



Office of Transport Safety Investigations

RAIL SAFETY INVESTIGATION REPORT

DERAILMENT OF 4BM7 LIDCOMBE

4 NOVEMBER 2005



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Office of Transport Safety Investigations
Level 17, 201 Elizabeth Street
Sydney NSW 2000

The Office of Transport Safety Investigations (OTSI) is an independent NSW agency whose purpose is to improve transport safety through the investigation of accidents and incidents in the rail, bus and ferry industries.

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EXECUTIVE SUMMARY

The Accident

At approximately 12:07am (ESDT)¹ on 4 November 2005, 4BM7, a Brisbane to Melbourne freight service, passed Signal ST 419GL at 'Stop' without authority² whilst traversing the Lidcombe Goods Loop and derailed at a set of catch points³ identified as No. 717. The catch points were deliberately positioned beyond Signal ST 419GL to derail any train that passed the signal at 'Stop' without authority, to mitigate the risk of collision with trains on the nearby main line.

4BM7 consisted of two locomotives and 34 container wagons and was operated by Interail Australia Pty Ltd (IAL), a subsidiary of Queensland Rail (QR). The leading locomotive derailed all wheels before becoming embedded in the ballast and resting against a small safety wall on top of an eight metre-high embankment. The second locomotive derailed all wheels on the leading bogie but remained upright. There were no injuries resulting from the derailment.

Findings

In relation to those matters prescribed by the Terms of Reference as the principal lines of inquiry, OTSI finds as follows:

a. Causation

- i. The derailment occurred when the driver of 4BM7 failed to respond to a 'Stop' indication at Signal ST 419GL and ran through a set of catch points which performed as they were designed to, by deliberately derailing the train to prevent both unauthorised entry onto the main line and the inherent hazard that such unauthorised entry would pose to authorised main line traffic.

¹ Times quoted in this report are Australian Eastern Summer Daylight Time.

² A signal displaying a 'Stop' indication may be passed if authorised by a Signaller – such authorisations will normally be granted when there is some form of technical problem with the signal or other components of the signalling system.

³ Catch points are a set of switches facing trains moving from a siding to the main line. They normally stand 'open' as a defence to 'catch' any unauthorised train movement and are intended to derail the train before it reaches the main line. They are closed to permit the authorised movement of a train from the siding onto a main line.

b. Contributory Factors

- i. Notwithstanding an indication from the preceding Signal ST 422S, which indicated that he should proceed with caution, the driver admitted to being complacent during his approach to Signal ST 419GL because it was his expectation that the Signal would be displaying a proceed, or 'calling on', indication. This expectation was based on his previous experiences at the Signal where he claims he had never previously been required to stop.
- ii. A large peppercorn tree on the Western side of the track restricted the driver's visibility until he was approximately 93 metres from Signal ST 419GL. However, had the driver maintained proper control of 4BM7 in accordance with the previous signal indication, he would have had sufficient time and distance, albeit with a small margin for error, to bring 4BM7 to a stand prior to Signal ST 419GL.
- iii. The driver had only been at the controls of 4BM7 for approximately 10 minutes and was still adjusting to the train's handling. In addition, he had not slept well following his previous shift. These factors, and the prospect of proceeding on holidays the next day, may also have affected the driver's attentiveness.

c. Anticipation and Management of Risk

- i. No. 717 catch points were positioned to mitigate the consequences of a train passing Signal ST 419GL at 'Stop' and colliding with other trains on adjacent lines and functioned as intended. However, the placement of the catch points did not conform to RailCorp's design standards.
- ii. In April 2005, RailCorp identified that the placement of No. 717 catch points did not meet its design standards but did not act at the time to remedy the deficiencies.
- iii. RailCorp has a maintenance program to check on matters that might impact on the operation or visibility of signals, but this program failed to detect what was an obvious and long-standing obstruction, caused by a large peppercorn tree on the Western side of the track, 93 metres from Signal ST 419GL.

- iv. The crew on 4BM7 had not been required to participate in, nor were they provided with, any recent emergency training.
- v. IAL's operations have been the subject of considerable scrutiny by ITSRR but that, in the area of train operations and particularly crew assessments, additional scrutiny may be required.
- vi. IAL's locomotives were not fitted with equipment that was compatible with RailCorp's MetroNet communication system which meant that 4BM7 was not logged onto RailCorp's Train Location System (TLS). As a consequence, 4BM7's train number was not visible on the Rail Management Centre's (RMC) indicator boards at Sydney Terminal, and the Train Controller had less visibility of this train than he had of other trains that were operating compatible communications equipment.

d. Effectiveness of the Emergency Response

The emergency was not well managed and rail safety workers, and potentially passengers on main line services, were placed at additional risk as a consequence of:

- i. the radio equipment available to the crew of 4BM7 not having an emergency function to override other radio transmissions when utilised;
- ii. the failure of 4BM7's crew to clearly identify their train number when they first reported their predicament, resulting in Network Control not being able to communicate directly with the crew and not being able to fully comprehend the circumstances it was required to control;
- iii. the failure 4BM7's crew to revert to other means of communication that were available to them, and in particular the telephone at Signal ST 419GL nearby, when their initial call was not clearly acknowledged;
- iv. the failure of 4BM7's crew to protect their train, as required by Network Rule NTR 400 and Network Procedure NPR 720, in the absence of positive assurances from Network Control that other trains were being prevented from approaching their train;
- v. notwithstanding the absence of important information, the failure of Network Control to immediately broadcast an emergency message, as

- required by Network Rule NTR 400, to stop or slow other trains until the location or source of the initial emergency broadcast could be ascertained;
- vi. the failure of the driver of CityRail passenger service 53-U to alight from his train to check on the condition of the crew of 4BM7 and the condition of the track over which he was intending to proceed;
- vii. the design of the Track Indication Panel which failed to provide an alarm to alert the Area Controller that Signal ST 419GL had been passed at 'Stop' without authority;
- viii. the failure of the Area Controller to comprehend that the failed signal indication for Signal ST 412LC on his track indication panel might have had something to do with a train (4BM7) which was shown to be standing on the Lidcombe Goods Loop in the vicinity of Signal ST412LC;
- ix. the failure of the first response personnel to arrive at the scene to confirm that 4BM7 was being protected in accordance with Network Rule NTR 400 and Network Procedure NPR 720, and
- x. the lack of clear planning and understanding between Network Control and Electrical Operating Centre staff at Sydney Terminal regarding the limits of overhead electrical isolation, whilst 4BM7 was being recovered, resulting in a passenger service (76-K) entering an area where the power had been isolated.

e. Other Matters that would Enhance the Safety of Rail Operations

- i. There is a requirement for all locomotives operating on the Sydney Network to be fitted with radio equipment that is interoperable with Network Control and which makes provision for the receipt and transmission of emergency calls on a priority basis. The amendment to Rail Safety Regulations which mandates this requirement for all rail operators to be compliant became effective on 1 September 2006. However, some operators, including IAL, have sought from ITSRR, and been granted, temporary exemptions until 31 March 2007 because of difficulties associated with procuring equipment which is in short supply, or the provision of which is the subject of long lead times.

- ii. IAL needs to implement a program to redress those deficiencies, previously identified, in relation to its crew training assessment practices and procedures.

