QUEENSLAND GOVERNMENT

Transport and Main Roads

Serious Injury Collision, St Vincents Road, Banyo 14 September 2012

Final report, rail incident investigation TMR 4617

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Published by: Department of Transport and Main Roads
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Incident reference
TMR 4617

Publication date
April 2013

Publication title
Serious Injury Collision, Banyo, 14 September 2012

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Major rail incident investigation

Final report, incident reference: TMR 4617

Contents

Terms of reference

As Rail Safety Regulator pursuant to the *Transport (Rail Safety) Act 2010* I hereby require a Rail Safety Officer, to conduct an investigation in accordance with section 183 (2) of the *Transport (Rail Safety) Act 2010* and report to me on the circumstances and causes of the incident where a northbound passenger train collided with a prime mover and low loader at St Vincents Road Level Crossing at Banyo on 14 September 2012 (the truck driver sustained serious injuries as a result of the collision).

Your investigation will:

- Conduct an immediate investigation into establishing the factual circumstances of the incident.
- Conduct an analysis of the cause or causes of the incident.
- Assess human factors to identify any underlying matters, the interface and the actions of relevant parties which may have caused or contributed to the incident.
- Review the geography and infrastructure of the St Vincents Road Level Crossing and Banyo station platform.
- Assess the appropriateness of speed limits for entering the Banyo station platform.
- Determine whether the heavy vehicle involved in the incident was appropriately authorised to traverse the St Vincents Road level crossing.
- Assess the effectiveness of the process within Queensland for the issue of heavy vehicle permits with respect to rail safety.
- Review the communication policies and procedures relevant to rail traffic crew and customer staff relating to incidents on the Queensland Rail network.
- If necessary make appropriate recommendations in order to prevent a recurrence of identified failures.

The investigation team will be comprised of members from the Rail Safety Regulator of the Department of Transport and Main Roads assisted by Queensland Rail Limited (Queensland Rail).

Director-General
Transport and Main Roads

Executive summary

On Friday 14 September 2012 at about 6.30am, a heavy vehicle became grounded on the rail level crossing at St Vincents Road, Banyo. The vehicle was carrying a 38.5 tonne, 3.65m high electrical transformer on a low loader trailer.

The driver of the heavy vehicle exited the cab with the intention to raise the low loader clear of the crossing. He was assisted by a member of the public who entered the rail corridor. A southbound passenger train was stationary at Banyo station at the time.

At about 6.32am the member of the public noticed an approaching northbound passenger train and alerted the heavy vehicle driver. The two men began to run from the rail corridor as the northbound train collided with the heavy vehicle.

The collision split the heavy vehicle combination apart and the heavy vehicle driver sustained serious injuries as a result of being struck by the low loader. The driver of the northbound train suffered minor injuries.

The northbound train derailed on impact and suffered moderate damage to the lead unit. The stationary southbound train received minor damage and the heavy vehicle combination was extensively damaged. The collision caused extensive damage to the rail infrastructure and resulted in significant delays to train services.

The Rail Regulation Unit of the Department of Transport and Main Roads conducted an investigation into the incident.

The investigation established that the vertical geometry of the eastern approach to the level crossing is not suitable for low loader trailers, resulting in the heavy vehicle becoming grounded across the level crossing. Contributing factors to the incident include a number of communication errors. Inconsistencies were also identified in the excess mass/overdimensional permit process, including the lack of a process in the coordination of permits between Transport and Main Roads and the Brisbane City Council.

The report makes safety recommendations to Transport and Main Roads, Queensland Rail Limited and Brisbane City Council. The recommendations include:

- continue to develop and implement an interface agreement in regard to road/rail level crossings.
- continue to develop and implement a web based permit approval process for local government roads.
- explore options to improve the vertical alignment at the St Vincents Road level crossing.
- continue to review the training and information provided to Queensland Rail staff about emergency communications.
- continue with the review of the psychometric testing and monitoring process supporting business group requirements.
- the establishment of a process for the coordination of permit approvals and notifications between Transport and Main Roads and other road authorities.

1 Introduction

Rail safety in Queensland is regulated by the Rail Regulation Unit (RRU) of the Department of Transport and Main Roads (Transport and Main Roads). All rail infrastructure managers and/or rolling stock operators within Queensland are required to be accredited in accordance with the *Transport (Rail Safety) Act 2010* (the Act). The RRU accredits rail infrastructure managers and/or rolling stock operators and monitors their compliance with the Act.

The accreditation process is to ensure the safe carrying out of railway operations, and the management of risks associated with railway operations. The RRU is responsible for investigating incidents, accidents and other transport safety matters involving railway operations.

The incident was a notifiable occurrence as defined in Schedule 3 of the Act. The reasons that it is considered a notifiable occurrence are:

- the operation or movement of rolling stock on a railway track is defined in section 9 of the Act as railway operations
- rolling stock as defined in Schedule 3 of the Act was involved in this incident
- the incident occurred on a railway as defined in Schedule 3 of the Act
- the incident caused an injury
- the operator of the rolling stock was accredited under the Act at the time of the incident.

The incident was an occurrence that was required to be reported by the rail transport operator under the conditions of accreditation.

2 Investigation Methodology

This report was prepared by the RRU in consultation with Queensland Rail in accordance with the Terms of Reference and the legal framework as defined in the Act.

The investigation analysed information obtained from a number of sources including:

- Queensland Rail
- Queensland Police Service
- Brisbane City Council
- Divisions of Transport and Main Roads
- O.D. Group Australia Pty Ltd
- Wilson Transformer Ltd
- MTES Pty Ltd
- Energex Limited
- field inspections of the incident site
- interviews with involved parties.

The RRU investigation is focussed on improving rail safety. During the course of the investigation some material that was requested by the investigation team was not provided and therefore subsequent analysis was not possible. The conclusions are based on the data available to the RRU at the time of finalising the report.

The findings made in this report should not be read as apportioning blame to any particular organisation or individual.

The RRU acknowledges the cooperation received from all parties who contributed to this investigation, both individuals and organisations.

3 Factual Information

3.1 Background Information

At 6.32am on Friday 14 September 2012, a northbound Queensland Rail passenger train collided with a heavy vehicle that had become grounded on the St Vincents Road level crossing at Banyo.

As a result of the collision, the driver of the heavy vehicle sustained serious injuries and was transported to hospital. The driver of the northbound train received minor injuries. Substantial damage was caused to rail infrastructure, rolling stock and the heavy vehicle.

3.2 Occurrence Location

St Vincents Road level crossing is on the Shorncliffe line, 12.6 rail kilometres[1] north east of Brisbane's Roma Street station. The rail track through the level crossing is signalled duplicated unidirectional[2] electrified line.

Banyo station is located 2.2km from Northgate station and situated between Bindah and Nudgee stations (refer Figure 1).

Figure 1: Location of Banyo station

[1] Queensland Rail Network South Line Diagram – Drawing number NAG 046, Issue date May 2012.
[2] A track which is signalled for trains to run in the one direction

3.2.1 Rail and Road layout

The rail infrastructure is made up of 47kg/m[3] rail on a mix of timber and concrete sleepers. The railway lines are almost straight and level on the approach to Banyo station from Bindha station with a maximum allowable speed of 100km/h. The whistle board[4] on the approach from Bindha station is correctly located[5] for the allowable track speed.

The road layout for westbound traffic approaching the level crossing (the direction of the heavy vehicle) is initially along Tufnell Road, which is straight and level. Vehicles then approach St Vincents Road[6], which is a T-intersection controlled by 'Give Way' signs. For vehicles turning left from Tufnell Road onto St Vincents Road, the southern raised guttering is curved, allowing easier access onto St Vincents Road.

After westbound traffic enters St Vincents Road there is a short distance to the rail level crossing. An 'S' bend configuration exists on the road requiring long vehicles to utilise a portion of the eastbound traffic lane to negotiate the left hand bend onto St Vincents Road from Tufnell Road.

The level crossing is a straight section of roadway. Directly after the level crossing, St Vincents Road turns approximately 90 degrees to the left, which requires long vehicles to utilise a portion of the eastbound lane on the level crossing to negotiate the tight corner. The road layout is depicted in Figure 2.

