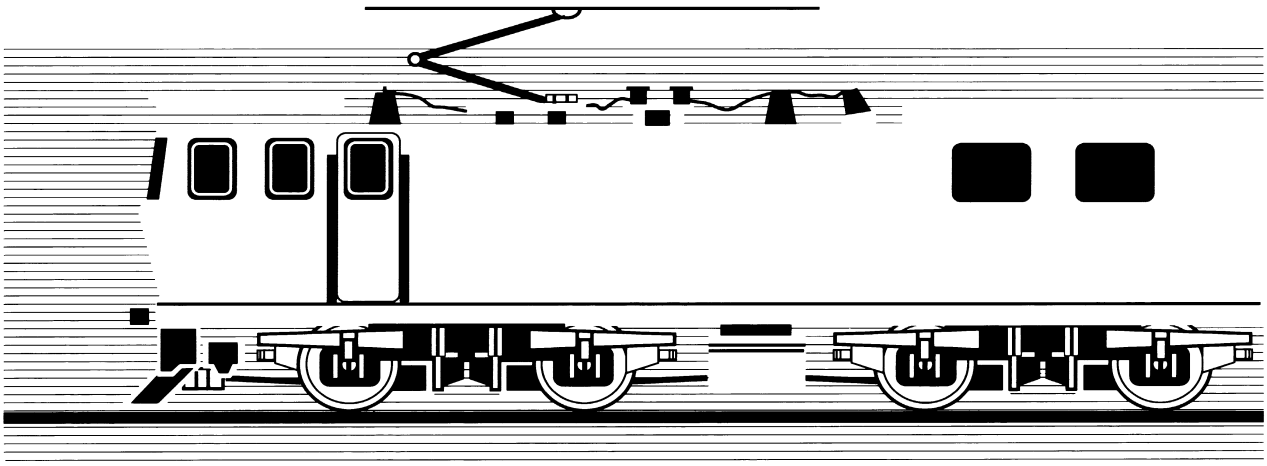
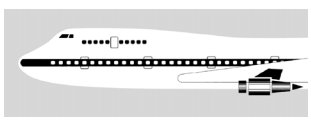
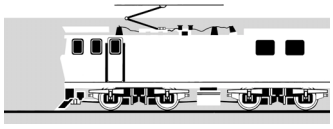


RAILWAY OCCURRENCE REPORT

05-107 **diesel multiple unit passenger Train 3037, wrong routing, signal passed at danger and unauthorised wrong line travel, Westfield** **14 February 2005**


TRANSPORT ACCIDENT INVESTIGATION COMMISSION
NEW ZEALAND

The Transport Accident Investigation Commission is an independent Crown entity established to determine the circumstances and causes of accidents and incidents with a view to avoiding similar occurrences in the future. Accordingly it is inappropriate that reports should be used to assign fault or blame or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

The Commission may make recommendations to improve transport safety. The cost of implementing any recommendation must always be balanced against its benefits. Such analysis is a matter for the regulator and the industry.

Report 05-107

diesel multiple unit passenger Train 3037

wrong routing, signal passed at danger

and unauthorised wrong line travel

Westfield

14 February 2005

Abstract

On Monday 14 February 2005, at about 0831, Train 3037, a Connex Auckland Limited Britomart to Papakura via Newmarket diesel multiple unit passenger train was wrong routed past Signal 30RAC at Westfield to an industrial siding, instead of the Down main. While attempting to regain the correct path, the locomotive engineer multiple unit passed Signal 36LD at stop and travelled 'wrong line[1]' on the Down main where he stopped adjacent to a signal that applied to the opposite main. There were no conflicting movements approaching Train 3037 in either situation.

Safety issues identified included:

- signal awareness training for locomotive engineer multiple units
- signal box workload
- use of non-standard terminology for siding names
- voice-recording in signal boxes

Three safety recommendations have been made to the Chief Executive of ONTRACK[2] to address these issues.

[1] A movement travelling opposite to the normal left hand running in the double line areas.
[2] Access provider and controller of the controlled rail network.

Contents

Figures

Abbreviations

ARTA	Auckland Regional Transport Authority
Connex	Connex Auckland Limited
DMU	diesel multiple unit
L9 shunt	L9 shunting service
LEMU	locomotive engineer multiple unit
NAL	North Auckland Line
NIMT	North Island Main Trunk
OJT	on-the-job training
S & I diagram	signalling and interlocking diagram
SBC	signal box controller
Signal 16R	Signal 16RAB Down Home from North Auckland Line at Westfield
Signal 24R	Signal 24RD Shunt and Down Starting from Loop at Westfield
Signal 28L	Signal 28LAB Up Starting from Up Main at Westfield
Signal 30R	Signal 30RAC Down Starting from NAL Down Main at Westfield
Signal 36L	Signal 36LD Shunt and Up Directing from East Sidings at Westfield
Toll Rail	Toll NZ Consolidated Limited
UTC	coordinated universal time

Data Summary

Train type and number:	diesel multiple unit passenger Train 3037
Date and time:	14 February 2005, at about 0831[3]
Location:	Westfield
Persons on board:	crew: 2 passengers: about 20
Injuries:	nil
Damage:	nil
Operator:	Connex Auckland Limited (Connex)
Investigator-in-charge:	Vernon Hoey

[3] All times in this report are New Zealand Daylight Time (UTC+13) and are quoted in the 24-hour mode.

1 Factual Information

1.1 Narrative

1.1.1 On Monday 14 February 2005, Train 3037 was the scheduled 0810 diesel multiple unit (DMU) passenger service from Britomart to Papakura via Newmarket. The train departed Britomart at about 0811 and followed late-running Train 4003 that had departed about 4 minutes earlier.