Recommendations

In order to prevent a recurrence of this type of accident, the following remedial safety actions are recommended for implementation by the organisations specified below:

a. Interail Australia Limited

- i. implement a program to redress those previously identified deficiencies in relation to its crew training assessment practices and procedures;
- ii. review the content, frequency and delivery of emergency training for its rail safety workers and update it where necessary;
- iii. review crew training records to identify which personnel are in the most need of emergency training, and provide that training for them;
- iv. ensure crews have a comprehensive understanding of the actions required of them in emergency situations and that they are familiar with the full suite of communications equipment that is available to them;
- v. ensure that its locomotives comply with Section 60A of the *NSW Rail Safety (General) Regulation 2003* in relation to radio communications equipment, and
- vi. ensure that event recorders on its locomotives are maintained and calibrated in accordance with prescribed specifications.

b. RailCorp

- i. utilise the lessons learnt from the response to this accident as a 'case study' in its training of Controllers and Emergency Managers;
- ii. review the appropriateness of the 'route setting' practices that may be in regular use at the Lidcombe Goods Loop and elsewhere throughout its network;
- iii. remedy any remaining sighting issues associated with Signals ST 419GL and ST 429GL;

- iv. rectify the deficiencies previously identified with No. 717 catch points, and
- v. review the effectiveness of the methods employed in signal sighting inspections.

c. The Independent Transport Safety and Reliability Regulator

- i. conduct a further review of IAL's crew training assessment practices and procedures to ensure that previously identified deficiencies have been corrected;
- ii. satisfy itself that RailCorp has taken appropriate remedial safety action in response to the accident, particularly in relation to deficiencies in the management of the emergency response; the design limitations of No.717 catch points and the visibility of Signals ST 419GL and ST 429GL, and
- iii. satisfy itself that RailCorp has utilised the lessons learnt from the response to this accident as a 'case study' in its training of Controllers and Emergency Managers and has disseminated the safety information to the relevant departments within the corporation.

PART 1 INTRODUCTION

Notification and Response

- 1.1 At 1:13am on Friday 4 November 2005, both IAL and RailCorp (RC) notified the Office of Transport Safety Investigations' Duty Officer that a freight train had derailed at catch points at Lidcombe at approximately 12:07am.
- 1.2 Based on the information provided by the reporter, the Chief Investigator directed an OTSI Investigator deploy to the incident site. The Investigator deployed by vehicle and arrived at the incident site at 2:20am on 4 November 2005 and commenced the inspection, assessment and evidence collection process.
- 1.3 The OTSI Investigator released the incident site for recovery and repair at 7:30am on 4 November 2005.

Initiation of Investigation

- 1.4 As a result of the primary evidence collected by the OTSI Investigator at the incident site, the Chief Investigator determined that the incident warranted formal investigation by OTSI and initiated a Rail Safety Investigation in accordance with s67 of the *Rail Safety Act 2002*.

Interim Factual Statement

- 1.5 On 4 November 2005, the Chief Investigator notified all Directly Involved Parties (DIPs) that OTSI was investigating the derailment and requested that each organisation nominate an officer to act as the point of contact for all inquiries made by the appointed OTSI Investigator in Charge. The Terms of Reference for the Investigation were provided to the DIPs with this notification.
- 1.6 An Interim Factual Statement notifying OTSI's investigation and describing the incident in terms of what had happened was published on the OTSI website on 8 November 2005.

Terms of Reference

- 1.7 The Chief Investigator established the following Terms of Reference to determine why the accident had occurred and what to do to prevent the recurrence of such accidents:
- a. identify the factors, both primary and contributory, which caused the accident;
 - b. identify whether the accident might have been anticipated and assess the effectiveness of any strategies that were in place to manage the related risk/s;
 - c. assess the effectiveness of emergency actions in response to the accident, and
 - d. advise on any matters arising from the investigation that would enhance the safety of rail operations.

Methodology

- 1.8 OTSI utilises the ICAM (Incident Cause Analysis Method) approach in the conduct of its investigations and applies the Reason Model of Active Failures and Latent Conditions to its analysis of causative and contributory factors.
- 1.9 The underlying feature of the methodology is the Just Culture principle with its focus on safety outcomes rather than the attribution of blame or liability.

Consultation

- 1.10 On 22 November 2006, a copy of the investigation Draft Report was forwarded to IAL, RailCorp and ITSRR. The purpose was to provide all DIPs with the opportunity to contribute to the compilation of this Final Report by verifying the factual information, scrutinising the analysis, findings and recommendations, and providing any commentary that would enhance the structure, substance, integrity and resilience of the Investigation Report. DIPs were requested to submit their comments by 11 December 2006. Submissions were received from IAL, RailCorp, and ITSRR.
- 1.11 The Chief Investigator considered all representations made by DIP's and where appropriate, reflected their advice in this Final Report. On 15 December 2006, the Chief Investigator informed DIPs which matters from

their submissions had been incorporated in this Final Report and where any proposal was not included, the reasons for not doing so.

Investigation Report

1.12 This report describes the derailment which occurred at Lidcombe on 4 November 2005 and explains why it occurred. The recommendations that are made are designed to contribute to the safety of rail operations.

PART 2 FACTUAL INFORMATION

Accident Synopsis

- 2.1 At approximately 12:07am (ESDT) on 4 November 2005, a Brisbane to Melbourne freight service designated as 4BM7, passed Signal ST 419GL at 'Stop' without authority whilst traversing the Lidcombe Goods Loop, and derailed at a set of catch points identified as No. 717. These catch points are deliberately positioned beyond Signal ST 419GL to derail any train that passes the signal at 'Stop' without authority, in order to mitigate the risk of collision with trains on the main line.
- 2.2 4BM7 consisted of two locomotives, X53 leading and EL58 trailing, and 34 container wagons and was operated by Interail Australia Pty Ltd (IAL), a subsidiary of Queensland Rail (QR). The leading locomotive derailed all wheels before becoming embedded in the ballast and resting against a small safety wall on top of an eight metre-high embankment. The second locomotive derailed all wheels on the leading bogie but remained upright. There were no injuries resulting from the derailment.

Accident Narrative

Before the Derailment

- 2.3 On 3 November 2005, a crew from IAL's Junee Depot was rostered to operate 4BM7 from Yennora to Junee. The crew consisted of a driver and an assistant driver and both reported for duty at Yennora at 11:00pm after resting at a nearby motel. The Junee crew took charge of 4BM7 in the yard after the IAL shunting crew had remarshalled, inspected and tested the train. 4BM7, a regular container freight service operated by IAL between Brisbane and Melbourne, departed Yennora at 11:55pm and was routed to travel to Melbourne via Guildford, Granville, Auburn, Berala and Villawood, and then onwards on the main South line.
- 2.4 At 12:03am on 4 November 2005, as 4BM7 passed Auburn, the crew observed Signal ST 422S displaying a stop indication with a subsidiary "calling on" indication, as illustrated in *Figure 1*. This meant that 4BM7



Figure 1: "Calling on" indication

was authorised to pass the signal (by the yellow indication) and cross from the Western lines onto the Lidcombe Goods Loop line at a restricted speed but that the driver was required to be prepared to stop 4BM7 prior to any visible obstruction. The signal also indicated that the next signal (ST 419GL) would normally be displaying a 'Stop' indication (one red indication on top of another).

- 2.5 On approaching Signal ST 422S, the driver of 4BM7 engaged dynamic braking to reduce the train's speed through the points onto the Lidcombe Goods Loop line. The driver recalls that his visibility of the next signal (ST 419GL) was obstructed by a large peppercorn tree growing on the Northern side of the line (see *Photo 1*). However, he maintained a steady speed, later established to be 28km/h, as he rounded a curved section of track.

