TECHNICAL REPORT NO 7

RAIL RISK ASSESSMENT

MINCIV MANAGEMENT SERVICES

REMONDIS®

RISK ASSESSMENT

Impact of

RECYCLING OPERATIONS at GRAND AVENUE

on

CAMELLIA LEVEL CROSSING and ENVIRONS

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1 EXECUTIVE SUMMARY

The potential impact of the proposed REMONDIS operations on the safety of road and rail traffic movements at the Camellia Level Crossing location has been reviewed in accordance with procedures in the RailCorp Safety Management System (SMS).

The Camellia Level Crossing has passive protection and road rules dictate that vehicles give way to trains. REMONDIS truck movements (184 per day) will arrive via a public road that traverses an eastern car park used by Aldi staff and the public, the Sandown Freight Branch Line Level Crossing, then a western car park used by rail commuters before accessing the proposed recycling site. The REMONDIS staff will park within the depot.

Significant features of the site that mitigate risk of collisions include:

- Slow road and rail traffic speeds
- Relatively clear sighting and visibility

While potentially adverse features include:

- Restricted space for vehicle movements in western (commuter) car park
- Lack of designation of motorist routes, parking adjacent rail corridor and pedestrian pathways
- Degraded current conditions of signage, lighting and line marking

The risk analysis is based upon hazards identified by Subject Matter Experts (SMEs) and stakeholders during a workshop at which a likelihood and consequence was assigned to each hazard. The risk levels were derived by applying the likelihood and consequence ratings in the RailCorp Level 2 Risk Matrix, and these have been included in the Hazard Log that is attached in Appendix A. Additional measures were nominated to reduce risk levels and then an ALARP determination was made as to the justification of further measures and expenditure to reduce risks to tolerable and where possible broadly acceptable target levels.

The results substantiate the assessment and recommendations of an earlier study - refer section 2.6 for details including proposed signage, line marking, road surface and lighting improvements. The current study endorses the previous conclusion:

- The rail level crossing does not require flashing lights and warning bells to safely manage the increase in road traffic; in addition, manual train driver operated push button barriers have also been discounted as they would cause delays to freight rail operations.

The current study also notes that:

- Risk based designs will comply with the ALARP determination where they comply with the Australian Standard, Manual of Uniform Traffic Control Devices AS 1742.7 - 2007 Railways crossings, including meeting specifications for road/pavement surfaces, designating and delineating pedestrian pathways to separate them from vehicles in the car parks and on the level crossing, providing adequate line marking, signage and lighting.

The scope of recommendations for upgrading the car park and level crossing include specific recommendations from the previous study detailed in section 2.6 and those developed in the current study, and comprise:

- Warning sign installed on the eastbound lane of Grand Avenue approaching the Grand Avenue North intersection alerting motorists of the crossing,
- High visibility reflective line marking on Grand Avenue North either side of the level crossing in accordance with RailCorp engineering standard ESC520,
- Line marking through eastern commuter car park designating a pedestrian access route from Camellia Station to the level crossing across the Aldi entrance gates to the footpath on Grand Avenue North
- Lighting either side of the level crossing to ensure good visibility at night,
- Upgrade subgrades and road surface along Grand Avenue North and through the level crossing
- Induction and training of truck drivers on the site conditions,
- Clearing vegetation on the eastern side of the crossing and installing signage to prevent car parking on south-east side of the crossing to improve visibility

Delineating the rail corridor will obviate parking that can infringe the danger zone, and delineating the pedestrian pathway, possibly with fencing, will separate them from vehicles on the level crossing. The road crossing will require widening with bollards installed infront of the rail corridor, and the road may be reconditioned with a distinct surface to further alert of the location of the rail crossing. Pedestrians take the shortest route along the north side of the western commuter car park, and a designated walkway area with signage will also be delineated in this area.

These recommendations are in line with the nominated safety targets and optimise:

- Sighting and visibility for motorists, truck and train drivers,
- Directional and warning signage for vehicles,
- Separation of pedestrians and road vehicles, and
- Minimise likelihood of unintentional and intentional (eg dangerous passing) vehicle driver errors using line and road markings.

Billbergia is currently meeting with RailCorp regarding the upgrading of the crossing in the rail corridor.

A review is currently being undertaken by Parramatta City Council and Railcorp regarding a draft Interface Agreement for on-going management of the site.

2 BACKGROUND

2.1 Billbergia / REMONDIS Proposal

REMONDIS is seeking approval for the construction and operation of an integrated recycling park, with a capacity to process up to 100,000 tonnes per annum of Commercial and Industrial Waste (C&I) and 50,000 tpa of food and green waste. The Integrated Recycling Park will include ancillary facilities including a weighbridge, administrative offices, parking and workshops – REMONDIS staff will not requires parking off-site ie in the car parks adjacent the level crossing. It will operate 24 hours per day, seven days per week. There would be approximately 40 staff working on the morning shift (6am to 2pm), 20 staff working on the 2nd shift (2pm – 10pm) and 5 staff working on the night shift (10pm to 6am). There will be a total of 92 trucks (184 movements) per day accessing the site for the proposed facility. Most trucks between 6am and 4pm, peak 11 per hour and up to 3 vehicles per hours between 4pm and 6am.. Trucks are rigid 8.8m to 12.5m with trailers. The REMONDIS truck drivers will hold appropriate heavy vehicle licences and will be trained for driving through the car parks and into the site as nominated in DA.

The development is to be undertaken on land owned by Billbergia and leased to REMONDIS. Billbergia has previously applied for development approval (DA) for a container depot operation of up to 200 truck movements per day carrying empty shipping containers into and out of the site, principally between 7pm and 4am. This was intended as a temporary approval for a two year operation to store up to 2,000 empty containers from Port Botany on the site, and would have expired before the REMONDIS operation commences. However, the empty storage contract was not realised and the only Billbergia traffic during this period has been for remedial works and the storage of 30 to 40 containers on site associated with these works.

Therefore scope of current study is for the REMONDIS 184 truck operation only, noting that Billbergia has committed to upgrade the area in accordance with the conditions of the DA application for the 2,000 container operation. The upgrading work will be undertaken by RailCorp (Renewals), and negotiations on costs and reimbursement are being undertaken.