1.1.2 Train 3037 was crewed by a locomotive engineer multiple unit (LEMU) and a train manager who was also tutoring 2 trainee on-board train personnel. The train conveyed about 20 passengers.

1.1.3 While travelling through Penrose, Train 3037 overtook L9 Shunting Service (L9 shunt), which was berthed on the loop waiting a following path to Westfield. At 0830, the train controller contacted the signal box controller (SBC) at Otahuhu and advised him that L9 shunt would be following Train 3037 from Penrose.

1.1.4 When Train 3037 approached Westfield, the LEMU slowed and stopped at Signal 30R which was displaying a stop indication. Shortly afterwards, the signal aspect changed to proceed and the LEMU passed the signal (see Figure 1).

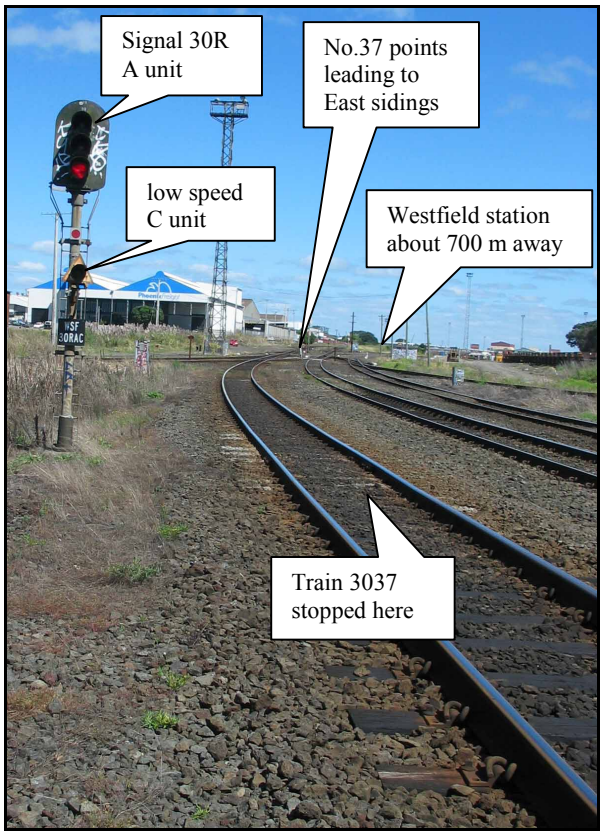


Figure 1
Signal 30R at Westfield, looking south

1.1.5 Approaching No.37 points, the LEMU noticed they were set for the East sidings and realised immediately that he had been wrong routed. Not wishing to delay other services, the LEMU continued partially into the East sidings and stopped (see Figure 2).

1.1.6 At the request of the SBC, the LEMU moved a short distance forward and cleared No.37 points behind him, and they then discussed a plan for Train 3037 to regain the Down main. The plan involved Train 3037 travelling from the East sidings to the loop from where it would be signalled from Signal 24R back on to the Down main (see Figure 2).

1.1.7 The LEMU changed his driving position to the cab at the other end of the DMU and saw that No.37 points were still set for the Down main, from which he had just travelled. The LEMU moved his train, passing Signal 36L at stop, and travelled about 170 m before stopping adjacent Signal 28L.

1.1.8 The LEMU advised the SBC at Otahuhu that he was stopped at Signal 28L and the SBC instructed the LEMU to return to the siding. The LEMU went back to the cab at the other end of the DMU and returned to the East sidings and waited for further instructions.