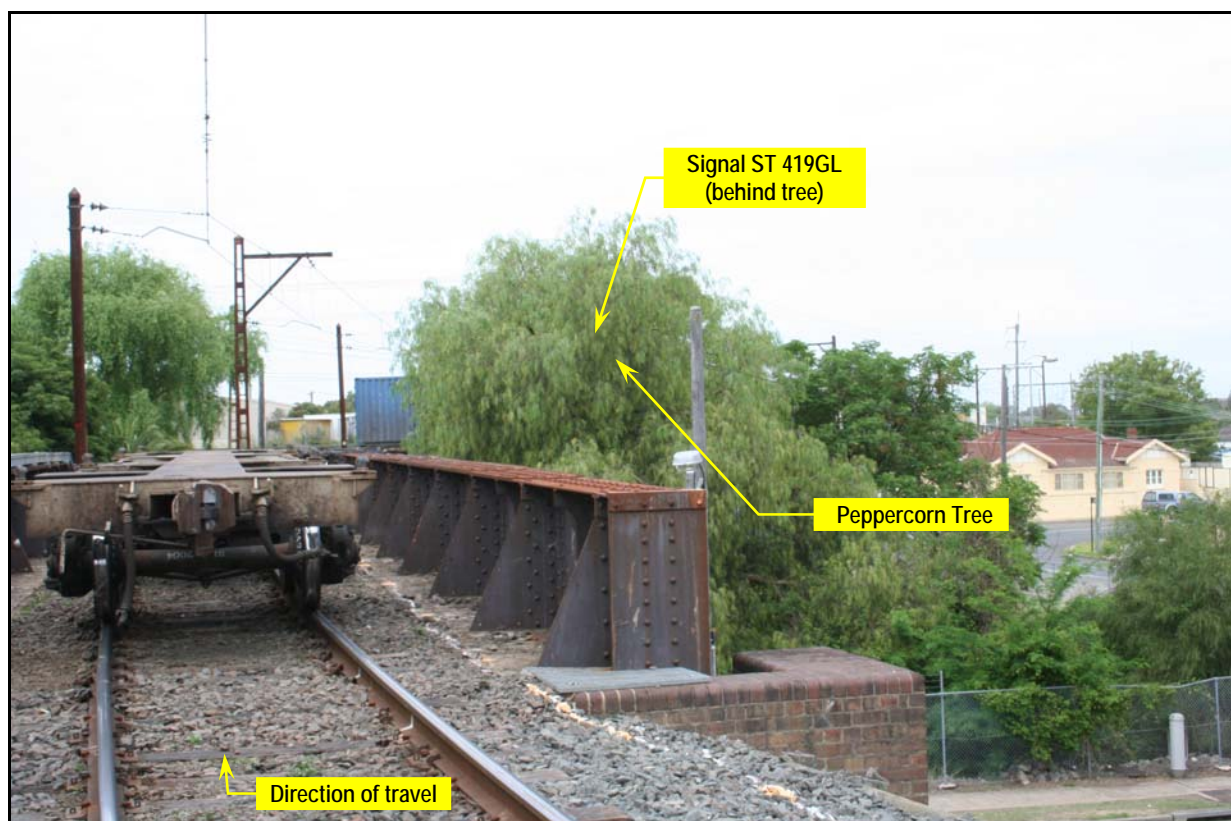


Photo 1 Looking towards Signal ST 419GL, with sighting obstructed by a peppercorn tree

The Incident

- 2.6 Upon sighting Signal ST 419GL at 'Stop', the driver immediately applied the emergency brakes. However, he was unable to stop 4BM7 and its leading locomotive (X53) travelled over the open set of catch points (No. 717) and

derailed. Both of the locomotive's bogies derailed and the locomotive came to rest in loose ballast on top of an eight metre-high embankment approximately 40 metres beyond Signal ST 419GL (see *Photo 2*). The leading bogie on the trailing locomotive (EL58) also derailed.



Photo 2 Derailed locomotives of 4BM7 at daylight on day of incident

After the Derailment

2.7 Once 4BM7 stopped, the driver checked on the welfare of his assistant and then made an emergency broadcast on the train's radio system. RailCorp's Rail Management Centre⁴ (RMC) heard the broadcast on the network and responded to the call. However, this response was not heard by the crew and therefore was not acknowledged. The driver continued trying to contact the Network Control and eventually made contact with Sefton Park Junction Signal Box and Goods Control and subsequently reported the accident to IAL. Thereafter, he stopped the locomotives' engines and secured the locomotives.

⁴ RailCorp's centralised management centre for train control on its network.

- 2.8 Unaware of the accident, the Area Controller⁵ at RailCorp's Strathfield Signal Complex noticed that Signal ST 412LC, located on the South 'Up' Main line between Berala and Lidcombe, was displaying a failed indication on his track indication panel (see *Photo 3*) despite previously having displayed a 'proceed' indication for CityRail passenger service 53-U.

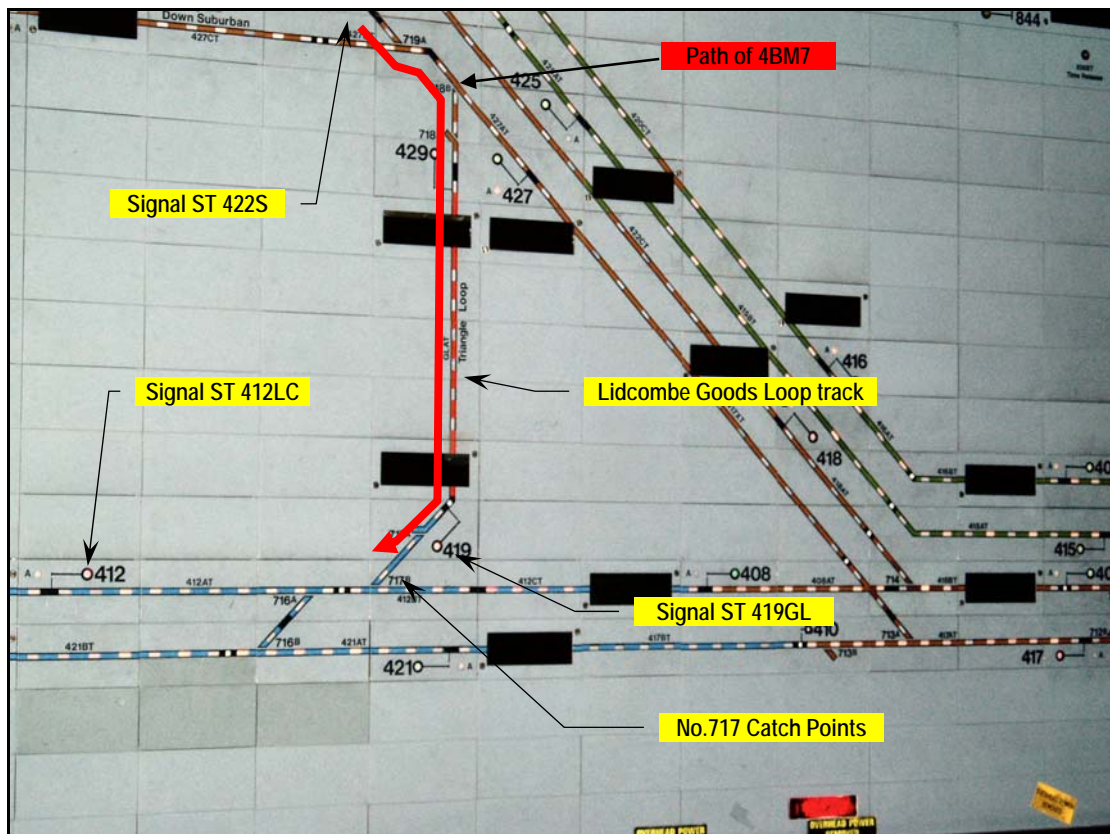


Photo 3 The Area Controller's Track Indication Panel, with the Lidcombe Goods Loop indicated

- 2.9 In the absence of a means for a SPAD to be displayed on his indication panel, the Area Controller believed that a technical fault existed with track-side equipment and advised the driver of 53-U that a problem existed with the signalling. He then authorised the driver of 53-U to pass Signal ST 412LC at 'Stop' but report any problems encountered. The driver of 53-U proceeded past Signal ST 412LC with an appropriate degree of caution.
- 2.10 Having passed Signal ST 412LC, the driver of 53-U saw what appeared to be two white lights, 4BM7's marker lights, as he approached the Lidcombe Goods Loop but assumed them to be street lights because of the odd angle at

⁵ A Signaller in charge of specified territory.

which they lay. He then noticed people moving on or about the track and, realising that the lights belonged to a derailed locomotive, immediately stopped 53-U and reported the incident to the Train Controller at RMC. The driver of 53-U advised the Train Controller that the derailed locomotives were not obstructing his train and was given authority, by the Train Controller, to continue past the incident site. The Train Controller, who coincidentally was in discussion with the Area Controller at the same time regarding the failure of Signal ST 412LC, then alerted the Area Controller to the derailment.