2.2 Camellia Station, Car Parks & Level Crossing

Camellia Station is on the Carlingford Line and has a low commuter usage. Data in the RailCorp Compendium of CityRail Travel Statistics, 7th Edition, June 2010, ranks it 268 out of the 309 stations surveyed in 2009 by way of commuter barrier counts. Actual figures are given in the following table:

02:00 - 06:00		06:00 – 9:30		09:30 – 15:00		15:00 – 18:30		18:30 – 02:00		24 Hour	
In	Out	In	Out	In	Out	In	Out	In	Out	In	Out
0	0	0	20	10	10	20	10	10	0	40	40

2009 Weekday Barrier Count at Camellia Station

The station also has a commuter car park that is located between the station and the Clyde - Sandown Line, and is accessed from Grand Avenue by driving over the level crossing on the Sandown Line at Km 22.885. The commuter car park appeared congested on the site visit (31 August 2010), and does not have formal car space markings. As a consequence, cars can park within the 'danger zone' ie 3m metres from the Sandown rail line adjacent the level crossing location. In its current condition it does not appear to comply with the standards nominated in the RailCorp Rail Station Commuter Car Parks, RailCorp Business Requirements, ver 7, Mar 09.

Land ownership and conditions will be resolved with RailCorp in November 2010 following completion of searches. Access to the car parks is via a public road with a 10m carriage way for Grand Avenue and 20m in the Aldi (eastern) public car park. The public car park to the west of the level crossing is used by rail commuters and is delineated by fencing from a RailCorp works area to south. To north there is a fence on the Billbergia boundary. The rail corridor and level crossing runs through the interface of these two car parking areas. Thus access to the REMONDIS site will be via a public road that crosses the RailCorp Sandown Branch Line rail corridor. There is no boom or flashing lights across the level crossing, just a STOP sign to warn motorists. Locos have right of way, and as per the road rules the motorists should give way. In addition to road and rail traffic, some 200 pedestrians per day may walk through the public car park areas and cross the level crossing.

2.3 Rail Corridor and Operations

Sandown Yard is unattended, and although the line is currently not being used, the accredited operators include Pacific National, Shell, Patrick Rail Services (Seaton's), RailCorp and other accredited operators who access the Yard as sub-contracted to RailCorp. It is noted that:

- Where RailCorp Track crosses public roads or formed private roads, RailCorp is responsible for maintaining the level crossing's related warning devices and notices, and
- RailCorp is responsible for scheduling all train movements into and out of the Yard.

The shunting process for freight train coming from the south off the Clyde-Sandown section of the Carlingford Line (between Rosehill and Camellia Stations and under Grand Avenue) is as follows:

- Train will progress onto the Sandown branch line after Train Control has notified the Signaller to authorise access past the last stop board, and a Qualified Worker on the train will be responsible for ensuring that there are no conflicting rail movements, that points are set in the correct position and that the train proceeds at caution up to the relevant siding.

- When departing the train operator will contact the Signaller at least thirty minutes before departure time to confirm that the train is ready to depart and send a train consist to Train Control in accordance with RailCorp's Operations Protocol. At the departure time the operator's Qualified Worker is responsible for ensuring that there are no conflicting rail movements, that the:
  - points are set in the correct position
  - train does not obstruct the Grand Avenue North level crossing
  - train proceeds at caution up to the stop board or first controlled signal

When authority to proceed is given by the Signaller at the stop board or first controlled signal, the freight train departs the Yard.

At level crossings the operators must comply with the instructions contained in RailCorp Network Rules, Network Procedures and relevant Operator Specific Procedures, including Accredited Rail Operator:

- Trains must not obstruct level crossings for greater than 8 minutes at a time.
- Unblock these level crossings immediately when directed to do so by Train Control or the Signaller

Train movements are limited to the speeds stated on signs located within the Yard (10kph) or, in the absence of signs, in accordance with the RailCorp Network Rules and Network Procedures.

The Level Crossing on the Clyde - Sandown Line is an at grade crossing providing vehicular access to the station, commuter car park and vehicular access to the Billbergia site, as well as pedestrian access from Grand Avenue and the Aldi premises to and from Camellia station. The commuter car park (western car park adjacent the station) is used by train commuters and persons working in or visiting

the area. Rail traffic always has priority at level crossings and passive protection is applied to the road reserve.

Freight trains travelled mainly between peaks during the day. Eighteen months ago this involved up to 30 conflicting movements per day, comprising trip trains to Seatons of full movements up to 10 to 16 trains per day (depending on what Patrick and Shell were moving) and then the loco travelling back to Clyde for other duties such as moving loaded tankers in Clyde Yard, before returning to Seatons Sidings. However, these train operations ceased in June 2010, and Shell and Patricks (Seaton) are not using their sidings or facilities in the Sandown Yard at present. But, the line is not truncated and is used by the RailCorp RVX Track Recording Machine (self-propelled), that crosses the level crossing one (1x) per day at 10am. The RVX operates as a loco ie blows its horn and uses head lights as warnings. The turnaround movement 1x per day is at low speed. The RVX has dedicated drivers with local and route knowledge, as the freight train drivers. It was noted at the workshop that if train operations resume the operators may seek to run trains up to 750/800m, although the available train path is only 600m. This could result in trains standing on the level crossing, but is not included in the scope of the current risk assessment and would be subject of a further study by RailCorp. It was also noted that the flat wagons on the freight trains have spot reflectors, ie no visible reflector tape line along the side of the wagon.

Departing trains stand back from the level crossing and may remain stationary for 10 minutes at the exit signal on the southern Clyde side (PR1020) of level crossing before continuing. Loco and RVX tack machine drivers use the train horn (whistle) to indicate to persons and traffic in the vicinity that they are about to move forward. Loco 2nd person does not flag as there is no shunter's switch.

2.4 Historical Incident Data

Data from the Incident Information Management System has indicated the following incidents since 2000 on the Sandown Branch Line; However, it should be noted that none of these occurred at the Camellia level crossing, which is the subject of this Risk Assessment.