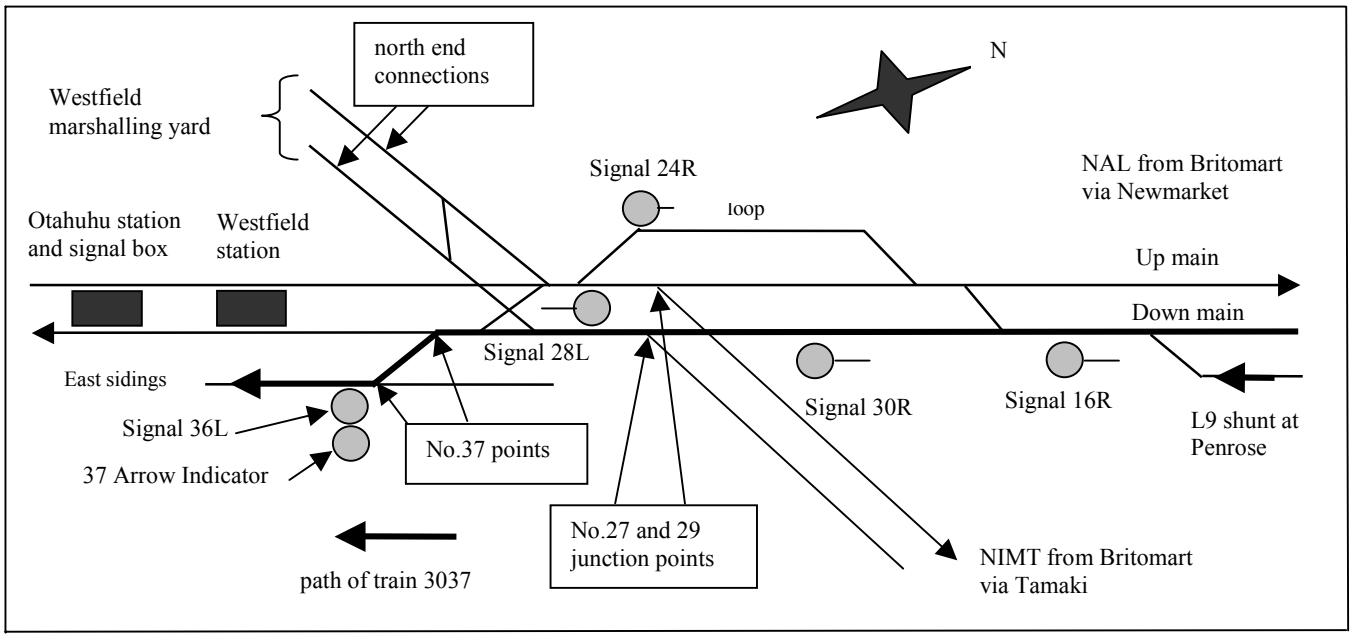


Figure 2
Track layout at Westfield (not to scale)

1.2 Site information and signalling arrangements

1.2.1 Westfield was a double-tracked junction station between the North Island Main Trunk (NIMT) and the North Auckland Line (NAL). Connections were provided at the north and south ends of Westfield marshalling yard where freight and empty passenger trains could travel between the ONTRACK controlled network and the Toll Rail controlled area.

1.2.2 The ONTRACK controlled network interlocking and signalling system at Westfield was operated from the signal box located at Otahuhu, but overall control of trains was performed from the national train control centre in Wellington. Otahuhu signal box was classified as a permanent signal box and SBCs were in attendance for all trains.

1.2.3 Signal 30R was a main line running signal that authorised down trains to continue through the junction points towards Westfield station, proceed into the East sidings or into Westfield marshalling yard via the north end connections. Trains continuing towards Westfield station were authorised by a clear (green) or caution (yellow) normal speed aspect in the A unit of the signal (see Figure 1). Trains travelling to either the East sidings or into the Westfield marshalling yard were authorised by a low speed (short range yellow) aspect on the C unit of the signal.

1.2.4 Signal 36L was a colour light shunting signal that, with a yellow or green aspect, authorised trains to exit the East sidings over No.37 points and travel on the Up main up to, or beyond, Signal 28L. There was an arrow indicator adjacent Signal 36L. When the arrow indicator was illuminated, trains could pass Signal 36L at stop and travel over No.37 points in the normal position and access other Toll Rail controlled sidings (see Figure 3).

1.2.5 A signalling and interlocking diagram (S & I diagram), issued by ONTRACK engineering personnel, described all the signal aspects that could be displayed, and the routes to which they applied at Otahuhu-Westfield.

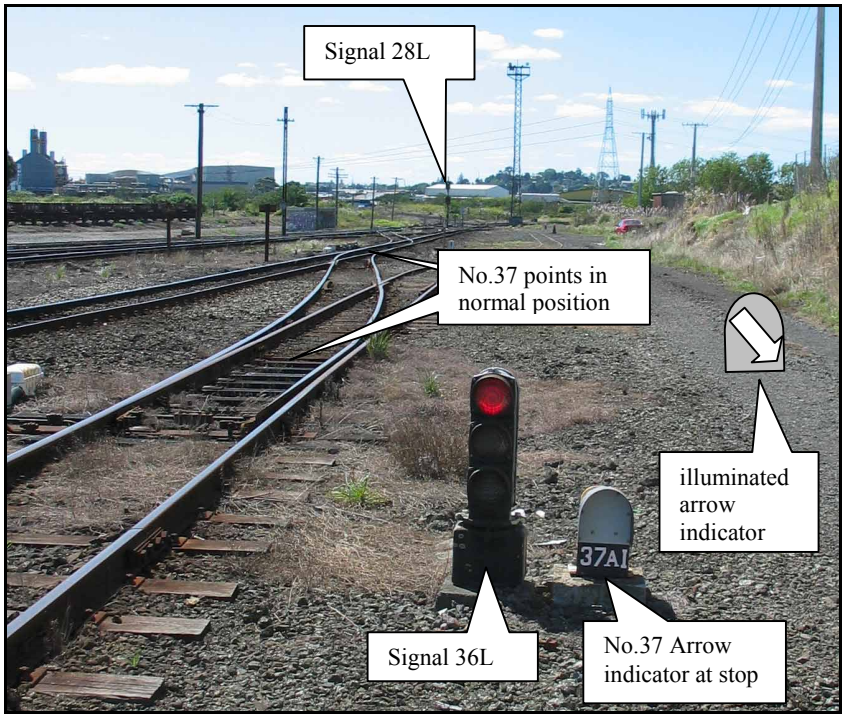


Figure 3
Signal 36L with adjacent No.37 Arrow Indicator and illuminated inset

1.3 Connex timetable changes

1.3.1 On 23 August 2004, under contract from Auckland Regional Transport Authority (ARTA), Connex Auckland Limited (Connex) took operational control of Auckland suburban train services from Toll Rail.

1.3.2 On 14 February 2005, Connex introduced a new and expanded timetable that added 29 services and brought the total number of daily services to 174. A timetable committee discussed the effect of the increased number of peak hour services on signal box operation. The new timetable represented a 20% increase in Connex services, some of which terminated at Otahuhu station, but no workload issues arose in regard to signal boxes as a result of the committee discussion.

1.3.3 To assist the SBCs, new berthing sheets were drawn up for the Otahuhu signal box that indicated the train running order and platform allocations at Otahuhu station. The route to which trains operated on was colour coded on the berthing sheets.