The Banyo suburban area in the vicinity of the level crossing is generally retail and residential in nature.

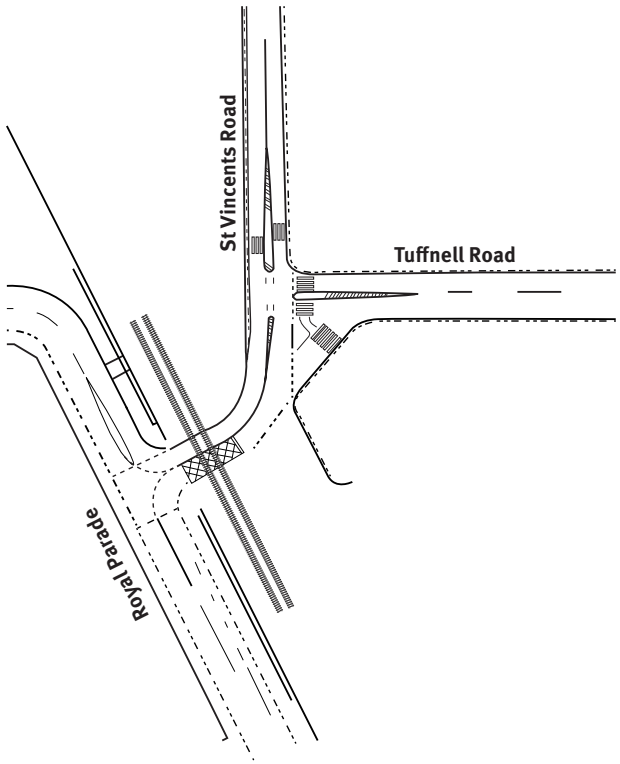


Figure 2: St Vincents Road level crossing layout

[3] Kilogram per metre, used to determine rail mass.
[4] A sign placed within the rail corridor located at a specific distance from a level crossing to notify the train driver to sound the locomotive/train unit klaxon.
[5] Queensland Rail Resurvey of Road Crossing – 03/10/12 whistle boards located in accordance with Queensland Rail whistle board table and standard drawing10732 of 450m +/-10%.
[6] Also known as Royal Parade East but referred to in this report as St Vincents Road

3.3 Details of rail operations

3.3.1 Accredited rail transport operator

Queensland Rail is accredited under the Act as a rail transport operator (RTO) to operate rolling stock and to manage the rail infrastructure and Network Control for the Brisbane suburban rail network.

Queensland Rail (the RTO) operates passenger services on the Brisbane suburban network and long distance passenger services throughout Queensland.

3.3.2 Rolling stock

The northbound train was a passenger service travelling from Roma Street to Shorncliffe. This is a scheduled Monday to Friday service timetabled to meet morning peak period requirements.

The northbound train was a six car Electric Multiple Unit (EMU) and is depicted in Figure 3. The train was made up of two three car units coupled together. The northbound train had a length of 144.8m and a mass of 235.6 tonnes. The lead unit was fitted with a forward facing Closed Circuit Television (CCTV) camera. The trailing unit was fitted with an event recorder. At the time of the collision, the train was carrying about 20 passengers.

Figure 3: Electric Multiple Unit

Figure 4: Suburban Multiple Unit

The southbound train was a passenger service travelling between Shorncliffe and Roma Street. This is a scheduled Monday to Friday service timetabled to meet morning peak period requirements.

The southbound train was a six car Suburban Multiple Unit 220(SMU220) Series and is depicted in Figure 4. The train was made up of two three car units coupled together. The southbound train had a length of 144.8m and a mass of 244.2 tonnes. The lead unit was fitted with a forward facing CCTV camera and a data logger event recorder. On arrival at Banyo station, the train was carrying about 300 passengers.

Both trains were being operated by a single driver occupying the leading cab and a guard occupying the fourth car in the six car consist[7].

The units of both trains underwent set pre-departure examinations prior to departure from the Mayne Electric Train Depot (Mayne) and were found to be operating and functioning correctly.

A review of rolling stock maintenance records did not identify any on-going maintenance issues.

Rolling stock maintenance is not identified to be a contributing factor to the incident.

[7] Listed order of vehicles arranged to make a train

3.3.3 Train driver information

The driver of the northbound train was a 50 year old male qualified to operate urban passenger trains, and was assessed as fit for duty on 7 March 2012. The driver was route, traction, train management and safeworking competent in accordance with the RTO's standards.

The driver of the southbound train was a 46 year old male qualified to operate urban passenger trains, and was medically assessed as fit for duty on 21 February 2012. The driver was route, traction, train management and safeworking competent in accordance with the RTO's standards.

3.3.4 Fatigue

The driver of the northbound train had been on duty for one hour and 40 minutes at the time of the collision. The driver of the southbound train had been on duty for two hours at the time of the collision. Fatigue is not considered to have contributed to the incident.

3.3.5 Customer Service Attendant

On 14 September 2012, a Customer Service Attendant (CSA) was rostered on duty at Banyo station. The CSA was a 53 year old male who was fit for duty and competent to perform his role.

The CSA had been employed by the RTO since 6 July 2009, and was a Customer Service Attendant Level 2. The role of the CSA is to provide interaction between the RTO and passengers. The role of the CSA is not identified as a safety critical role and does not have direct contact with train operations.

The CSA on duty at the time of the incident was usually located at Northgate station. He had been rostered to work at Banyo station four times in the three months prior to the incident. The CSA had been on duty for one hour at the time of the collision, and was not suffering the effects of fatigue.

Customer service at Banyo station is managed by a Customer Service Leader (the Supervisor) located at Northgate station.

3.3.6 Network Control

The Mayne Network Control Centre (Network Control) in Brisbane is responsible for the correct supervision and coordination of all rail traffic within the Brisbane suburban area. The centre also coordinates operational activities such as the reporting of rolling stock defects, monitoring of the 25kv overhead electrical system, customer service facilitation, corridor and station security and incident management.

Rail traffic movements are monitored and coordinated by network controllers[8] remotely operating equipment in the field such as signals and points through the application of a supervisory Universal Train Control system (UTC)[9]. In operating the UTC, network controllers are able to safely route rail traffic over a wide area of railway aided by special safeguards built into the system. Network controllers' workstations display the location of all rail traffic, signals and alarms for various circumstances.

Customer service and support is monitored and coordinated by Passenger Service Officers[10] (PSO) working in an office located in Network Control. The PSO assists network controllers during emergencies and service disruptions by concentrating on passenger needs and management of passenger issues.

[8] A worker qualified to and authorised to control the movement of rail traffic in the relevant safeworking system.

[9] The UTC system is a remote control system that provides the operator interface between Network Controllers and the vital signalling system. The system monitors and controls all remotely controlled signalled territory in the Brisbane suburban area and are operated by Network Controllers assigned to specific sections of the network.

[10] A worker responsible for the dissemination of information in relation to service amendments and disruptions on the suburban network to station staff.

3.4 Details of heavy vehicle operations

3.4.1 The driver

The driver of the heavy vehicle was 47 years old at the time of the collision and resided in Victoria.

The driver had been employed in the trucking industry for over 25 years and had driven heavy vehicles for the heavy vehicle operator for a period of six years. The driver had prior interstate experience and had travelled to Brisbane on previous occasions. The driver was appropriately licensed to operate the heavy vehicle.

3.4.2 The heavy vehicle

The heavy vehicle consisted of a 2006 Kenworth prime mover with a trailer combination of a 2006 MTES converter dolly trailer and 2009 MTES quad axle low loader. The heavy vehicle was registered to O.D. Group Australia Pty Ltd in Victoria (the heavy vehicle operator). The heavy vehicle was appropriately registered to travel on Queensland roads.

The heavy vehicle was transporting a 38.5 tonne, 3.65m high, 3.1m wide electrical transformer from Wilson Transformer Company Pty Ltd (Wilson Transformer) to the Energex depot located in Blinzinger Road, Banyo.