DATE	LOCATION	INCIDENT
9 Nov 2000	Sandown Yard	Grand Ave Level Xing Km24.150 not maintained; light & bells switched off as equipment operating continuously
17 Jun 2002	Sandown Shell	Freight collision with road motor vehicle while shunting across level crossing; light & bells activated but car still ran into train
22 Oct 2004	Rosehill	Freighter reported level crossing booms raise lower as train passing – caused by build up of mud from lorries on track
23 Oct 2004	Rosehill	Freighter near miss on pedestrian level crossing
22 Jan 2005	Sandown Yard	Hand signallers used for race day for freight trains at pedestrian level crossing
16 Feb 2006	Sandown Yard	Pedestrian upside gate and access road not lowering
21 Feb 2006	Sandown Yard	Freighter report road motor vehicles ignoring level crossing warning equipment
15 May 2006	Sandown Shell	Freighter collision with road motor vehicle at Grand Parade level crossing
21 Dec 2006	Sandown Yard	Freighter near miss with road motor vehicle while shunting across Grand Avenue

2.5 ALCAM Model

The level crossing is recorded in the Australian Level Crossing Assessment Model (ALCAM) Model that is managed by RailCorp Infrastructure Projects. The model provides an assessment methodology for identifying risk at level crossings and ranking them accordingly based upon physical properties (characteristics and controls) and related common human behaviours to provide a Likelihood Factor score; this is multiplied by an "Exposure" score (a factor taking into account the volumes of vehicles/pedestrians and trains); and then multiplied by a "Consequence" score to give an ALCAM Risk Score = Likelihood Factor x Exposure x Consequence. ALCAM rankings are used in conjunction with stakeholder consultation, including on-site level crossing assessments, standards, and other risk mitigation strategies. The list of hazards recorded for the Camellia Level Crossing include:

- Proximity of intersection near road layout,
- Distractions eg pedestrians walking,
- Substandard signage and lack of AS1742 compliance,
- No line marking on road to stop, and
- Low level rail traffic (ie motorists get complacent) and infrequent.

Other site specific characteristics include:

- Long trains operating at low train speeds - off main line approach at low speed and from Sandown stop before crossing, and
- RMV very low sighting risk (relatively clear view of rail lien approaches).

It is noted that road rules specify that the onus is on the motorist or truck driver to stop if a train is approaching or on a level crossing. The loco (or RVX) driver will sound the train horn as a warning that the train is about to commence crossing the level crossing.

Adequate risk control measures can be provided through design, operation and maintenance compliance with AS 1742.7, including meeting specifications for road/pavement surfaces, designating and delineating pathways, providing adequate line marking, signage and lighting.

Parramatta Council is the road authority and is responsible for implementing controls and standards including designating pedestrian pathways, new line marking and making the crossing wider for pedestrians so they do not walk on the road when traffic is approaching or on the crossing. These requirements may be reflected in the DA.

2.6 Previous Risk Assessment and Recommendations

A risk assessment of the level crossing had been undertaken by Connell Wagner (Billbergia Pty Ltd, Proposed Development of Lot 1, DP226202, No.1 Grand Avenue North, Camellia, Level Crossing Risks Assessment Report, 3 February 2009, Reference 39469/LX-RP-001). The report concluded that the rail level crossing would not require flashing lights and warning bells to safely manage the increase in road traffic as a result of 200 daily empty shipping container truck movements into the new development at No.1 Grand Avenue North. Manual train driver operated push button barriers were also discounted as they would cause delays to freight rail operations.

The analysis was undertaken of Billbergia truck operations that were proposed to operate mainly from 7pm until 4am, and it was estimated that 1 in 5 trucks could be delayed by freight train movements across the level crossing for an average of less than 2 minutes based on fuel freight haulage of 40 carriages at a speed of approx. 20km/h. Proposed improvements to the site to assist in the safety of this crossing were nominated as follows:

1. New sign to be installed by Parramatta City Council on the eastbound lane of Grand Avenue approaching the Grand Avenue North intersection warning motorists of the location of a rail level crossing on Grand Avenue North.
2. New high visibility reflective line marking on Grand Avenue North either side of the level crossing in accordance with the latest version of RailCorp engineering standard ESC520.
3. New high visibility reflective stop signage on Grand Avenue North either side of the level crossing in accordance with the latest version of RailCorp engineering standard ESC520.
4. New line marking through RailCorp car park adjacent to Billbergia property fence for clearly designating a safe pedestrian access route from Camellia Station to the level crossing. This pedestrian crossing should be extended across the Aldi entrance gates to the footpath on Grand Avenue North.
5. New lighting required either side of the level crossing with minimum lux levels to ensure good visibility at night of the level crossing itself and approaching trains, motor vehicles and pedestrians.
6. Improvements will be required to the subgrades and road surface along Grand Avenue North and at the level crossing itself to allow for the substantial increase in proposed truck movements on this road.
7. All new truck drivers appointed to deliver containers to/from this site are to be formally inducted including full safety briefing of their requirements in relation to negotiation of the Camellia Level Crossing.
8. Improve sight lines through the following measures;
    - RailCorp Metro West to clear local vegetation on either side of the freight line track within the rail corridor on the eastern side of the level crossing.
    - RailCorp Property to consider signage preventing car parking on south-east side of the level crossing to improve visibility to both train drivers and truck drivers

It was concluded that these upgrades would be adequate to manage the proposed new Billbergia development and operations to an acceptable safety risk level.

2.7 Current Status

Since the previous risk assessment:

- Freight train operations have ceased on the line and crossing – however, the line has not been closed and the RVX machine operates on it daily,

- Billbergia did not conclude the contract to store 2,000 containers on the site that would involve 200 truck movements in and out of the site per day, and did not finalise the DA,

- REMONDIS entered into negotiations to develop a waste recycling depot that would see 184 truck movements in and out of the site per day, and

- None of the improvements (risk handling measures) raised in the Risk Assessment Report on the Level Crossing on Grand Avenue Camellia, 2009, were evident during a site visit on 31 August 2010. It is understood that Billbergia has been in negotiation with RailCorp to determine the requirements for the upgrade works which are to be carried out in conjunction with RailCorp's own scheduled works on the siding.