1.3.4 Future expansion in passenger services, planned by Connex for late 2005 and early 2006, will eventually add a further 110 new services and bring the daily total to 284, representing a greater percentage increase than that introduced on 14 February 2005.

1.4 Rail Operating Rules and Procedures

1.4.1 ONTRACK's Rail Operating Rules and Procedures required in part that:

- **Rule 49. (c) Colour Light Shunting Signal to be Used –** When the exit from or entrance to a section of line is controlled by colour light shunting signals, a train or shunt must not be moved to or from such line until the proper fixed signal is exhibited.
- **Rule 51. Colour Light Shunting Signals: Meaning of Indications of – (a)** When Colour Light Shunting signals are at "stop" they indicate only that the line is not clear, or that trains must be stopped.
- **Rule 54. (a) Arrow and Colour-Light Indicators –** An illuminated Arrow Indicator and a Two-position Colour-light Indicator are provided at the facing and trailing ends respectively of points, which are the termination of the interlocking in station yards, or other places as shown on S & I diagrams.
- **Rule 93. Signalman's [SBC's] Duties in working and Care of Signals**
  (a) A Signalman [SBC] must not display a "Proceed" indication without first being satisfied that all points are in the proper position.
- **Rule 109. (a) Locomotive Engineer to Identify Signal-**
  When a signal is placed at "Proceed" the Locomotive Engineer must be satisfied that it refers to his train and the line it is on, and must understand the movement thereby authorised.
- **Double Line Signalling Regulation**

  1. Trains Not to Set Back
  (a) Trains must not set back after leaving a station, or run on the right-hand side line in the direction of travel except: -

  (ii) When at a station and wholly within the Home or Outer Home signals movements may reverse direction on the authority of the Signalman [SBC] who must first satisfy himself that it is safe for the intended movement.

1.5 Working Timetable instructions

1.5.1 ONTRACK's Working Timetable required in part that:

2.3.3. Signalling of Trains: Auckland Suburban Area

When attended it will be necessary to advise the adjacent Signalbox/panel concerned of the running order of all trains except suburban passenger services unless they are running 5 minutes or more late. Radio communication between signalboxes/panels must only be used when the telephone system is out of order.

1.6 Radio communication

1.6.1 ONTRACK's Rail Operating Code Supplement 3.4 contained procedures on correct radio use. The code included the following general procedures in part:

2.2.2 Radio Technique

The following points should be observed when transmitting: -
Standard terms and phrases should be used whenever possible.

1.6.2 Radio communications between signal boxes and trains were not recorded, but recordings were made of the telephone conversations between the train controller and the SBC.

1.7 Personnel

Locomotive engineer multiple unit

1.7.1 Tranz Rail[4] recruited the LEMU from outside the rail industry into its Auckland Tranz Metro[5] LEMU training program in February 2004. When Connex took responsibility for the suburban train operation, the LEMU, who was still under training, transferred across.

1.7.2 The LEMU's training period lasted a total of 47 weeks, with an initial 15-week theory/practical training course, followed by a 32-week period of on-the-job training (OJT) with a minder driver. During the 15-week theory training, the LEMU, accompanied by tutors, made site visits to Westfield and observed signal aspects.

1.7.3 Additionally, the LEMU received theory training that covered unusual movements, including the towing of a failed DMU into Westfield marshalling yard via the north end connections during the hours of darkness. In this situation, the LEMU would be required to pass Signal 30R displaying a low speed aspect. This was an exception to normal practice where empty Connex services entered and exited the controlled network via the south end of Westfield, near where the Otahuhu signal box was located.

1.7.4 During his theory training, the LEMU was taught about the importance of clearly identifying signal aspects and ensuring that they applied to his train. The S & I diagram was the principal document for this aspect of training, and he was taught to refer to this document when he needed clarification on signal aspects anywhere within the Auckland suburban network.

1.7.5 He also passed a written radio procedures test of his knowledge of correct radio procedures, including questions relating to the use of standard terms and phrases during radio transmitting.

1.7.6 On 2 February 2005, after meeting all requirements of his task procedures, including the testing of his knowledge of signal rules, the LEMU was certified to drive DMUs.

1.7.7 On the day of the incident, the LEMU said that while driving Train 3037 between Britomart and Penrose, it was clear that he was closely following another DMU. He had passed a number of signals displaying a yellow aspect, which meant the next signal would be at stop or low speed. When he departed Penrose, he noticed L9 shunt was "sitting up close to the platform".

1.7.8 Within seconds of stopping at Signal 30R, the aspect of the signal changed to a low speed which meant that all points were in the proper position but the track may be occupied or suitable for low speed only. The LEMU decided to pass the signal although he had not encountered a low speed aspect on this signal during his OJT. He said he thought he was following the DMU that was then stopped on the Down main at Westfield station, and he was being signalled in behind it.

1.7.9 The LEMU passed the signal but when he saw that No.37 points were in the reverse position, he immediately realised that he had been wrong routed into the East sidings. He said he decided to continue into the sidings because he did not wish to delay other services while the situation was clarified.

1.7.10 When he stopped, the LEMU discussed a recovery plan with the SBC at Otahuhu, which required him taking a route that he not driven before. He was told by the SBC that he would be signalled from the "greasy pig" to "one arrival Westfield". The LEMU referred to his S & I diagram but found no reference to these locations. He said that he then became disorientated and a bit confused.

[4] The predecessor to Toll Rail.
[5] The group within Tranz Rail, and subsequently Toll Rail, responsible for the operation of the suburban train services in Auckland.