- 2.11 Having discovered that the derailed train was 4BM7, the Train Controller contacted its crew by mobile phone to seek their assessment of the situation at the site of the derailment and then called relevant response personnel. IAL staff arrived on site at approximately 12:45am, followed by NSW Police and Fire Brigade officers, who arrived at 12:50am, and RailCorp officers at 1:02am. Both IAL and RailCorp notified OTSI of the derailment at 1:13am and an OTSI investigator commenced to deploy shortly thereafter. At 1:25am, senior RailCorp staff declared the incident to be of major significance and commenced the required MIM⁶ procedures.
- 2.12 After his initial inspection of the site, OTSI's investigator advised RailCorp that operations on the Main South lines could recommence but recommended that speed restrictions be imposed to ensure that the risk of the derailed locomotives toppling off the embankment was not exacerbated. The next train passed through the site at 5:00am.

Site Location

- 2.13 Lidcombe is a suburb and major rail junction located 17 kilometres by rail West of Sydney's CBD (see *Figure 2*).

⁶ Major Incident Management procedures are invoked by RailCorp in response to significant occurrences that require a response beyond the local level.

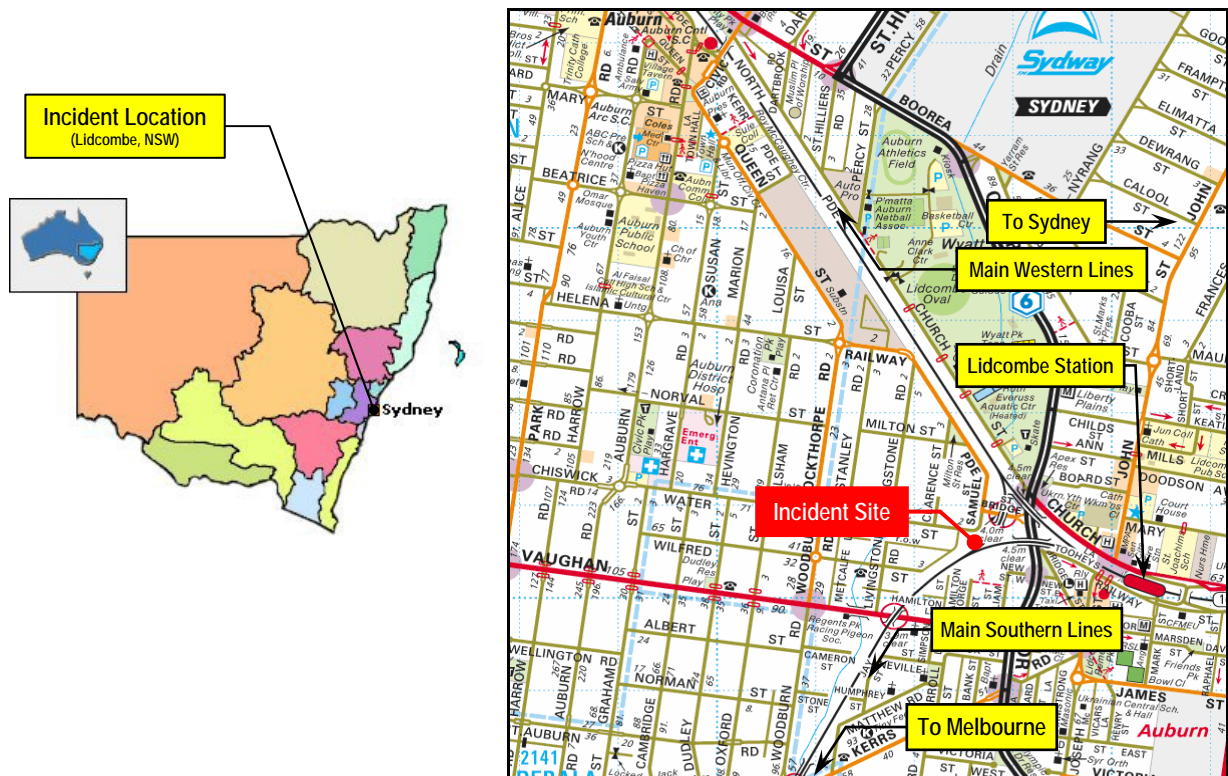


Figure 2: Incident Location

Site Information

2.14 The Lidcombe Goods Loop is part of RailCorp's network and merges with Sydney's Main Western and Southern lines (see Figure 3).

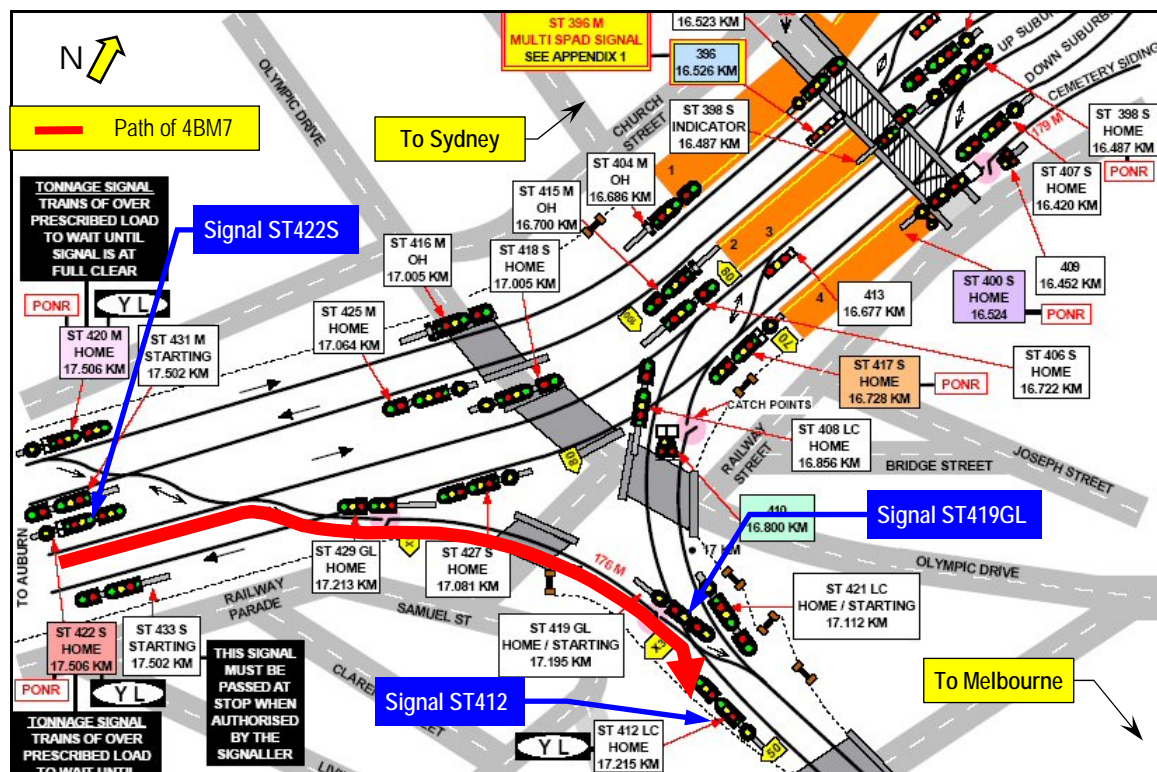


Figure 3: Track arrangement at Lidcombe

- 2.15 The loop line is an electrified single line track, approximately 176 metres in length and sits on top of an eight metre-high embankment. The track is in close proximity to a number of roads and commercial properties. A bridge spanning a two-lane vehicular thoroughfare is located approximately mid way along the loop line.
- 2.16 Train operations on the line are bi-directional with signalling and points controlled under the Rail Vehicle Detection System (RVDS) from RailCorp's Signalling Complex at Strathfield. While RailCorp's *Train Operating Conditions Manual (TOC)* stipulates a maximum train speed of 35km/h on the loop line, the maximum train speed for trains crossing through the points from the Western lines and onto the loop line is 25km/h. This speed remains applicable until the train has fully cleared the points.
- 2.17 The proximity of the loop line to roads, commercial premises and facilities is depicted in *Photos 4 and 5* (over page).