The low loader was equipped with hydraulic suspension to allow the trailer to be lowered for loading and raised for travel. The driver had set the deck height of the low loader to 950mm above road level. The deck where the transformer was secured was 125mm lower, giving a minimum height for the load deck of 825mm above the road.

The overall dimensions of the laden heavy vehicle were a total mass of 69.3tonnes, 25m in length, 3.1m wide and less than 4.6m in height.

The heavy vehicle was inspected at the incident site by Transport and Main Roads Transport Inspectors. The condition of the heavy vehicle did not contribute to the collision. All vehicles in the combination displayed current Victorian registrations.

3.5 Environmental conditions

'Geoscience Australia[11] recorded that on 14 September 2012, sunrise was at 5.46am, while nautical twilight[12] was 4.56am. There was no recorded rainfall on the date of the incident; minimum temperature was 13.0 degrees with maximum temperature 23.2 degrees[13].

At the time of the incident, the position of the sun did not create impairment to the southbound train driver or driver of the heavy vehicle.

The driver of the northbound train experienced glare from the sun through the windscreen, and was wearing sunglasses.

[11] www.ga.gov.au

[12] Twilight, Geoscience Australia defines as, 'the instant in the morning, when the centre of the Sun is at a depression angle of twelve degrees below an ideal horizon. At this time in the absence of moonlight, artificial lighting or adverse atmospheric conditions, it is dark for normal practical purposes'.

[13] www.bom.gov.au

3.6 Injury and damage information

3.6.1 Injuries

The driver of the heavy vehicle sustained serious injuries and was admitted to hospital. The injuries were received as a result of the impact with the low loader trailer. The driver of the northbound train sustained minor cuts from glass shattering in the windscreen of the train. None of the passengers reported suffering physical injuries.

3.6.2 Damage to rolling stock

The stationary southbound train sustained minor damage to the front of the cab. The northbound train derailed on impact and sustained significant damage to the drivers cab and along the right hand side of the lead unit, as depicted in Figure 5.

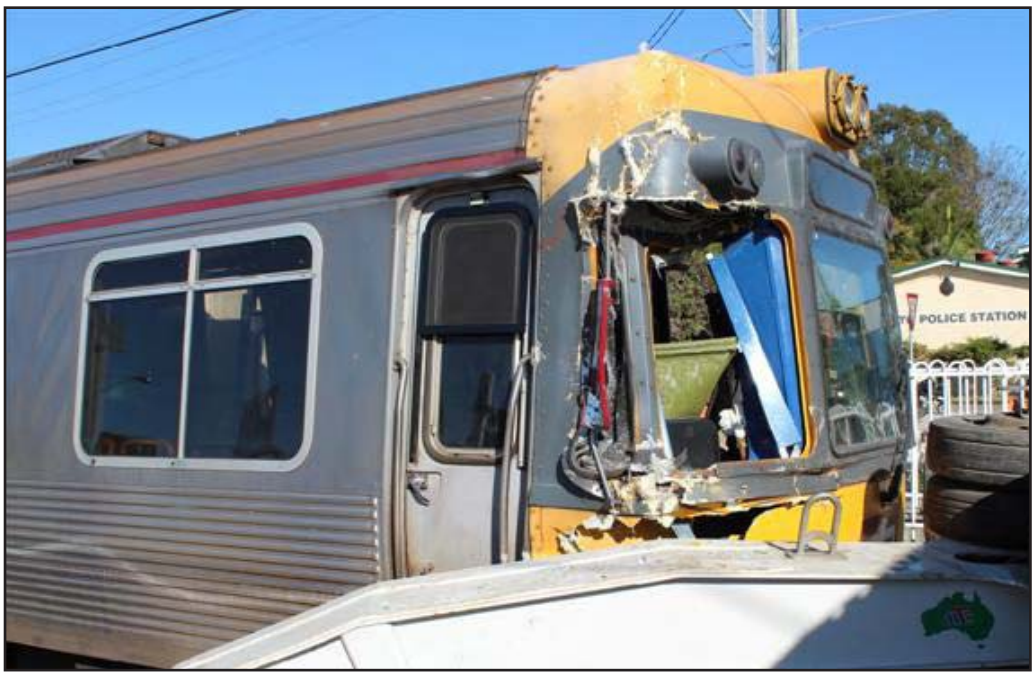


Figure 5: Damage to northbound train

3.6.3 Damage to rail infrastructure

The pedestrian and level crossing protection equipment sustained extensive damage, as shown in Figure 6. The rail infrastructure including tracks and support structures and the overhead electrical lines sustained minor damage.

Figure 6: Damage to rail infrastructure

3.6.4 Damage to heavy vehicle

The heavy vehicle sustained extensive damage, as shown in Figure 7.

Figure 7: Damage to heavy vehicle

4 Analysis

4.1 The incident

The chronology of events prior to, and immediately following the collision was collated using information gathered from the investigation[14]. A timeline is attached in Appendix 1.

At 2.30am on Friday 14 September 2012, the heavy vehicle left Heathwood, 20km south of Brisbane and travelled along the Logan, Southern Cross Way and Gateway Motorways towards Nudgee. The driver stopped for a break at the service station at the Nudgee Road exit at 3.15am.

The rail traffic crew (RTC)[15] rostered to work the southbound train (at the time of the incident) signed on at 4.30am and completed pre-departure preparation of the rolling stock. The train departed Mayne at 5.15am and commenced a service from Roma Street to Shorncliffe arriving at 6.02am. The RTC then prepared for the return journey to Roma Street as the southbound train, departing as scheduled at 6.19am.

At 4.50am the RTC for the northbound train signed on and carried out set pre-departure checks on the rolling stock. The train departed Mayne at 5.53am and commenced a service from Roma Street to Shorncliffe. The train departed Roma Street at 6.09am, four minutes behind schedule.

About 6.15am, the heavy vehicle continued its journey and travelled along Nudgee Road and turned right into Tufnell Road, Banyo. At 6:30:32am the heavy vehicle entered the level crossing at St Vincents Road. As the heavy vehicle attempted to cross the St Vincents Road level crossing, the chassis in the vicinity of the third axle of the low loader trailer became grounded on the roadway, straddling the centre line of the roadway.

The CSA was located on the western platform at this time and observed the heavy vehicle become grounded on the crossing. The CSA ran back to the eastern platform where the station office is located to obtain a radio. As the CSA was returning to the station office, the driver of the heavy vehicle exited the cab.

The southbound train was on the approach to Banyo station from Nudgee, activating the level crossing protection at St Vincents Road. The flashing lights were activated at 6:30:48am with the boom gates descending at 6:30:58am and the boom gates were located in the down position at 6:31:08am.

[14] Inconsistencies were noted between the recorded times on electronic devices. Times were identified by the data logger unit of the northbound train. The time recordings from the data logger are calibrated by Global Positioning System.

[15] The driver and the guard.

The CSA walked to the front of the office while talking into the hand held radio and checked the Remote Train Overview Application[16] screen to identify the location of approaching trains. At 6:31:32am the CSA left the office while talking into the radio and walked towards the southern end of the platform near the level crossing. Figure 8 shows the CSA talking into the radio and the heavy vehicle grounded on the crossing.

Figure 8: Heavy vehicle grounded on the level crossing, the CSA to the left on the radio

At about 6:31am, the PSO located at Network Control advised the Train Control Supervisor that three separate emergency broadcasts were heard via the digital radio system from an unknown caller. The investigation determined that the broadcasts were made by the CSA.

At the time the PSO heard these broadcasts, the northbound train had departed Bindha station at 6:31:37am[17] and the southbound train was coming to a stop at Banyo station, stopping at 6:31:42am[18].

As the southbound train came to a stop, the CSA moved along the platform and stood adjacent to the front of the southbound train and continued to speak into the hand held radio. The CSA then moved back to the driving cab of the southbound train and briefly spoke to the driver.

While the CSA was on the radio, the driver of the heavy vehicle was attempting to raise the boom gate. While he was attempting this, a member of the public entered the rail corridor to assist the driver by holding the boom gate in the up position. The lifting of the boom gates was recorded in the UTC Reply Data as occurring at 6:32:18am. The driver of the heavy vehicle then moved towards the trailer to attempt to raise the hydraulic suspension.