3 RISK ANALYSIS

3.1 Site visits

A site review was held on 31 August 2010 with representatives from the National Environmental Consulting Services, Rail Corp Access and (separately) Parramatta Council.

Following the risk workshop, a site inspection was also held with Billbergia and RailCorp (Renewals).

3.2 Risk Workshop and Stakeholders

The following Subject Matter Experts (SMEs) and stakeholders participated in a risk workshop that was held on 26 October in the Stirling Room, Level 18, 477 Pitt Street, Sydney:

NAME	ORGANISATION	TITLE	Telephone
Eugene Saw	RailCorp	Project Development Manager, Network Access	8922 0985
Robert McLellan	RailCorp	Safety Interface Manager	8202 2390
Daryl Cooke	RailCorp	Project Manager, Infrastructure Projects	0437891239
Adrian Parsons	RailCorp	Network Operations Superintendent	0417065755
Sue Just	National Environmental Consulting Services	Environmental Scientist	9550 2686
Warren Atkinson		Environmental Scientist	9550 2686
Eddie Lucas	Billbergia	Project Manager	8878 6900
Richard Searle	Parramatta Council	Manager Traffic & Transport Services	9806 5620

The following nominations have been circulated copy of the risk assessment report for review and comment:

NAME	ORGANISATION	TITLE	Telephone
Stuart Hardaker	RailCorp	Customer Services Manager, Network Access	8922 0985
Darren Sloane	RailCorp	Sector Operations Manager, North West	9847 8837
Jeff Francis	RailCorp	Manager Station Development, Operations	8202 2363
Barry Palmer	RailCorp	Senior Accountant, Manager North/West, Property	8922 4483
Sarkis Yalda	RailCorp	Project Coordinator, Metro West, Corporate Services	8922 4286
Ken Armegor	RailCorp	Project Manager External Party Works, Metro W	9848 9650
Rachit Patel	RailCorp	Senior Asset Engineer, Civil, Metro West	9848 9573
Mohan Selvaraj	REMONDIS	National Technical Manager	9032 7100

3.3 Hazard Identification

The participants identified hazards at the interfaces of people, road vehicles trucks and trains, and reviewed the impact of additional truck movements from the proposed REMONDIS operation. Specific hazards and their causes of accidents at the level crossing are identified in the Hazard Log in Appendix A

3.4 Risk Analysis

The RailCorp Level 2 Risk Matrix is appropriate for analysing safety hazards at a particular location rather than for the RailCorp Network as a whole. For each hazard, the most likely outcome was identified taking into account the consequence controls known to exist at the level crossing. The likelihood of this most likely consequence occurring was then identified taking into account the causal controls known to exist at the crossing. The known controls were reviewed during the workshop, and a number of potential additional controls were identified. The impact of these additional potential controls on the likelihood and consequence associated with the hazards was then assessed as part of the ALARP determination.

RailCorp Level 2 Risk Matrix Regional & Local SMS-06-PR-1383 issued 26/02/10		Likelihood / Frequency						
		Event Frequency	Less than once every 1,000 years	Once every 100 to 1,000 years	Once every 10 to 100 years	Once every 1 to 10 years	More than once up to and including 10 times per year	More than 10 times per year
		Historical (Likelihood)	Unheard of in the industry	Has occurred once or twice in the industry	Has occurred many times in the industry, but not in NSW	Has occurred once or twice in NSW	Has occurred frequently in NSW	Has occurred frequently at specific locations
		Workplace Historical (Likelihood)	Not expected to occur	May occur only in exceptional circumstances	Could occur at some time but not likely	Expected to occur at least once in the next ten years performing similar activities	Expected to occur at least once this year performing similar activities	Expected to occur at least once this month performing similar activities
			F1	**F2**	**F3**	**F4**	**F5**	**F6**
Consequence			Incredible	Improbable	Remote	Occasional	Probable	Frequent
>10 Fatalities	C6	Disastrous	**B-**	**B+**	**A**	**A**	**A**	**A**
2-10 Fatalities	C5	Catastrophic	**C+**	**B-**	**B+**	**A**	**A**	**A**
1 Fatality (2-10 Major injuries)	C4	Critical	**C-**	**C+**	**B-**	**B+**	**A**	**A**
1 Major injury	C3	Major	**D**	**C-**	**C+**	**B-**	**B+**	**A**
1 or more Minor injuries	C2	Minor	**D**	**D**	**C-**	**C+**	**B-**	**B+**
Illness, First Aid Treatment, or Injury not requiring treatment	C1	Negligible	**D**	**D**	**D**	**C-**	**C+**	**B-**

Risks were ranked in the Hazard Log and potential additional mitigation measures reviewed in the accordance with nominated Target Actions, as follows:

Ranking	Risk Description	Target Actions
A	Unacceptable (Extreme)	All steps should be taken to further control the hazard or the activity must cease except in extraordinary circumstances. New activities with this risk ranking should not commence.
B	Undesirable (High)	Additional control measures should be sought and evaluated to assess their reasonable practicability. Where the additional control measures which fail the test of reasonable practicability, a further review should be undertaken by management to confirm that such measures should not be implemented. The 'B' level hazards are further categorised as B+ and B- to enable a further degree of prioritization and relative importance. B+ hazards are considered to be on the verge of being unacceptable and should be given immediate priority.
C	Tolerable (Medium)	Risk is generally regarded as tolerable but should be further reduced if a significant net benefit in doing so can be demonstrated and/or there is an additional control measure which is recognised as good practice in other relevant railways. The 'C' level hazards are further categorised as C+ and C- to enable a further degree of prioritization and relative importance.
D	Broadly Acceptable (Low)	Level of risk is broadly acceptable and should be subject to continuous monitoring.