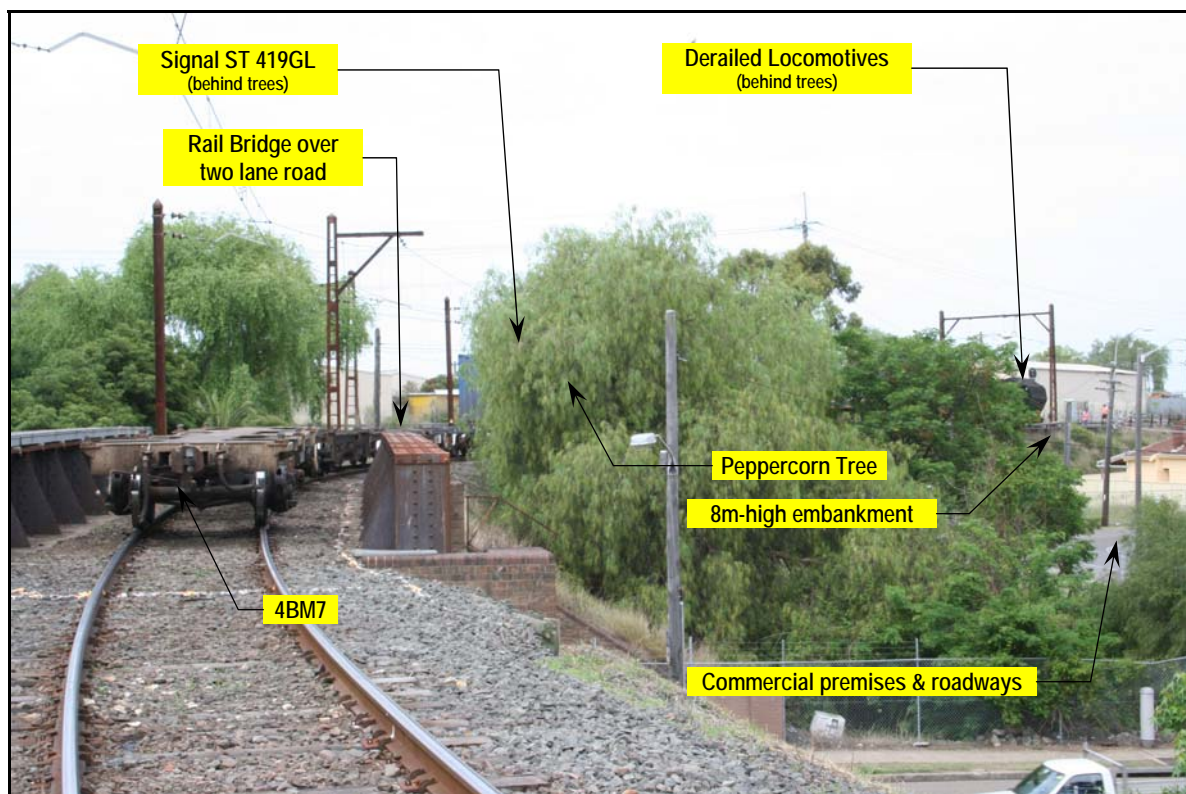


Photo 4 Lidcombe Goods Loop Line, approaching Signal ST 419GL, showing roads and commercial premises



Photo 5 Locomotive X53 at rest, on top of 8m-high embankment, and its proximity to commercial premises and roads

Train Information

2.18 4BM7 consisted of two locomotives (X53S and EL58) and a mixture of 34 loaded and empty container wagons. It was 698 metres in length and weighed 1,246 tonnes. Like all IAL locomotives, 4BM7 was fitted with vigilance equipment that requires a crew member to acknowledge its operation before 94 seconds has elapsed to prevent an automatic application of the train's brakes.

Communication Equipment

2.19 The train crew had access to the following communication equipment to enable contact with Train Control and Signallers:

- a WB 450.050 MHz radio system installed in the locomotives;
- b. a WB 450.050 MHz portable radio handset;
- c. a mobile telephone, and
- d. phones co-located at signals.

Damage

- 2.20 Both of 4BM7's locomotives suffered minor damage. Six concrete sleepers and various components within No. 717 catch points were crushed during the derailment. A short section of signal troughing and a timber retaining wall also suffered impact damage, but the integrity of the signalling and track systems was not affected. Fire crews remained on-site to respond to any fluid that might have leaked from the derailed locomotives.
- 2.21 Concerns over the stability of the derailed locomotives and the security of the train's load, resulted in the site of the derailment being cordoned-off to prevent the access of other than response personnel.

Employee Information

- 2.22 The driver of 4BM7 had been driving trains for five years but three of these had been spent as an assistant driver. He was based out of Junee, and was familiar with, and qualified for, the route. The assistant driver had two years rail experience. Both crew members were within their respective medical and competency assessment periods.

Injuries

- 2.23 The crew was shaken, but not injured, by the derailment.

Medical and Toxicological Information

- 2.24 The crew members of 4BM7 were breath-tested at 1:10am by NSW Police and returned negative results.

Meteorological Information

- 2.25 The train crew described the weather conditions at the time of the incident (12:05am) as dark, dry and clear. Bureau of Meteorology (BOM) readings recorded a minimum temperature of 19.4°C on the night of the incident.

PART 3 ANALYSIS

Causal and Contributory Factors

- 3.1 Given the driver's admission that he failed to react to the indications of Signal's ST 422S and ST 419GL, OTSI's investigation focused on matters that may have impacted on his decision making and actions.
- 3.2 The derailment occurred approximately 10 minutes after a change of a crew and whilst the new crew would still have been adjusting to the handling characteristics of 4BM7. At interview, the driver admitted to being complacent on his approach to Signal ST 419GL, assuming that the signal would be displaying a 'Proceed' indication, despite the previous signal (ST422S) indicating that this would likely not be the case. The driver advised that on all the previous occasions he had driven over the Lidcombe Goods Loop, he had never encountered Signal ST 419GL at 'Stop'. There was no way of verifying this statement, but OTSI understands that the route is often set to give freight trains clear passage through the Lidcombe Goods Loop in order to prevent their rear from 'overhanging' the main lines and disrupting other services.
- 3.3 The assistant driver stated that he had 'called'⁷ the previous signal in accordance with normal practices, but not ST 419GL as the signal was on the opposite side to where he was positioned within the cab. This meant that the driver had first view of the signal.
- 3.4 OTSI reviewed the crew's roster and questioned both the driver and the assistant driver to establish whether there were work or domestic matters that might have affected their concentration. Neither driver indicated being distracted by domestic matters and a review of their rosters indicated that the drivers had been working within acceptable industry rostering limits. Both crew members had had three rest days prior to operating IAL's freight service 4MB7 from Junee to Yennora on 3 November 2005. Upon signing-off at Yennora at 12:30pm, they relocated to a nearby motel for 10½ hours respite.

⁷ 'Calling' is a process in which the assistant driver describes the aspect of the signal to the driver.

However, both the driver and the assistant driver indicated that they did not sleep particularly well during their respite period because of noise from road traffic and because their rooms could not be sufficiently darkened. OTSI also noted that the driver was due to commence his annual leave upon completion of the journey to Junee. Comments made by the driver to OTSI about his lapse in concentration led it to conclude that, whilst the crew's rest might have been sub-optimal, his failure to stop at Signal ST 419GL was affected to a greater extent by his expectation that the signal would be 'clear' and the anticipation of his impending holidays.

- 3.5 While at the incident site, and in the light of day, OTSI noted that a large peppercorn tree, on the Western side of the embankment, obstructed visibility of signal ST 419GL up to a point 93 metres from it (See *Photo 6*).