At 6:32:32am, the member of the public observed the approaching northbound train and moved towards the truck driver and warned him of the danger. The driver and member of the public then ran from the rail corridor towards the eastern side of the crossing. As this was occurring, the CSA was standing on the platform and recalls hearing the train's klaxon[19] sound.

[16] Provides station staff with a view of the location of all trains on the suburban network.
[17] Time taken from the data collected from train unit data logger event recordings of the northbound train. The time is calibrated by Global Positioning System.
[18] Time from the forward facing camera on the southbound train have been adjusted to show times that correlate with those times recorded from data collected from train unit data logger of the northbound train.
[19] The train units whistle operated by the driver.

At 6:32:35am, the northbound train collided with the heavy vehicle in the vicinity of the articulation point between the prime mover and dolly trailer (refer Figure 9). The member of the public escaped uninjured however the driver was struck by the low loader trailer and pushed into the eastern side rail corridor fence.

Figure 9: Moment of impact

Upon impact, the prime mover was pushed to the western side of the rail corridor against the left hand side of the northbound train. The dolly trailer was pushed north, through the level crossing becoming jammed between the two station platforms and against the stationary southbound train. The low loader trailer, still attached to the dolly trailer, was pushed towards the eastern side of the rail corridor coming to rest against the corridor fencing. The transformer was dislodged and came to rest in an upright position spilling a small amount of oil and fluid on the roadway beside the northbound train. Figure 10 shows an aerial view of the incident site.

Figure 10: Aerial view

4.2 Road and rail infrastructure

4.2.1 Level crossing

The level crossing is within the rail corridor and was the responsibility of the RTO to manage and maintain. The RTO's responsibility for the level crossing extends 600mm from the outside rail. The area beyond this point was the responsibility of the road authority. In this instance, the road authority was the Brisbane City Council (the road manager).

St Vincents Road provides the only crossing on the Shorncliffe rail line in the Banyo area; as a result about 3000 vehicles use the crossing in a day, approximately 10 per cent of which are heavy vehicles[20]. The level crossing is protected by half boom gates and flashing lights, with passive level crossing warning signs and 'overhead live wires clearance 5.0m' warning signs on the approach. The level crossing includes pedestrian crossings to the north and south of St Vincents Road.

Level crossings in the Brisbane suburban area are assessed by the RTO using the Australian Level Crossing Assessment Model (ALCAM).

ALCAM is an assessment tool used to identify key potential risks at level crossings and to assist in the prioritisation of railway level crossings according to their comparative safety risk. It is used to support a rigorous defensible process for decision making for road and pedestrian level crossings as well as a method to help determine the most cost effective treatments[21].

The St Vincents Road level crossing was last assessed on 5 March 2002. The assessment made several recommendations including:

- installation of advance warning signs for road traffic
- cross hatching to be painted on the roadway
- the pavement markings on pedestrian pathway to be repainted
- installation of LED lights.

All of the recommended upgrades were completed in mid 2003 (refer to Figure 11). On 12 September 2012, the RTO assessed the St Vincents Road pedestrian level crossing as part of scheduled inspections. During this assessment, the RTO did not observe any issues relating to the road level crossing protection.

Figure 11: St Vincents Road level crossing

[20] ALCAM assessment report 5 March 2002
[21] ALCAM in Detail: http://www.transport.nsw.gov.au/sites/default/files/b2b/levelcrossings/ALCAM_In_Detail-NSW.pdf

The investigation team reviewed the operation of the level crossing and it was found to be in accordance with the RTO's standards.

The rail infrastructure within the rail corridor is not considered to have contributed to the cause of this incident.

The risk of death or serious injury at level crossings is substantial. Transport and Main Roads has established the Queensland Level Crossing Safety Group (QLCSG) to review and provide advice on measures to ensure the safety of all persons at rail level crossings in Queensland. The QLCSG will oversee the implementation of the Queensland Level Crossing Safety Strategy 2012-2021. The QLCSG consists of Transport and Main Roads, the Local Government Association of Queensland and industry representative groups. The RTO is a member of the QLCSG.

4.2.2 Platform

The Banyo station platforms are identified as side platforms with a length of 150m. The southern ends of these platforms are five metres from the edge of the road at the level crossing. Such proximity of platforms and level crossings is common throughout the network, both regional and metropolitan, and are considered to be a design legacy for pedestrian access to the platform from when the track was originally laid down.

4.2.3 Road characteristics

Tufnell and St Vincents Roads are managed and maintained by the road manager. The roads are classified as suburban routes which connect arterial routes in and around suburbs and form important links in the public transport and inter-suburban freight network. The chassis of the low loader of the heavy vehicle combination became grounded on the road pavement in the vicinity of the third axle, which is depicted in Figure 12.

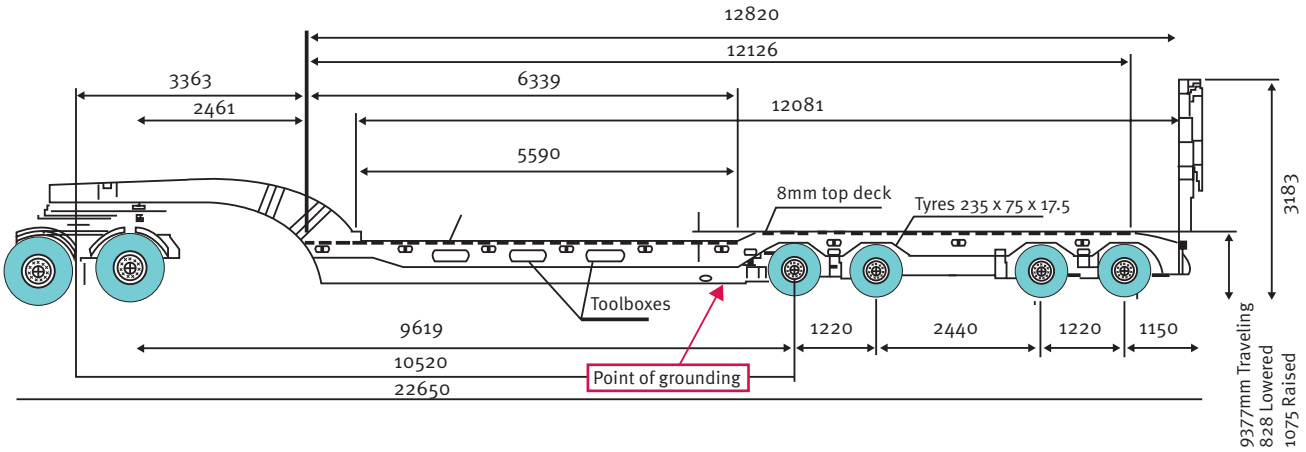


Figure 12: Schematic of low loader

The grounding of the heavy vehicle is considered to be a contributing factor to the incident. Following the incident, the RTO undertook an assessment of the road geometry to determine its potential contribution to the incident. The RTO has created engineering drawings[22] that specify details of public road grading and sign posting for level crossings.

The assessment surveyed the geometry with vertical alignment cross sections at the centreline and both shoulders. The assessment found that the vertical geometry of St Vincents Road across the level crossing does not comply with the drawings, in that all three cross sections fall away more steeply on the approach side of the crossing.

The investigation team sought advice from the road manager on the existing vertical geometry of the road. The signed maximum speed on the eastern approach is 40km/h for all road vehicles. The horizontal radius[23] approaching the level crossing however is suitable for a 20km/h design speed, and the vertical geometry would be designed for this speed. For a semi-trailer 19m in length, a significant lower design speed of about 10kmp/h is relevant.

The existing vertical geometry at St Vincents Road level crossing has a change of grade across the railway tracks of approximately 1.25 per cent. The road grade on the eastern approach from 15m before and up to the railway tracks varies from 5.4 to 8.1 per cent. This creates a maximum rate of change of grade of 2.7 to 6.85 per cent.

The change of grade that is acceptable is dependant on the speed environment and is based on vehicle driver comfort. Austroads[24] recommends that for a 40km/h speed environment, the maximum rate of change of grade is 1 per cent. For a 10 to 20kmp/h design speed, an acceptable change of grade of up to 1.5 per cent would be considered appropriate.