3.5 Assignment of Credible consequence Category

The consequence categories within the RailCorp level 2 Risk Matrix have been used in the Risk Analysis. Categories have been assigned as follows:

- **Collision with RMV**
  Outcomes of collisions between a train and a road vehicle have been assigned Category C3 as the most credible outcome at this location. This represents 1 major injury and reflects the slow speeds of both rail and road traffic and the open visibility in the car parks and of the rail corridor. It is noted that a review of statistical information on railway level crossing sites in NSW published on the Level Crossing Strategy Website indicates that for active level crossings between the years 1989 and 2007 on average less than 20% of collisions at railway level crossings result in fatalities. For the purposes of this report, road traffic includes REMONDIS trucks as well as motor vehicles.

- **Collision with pedestrian**
  Outcomes involving a pedestrian have been assigned category C4 representing a single fatality.

- **Struck by RMV**
  Outcomes involving collision between two road vehicles have been assigned a consequence category C3, one major injury.

- **Slips trips and falls**
  Outcomes involving passengers slips, trips and falls have been assigned a consequence category of C2 representing one of more minor injuries.

These are recorded in the ‘Consequence’ column of the Risk with Current Controls in the Hazard Log (Appendix A).

3.6 Assignment of Likelihood of Consequence Occurring

While the assessment of likelihoods has been derived from SME judgements at the risk workshop, these have been verified by cross checking with a number of other sources including historical statistics for the Sandown Line and Camellia Level Crossing itself and NSW statistics for level crossing incidents. The latter have also been used in reviewing the proportion of level crossing incidents attributed to different causes.

ATSB Report: The Australian Rail Safety Occurrence Data 1 January 2001 to 30 June 2009. ATSB Transport Safety Report Rail Statistics RR-2009-007(1) contains statistics for Rail Safety occurrences in Australia. These statistics indicate for this period in NSW:

- Level crossing collision with people (excluding suicides) were recorded as 5 over the 8.5 years of data covered. This would correspond to likelihood category F4, and
- Road vehicle collisions were recorded as 92 over the 8.5 years of data covered. This would correspond to a likelihood category of F5.

ATSB Report: Monograph of Level Crossing Accidents reviewed level crossing incidents between 1988 and 1998 and found the following casual factors associated with fatal level crossing accidents:

- Adverse weather or road conditions (degraded conditions) 13%
- Alcohol/drugs 9%
- Fatigue 3%
- Driver error (unintended) 46%
- Excessive speed 7%
- Other risk taking 3%

Taking into account the local conditions at the Camellia level crossing, including the slow speeds of both rail and road traffic, the open visibility in the car parks and rail corridor, and the fact that the incident data base and local records indicate no serious incidents at this level crossing over the past twenty years, the following local likelihood ratings that were assessed at the workshop are considered credible:

- RMV driver error normal conditions train starting from stop signal ex Sandown F1, approaching from main line F2
- RMV Driver error normal or degraded conditions train starting from stop signal ex Sandown or approaching from main line F3
- Pedestrian struck by loco ‘fouling’ crossing F2, most normal operations F1
- Pedestrian slips and falls F4
- RMV/ RMV minor collisions in car parks F4, major collisions F3

Thus the national statistics are not generally applicable in this case where specific local conditions vary significantly from the national average, in particular as a consequence of the prevailing slow road and rail speeds.

4 RISK ASSSESSMENT

4.1 Operation Phase Risks

The Hazard Log in Appendix A contains the outcome of the Hazard analysis based on the consequence and likelihood categories assigned. Twenty eight (28) hazards were identified in the Hazard Identification exercise. On the basis of the risk analysis undertaken with existing controls in place:

Risk Ranking ex Level 2 Matrix		Control Measures nominated in PHA		Residual After Mitigation Measures					
				Hazard - Collision					Hazard - Falls
		Exist	Addit	1 Vehicle / Train Normal	2 Vehicle / Train Degraded	3 Pedes / Train	4 Pedes / Vehicle	5 Vehicle / Vehicle	6 Slip, Trip, Fall
Unacceptable	A								
Undesirable	B+								
Undesirable	B-	1					1		
Tolerable	C+	9			4	1	1	2	1
Tolerable	C-	14		5	5	3	1		
Broadly Acceptable	D	4		4					
TOTAL		28		9	9	4	3	2	1

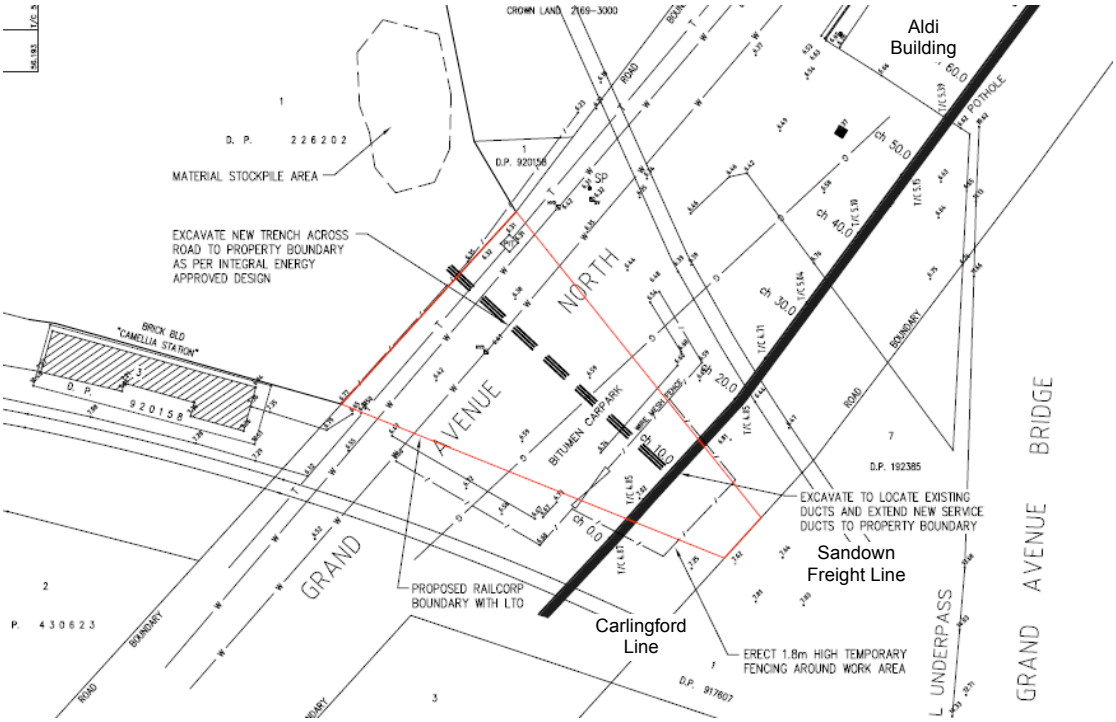
Proposed mitigation measures and application of ALARP justification process resulted in the following residual risk profile if the recommendations are implemented:

Risk Ranking ex Level 2 Matrix		Control Measures nominated in PHA		Residual After Mitigation Measures					
				Hazard - Collision					Hazard - Falls
		Exist	Addit	1 Vehicle / Train Normal	2 Vehicle / Train Degraded	3 Pedes / Train	4 Pedes / Vehicle	5 Vehicle / Vehicle	6 Slip, Trip, Fall
Unacceptable	A								
Undesirable	B+								
Undesirable	B-	1							
Tolerable	C+	9	1				1		
Tolerable	C-	14	13		4	4	2	2	1
Broadly Acceptable	D	4	14	9	5				
TOTAL		28	28	9	9	4	3	2	1

4.2 Construction Phase Risks

The risk assessment specifically analyses the impact of REMONDIS operations on the RailCorp corridor and operations and excludes the construction phase that will be addressed in hazard and risk analyses undertaken in accordance with and the conditions of the Development Application and any Interface Agreements, and documented in the Project Management Plan, Site Safety Management Plan with OH&S practices detailed in Safety Work Method Statements.

Specific construction risks may arise as a result of the proposal for Billbergia to access power conduits to bring power to their site and the presence in the area of overhead cables.



Plan showing the proposed electrical works Billbergia will undertake. The RailCorp boundary is shown in red as determined (surveyed) by RailCorp.

5 ALARP DETERMINATION

The presumption that risks have been reduced to ALARP is based upon ensuring residual risks are within the target benchmarks given in section 3.4. That is that they are at least tolerable and for there to be no reasonably practicable and financially justifiable alternative or additional measures that can be implemented to reduce the risk further.

Risks may also be defined as being broadly acceptable where design, operating and maintenance specifications comply with the Australian Standard, Manual of Uniform Traffic Control Devices AS 1742.7 - 2007 Railways crossings.

The assessment complies with the process adopted by RailCorp which is in line with the NTC Document “Meaning of So Far as is Reasonably Practicable” and also with the relevant sections of the RailCorp Safety Management System (SMS).

The ALARP assessment takes account of the concerns and issues identified by SMEs and stakeholders both during site visits and at the risk workshop, and is based on the Hazard Identification and Risk Analysis.

In summary, when the additional controls are taken into account at the level crossing and in the car parks, risk levels may be reduced as follows:

- 1 B- risk to C+
- 9 C+ risks to C-
- 9 C- risks to D

APPENDIX A: HAZARD LOG

Attached excel spreadsheet (A3 size)