Photo 6 Point 93m from Signal ST 419GL, at which sighting first becomes unobstructed

- 3.6 The tree also obstructed the sighting of Signal ST 429GL. Given the size of the tree, it had clearly been obscuring Signals ST 419GL and ST 429GL for a long time. However, OTSI noted that this had not been the subject of reporting by drivers or by those responsible for inspecting and maintaining the

track and signals. The most recent sighting inspection in the area had been conducted on 22 June 2005 and there was no comment on any matters affecting visibility.

- 3.7 RailCorp's "Signals Engineering Standard Construction Specification" SC-00-47-00-00-SP requires a signal to be visible for a minimum of six seconds at line speed. The specification also states "*running signals shall be located to provide so far as practical, the longest, most continuous sighting of the signal after passing the signal in the rear*" and "*preferably, a minimum of 200 metres sighting distance for speeds to 100 kph and 300 metres for speeds over 100 kph wherever the environment permits*". As previously noted, Signal ST 419GL first becomes visible at a distance of 93 metres which is at the point where the locomotive driver passes the peppercorn tree (as depicted in *Photo 6*). At 28km/h, OTSI calculated that Signal ST 419GL would have remained visible to the driver for approximately 11.9 seconds. At the maximum permitted speed of 25km/h while 4BM7 was still clearing points on the West Suburban lines, this signal would have been visible for approximately 14.1 seconds. Calculations on rates of braking estimated that, at full service braking⁸, a freight train similar to 4BM7 requires a minimum of 86 metres to stop when travelling at the speed of 28km/h. The implication is that at the point at which Signal ST 419GL first became visible, the driver had sufficient time and distance to have maintained proper control of 4BM7 had he been sufficiently alert. A sufficiently alert driver would have slowed 4BM7 down to below 25km/h on the basis of the 'calling on' indication at the preceding signal (ST 422S) because this indicated to the driver that he needed to be prepared to stop at any time before ST 419GL if the line was obstructed.

Anticipation and Management of Risk

- 3.8 OTSI noted that the positioning of No. 717 catch points presented a number of risks. Whilst the points functioned as intended, by derailling 4BM7 when it passed Signal ST 419GL without authority, the run-off rail and ramp⁹ at No.717 catch points directed it towards the edge of an eight metre-high

⁸ A rate of deceleration calculated at 0.35ms².

⁹ The ramp is positioned to lift the wheel up over the rail head and assist in guiding the opposite wheel along the run-off rail.

embankment and potentially onto property or roadways directly below. RailCorp had identified the limitations associated with No. 717 catch points during a risk assessment conducted in April 2005. It concluded that:

- *"Catch points located at (17.139 Distance) on southern end of Lidcombe Loop have a train speed limit of 25km. There is approximately a 2m ballast derailment zone before a 10m drop down an embankment to a residence and road below."*
- *"The ballast to the right of catch points drops away sharply and any derailment could result in the wheels sinking into the ballast and the train rolling over to the right and down the steep embankment."*
- *"Any derailment at this site would be with very significant risk. If the lead engine/carriage were to roll it is possible that the second and remaining close coupled carriages may follow."*
- *"Train movements daily on the loop are of low to medium frequency and both passenger and freight trains use it."*
- *"In the event of a SPAD at this location consequences may be severe."*
- *"No catch point signage was present."*

3.9 While a small landing pad had been installed beyond No. 717 catch points, to mitigate the limitations associated with the location of the points, the pad's length did not meet the minimum requirements specified in Section 8 of RailCorp's standard for *"Catch Point Design & Clearance Beyond Catch Points"* (TS3504). The following requirements, specified in the same standard, were also not met:

- *"Designers, including designers of infrastructure in the vicinity of catch points, derailleurs or other similar devices, must ensure that a vehicle derailed at such a device has a clear, even throw-off area to minimise subsequent damage. Derailed vehicles must not be directed into a building or onto any structure, particularly overbridges, overhead wiring masts or transmission line poles, earthworks or over any embankment or directly into any cutting or retaining wall. Each site will need to be reviewed in detail."*
- *"The clear, even area required is dependent on the potential size and speed of any vehicle or train to be derailed and the nature of any retarding equipment or infrastructure (such as a sand drag) and will have to be determined for each site. The minimum requirement is 2 vehicle lengths beyond the catch point."*
- *"Bridge columns would need deflection walls in accordance with other standards."*
- *"Special consideration must be given if there is any possibility of an occupied building being in the path of a derailed vehicle. This will include land outside the rail boundary where there is, or is the potential for, building development."*
- *"Note that relocation of catch points may be an option where these requirements cannot be met."*

Adequacy of the Emergency Response

3.10 **Communication.** OTSI noted that immediately after the derailment, there was a breakdown in communications between the crew of 4BM7 and the RMC. Consequently, OTSI examined voice recordings to better understand the related communication difficulties. These recordings revealed that the driver of 4BM7 made the initial emergency broadcast on the WB 450.050 MHz

radio system, using the portable radio handset, and identified the location of the derailment but did not identify his train number. The RMC heard this broadcast and attempted to respond to the call twice, but could not direct their response to a specific crew. As a consequence, the crew of 4BM7 failed to respond to the calls from the RMC. At this point, *Network Rule NTR 400* obliged the RMC to broadcast a message across the network to alert other trains in the area of an emergency and to require them to stop their trains until the source of the initial broadcast, 4BM7, could be identified. Instead, the RMC contacted a number of signal boxes throughout the network in an effort to ascertain the source of the call. However, none of the signal boxes was aware of an incident and it was not until the driver of 53-U, who was permitted to enter the area of the derailment, contacted the RMC that it was able to establish that 4BM7's crew had initiated the original emergency broadcast.

3.11 While the RMC was trying to ascertain the source of the initial emergency broadcast, the driver of 4BM7 stated that he continued to broadcast an emergency message on the train's radio and eventually made contact with the signaller at Sefton Park Junction Signal Box. OTSI noted that the Sefton Park Junction Signal Box had no functional responsibility in the area of the derailment; responsibility rested with the Area Controller at Strathfield. It also noted that there were at least two signal phones, approximately 50m from the derailed locomotive, which would have provided direct access to the Area Controller. Instead third parties, were required to relay communications to Train Control and the Area Controller.¹⁰

3.12 ***Individual and Crew Actions.*** In the absence of a response from Network Control, the crew of 4BM7 had no way of knowing whether other trains in the area were aware of their predicament. *Network Rule NTR 400* and *Network Procedure NPR 720* require train crews to undertake specific actions to protect themselves, and their train, after an emergency unless they receive positive confirmation from Network Control that this has been done on their behalf. In the absence of such confirmation, the crew was required to:

¹⁰ Sefton Park Signal Box communicated to the Rail Management Centre. RailCorp advised that an employee at Clyde Yard also contacted the Rail Management Centre after overhearing the driver's emergency call.

- a. place audible warning devices (detonators), 500 metres behind 4BM7 to warn following trains of their predicament and, because this incident occurred on a single bi-directional line, 500 metres in front of the train to warn oncoming trains;
- b. place track shorting clips on the adjacent tracks to stop approaching trains at signals, as the derailed locomotives potentially obstructed other tracks, and
- c. secure the train by applying their train's handbrakes.