For this site, the road manager advised that the main criterion for safety is adequate sight and stopping distances. The current change in grade at the location would have minimal affect on sight and stopping distances, but would subject vehicle drivers to some discomfort[25].

The road manager advised that the existing change in grade on the road approach is acceptable with respect to standard vehicle clearance and design speed. Cars, buses and semi-trailers were identified as standard vehicles, but not low loader trailers.

It is of the opinion of the road manager that the approach would require extensive adjustment of existing kerb and channel, footpath levels and service pit levels within close proximity to the RTO's track. The works could be undertaken to increase driver comfort but were not required to ensure compliance with design criteria.

The approaches to the level crossing were resurfaced by the road manager in 1995. Subsequent resurfacing works undertaken on the level crossing by the RTO have maintained the height of overhead wires above the track to meet clearance requirements. The heights and offsets are managed electronically to ensure that there is no possibility for the crossing height to raise and increase the rate of decline to the road approach.

4.2.4 Interface agreement

As of 1 September 2012, all rail infrastructure managers and road managers in Queensland were required to seek to enter into an interface agreement for road or rail crossings in accordance with the Act. An interface agreement is designed to define the responsibilities and accountabilities of road and rail managers regarding matters affecting the operations at level crossings.

The incident occurred two weeks after the legislative requirement came into place. The RTO and road manager did not have an Interface Agreement in place to manage the responsibilities at the level crossing. It is noted that both parties were negotiating an interface agreement, and a draft agreement had been provided to the road manager by the RTO for review. This complied with the requirements of the Act.

[22] Queensland Rail Civil Engineering Drawing 2586, Issue B.

[23] The maximum allowable horizontal radius of a section of curved road formation determined by the intended design speed for vehicles travelling around the curve.

[24] Austroads 2009 Guide to Road Design Part 3 Geometric Design

[25] Brisbane City Council, reference 305942, dated 13 February 2013.

4.3 Heavy vehicle permit

4.3.1 Planning of the heavy vehicle route

The transformer was originally loaded onto the low loader at the Wilson Transformer depot in Dandenong South, Victoria. The transformer was to be delivered to the Energex depot at Blinzinger Rd, Banyo. Energex has advised that the transformer was the first of its size to be delivered to this site. Transportation from Victoria to the Energex depot was undertaken by the heavy vehicle operator. Wilson Transformers supply about 50 transformers per year to Queensland and use the heavy vehicle operator on a regular basis.

The heavy vehicle operator was required to obtain a heavy vehicle permit to transport the transformer to Queensland and was responsible for route planning.

The route selected had not been used previously by the heavy vehicle driver. The heavy vehicle driver had, on a previous occasion, transported equipment from the Energex depot to Victoria via a different route.

At the time of the incident, the driver of the heavy vehicle had a copy of the permit issued by Transport and Main Roads in the heavy vehicle.

The heavy vehicle operator was offered an opportunity to provide information about how the route was selected but declined to do so. During the course of this investigation, the heavy vehicle operator had placed itself into voluntary administration restricting the availability of information to the investigation team.

4.3.2 The heavy vehicle permit system

4.3.2.1 Department of Transport and Main Roads

A vehicle that exceeds the mass, dimensions or operating parameters defined by legislation[26] may be able to travel under a permit issued by Transport and Main Roads. The permit may contain a number of specific conditions that operators and drivers must comply with. The conditions are designed to mitigate the risk of damage to public infrastructure and the risk to the safety of public road users. The permit conditions may include, but are not limited to:

- driver responsibilities
- display of warning devices
- obtaining a route assessment and verification
- obtaining permissions from other authorities
- travel time and route restrictions, and
- requirements for pilot or escort vehicles.

At the time of the incident, Transport and Main Roads was responsible for managing overdimension Letters of No Objection (LONO)[27] and Excess Mass Permits[28] on all state controlled roads in Queensland.

For the type of heavy vehicle that was involved in this incident, Transport and Main Roads may issue excess mass permits to carry an item that exceeds 59.5 tonnes and LONO for 5m in height and 3.5m in width. Loads exceeding 5m in height and 3.5m in width are managed by the Queensland Police Service on behalf of Transport and Main Roads.

Transport and Main Roads have an established procedure for receiving, reviewing and issuing permits and LONO. In 2012, Transport and Main Roads received about 22,000 applications for excess mass permits and LONO.

On the 6 September 2012, the heavy vehicle operator submitted a permit application via email to Transport and Main Roads. The application provided details of the gross weight, the length and width of the heavy vehicle. The heavy vehicle operator proposed a route from the Newell Highway in New South Wales to the Blinzinger Road depot in Banyo.

[26] Transport Operations (Road Use Management – Mass, Dimensions and Loading) Regulation 2005
[27] Letter of No Objection is issued for exceeding dimensions
[28] Excess Mass Permit is issued for exceeding the mass

The proposed route included a combination of State controlled roads and local government roads. Under respective legislation, state controlled roads were the responsibility of Transport and Main Roads and local government roads were the responsibility of the road manager. The route is depicted in Figure 13.

On 11 September 2012, Transport and Main Roads approved the application and issued a LONO and Excess Mass Permit to the heavy vehicle operator with a number of conditions.

The approved route in the permit was the route proposed by the heavy vehicle operator with the exception of local government roads that were the responsibility of the road manager. The permit therefore authorised travel from the Cunningham Highway at Inglewood to Gateway Motorway, Nudgee. The permit further stated that approval for operations of vehicle/s on local government roads must be obtained from the appropriate authority/s.

Form 4[29] that accompanied the permit included the following wording at Section 9.1:

- 9.1.1 The driver of an oversize vehicle or combination has the overall responsibility:

  (a) for organising any required permits/authorisations; and
  (b) for the loading of the overdimensional vehicle to comply with any permits/authorisations issued; and
  (c) to ensure that the routes used by the overdimensional vehicle comply with any permits/authorisation issued; and
  (d) of any compliance or other conditions contained in any permits/authorisation which are relevant to the operation of the overdimensional vehicle.

The onus to seek approval from the local road manager for operations on local government roads is a condition of travel under the current process. At the time of the incident, the heavy vehicle operator, and therefore the heavy vehicle driver did not have authority to travel on the local government roads.

The investigation team identified that there is no process in place whereby Transport and Main Roads notifies the relevant road manager that a permit application had been received or that an approval had been granted that interacts with the local roads. As a result, a coordinated response did not occur to address the risks of public safety and damage to infrastructure.

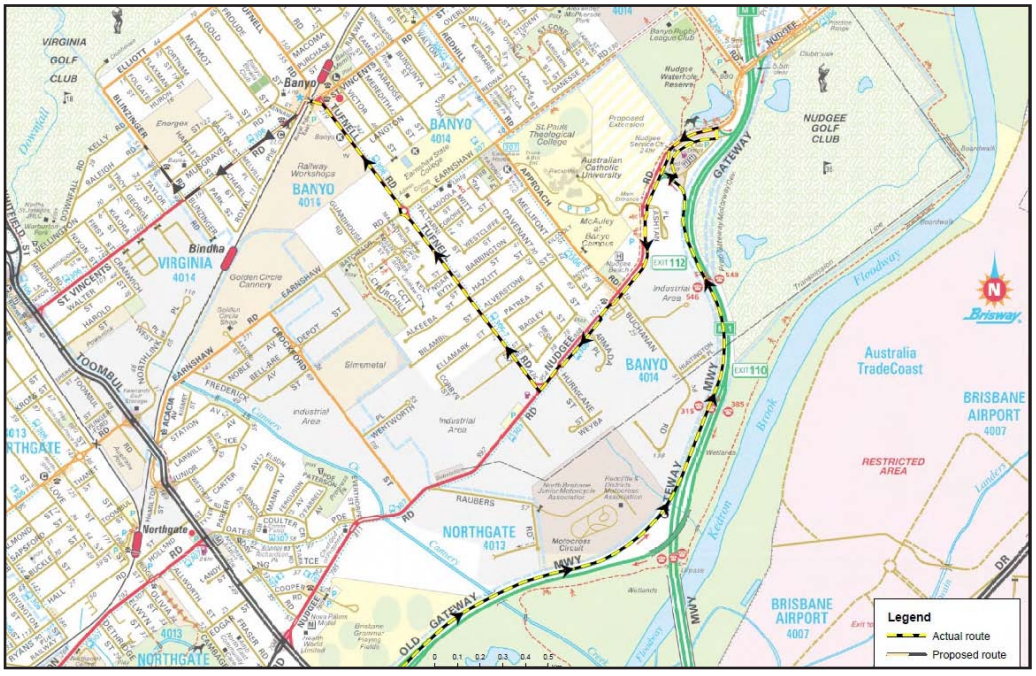


Figure 13: Route taken by the heavy vehicle

[29] Guideline for Excess Dimension – Vehicles Carrying Indivisible Articles; Special Purpose vehicle; Vehicles that require a Pilot or Escort in Queensland. Form 4 Version 7 February 2012.

