection
Mirrool (Newell Highway)	$180,000	1	Remove 2 signals from the centre of the road and install 4 new signals
Parkes (Newell Highway)	$762,000	1	Upgrade pedestrian level crossing from boom to swing gate and upgrade out of date road booms
Bathurst, Georges Plains	$98,000	1	Axle counter trial to type approve a more cost effective detection system
Werris Creek to Tamworth (Duri Road, Robert Street and Green Street)	$958,000	3	Upgrade level crossing to axle counter detection
Total	$3,242,000	9	

8. Interface Agreements

The *Rail Safety National Law (NSW)* requires rail infrastructure managers and road authorities to identify and assess risks to safety at level crossings, and for the purpose of managing those risks, to enter into interface agreements. Rail and road agencies are actively working towards meeting these obligations and are currently negotiating safety interface agreements.

RMS

RMS updated its template Interface Agreements in line with changes in legislation, namely the introduction of the *Rail Safety National Law (NSW)*, and has agreed templates with ARTC, JHR, V/Line and Sydney Trains.

To date, RMS has one Interface Agreement signed with ARTC, and is in the process of signing fourteen with JHR.

RMS continues to seek to enter into interface agreements with rail infrastructure managers, and local councils. However, as noted by ARTC, there have been delays by some road managers.

Sydney Trains

Over the last 12 months, Sydney Trains has been working with 47 road managers to facilitate the development of Interface Agreements. In 2013/14, Sydney Trains completed all of the Interface Agreements and these were subsequently issued to the various road managers for execution. A total of 36 agreements have now been signed off and executed. There was no response from 11 road managers for the remaining agreements.

ARTC

ARTC provided updated copies of the draft ARTC/RMS Interface Agreement to road managers following the adoption of the National Rail Safety Law in NSW. The major blockage to progress in the signing off of Interface Agreements has been council concern over the requirements placed on them for working in the rail corridor. These concerns were detailed in a meeting between ARTC, JHR and the Institute of Public Works Engineering Australasia (IPWEA) who are representing councils.

ARTC is reviewing its current requirements with the possibility of concessions being made to councils who have signed an Interface Agreement. These concessions are still in the review stage and are required to be approved by ARTC's Safety and Environment Committee following consultation with stakeholders within ARTC. As at the end of 2013/14, 5 Interface Agreements have been signed by all parties with the remaining 56 outstanding.

Following the RailCorp restructure, ARTC has contacted NSW Trains to progress the Interface Agreement for pedestrian access at NSW Trains stations. The RailCorp restructure also impacted on the progress on an Interface Agreement for the Shared Corridor in Sydney with Sydney Trains.

CRC and JHR

On the CRN, Interface Agreements were distributed for agreement to 72 public road managers in 2013/14. During the year, 17 Interface Agreements with private road managers have been signed out of approximately 524 known private Interfaces and 20 have been executed with public road managers (councils).

9. Funding for Level Crossings in NSW

Table 10 provides a summary of the total expenditure on level crossing safety improvements in NSW since 2003/04.

Table 10 – Funding for Level Crossing Safety Improvements in NSW from 2003/04 to 2013/14

Year	Program / Agency	Expenditure ($ millions)	Total ($ millions)
2003/04	CRIA LCIP	2.00 3.00	5.00
2004/05	LCIP	5.00	5.00
2005/06	RailCorp LCIP	1.30 6.00	7.30
2006/07	RailCorp ARTC CRIA LCIP	2.40 1.65 0.28 7.00	11.33
2007/08	RailCorp ARTC CRIA LCIP	2.65 6.90 1.94 7.00	18.49
2008/09	RailCorp ARTC CRIA RTA LCIP	2.81 2.47 4.53 2.94 5.28	18.03
2009/10	RailCorp ARTC CRIA RTA LCIP	3.27 42.77[3] 3.87 3.30 6.57	59.77
2010/11	RailCorp ARTC CRIA LCIP[4]	3.60 1.65 3.37 7.33	15.94
2011/12	RailCorp ARTC CRIA LCIP[5]	3.20 29.21 2.88 7.40	42.69

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[3] One-off funding for the Boom Gates for Rail Crossings Program was provided as part of the Commonwealth Government's Nation Building Program.
[4] Includes $2 million funding provided from the RTA.

Year	Program / Agency	Expenditure ($ millions)	Total ($ millions)
2012/13	RailCorp ARTC CRC RMS LCIP[6]	1.90 12.90 1.04 1.30 7.51	24.65
2013/14	Sydney Trains ARTC CRC RMS LCIP[7]	1.80 8.17 3.24 0.46 7.60	21.27

[5] Includes $2.5 million provided by RailCorp and $4.8 million provided by RMS
[6] Includes $2.5 million provided by RailCorp and $5.0 million provided by RMS
[7] Includes $2.5 million provided by RailCorp and $5.0 million provided by RMS