3.13 Unaware of the derailment, the Area Controller at the Strathfield Signal Complex noticed that Signal ST 412LC, located approximately 50m prior to where the leading locomotive of 4BM7 came to rest, was displaying a failed indication on the track indication panel. Signal ST 412LC protects trains on the Lidcombe Goods Loop from those approaching in the 'Up' direction¹¹ on the Main South Line, and vice-versa. The signal had previously displayed a "proceed" indication for 53-U. In the absence of a means for a SPAD to be displayed on his indication panel, the Area Controller considered the failed indication to be the result of some form of technical problem and advised the driver of 53-U to pass the Signal at 'Stop', but to report any problems encountered. When the driver of 53-U encountered 4BM7, derailed, he stopped and conferred with the RMC. Network Rule *NPG 608 (Passing Signals at Stop)* required the driver of 53-U to seek authorisation from the Area Controller (Signaller) before proceeding and to stop prior to any obstruction. However, the driver of 53-U did not alight from his train to check on the condition of the infrastructure, track or on the welfare of the crew from 4BM7, but advised the RMC that the track was unobstructed. Given that this communication was occurring at approximately 12:08am with minimal local illumination sources, it is difficult to determine how the driver of 53-U was able to give such an assurance. OTSI also considers that the Train Controller, having been notified of the accident, was obliged under Network Rule *NGE 208 (Responding to a Major Incident)*, to stop or warn trains approaching or travelling in the area of the derailment until he/she had received an assurance from an Incident Management Coordinator that it was safe to re-assume

¹¹ Towards Sydney.

operations through the area. In the absence of these assurances and an understanding of whether or not there were other risks that had to be managed, OTSI considers that the Train Controller should not have authorised the driver of 53-U to proceed through the derailment site. In the absence of information pertaining to the condition of the overhead power supply, the Train Controller should also have immediately arranged for the isolation of power in the area.¹²

- 3.14 Staff from RailCorp and IAL arrived on site at 1:25am but failed to appreciate that the site still had not been properly protected. Normal emergency response procedures required these staff to conduct a risk assessment before arriving at the site and to confirm that assessment at the site before commencing response actions at the site. However, this important precautionary measure was not observed.
- 3.15 **Subsequent Actions.** When OTSI arrived on site at 2:20am, it found that the Police had an effective cordon in place and NSW Fire Brigade crews were ready to respond to any fluids that might leak from the derailed locomotives. OTSI completed its initial examination of the site at approximately 5:00am and, after consultation, RailCorp recommenced limited running on the Main South lines, at reduced speed, through the site. Following the passage of the first train under the revised arrangements, OTSI's investigator raised concerns about the possibility that the retaining wall, upon which 4BM7 was resting, might collapse because of the vibration caused by a passing train. After additional consultation with OTSI, RailCorp further restricted the running speed to 10km/h, and commenced to monitor the stability of the retaining wall.
- 3.16 The recovery of the derailed locomotives commenced on the afternoon of 4 November 2005 and required the use of heavy-lifting equipment, necessitating the isolation of power to the derailment site beforehand. At 7:36pm, whilst the recovery work was in progress, a CityRail passenger service (76-K), enroute from Central to Penrith, entered an area affected by the isolation on the Down (West) Suburban line between Lidcombe and Auburn. This potentially exposed the recovery staff to the risk of electrocution

¹² 4BM7 was a diesel-hauled train and the Train Controller would have received indications had the derailment interrupted overhead power supply in the area. However, there was a possibility that overhead lines could have remained 'live' and posed a real danger to those on the ground had the derailed locomotives impacted with nearby power stanchions.

when the pantographs of run 76-K bridged the section isolators between the live and dead sections of the overhead power supply. The subsequent requirement to manage this secondary incident resulted in those onboard 76-K being subjected to significant delay. Investigation of this secondary incident, by RailCorp, established that both the RMC and the relevant Area Controller did not clearly understand the full extent of the area that would be affected by the requirement to isolate power while 4BM7 was being recovered. Notwithstanding, the recovery operation was completed and the line was re-opened at 4.50am on 5 November 2005.

- 3.17 **Post Incident Testing.** As previously noted the crew of 4BM7 were breath-tested at 1:10am by NSW Police and returned negative results. RailCorp's drug and alcohol testing policies at the time did not require it to test the Train Controller and Area Controller unless there were grounds to suggest that they had contributed to the accident. Notwithstanding, the Area Controller was tested, under RailCorp's auspices, for the presence of alcohol and returned a negative result. OTSI noted, however, that this testing occurred approximately five hours after the accident, rather within a prescribed three hour 'window'.

Other Safety Matters

- 3.18 **Accreditation and Compliance.** IAL was formed by QR when it acquired the Northern Rivers Railroad based in Casino and was accredited to operate in NSW by the NSW MoT in November 2003. Under mutual accreditation arrangements, IAL is also accredited to operate in Victoria.
- 3.19 OTSI noted that IAL has been subjected to considerable audit scrutiny by ITSRR¹³ and that it had observed that IAL's audit procedure lacked robustness, especially in relation to IAL's train operations and its crew assessment program. In a subsequent second audit report, ITSRR observed that IAL's train crew audits were more frequent and more "precise". OTSI also reviewed two reports arising out of compliance audits of IAL undertaken by the Victorian Department of Infrastructure (within which the Victorian Rail

¹³ ITSRR came into being on 1 January 2004 and the role of rail regulator was devolved to it, from MoT, on that date.

Regulator is located). However, these reports did not include any adverse findings in relation to IAL's train operations.

- 3.20 Concerned by a statement made by 4BM7's crew that their emergency training had never incorporated other than theoretical aspects, OTSI reviewed crew assessment sheets provided to it by IAL. OTSI noted that there was no reference to any driving standards and whilst assessment areas were clearly listed, there were no criteria against which the performance of drivers could be assessed. OTSI therefore considers that these important areas of IAL's operations should be subjected to additional scrutiny.
- 3.21 **Communication Equipment.** OTSI noted that the locomotives or crew of 4BM7 did not carry communication equipment capable of providing a blanket emergency broadcast across the radio network and had to rely on portable handsets and a mobile phone in order to report the incident. The Special Commission of Inquiry into the Glenbrook Rail Accident (1999) recommended that all trains operating on the NSW network be able to communicate across the network. This recommendation was reiterated in the Special Commission of Inquiry's Report into the Waterfall Rail Accident. ITSRR subsequently recommended that the *Rail Safety (General) Amendment (Miscellaneous) Regulation 2006* should be amended to mandate, amongst other things, that all train radio systems "*be capable of receiving and transmitting emergency calls; be fitted with an emergency button that enables an emergency call from a train to have priority over other calls and that enables direct communication between the train and the network control officer responsible for the area in which the train is operating*". This amendment to the Regulation came into force on 1 September 2006.
- 3.22 **Event Recorders.** OTSI examined the data from onboard event recorders from both locomotives involved in the incident. The data from both locomotives was similar and there was nothing in the data to indicate that 4BM7 had been managed inappropriately prior to entering the Lidcombe Goods Loop. However, OTSI noted that Locomotive X53 was fitted with a Hasler-style event recorder which was two minutes slow and that Locomotive EL58 was fitted with a Fischer electronic-style event recorder which was 60 minutes slow. OTSI notes that IAL is not alone in paying insufficient attention

to the requirement to ensure that event recorders are properly maintained and properly calibrated.¹⁴

Remedial Actions

- 3.23 RailCorp advised OTSI that the peppercorn tree obstructing the sighting of Signal ST 419GL was subsequently pruned. It also advised that it will commence to upgrade the landing pad near No. 717 catch points in early 2007 and that the lessons learned as a result of this accident have been incorporated in safety refresher training for signallers.
- 3.24 IAL advised that the driver of 4BM7 was required to undergo, and has completed, a retraining program. The program was conducted over six months and included modules in safe-working systems, route knowledge and train management. The assistant driver was formally counselled in relation to his performance. IAL also advised OTSI that it has acted to reinforce its training, including emergency training, and assessment processes, and that it intends to act to improve the maintenance and calibration of its event recorders. It further advised that whilst it has upgraded the communication equipment on approximately half of its locomotives, to meet the requirements of the amended *NSW Rail Safety (General) Amendment (Miscellaneous) Regulation 2006*, it has had to seek an extension for the completion of its fitment program until 31 March 2007 because of difficulties in sourcing the required components and the lead times required by overseas suppliers. This extension was subsequently approved by ITSRR.

Summary

- 3.25 4MB7 derailed on a set of catch points when its driver failed to respond to a 'Stop' indication at Signal ST419GL. The catch points were deliberately positioned beyond the signal to derail any train that passed the signal at 'Stop', without authority, to mitigate the risk of collision with trains on the nearby main line.