SPECIFIC HAZARD INFORMATION				EXISTING RISK CONTROLS	RISK WITH EXISTING CONTROL			EXPOSED PARTIES				ADDITIONAL MITIGATION	RESIDUAL RISK			NOTES	ACTION INFORMATION				
Hazard Ref	Hazard Description	Potential Cause(s)	Safety Potential Worst Consequence(s) prior Controls	Existing Controls (prior to remediation to meet DA and risk assessment recommendations)	Likelihood	Consequence	Risk Score	Pedestrians	Motorist	Trucks	Loco / RVX Driver	A (*Must Mitigate*) B (*Target Mitigation*) C (*Cost Effective Mitigation*) D (*Discretionary Mitigation*)	Likelihood	Consequence	Risk	*Supplementary Comments*	*Action Ref.*	Action Statement for Stakeholders	Owner	Status	Target Date (2010)
1	**COLLISION VEHICLE / LOCO NORMAL DAYTIME**			Major control at present is extremely low volume of rail traffic (1 / day)																	
1.1	Motor Vehicle / Truck exiting Commuter Car Park (and REMONDIS site) collides with train on crossing:																				
1.1.1 -a	Train ex Sandown	Motor Vehicle driver error	Major Injury	Road rules - loco has right of way; Signage (stop and level crossing);	F2	C3	C-		X	X		C. Upgrade location to comply with AS1742.7	F1	C3	D		1.1	Eddie Lucas Billbergia (B) / Ken Armegor, RailCorp (RC) to review	B / RC	Open	Dec '10
1.1.1 -b		Train / RVX driver error	Major Injury	Blow whistle / flash headlight when start moving from stop sign to level crossing; Adequate sighting	F1	C3	D		X	X	X	D.	F1	C3	D	ALARP justification - Risk level mitigated to Broadly Acceptable (D) through compliance with AS1742.7 design principles					
1.1.2 -a	Train ex Main Line into Sandown	Motor Vehicle driver error	Major Injury	Road rules - loco has right of way; Signage (stop and level	F2	C3	C-		X	X		C. Upgrade location to comply with AS1742.7	F1	C3	D						
1.1.2 -b		Train / RVX driver error	Major Injury	Blow whistle / flash headlight when approaching level crossing; Adequate sighting	F1	C3	D		X	X	X	D. Board on approach to crossing	F1	C3	D						
1.2	Motor Vehicle / Truck entering Commuter Car Park from Grand Avenue collides with train on crossing:																				
1.2.1 -a	Train ex Sandown	Motor Vehicle driver error	Major Injury	Road rules - loco has right of way; Signage (stop and level	F2	C3	C-		X	X		C. Upgrade location to comply with AS1742.7	F1	C3	D						
1.2.1 -b		Train / RVX driver error	Major Injury	Blow whistle / flash headlight when start moving from stop sign to level crossing; Adequate sighting	F1	C3	D		X	X	X	D.	F1	C3	D						
1.2.2 -a	Train ex Main Line into Sandown	Motor Vehicle driver error	Major Injury	Road rules - loco has right of way; Signage (stop and level	F2	C3	C-		X	X		C. Upgrade location to comply with AS1742.7	F1	C3	D	ALARP justification - Risk level mitigated to Broadly Acceptable (D) through compliance with AS1742.7 design principles					
1.2.2 -b		Train / RVX driver error	Major Injury	Blow whistle / flash headlight when approaching level crossing; Adequate sighting	F1	C3	D		X	X	X	D. Board on approach to crossing	F1	C3	D						
1.3	Vehicle illegally parked	Illegal Parking within 3m (danger zone) of rail corridor	Major Injury	Blow whistle when start moving to level crossing Signage Adequate sighting	F2	C3	C-		X		X	C. REMONDIS parking on site (not public car park)	F1	C3	D						
												Upgrading crossing will delineate rail corridor (and danger zone) and obviates parking at interface of crossing with car parks to west & east Loco / RVX drivers approach at slow speed (10kph) from main line or from stop ex Sandown, and have clear view of rail corridor and any infringement through crossing	F1	C3	D	Tolerable (C) levels subjected to review - SMEs and stakeholders did not identify additional financially justified measures and considered delineation of rail corridor in accordance with AS1742.7 adequately complies with ALARP justification					
2	**COLLISION VEHICLE / LOCO DEGRADED CONDITIONS (Poor Visibility, Night, Flat Wagons)**			Major control at present is extremely low volume of rail traffic (1 / day)																	
2.1	Motor Vehicle / Truck exiting Commuter Car Park (and REMONDIS site) collides with train on crossing:																				
2.1.1 -a	Train ex Sandown	Motor Vehicle driver error	Major Injury	Road rules - loco has right of way; Signage (stop and level crossing); Adequate sighting	F3	C3	C+		X	X		C. Upgrade location to comply with AS1742.7 in particular: - Lighting - Road Line Marking and in the event freight traffic resumes: - Review installing reflectors on wagons (RailCorp ref Operating Agreement with Operators)	F2	C3	C-	ALARP justification - Broadly Acceptable (D) where risk level mitigated through compliance with AS1742.7 design principles on public road, in car parks and public road (pavement) crossing of level crossing Tolerable (C) levels subjected to review of additional measures such as boom gates not considered effective as car with impatient driver will still attempt to 'go round' and pass stopped car in front. SMEs and stakeholders assessed that cost of protection and associated re-signalling, track circuit testing and potential adverse impact on On Time Running (longer time for train to clear signals) was not justified within ALARP concept. Furthermore, such measures may create a 'false' perception with motorists that this is a hazardous crossing, when infact the other crossings along Grand Ave are a higher risk.	2.1	Eddie Lucas Billbergia (B) / Ken Armegor, RailCorp (RC) to review	B / RC	Open	Nov '10
2.1.1 -b		Train / RVX driver error	Major Injury	Blow whistle / flash headlight when start moving from stop sign to level crossing; Adequate sighting	F2	C3	C-		X	X	X	C. Upgrade location to comply with AS1742.7	F1	C3	D						
2.1.2 -a	Train ex Main Line into Sandown	Motor Vehicle driver error	Major Injury	Road rules - loco has right of way; Signage (stop and level crossing); Adequate sighting	F3	C3	C+		X	X		C. Upgrade location to comply with AS1742.7 in particular: - Lighting - Road Line Marking and in the event freight traffic resumes: - Review installing reflectors on wagons (RailCorp ref Operating Agreement with Operators)	F2	C3	C-						
2.1.2 -b		Train / RVX driver error	Major Injury	Blow whistle / flash headlight when approaching level crossing; Adequate sighting	F2	C3	C-		X	X	X	C. Upgrade location to comply with AS1742.7 - will delineate rail corridor	F1	C3	D						
2.2	Motor Vehicle / Truck entering Commuter Car Park from Grand Avenue collides with train on crossing:																				
2.2.1 -a	Train ex Sandown	Motor Vehicle driver error	Major Injury	Road rules - loco has right of way; Signage (stop and level crossing); Adequate sighting	F3	C3	C+		X	X		C. Upgrade location to comply with AS1742.7 in particular: - Lighting - Road Line Marking and in the event freight traffic resumes: - Review installing reflectors on wagons (RailCorp ref Operating Agreement with Operators)	F2	C3	C-						
-b		Train / RVX driver error	Major Injury	Blow whistle / flash headlight when start moving from stop sign to level crossing; Adequate sighting	F2	C3	C-		X	X	X	C. Upgrade location to comply with AS1742.7	F1	C3	D	ALARP justification - Broadly Acceptable (D) where risk level mitigated through compliance with AS1742.7 design principles on public road, in car parks and public road (pavement) crossing of level crossing Tolerable (C) levels subjected to review of additional measures such as boom gates not considered effective or justified within ALARP concept - as 2.1					
2.2.2 -a	Train ex Main Line into Sandown	Motor Vehicle driver error	Major Injury	Road rules - loco has right of way; Signage (stop and level crossing); Adequate sighting	F3	C3	C+		X	X		C. Upgrade location to comply with AS1742.7 in particular: - Lighting - Road Line Marking and in the event freight traffic resumes: - Review installing reflectors on wagons (RailCorp ref Operating Agreement with Operators)	F2	C3	C-						
-b		Train / RVX driver error	Major Injury	Blow whistle / flash headlight when approaching level crossing; Adequate sighting	F2	C3	C-		X	X	X	C. Upgrade location to comply with AS1742.7 - will delineate rail corridor	F1	C3	D						
2.3	Vehicle illegally parked	Illegal Parking within 3m (danger zone) of rail corridor	Major Injury	Blow whistle when start moving to level crossing	F2	C3	C-		X		X	C. REMONDIS parking on site	F1	C3	D						