4.3.2.2 Queensland Rail

Heavy vehicle operators are required to apply for a permit to move excess mass and overdimensional loads across the RTOs rail infrastructure. The heavy vehicle operator was not required to apply for a permit to transport the transformer across the level crossing at St Vincents Road because it did not exceed mass or height limitations.

4.3.2.3 Brisbane City Council

The remainder of the journey from Southern Cross Way/Gateway Motorway to Blinzinger Rd through St Vincents Road level crossing was undertaken on local government controlled roads. In accordance with the *City of Brisbane Act 2010*, the road manager was required to make local laws to regulate the use of roads which includes the movement of traffic on roads.

A vehicle that exceeds the mass, dimensions or operating parameters defined by legislation may be able to travel under a permit issued by the road manager. The road manager requires an application for vehicles in excess of 42.5 tonnes and 19m in length to travel on its roads.

Low loader combinations are a category of vehicles which require a permit. Because of the additional risks presented by the clearance of a low loader trailer, the route would be assessed for pavement loading, structure loading on bridges, clearances and road geometry.

The road manager has an established process for receiving, reviewing and issuing of LONO. The LONO issued by the road manager is for excess mass and/or excess dimension and special purpose vehicles. Since January 2012, the road manager has received 33 excess mass and dimension applications, approving 29.

The heavy vehicle operator did not apply for a LONO from the road manager for the heavy vehicle involved in the incident. The heavy vehicle operator was aware of the road managers requirements, and had applied for permits on previous occasions. The most recent application was made in January 2010. The application in 2010 was made by the same individual employed by the heavy vehicle operator who was responsible for ensuring a permit was in place for this trip.

At the time of the incident, no information about the movement of heavy vehicles or permit process was available on the road managers website. The road manager advised that the 24 hour Contact Centre has a script to inform potential applicants about permit process and to refer applicants to the responsible persons.

The investigation team found that the information provided by the Contact Centre was in contradiction to the advice provided by the road manager. The road manger was made aware of this inconsistency.

During the investigation, it was noted that no structured process existed between the local road manager and the State road manager to coordinate the issuing of heavy vehicle permits.

The investigation team noted that an application was made by the heavy vehicle operator after the incident for the return journey of the damaged transformer.

4.3.2.4 National Heavy Vehicle Regulator

On 21 January 2013, the National Heavy Vehicle Regulator (NHVR) commenced as an independent body under the Heavy Vehicle National Law (HVNL).

At the time of writing this report the NHVL will be adopted by Australian states during late 2013[30]. General mass, dimension and loading rules for heavy vehicles will continue to be administered by Transport and Main Roads and the local road manager[31]. Once in place the Heavy Vehicle (Mass, Dimension & Loading) National Regulations will align existing jurisdictional regulations.

Applications will be lodged to a central agency (the NHVR) that will ensure the correct permit is issued. Unlike the current regulatory requirements for heavy vehicle access permits in Queensland, under the NHVL the NHVR is required to obtain the consent of every road manager (local and state government) for a route before it may issue a permit. This will provide an assurance that the mass, dimension and load characteristics of every oversize or overdimensional vehicle movement will have been appropriately assessed to determine its compatibility with the road network for its entire journey. There are significant safety and regulatory benefits that will be derived from this approach over the current permit system in Queensland.

The current permit system places the obligation on the applicant to firstly correctly identify every road manager for a particular route and then individually seek their permission for the heavy vehicle movement.

4.4 Train handling

4.4.1 Northbound train

The onboard data logger for the northbound train was analysed by the rolling stock operator and the results provided to the investigation team. The data shows that:

- The train attained a maximum speed of 82km/h on the section approaching St Vincents Road level crossing after leaving Bindha station. The maximum allowable speed for the section is 100km/h.
- The driver first applied the train brakes approximately 223m prior to the level crossing.
- Five seconds later, the driver made an emergency brake application. The emergency application was made at a point 119m from the level crossing.
- The deceleration rate of the train was within the design specification.
- The speed of the train at the point of impact was 35.57km/h.

The maximum train speed through the level crossing is 100km/h. For a station stop at Banyo, the normal driving practice in good conditions and level track is to be travelling about 60km/h on entering the platform. The speed at which the northbound driver approached the platform was below the designated speed.

From the northern end of Bindha station, the investigation team noted that it is possible, in good environmental conditions to observe vehicle traffic crossing the St Vincents Road level crossing.

An analysis of the event recorder data indicated that the driver of the train accelerated from Bindha station as he would under normal operating conditions.

A re-enactment of the driver's actions using data from the event recorder on a similar train unit indicated that the driver had most likely operated the train and set the brakes for a normal platform stop prior to identifying the heavy vehicle on the level crossing.

[30] https://www.nhvr.gov.au/road-access/mass-dimension-and-loading

[31] Queensland Government passed the Heavy Vehicle National Law Amendment Bill 2012: http://statements.qld.gov.au/Statement/2013/2/15/heavy-vehicle-onestopshop-ready-to-go-national

4.4.2 Southbound train

The investigation determined that:

- the train departed Nudgee station at 6:30:28am
- the train stopped at Banyo station at 6:31:42am

Upon approach to Banyo station, the driver identified the heavy vehicle on the level crossing. The driver operated the train in accordance with general driving practice. He continued along the platform to stop at the designated mark on the southern end of the platform to allow passengers to entrain and detrain. The driver's decision not to immediately contact Network Control on the radio and say "Emergency, Emergency, Emergency", warn any approaching trains and press the "Emergency Pan Down" button was in contravention of the RTO's standard for level crossing emergencies[32].

4.5 Communications

4.5.1 Radio operations

Train to base radio communications are available through the RTOs Train Control Radio (TCR). A fixed TCR is provided in the cabs of all suburban passenger trains.

The TCR features an 'open channel' system which allows the transmission and receiving of radio communications between trains and network controllers and other trains operating in the same area. The radio communications on the TCR system are not able to be heard by customer service staff. All train to train and train to base radio communications are recorded by Network Control.

A second radio communication system is used for customer service, between station staff and the PSO in Network Control and is not able to be heard by network controllers or train drivers. Each suburban station throughout the network is equipped with at least one hand held radio, this allows for communication with other stations in the area. The radio provided to station staff is for on time running commitments and customer service and is not programmed to report emergencies to Network Control. The communications on the closed digital system are not permanently recorded but are monitored by the PSO. The southbound train driver was unaware that customer service staff were not in a position to talk directly to Network Control by radio.

At the time of the incident, rail traffic on the Shorncliffe line was managed through the UTC8 workstation. The UTC8 network controller was on the telephone to the Supervisor at Northgate. The Supervisor advised the network controller that the Banyo CSA had reported a truck grounded on the St Vincents Road level crossing. While on the telephone, the UTC8 network controller overheard the emergency call over the network radio from the northbound train that he had hit a truck on the St Vincents Road level crossing.

The UTC3 network controller responsible for the rail traffic movements between Virginia and Beerburrum answered the emergency call and proceeded to initiate emergency procedures[33].