1.7.11 The LEMU changed his driving position to the cab at the other end of the DMU. He said that he saw Signal 36L at stop but thought the signal applied for movements along the siding. As No.37 points were still in the reverse position and Signal 28L in the distance was at stop, he moved the DMU forward onto the Down main where he had come from, and stopped adjacent Signal 28L and advised the SBC what he had done.

1.7.12 When the SBC advised the LEMU to return to the East sidings, the LEMU changed his driving position and drove Train 3037 back into the East sidings.

Signal box controller

1.7.13 On 28 September 2004, the SBC transferred from a Tranz Metro train manager's position and commenced theory training in order to attain signalman's qualification. During the 2-week course in Wellington, he passed a written progressive assessment test of his knowledge of correct radio procedures. The test included a question relating to the use of standard terms and phrases during radio transmissions.

1.7.14 The SBC commenced a 7-week OJT period with a minder signal box controller on 9 October 2004. Due to the widespread use of local names by operating personnel at Westfield-Otahuhu, the SBC had adopted a workaround process of applying stickers to the signal panel. These stickers provided a visual reference to the actual location and its proper location name until he became familiar with the local names (see Figure 4).

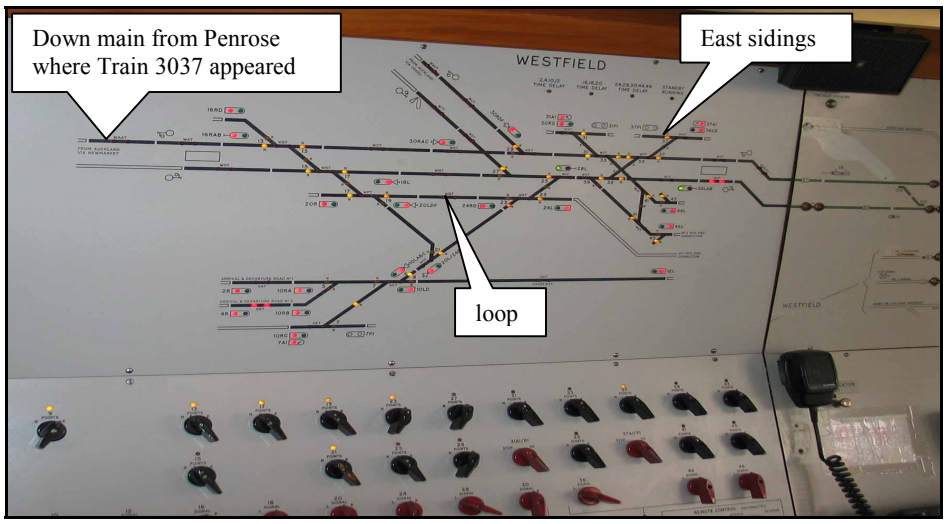


Figure 4
Otahuhu signal box panel displaying the Westfield signalling and interlocking arrangements

1.7.15 Some of the local names in use were:

Standard names	Local names
East sidings	greasy pig; Peter Baker Transport
Loop	Westfield loop; one arrival Westfield; one short

1.7.16 On 25 November 2004, the SBC gained certification, having met requirements in all aspects of his task procedures, including his knowledge of radio procedures. Although ONTRACK had scheduled monthly safety observations for new operating personnel during the first 3 months after certification, the SBC had not been subjected to these audits in that period of time.

1.7.17 The day before the incident, the SBC contacted a senior colleague who had been involved in the production of the new berthing sheets. The SBC queried his colleague on the details of the new timetable and commented that he was not looking forward to the first day of the new timetable, as he was going to be in amongst the busy part of it. He also said, "I hope everything goes all right." The SBC recalled later that he felt the timetable starting on 14 February conservatively represented a 20% increase in workload in the Otahuhu signal box.

1.7.18 On the day of the incident, the SBC took over at 0800, and the outgoing SBC remarked that some of the trains on the new timetable were already running late.

1.7.19 About 30 minutes later, the SBC responded to the train controller's call that L9 shunt would follow Train 3037 from Penrose saying, "I've got him." Soon afterwards he was alerted to the train approach buzzer sounding for a train arriving from Penrose. The SBC thought it was Train 3037, and signalled the train onto the Down main at Otahuhu. In fact, this movement was the late running Train 4003, travelling ahead of Train 3037.

1.7.20 When the train approach buzzer again sounded shortly afterwards, the SBC assumed the movement was L9 shunt so he signalled a route into the East sidings. When this movement had passed Signal 30R, he answered a radio call from the crew of L9 shunt wishing to change their destination to one arrival Westfield. When the SBC asked where they were, the L9 shunt crew replied that they were stopped at Signal 16R.

1.7.21 When he realised that the movement heading to the East sidings was Train 3037, the SBC contacted the LEMU and asked him to stop immediately, and he then signalled L9 shunt into the loop at Westfield. After he had considered his options, the SBC instructed the LEMU to continue into the East sidings to clear No.37 points.

1.7.22 Once Train 3037 was inside the siding, the SBC intended to signal the train to the loop (see Figure 5), which would then allow him to clear Signal 24R and reroute the train back on to the Down main and continue to Papakura. He discussed the plan with the LEMU.