¹⁴ See OTSI's investigation reports, at www.otsi.nsw.gov.au, into incidents at Bethungra (2004), Grawlin Plains (2005) and Old Burren (2005).

- 3.26 There were a number of factors that may have affected the driver's judgement, the most likely of which was his expectation that the Signal would be displaying a 'Proceed' indication, together with distraction caused by anticipation of being on holidays the next day.
- 3.27 Although the catch points functioned as intended, the placement of the points did not meet the required design standards.
- 3.28 The major lessons to be learned from this accident relate to procedural aspects of the emergency management. Errors and omissions following the derailment complicated the management of the emergency response and placed emergency personnel and other trains in the vicinity at additional risk.

PART 4 FINDINGS

4.1 In relation to those matters prescribed by the Terms of Reference as the principal lines of inquiry, OTSI finds as follows:

a. Causation

- i. The derailment occurred when the driver of 4BM7 failed to respond to a 'Stop' indication at Signal 419GL and ran through a set of catch points which performed as they were designed to, by deliberately derailing the train to prevent both unauthorised entry onto the main line and the inherent hazard that such unauthorised entry would pose to authorised main line traffic.

b. Contributory Factors

- i. Notwithstanding an indication from the preceding Signal ST 422S, which indicated that he should proceed with caution, the driver admitted to being complacent during his approach to Signal ST 419GL because it was his expectation the Signal would be displaying a proceed, or 'calling on', indication. This expectation was based on his previous experiences at the Signal where he claims he had never previously been required to stop.
- ii. A large peppercorn tree on the Western side of the track restricted the driver's visibility until he was approximately 93 metres from Signal ST 419GL. However, had the driver maintained proper control of 4BM7 in accordance with the previous signal indication, he would have had sufficient time and distance, albeit with a small margin for error, to bring 4BM7 to a stand prior to Signal ST 419GL.
- iii. The driver had only been at the controls of 4BM7 for approximately 10 minutes and was still adjusting to the train's handling. In addition, he had not slept well following his previous shift. These matters, and the prospect of proceeding on holidays the next day, may also have affected the driver's attentiveness.

c. Anticipation and Management of Risk

- i. No. 717 catch points were positioned to mitigate the consequences of a train passing Signal ST 419GL at 'Stop' and colliding with other trains on adjacent lines and functioned as intended. However, the placement of the catch points did not conform to RailCorp's design standards.
- ii. In April 2005, RailCorp identified that the placement of No. 717 catch points did not meet its design standards but did not act at the time to remedy the deficiencies.
- iii. RailCorp has a program to check on matters that might impact on the operation or visibility of signals, but this program failed to detect what was an obvious and long-standing obstruction, caused by a large peppercorn tree on the Western side of the track, 93 metres from Signal ST 419GL.
- iv. The crew on 4BM7 had not been required to participate in, nor were they provided with, any recent emergency training.
- v. IAL's operations have been the subject of considerable scrutiny by ITSRR but that, in the area of train operations and particularly crew assessments, additional scrutiny may be required.
- vi. IAL's locomotives were not fitted with equipment that was compatible with RailCorp's MetroNet communication system which meant that 4BM7 was not logged onto RailCorp's Train Location System (TLS). As a consequence, 4BM7's train number was not visible on the Rail Management Centre's (RMC) indicator boards at Sydney Terminal, and the Train Controller had less visibility of this train than he had of trains that were operating compatible communications equipment.

d. Effectiveness of the Emergency Response

The emergency was not well managed and rail safety workers, and potentially passengers on main line services, were placed at additional risk as a consequence of:

- i. the radio equipment available to the crew of 4BM7 not having an emergency function to override other radio transmissions when required;
- ii. the failure of 4BM7's crew to clearly identify their train number when they first reported their predicament, resulting in Network Control not being able to communicate directly with the crew and not being able to fully comprehend the circumstances it was required to control;
- iii. the failure 4BM7's crew to revert to other means of communication that were available to them, and in particular the telephone at Signal ST 419GL nearby, when their initial call was not clearly acknowledged;
- iv. the failure of 4BM7's crew to protect their train, as required by Network Rule NTR 400 and Network Procedure NPR 720, in the absence of positive assurances from Network Control that other trains were being prevented from approaching their train;
- v. notwithstanding the absence of important information, the failure of Network Control to immediately broadcast an emergency message, as required by Network Rule NTR 400, to stop or slow other trains until the location or source of the initial emergency broadcast could be ascertained;
- vi. the failure of the driver of CityRail passenger service 53-U to alight from his train to check on the condition of the crew of 4BM7 and the condition of the track over which he was intending to proceed;

- vii. the design of the Track Indication Panel which failed to provide an alarm to alert the Area Controller that Signal ST 419GL had been passed at 'Stop' without authority;
- viii. the failure of the Area Controller to comprehend that the failed signal indication for Signal ST 412LC on his track indication panel might have had something to do with a train (4BM7) which was shown to be standing on the Lidcombe Goods Loop in the vicinity of Signal ST412LC;
- ix. the failure of the first response personnel to arrive at the scene to confirm that 4BM7 was being protected in accordance with Network Rule NTR 400 and Network Procedure NPR 720, and
- x. the lack of clear planning and understanding between Network Control and Electrical Operating Centre staff at Sydney Terminal regarding the limits of overhead electrical isolation, whilst 4BM7 was being recovered, resulting in a passenger service (76-K) entering into an area where the power had been isolated.

e. Other Matters that would Enhance the Safety of Rail Operations

- i. There is a requirement for all locomotives operating on the Sydney Network to be fitted with radio equipment that is interoperable with Network Control and which makes provision for the receipt and transmission of emergency calls on a priority basis. The amendment to Rail Safety Regulations which mandates this requirement for all rail operators to be compliant became effective on 1 September 2006. However, some operators, including IAL, have sought from ITSRR, and been granted, temporary exemptions until 31 March 2007 because of difficulties associated procuring equipment which is in short supply or the provision of which is the subject of long lead times.
- ii. IAL needs to implement a program to redress those deficiencies, previously identified, in relation to its crew training assessment practices and procedures.

PART 5 RECOMMENDATIONS

- 5.1 In order to prevent a recurrence of this type of accident, the following remedial safety actions are recommended for implementation by the organisations specified below.

Interail Australia Limited

- a. Implement a program to redress those previously identified deficiencies in relation to its crew training assessment practices and procedures;
- b. review the content, frequency and delivery of emergency training for its rail safety workers and update it where necessary;
- c. review crew training records to identify which personnel are in the most need of emergency training, and provide that training for them;
- d. ensure crew have a comprehensive understanding of the actions required of them in emergency situations and that they are familiar with the full suite of communication equipment that is available to them;
- e. ensure that its locomotives comply with Section 60A of the *NSW Rail Safety (General) Regulation 2003* in relation to radio communications equipment, and
- f. ensure that event recorders on its locomotives are maintained and calibrated in accordance with prescribed specifications.

RailCorp

- a. utilise the lessons learnt from the response to this accident as a 'case study' in its training of Controllers and Emergency Managers;
- b. review the appropriateness of the 'route setting' practices that may be in regular use at the Lidcombe Goods Loop and elsewhere throughout its network;
- c. remedy any remaining sighting issues associated with Signals ST 419GL and ST 429GL;

- d. rectify the deficiencies previously identified with No. 717 catch points, and
- e. review the effectiveness of the methods employed in signal sighting inspections.

The Independent Transport Safety and Reliability Regulator

- a. conduct a further review of IAL's crew training assessment practices and procedures to ensure that previously identified deficiencies have been corrected;
- b. satisfy itself that RailCorp has taken appropriate remedial safety action in response to the accident, particularly in relation to deficiencies in the management of the emergency response; the design limitations of No. 717 catch points and the visibility of Signals ST 419GL and ST 429GL, and
- c. satisfy itself that RailCorp has utilised the lessons learnt from the response to this accident as a 'case study' in its training of Controllers and Emergency Managers and has disseminated the safety information to the relevant departments within the corporation.