[32] Standard SAF/SPC/0022/EMG Module EP1 – 02 Level Crossing Emergency - Section 2.5.2
[33]SAF/SPC/0022/EMG – Module EP1-02 Level Crossing Emergency and Module EP1-07 Collision.

4.5.2 Communications on the platform

The investigation found that the CSA had attempted to contact Network Control to warn of the heavy vehicle grounded on the level crossing.

The CSA located at Banyo was the first RTO employee to observe the unsafe condition develop on the St Vincents Road level crossing. He was required[34] to raise the alarm by contacting the Network Control and say "Emergency, Emergency, Emergency".

It is intended that customer service staff will communicate emergencies to Network Control by telephone. A Safety Notice was issued to all suburban stations on 12 March 2012 about communications with Network Control. The Safety Notice includes actions to be taken:

- Queensland Rail employees must promptly report conditions that can, or do affect the safety of operations in the Network to the Network Controller responsible for the affected portions of the line.
- When Queensland Rail employees see, or are advised of, person(s), who are on or will be on track in unsafe locations – you must advise Network Control, immediately and provide information that identifies the person(s), location and the activity.
- Network Control will make necessary arrangements and is dependant on the information supplied, it is therefore critical to identify conditions that affect safety on the network and report them to Network Control as early as possible.
- You may be requested to supply ongoing information to Network Control regarding the situation and you should ensure that all information is provided as requested or whenever the situation changes.
- Contact with Network Control is available on 1800 XXX XXX[35] for unsafe conditions that affect the network.

The initial response by the CSA was to call an emergency by using the hand held radio. The investigation determined that the emergency calls heard by the PSO were from the CSA at Banyo. The same emergency calls were heard by the Supervisor at Northgate.

Upon hearing the emergency call, the Supervisor at Northgate contacted Network Control and advised that a truck was grounded on the level crossing.

After the collision the CSA attempted to use the mobile phone, but was not aware that he had to dial #1[36] to make a connection to an internal number. The CSA was unable to use the cordless station phone as the accident had disconnected the power.

The CSA used the mobile to call "000" and handed the mobile phone to an off duty member of the Queensland Police Service who had alighted from the southbound train. The off duty police officer provided details of the incident to the 000 operator.

The CSA was inexperienced in dealing with emergencies. The CSA is normally rostered on duty at Northgate station and in the event of an emergency he would normally report to his supervisor and not directly deal with Network Control. On this occasion, the CSA had been rostered to work at Banyo station as the only officer on duty, and consequently responsible for dealing with emergency situations.

The investigation team attempted to determine whether the CSA and the southbound train driver verbally communicated about the heavy vehicle on the level crossing. The southbound train driver stated that he had asked the CSA whether Network Control was aware of the situation. The train driver believed that Network Control had been advised by the CSA.

The investigation team found that the CSA's recollection of the events in general was poor. The CSA did not recall moving onto the platform near the cab of the southbound train. The CSA did not recall the conversation with the train driver.

The southbound driver stated that he made the assumption that all rail traffic had been stopped, however he does not recall hearing any alerts from Network Control.

[34] Standard SAF/SPC/0022/EMG Module EP1 – 02 Level Crossing Emergency - Section 2.5.1

[35] Telephone number deleted by investigation team

[36] Mobile phones used by the network manager employees are through two separate service providers. To obtain an outside number, users are required to dial a prefix.

4.6 Emergency response and recovery

RTO employees are required to report any unsafe conditions or persons in unsafe locations that can or have affected the safe operation of rail traffic on any part of the network to Network Control[37].

The Electric Control Operator[38] (ECO) isolated power to the overhead line equipment (OHLE).

At 6.36am Queensland Police Service personnel were on the scene, with Queensland Ambulance Service and Queensland Fire and Rescue Service arriving by 6.40am.

Normal services resumed at 7.57pm on Saturday 15 September 2012.

The network controllers followed the correct procedure in response to the emergency call received from the northbound train driver.

The investigation found that the emergency response and recovery were in accordance with relevant standards and procedures.

4.7 Human Factors

4.7.1 Train driver behaviour

As part of the RTO's train driver recruitment process, candidates are required to meet minimum standards for key selection criteria identified by psychometric assessment. The Psychometric assessment process was managed in accordance with the Standard SAF/STD/0121/COM - Psychometric Assessment for Safety Critical Work.

At the completion of a psychometric test an assessment report is developed on each candidate. A failure by a candidate to meet any one or more safety critical ability tests may present a safety risk. A candidate that does not satisfy the minimum standard for all key selection criteria may not be suitable for appointment.

The investigation identified that one of the train drivers failed to satisfy the minimum standard for the safety critical criteria in respect of the reaction time test[39] . Where a candidate is identified as not meeting the minimum requirement, the candidate should be rejected for the position. However, the standard provides if the RTO chooses to employ the candidate; a targeted developmental program must be developed to address the weakness in ability. The investigation team noted that the RTO had not put in place a targeted development process for the driver.

From the northern end of the platform beside the driver stop mark at Bindha station, vehicular traffic can be seen moving across the St Vincents Road level crossing in conditions of good visibility. The investigation team noted that moving vehicular traffic was easier to sight than stationary traffic at the crossing.

At the time the driver departed Bindha station, the heavy vehicle was already stopped on the level crossing. The actions of the driver in accelerating the train to a normal operating speed is consistent with his statement that he had not observed the heavy vehicle on the level crossing.

The driver of the northbound train had driven the Shorncliffe line on numerous occasions and during that time he would have observed traffic moving across the level crossing while stopped at Bindha.

[37] QR2009 of Standard MD-12-189 Network Rules and Procedures.

[38] The Worker who controls the power supply to the overhead line equipment and is responsible for all switching operations and isolations of electrical equipment.

[39] Ability to physically react quickly and accurately to simple visual and auditory signals.

The driver's behaviour[40] could be explained by the phenomenon known as inattentional blindness. This occurs where a person does not notice an object which is fully visible because their attention is engaged on another task. This does not necessarily mean an individual was not paying attention, rather that their attentional resources were occupied elsewhere. This may mean that a person may fail to detect an object even though they were looking directly at it. Research into inattentional blindness has shown that when people focus their attention on a particular task, they tend not to notice unexpected objects, even if the object is conspicuous, potentially important, and right where they are looking[41].

The southbound driver assumed, based on his conversation with the CSA that Network Control was aware that a heavy vehicle was grounded on the level crossing. Because of this conversation, it did not occur to the driver to make an emergency call. The southbound driver did not hear any radio communications in regards to the emergency. The driver assumed that the northbound train had been stopped by Network Control as the two trains normally cross at Nudgee, and on this occasion had not.

4.7.2 CSA behaviour

The CSA at Banyo station attempted to contact Network Control by radio to advise that the heavy vehicle was grounded on the crossing.

Three emergency calls were heard by the PSO at Network Control advising that there was a heavy vehicle on the level crossing but no identification as to what level crossing or who was calling was provided. The CSA did not provide key details such as his location and nature of the emergency due to stress, time pressures and inexperience.

The RTO had a process in place for station staff to report emergencies, with regular safety notices to remind staff of their responsibilities. The CSA did not follow the correct procedure to use the mobile phone to call the 1800 number.

5 Findings

5.1 Context

A northbound train collided with a heavy vehicle that had become grounded on the roadway prior to the St Vincents Road level crossing at Banyo.

5.2 Contributing safety factors

- The vertical geometry and alignment of the eastern side road approach to the level crossing from St Vincents Road rises more steeply than the acceptable vehicle driver comfort standards.
- The existing road design and grading on the approach to the level crossing from St Vincents Road is not suitable for low loader trailers. As a result, the heavy vehicle became grounded on the roadway straddling the level crossing.
- The heavy vehicle operator and driver did not have approval from the road manager to access the local government roads.
- The CSA attempted to notify Network Control of the obstruction, however the delay in using a direct line of communication delayed the passing of information.
- The driver of the southbound train did not make an emergency broadcast in accordance with the required standard of the RTO.
- Network Control was unable to warn trains in the area and immediately protect rail traffic and the general public.
- The northbound train driver operated the train in accordance with normal driving practices, and delayed making an appropriate brake application for the circumstances.