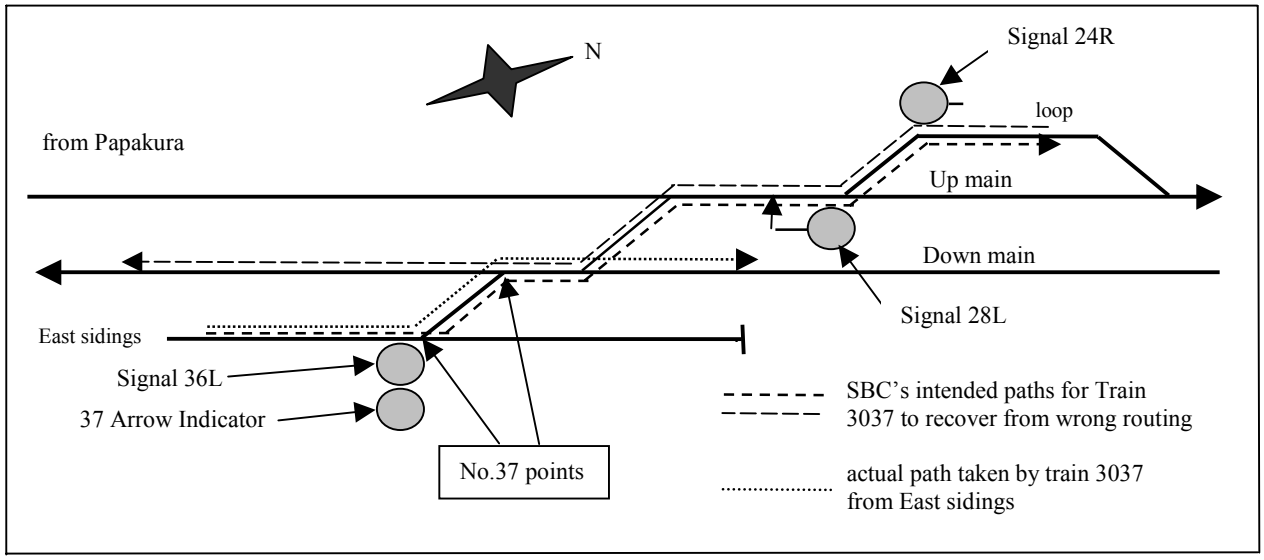


Figure 5
Detailed track layout at Westfield (not to scale)

1.7.23 The SBC was interrupted with other duties before he could implement his plan, and when he looked at the panel, he saw that Train 3037 had exited the East sidings in an Up direction and wrongly entered the Down main. The SBC radioed the LEMU and instructed him to return to the East sidings.

1.7.24 When Train 3037 arrived back into the East sidings, the SBC notified the train controller of the incidents.

1.8 Previous operating incidents in the Auckland suburban area investigated by the Commission

Rail occurrence report 03-113, DMU passenger Train 3366 passed conditional stop board without authority, Glen Innes, 30 October 2003

1.8.1 On 30 October 2003, Train 3366, a Tranz Metro Papakura to Britomart DMU passenger train passed a conditional stop board, between Tamaki and Glen Innes, without authority. A trainee LEMU, under the tuition of a minder driver, was driving the train and they entered the work area without establishing that they had proper authorisation to do so.

1.8.2 The minder driver was new to the tutoring role and it was concluded that a more experienced tutor may possibly not have allowed the trainee LEMU to pass the conditional stop protection board without proper authority.

1.8.3 Following this incident, Tranz Rail modified and amended their operating procedures for conditional stop protection and conducted a series of subsequent radio audits to check radio procedures.

Rail occurrence report 04-119, DMU passenger Train 3358 travelled wrong line without the required track and time permit, between Tamaki and Britomart, 28 July 2004

1.8.4 On 28 July 2004, during a wrong line running operation, Train 3358 a Tranz Metro Papakura to Britomart diesel multiple unit passenger train passed Signal 8B at Tamaki, at Stop, without verbal authority. The train continued on the Down main towards Britomart Station without the required Track and Time Permit being issued by the train controller.

1.8.5 The LEMU had been certified to driving duties about 2 months prior to the incident and it was concluded that he had either not read or not fully understood an information bulletin containing the wrong line running instructions.

1.8.6 On 27 June 2005, the Commission recommended to the General Manager of Connex Auckland Limited that he:

> develop training procedures to strengthen the focus to Mis 60 and wrong line running procedures (047/05).

1.8.7 On 26 May 2005, the General Manager of Connex replied in part to the preliminary safety recommendation:

> Connex Auckland agrees with the Commission's safety recommendation, and has already extended the training of Locomotive Engineer Multiple Units (LEMU) in respect of the use of Mis.60 Track and Time Permit, and Mis.59 Authority to pass Departure Signals at Stop and Proceed Through Block Sections Procedures.
>
> In particular, Connex Auckland Ltd has extended the practical field training in the use of the procedures by running a special train on a Sunday to enable LEMUs to practice their use. The scenarios covered are:
>
> - Wrong Line Running (in double line areas)
> - Disabled diesel multiple unit in front of a Stop and Stay signal – being assisted by a following train
> - Disabled diesel multiple unit in front of a Stop and Stay signal – giving assistance to a train in advance
> - Failed signal – seeking and acting upon a Mis.59

- Setting back – there are two relevant scenarios for Connex Auckland LEMUs: one is the termination of a service at Ranui, with subsequent setting back to Henderson; and the other is the setting back to a platform in a double line automatic signalling area after having passed the first intermediate signal.

1.9 Locomotive event recorder

1.9.1 The DMU was not equipped with a locomotive event recorder.

2 Analysis

2.1 The signalling system at Westfield was operating correctly and there were no equipment failures that the SBC had to contend with. Likewise there were no mechanical defects on the DMU that the LEMU had to contend with.