SPECIFIC HAZARD INFORMATION				EXISTING RISK CONTROLS	RISK WITH EXISTING CONTROL			EXPOSED PARTIES				ADDITIONAL MITIGATION	RESIDUAL RISK			NOTES	ACTION INFORMATION				
Hazard Ref	Hazard Description	Potential Cause(s)	Safety Potential Worst Consequence(s) prior Controls	Existing Controls (prior to remediation to meet DA and risk assessment recommendations)	Likelihood	Consequence	Risk Score	Pedestrians	Motorist	Trucks	Loco / RVX Driver	A (*Must Mitigate*) B (*Target Mitigation*) C (*Cost Effective Mitigation*) D (*Discretionary Mitigation*)	Likelihood	Consequence	Risk	*Supplementary Comments*	*Action Ref.*	Action Statement for Stakeholders	Owner	Status	Target Date (2010)
				Yard conditions - Slow Loco Speed / RVX as 1.3								C. Upgrade location to comply with AS1742.7 - will delineate rail corridor as 1.3	F1	C3	D						
3	**COLLISION PEDESTRIAN / LOCO**			Major control at present is extremely low volume of rail traffic (1 / day)																	
3.1	Intentional collision	Suicide	Fatality	Remote Location	F1	C4	C-	X			X	D.	F1	C4	C-						
3.2	Unintentional collision - normal behaviour	Driver or pedestrian error	Fatality	Loco / RVX travelling slow speed (10kph), adequate sighting	F1	C4	C-	X			X	C. Upgrade location to comply with AS1742.7 - will delineate rail corridor	F1	C4	C-						
3.3	Unintentional collision - abnormal behaviour	Train fouls crossing and person 'crawls' through (short cut)	Fatality	Signage Sighting good, train speed slow, train horn / whistle when commences moving towards crossing, adequate warning time	F2	C4	C+	X			X	C. Designate walkway with line marking (no footpath) in Commuter Car Park across Level Crossing	F1	C4	C-	Tolerable (C) levels subjected to review of additional measures such as boom gates not considered effective or justified within ALARP concept - as 2.1	3.1	Eddie Lucas Billbergia / Ken Armegor, RailCorp (RC) to review	B /RC	Open	Nov '10
3.4	Disabled person	Wheel chair stuck in rail	Fatality		F1	C4	C-	X			X	C. Upgrade location to comply with AS1742.7 - will delineate rail corridor	F1	C4	C-						
4	**COLLISION PEDESTRIAN / VEHICLE**																				
4.1	On level crossing Grand Avenue and Road Reserve on approaches to level crossing are 'MIXED ZONES' with heavy trafficking of pedestrians, Motor Vehicles and trucks at peak times, and no delineated footpaths	Error by motor vehicle or truck that strikes pedestrian on level crossing where there is no clear footpath	Fatality	Provision of Motor Vehicle STOP sign, and low road and rail traffic speeds	F2	C4	C+					C. Delineate pedestrian pathway as AS1742.7 that requires separation of Motor Vehicles and Pedestrians on level crossing, and upgrade/install new signage.This will require widening level crossing road width as part of upgrading works, and include a pavement through	F1	C4	C-	Road rules require Motor Vehicle to stop at STOP sign. Level crossing road width 7.8m, but requires at least 8m when pavement laid as truck lanes are 3.5m. Review concrete base pavement for vehicles and extend line marking and extra 1m and install fencing as per AS1742.7 as a minimum. Compliance of design and installation with AS 1742.7 will achieve ALARP	4.1	Eddie Lucas Billbergia (B) / Ken Armegor, RailCorp (RC) to review	B / RC	Open	Nov '10
4.2	West side - Camellia Station Commuter Car Park (most pedestrians are train commuters ie few Aldi employees)	Error by motorist or truck drivers turning on way in or out of REMONDIS site	Fatality	Provision of Motor Vehicle STOP sign, and low road and rail traffic speeds	F3	C4	B-					Site induction for all truck drivers. Pedestrians take the shortest route along the north side of the car park. Therefore delineate (and widen) a designated (with signage) walkway area. Trucks will be travelling slowly since they will be approaching or exiting a weighbridge near the entrance in REMONDIS compound.	F2	C4	C+	Curbing to delineate pathway is not a solution since it will block drainage and lead to flooding of the corridor in heavy rain. Compliance of design and installation with AS 1742.7 will achieve ALARP	4.2	Eddie Lucas Billbergia / Sarkis Yalda or Barry Palmer, RailCorp (RC) to review with Parramatta Council (PC) re land ownership / interface agreement, conditions in DA	PC	Open	Dec '10
4.3	East side - Aldi / Public Car Park	Error by motorist or truck driver	Fatality	Provision of Motor Vehicle STOP sign, and low road and rail traffic speeds	F1	C4	C-					Extend existing footpath from Aldi building to level crossing	F1	C4	C-	Compliance of design and installation with AS 1742.7 will achieve ALARP					
5	**COLLISION VEHICLE / VEHICLE**																				
5.1	MIXED ZONES' with heavy trafficking of pedestrians, Motor Vehicles and trucks at peak times	Surface of car parks and crossing not maintained and uneven, no line marking, congestion in peak periods and visibility blocked by other pedestrians / vehicles moving around car parks	Major Injury	Slow traffic speeds in car parks and on public road in this area	F3	C3	C+					[illegible] in accordance with AS 1742.7 to mitigate over-taking and dangerous passing; Unobstructed sighting; Adequate warning signage; Designate routes to separate motorists and pedestrians both in car parks and on level crossing	F2	C3	C-	Compliance of design and installation with AS 1742.7 will achieve ALARP	5.1	Eddie Lucas Billbergia / Sarkis Yalda or Barry Palmer, RailCorp (RC) o review with Parramatta Council (PC) re land ownership / interface agreement, conditions in DA	PC	Open	Dec '10
			Minor Injury		F4	C2	C+						F3	C2	C-						
6	**SLIP / TRIPS / FALLS PEDESTRIAN**																				
6.1	Pedestrian slips, trips & falls	Surface of car parks and crossing not maintained and uneven	Minor Injuries	Irregular inspections and maintenance Visibility good under normal conditions	F4	C2	C+					Designated, delineated pathway with even, maintained surface and lighting as per AS1742.7	F3	C2	C-	Compliance of design and installation with AS 1742.7 will achieve ALARP	6.1	Eddie Lucas Billbergia / Sarkis Yalda or Barry Palmer, RailCorp (RC) o review with Parramatta Council (PC) re land ownership / interface agreement, conditions in DA	PC	Open	Dec '10