[40] Schoppert and Hoyt, 1968 cited in National Transport Safety Board (199a). Safety at passive grade crossing. Volume 1: Analysis. Safety study NTSB/SS-98/02. Washington DC.

[41] Chabris, C., and Simons, D., 2010, The Invisible Gorilla, HarperCollins Publishers.

5.3 Other safety factors

- The road manager had no information about the movement of heavy vehicles or permit process on its website, and inconsistencies were identified in the information provided through the Contact Centre. Potential applicants may become despondent and decide to bypass the process.

5.4 Safety actions undertaken

5.4.1 The RTO

All train crews involved in the incident were offered counselling, following the incident.

- The driver identified as failing the minimum standard for the safety critical criteria has undergone extensive retraining, which included some additional psychometric testing and additional driver training.
- A full review of the Psychometric Testing and monitoring process for all RTC, including:
  - the assessment and review of Rail Operations business group requirements, scheduled for completion by April 2013
  - Policy review and rewrite, scheduled for completion by June 2013.
- The protocols, processes and related communication devices utilised for the relaying of emergency situations have been reviewed including:
  - current operations and training in radio and telecommunication protocols
  - dissemination of radio and telecommunication protocols to all customer service staff to emphasis the importance of immediate contact and the required method of communication
  - the feasibility of regular exercises to highlight and reinforce emergency communication practices to customer service staff.

5.4.2 The local road manager

The Brisbane City Council and other interested parties were given an opportunity to review the draft report and provide comment prior to the release of the final investigation report. The Brisbane City Council disputes the conclusion that the existing vertical geometry necessarily resulted in the low loader becoming grounded.

The investigation conducted by the RRU determined, from the evidence available, that the existing vertical geometry on the eastern approach to the level crossing was not suitable for low loader vehicles. It is noted that the local road manager did not provide any evidence of any enquires that it had conducted to support its own conclusion.

The local road manager has advised that it is developing a web based heavy vehicle permit application and information system.

5.5 Recommended safety actions

To prevent a recurrence of similar incidents, the following safety recommendations are made:

5.5.1 Brisbane City Council

- Continue to develop and implement an interface agreement with Queensland Rail in regard to road/rail level crossings to include design standards and road grading limits.
- Continue with the development of the web based process for the application of excess mass and excess dimension permits on the road network.
- Develop a formal process in conjunction with Transport and Main Roads in the coordination of permit approvals and notifications until the introduction of the Heavy Vehicle (Mass, Dimension & Loading) National Regulations.
- Assess and explore options to improve the vertical alignment of the road approach to the St Vincents Road level crossing at Banyo.

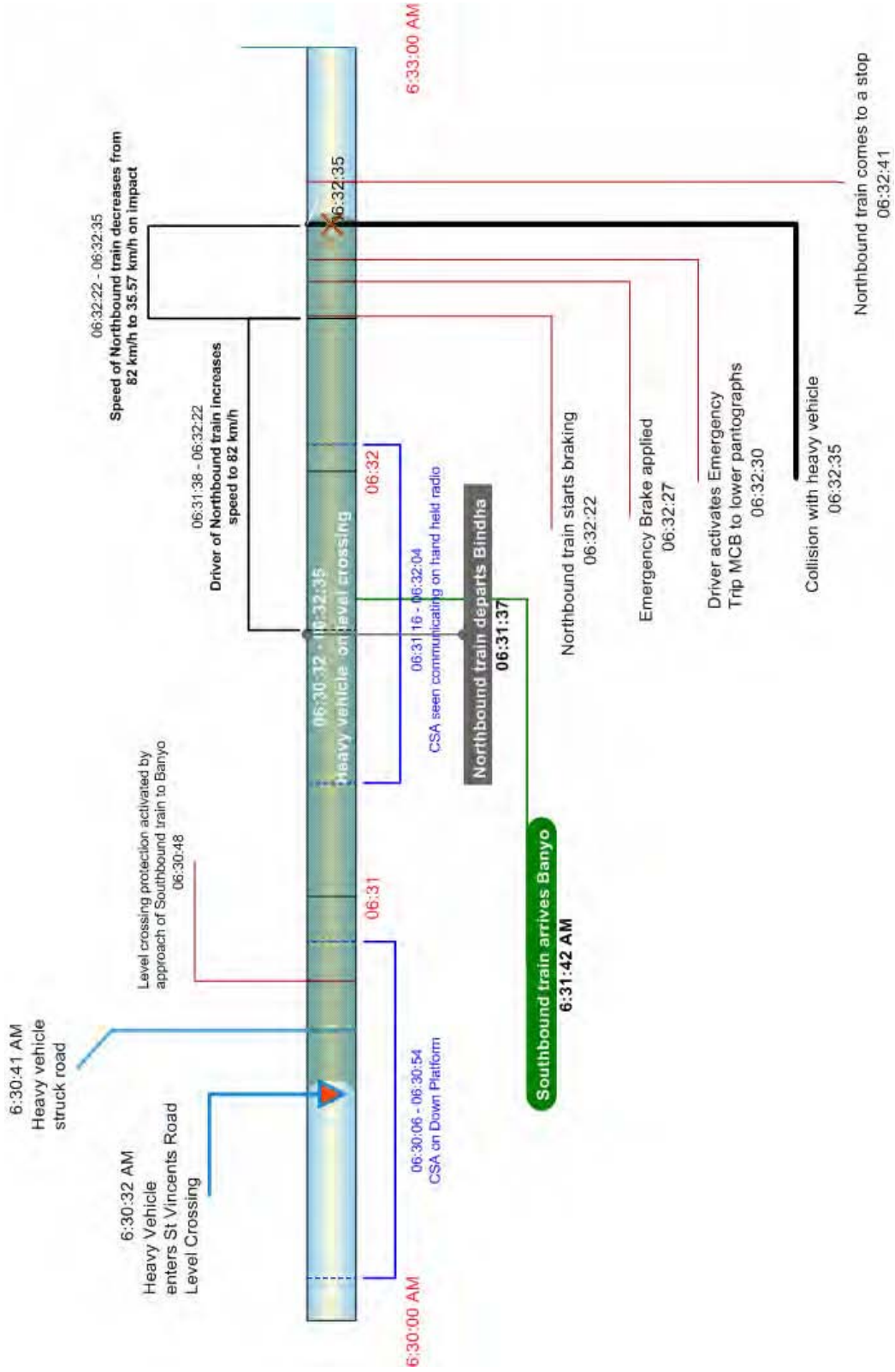
5.5.2 Queensland Rail

- Continue to develop and implement an interface agreement with Brisbane City Council in regard to road/rail level crossings to include design standards and road grading limits.
- Continue with the review of Psychometric Testing and monitoring process to ensure suitability to employment practices.
- Continue with the review of the training and information provided to staff about emergency communications.

5.5.3 Transport and Main Roads

- Establish a process for the coordination of permit approvals and notifications between Transport and Main Roads and other road authorities until the introduction of the Heavy Vehicle (Mass, Dimension & Loading) National Regulations.

6 Appendix 1


6:30:41 AM
Heavy vehicle struck road
6:30:32 AM
Heavy Vehicle enters St Vincents Road Level Crossing
Level crossing protection activated by approach of Southbound train to Banyo
06:30:48
06:30:32 - 06:32:35
Heavy vehicle on level crossing
06:31:38 - 06:32:22
Driver of Northbound train increases speed to 82 km/h
06:32:22 - 06:32:35
Speed of Northbound train decreases from 82 km/h to 35.57 km/h on impact
06:32:35
Northbound train comes to a stop
06:32:41
6:30:00 AM
06:31
06:32
6:33:00 AM
06:30:06 - 06:30:54
CSA on Down Platform
06:31:16 - 06:32:04
CSA seen communicating on hand held radio
Northbound train departs Bindha
06:31:37
Southbound train arrives Banyo
6:31:42 AM
Northbound train starts braking
06:32:22
Emergency Brake applied
06:32:27
Driver activates Emergency Trip MCB to lower pantographs
06:32:30
Collision with heavy vehicle
06:32:35

Notes:

Connecting Queensland
www.tmr.qld.gov.au