2.2 When the train controller advised the SBC that L9 shunt would be following Train 3037 from Penrose, the SBC overlooked that late-running Train 4003 had yet to appear on his signal panel from Penrose. The train controller would have been aware of the late-running Train 4003, but it was unclear if the SBC had been advised by the SBC at Newmarket of its late running. The SBC was unfamiliar with the extent of the alterations contained on the new berthing sheets provided in the Otahuhu signal box and had probably lost situational awareness. Train 4003 was one of the services introduced with the new timetable and when the train approach buzzer sounded immediately after the telephone call from the train controller, he thought it was Train 3037, instead of Train 4003.

2.3 After Train 4003 had travelled beyond Signal 30R towards Westfield station and the train approach buzzer sounded again, the SBC cleared Signal 16R. The LEMU driving Train 3037 passed Signal 16R at caution proceed and when he saw Signal 30R ahead at stop, he slowed and stopped at the signal. The LEMU was probably not surprised at the minor delay at Signal 30R, as he had been closely following late-running Train 4003 since leaving Britomart. The LEMU had probably approached a number of signals that could have been displaying a stop aspect before automatically changing to a caution proceed aspect as Train 4003 progressed past signals in advance.

2.4 After Train 4003 had travelled beyond No.37 points, the SBC set a route to the East sidings for what he mistakenly thought was L9 shunt and cleared Signal 30R to proceed. The LEMU saw Signal 30R change to a slow speed aspect and understandably presumed that he was being signalled in behind the preceding service, then stopped at Westfield station some distance ahead and out of sight.

2.5 Low speed signals have 2 principal functions and, depending on the complexity or otherwise of the track work and the amount of movements at a particular location, the low speed aspect may indicate either alternative. Firstly they indicate to locomotive engineers that they could be advanced to an operator-controlled area where they will be directed by that operator's field personnel. Alternatively, the low speed could indicate to the locomotive engineer that they are being advanced into an occupied section of controlled track.

2.6 In this instance the low speed aspect was actually set for the first type of function because the SBC thought the next service was L9 shunt. However the LEMU of Train 3037, the service actually stopped at Signal 30R, thought the aspect was set for the alternative function as he had regularly passed such signal aspects during his OJT when berthing behind other DMUs stopped on platforms at Britomart and Papakura. Being fully conscious that he had been closely following another service, the LEMU acted in good faith, accepted that the signal was for his train and passed it cautiously.

2.7 The low speed aspect of Signal 30R had not been designed and equipped to permit the movement that the LEMU thought he was undertaking. It was likely that consideration had not been given to changing the signalling system to allow the low speed aspect to be used to signal a following train onto the occupied Down main, probably because there had been no demand. There was no mention on the S & I diagram that the low speed aspect authorised a following train to enter the Down main if occupied.

2.8 However, despite his inexperience, when the LEMU saw that No.37 points were set for the East sidings, he correctly concluded that he had been wrong routed. His decision to continue towards the East sidings and therefore minimise any delay to any following services was appropriate.

2.9 Having received the request from the crew of L9 shunt to divert their movement to the loop at Westfield, the SBC acted quickly to establish the identity of the train travelling towards the East sidings. However, by then the LEMU had stopped partway into the East sidings. When the LEMU informed the SBC that he was Train 3037, the SBC considered his options. These options included either arranging for the LEMU to manually hand wind both ends of No.37 points or alternatively obtain verbal permission from the SBC to set Train 3037 back to Signal 30R. Both options would have been time-consuming and relatively difficult to execute, as other services were probably waiting to travel through the area.

2.10 The SBC's decision to signal Train 3037 from the East sidings to the loop in order to regain the Down main was a safe and expeditious recovery option that made full use of the available signalling system without disrupting other services.

2.11 After the LEMU had completely entered the sidings, but before he changed ends, the SBC explained the details of the recovery plan to the LEMU. However, the SBC introduced location names that were foreign to the LEMU. The LEMU had been trained to refer to his S & I diagrams on these occasions, but these were of little use to him as there was no reference to these local names on the documents. From the disorientation and confusion he experienced in not being able to identify these names on the S & I diagram, it is probable that the LEMU consequently lost situational awareness.

2.12 The use of the terms "greasy pig" and "one arrival" by the SBC was something that he, despite his relative inexperience, was well versed in. The SBC would have been clear where he wanted the LEMU to travel from and to but was probably unaware that the LEMU had no notion of the meaning of the unofficial terms. A safety recommendation has been made to the Chief executive of ONTRACK, in conjunction with train operating companies, to address this issue.

2.13 Having lost situational awareness and being disorientated, the LEMU would have been unsure of the route the SBC intended to set for him. Seeing that the position of No.37 points had not changed, he may have presumed the route was already set, so he proceeded. However in doing so he passed Signal 36L at stop without authority and travelled wrong line to Signal 28L which was at stop, but did not apply to the main line he was on.

2.14 Signal 36L and the adjacent arrow indicator were prominent and should have been easily recognisable to the LEMU because he had been required to pass similar types of signals when travelling to and from Westfield marshalling yard at the start and end of his shifts. Additionally, the LEMU had been certified to driving duties 12 days previously after achieving clear results in his signal tests.

2.15 When the SBC received a call from the LEMU advising that he was now stopped at Signal 28L, the SBC correctly instructed the LEMU to return to the East sidings. The SBC had been distracted with other work and had not had time to set up the planned route for Train 3037 to travel from the East sidings to the loop. In view of the further pending increases in Connex services, a safety recommendation has been made to the Chief Executive of ONTRACK to conduct a workload analysis at all signal boxes in the Auckland area.

2.16 The theory and practical training the SBC and LEMU received was extensive and appropriate. However, both were relatively new to their roles, particularly the LEMU. Given the SBC's level of experience and his voiced concerns regarding the new timetable, it may have been prudent to either provide an initial level of support or to have rostered him to a less busy late or night shift.