Appendix A: Total LCIP 2013/14 Expenditure

Street	Location	Cost
Construction Projects		
Dandaloo Street	Narromine	$483,193
Summerland Way	Nammoona	$294,417
Nash Street	Parkes	$634,071
Burrington Road	Moree	$760,613
Phillips Street	Gloucester	$5,506
Whitton Street	Narrandera	$688,000
Kooringal Avenue	Griffith	$688,000
Summerland Way	Koolkhan	$870,748
Rossglen Road	Rossglen	$886,382
	Total	**$5,310,930**
Concept & Detailed Design		
Bruxner Highway	Casino	$127,000
Mangoola Road	Mangoola	$126,979
	Total	**$253,979**
Detailed Design		
Wheelers Lane	Dubbo	$48,956
Goondah Road	Bowning	$127,000
Darkes Road	Dapto	$386,791
	Total	**$562,747**
Minor Works		
23 Level Crossings on ARTC Lease Network		$476,008
1 Level Crossing on Country Regional Network		
	Total	**$476,008**
Projects Withdrawn/On Hold		
Martins Creek Road	Martins Creek	$29,894
	Total	**$29,894**
Other Level Crossing Initiatives		
Level Crossing Awareness and Enforcement Campaign		$607,088
ALCAM Development & Data Collection		$230,966

Street	Location	Cost
Level Crossing Strategies and Policies Development		$56,936
Assessment & Trial of New Technology		$68,000
	Total	**$962,990**
	Grand Total	**$7,596,548**

Appendix B: Expenditure on Level Crossing Upgrades in NSW Funded through the Level Crossing Improvement Program and by Rail and road Agencies 2008/09 – 2013/14

Expenditure ($million)
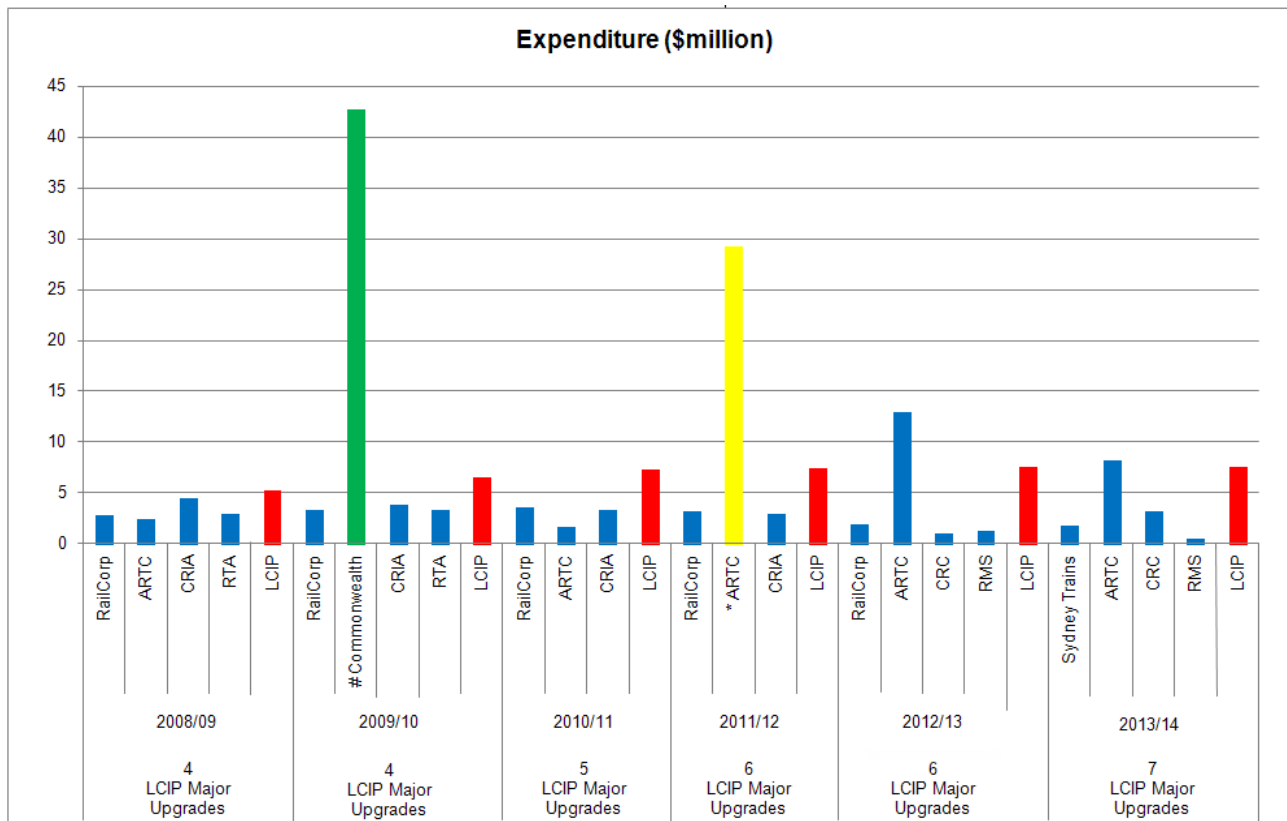
Note: # – ▮ Federal stimulus funded projects under the National Building Program: *Boom Gates for Rail Crossings* (*55 sites*).

Note: * – ▮ During 2011/12 ARTC undertook works in excess of $29 million to enhance or eliminate level crossings across its network in NSW. Twenty three million of this was spent on two major grade separation projects as part of the Maitland to Minimbah Third Track and other safety improvements within the network.