2.17 Likewise, with more experience, the LEMU would probably have realised that a low speed aspect on Signal 30R only directs movements through any one of 3 diverging routes away from the Down main instead of routing a movement in behind another at Westfield station. However, in view of the safety actions taken by Connex immediately after the incident to augment their practical and theory signal awareness training for new LEMUs and, retrospectively use this incident to educate all their certified LEMUs, no safety recommendation has been made.

2.18 Because the SBC had not been assessed in the scheduled monthly safety observations for newly appointed persons in operating roles, the opportunity was lost to assess his progress and possibly identify and correct any non-conforming practices.

2.19 Proper radio communication is a critical component in the working of signal boxes as it is in the national train control centre, which is deemed to be a signal box. A safety recommendation has been made to the Chief Executive of ONTRACK to install voice-recording systems in all signal boxes.

3 Findings

Findings are listed in order of development and not in order of priority.

3.1 The equipment that the SBC and LEMU were operating at the time of the incidents was functioning normally.

3.2 Both the SBC and LEMU were newly qualified.

3.3 The SBC was unprepared for the new timetable and short-term assistance would have been beneficial while the new timetable was bedded in.

3.4 Anxiety at the introduction of the new timetable led the SBC to becoming disorientated and losing situational awareness.

3.5 When the train controller notified the SBC of the sequencing of L9 shunt behind Train 3037, the SBC should have referred to the berthing sheets and confirmed to himself the running order of trains with reference to the new timetable.

3.6 The LEMU misunderstood the low speed aspect on Signal 30R because of his lack of awareness of its meaning and the conditioning of closely following another train since leaving Britomart.

3.7 Although the LEMU had not previously been required to drive into the East sidings and consequently had not passed Signal 36L at Westfield before, he should have recognised that he required a proceed aspect before passing it.

3.8 The LEMU had not previously heard the local names of sidings used by the SBC to direct the LEMU from the East sidings to the loop at Westfield and their use led him to becoming disorientated and losing situation awareness.

3.9 The official names of sidings connected directly to the controlled network on the S & I diagram for Otahuhu-Westfield had no relevance to the local names in widespread use.

3.10 The lack of voice recording equipment in signal boxes precluded the same level of auditing of radio procedures as that provided for in train control.

4 Safety Actions

4.1 On 15 February 2005, Connex issued a memo titled Unusual or irregular signal which said in part:

- If a driver receives a signal aspect which appears unusual or irregular for a train service, the driver must seek clarification from the signalman or from train Control (as appropriate) before proceeding. This is the safe and correct course of action. Do not make an assumption about what the signal indication means, or might mean for your train.
- If you do not understand a radio message, ask the caller to repeat the message, make sure you have a clear understanding of the intended movement before acting on the instructions. Do not assume a meaning for the words that are not clear.
- During the incident, the expression "Greasy Pig" was used. This location does not appear on the S & I for Westfield-Otahuhu, nor in the training material for LEMUs, this location is referred to on the Westfield S & I as the East sidings. Old nicknames may have an interesting history, but they should not be used in giving directions in train operations.

4.2 On 27 May 2005, Connex advised in part that the following steps had been taken to learn from the incidents and their LEMU training program has been boosted as follows:

- The incidents on 14 February was as much a surprise to Connex Auckland as it was to the LEMU. On reviewing the event, Connex reached the conclusion that the OJT in "unusual" operating movements and places needed boosting. In the immediate case of the LEMU, he spent a full week in the company of an experienced driver, and walked every signal and siding in Otahuhu-Westfield, Newmarket, Morningside, and Papakura.
- On the successful completion of this additional training, the LEMU was returned to driving duties. There has been no further incident, and the safety observations made on the LEMU since then have all been satisfactory.
- Connex has reviewed the training of all LEMUs who were recently qualified, and ensured that they were aware of the circumstances of the incidents, and the location and meaning of signals and signs they might encounter in unusual movements.
- The OJT of all LEMUs has been further strengthened in the light of the incidents with the intention of preventing a reoccurrence. This augmentation of the time spent on signal and siding knowledge in the field is over and above the OJT in the use of Mis.60 and Mis.59 procedures referred to in my response to the Commission's Safety Recommendation 047/05.

5 Safety Recommendations

Safety recommendations are listed in order of development, not in order of priority.

5.1 On 2 November 2005, the Commission recommended to the Chief Executive of ONTRACK that he:

conduct a workload analysis at all signal boxes in the Auckland area, including train control, to ensure adequate resources are available to meet existing and projected increased passenger traffic (077/05).

in conjunction with operating companies and using the Signalling and Interlocking diagram as the standard, institute a policy for the agreement and adoption of appropriate siding names connected directly to the controlled network on the diagram (078/05)

install a voice recording system in all major signal boxes under the same conditions and purposes as operating in the national train control centre (079/05).

5.2 On 29 November 2005, the Chief Executive of ONTRACK replied in part:

> 077/05: ONTRACK accepts this recommendation. A time for a projected workload analysis to be completed cannot be established until the detail of future timetable changes has been determined and advised to ONTRACK through the timetable committee.
>
> 078/05: ONTRACK accepts this recommendation. The policy has already been adopted on the current draft S & I diagram for Otahuhu/Westfield and will be progressively implemented as required on all reissued S & I diagrams.
>
> 079/05: ONTRACK accepts this recommendation. Voice recording equipment has been purchased for Auckland, Newmarket, Otahuhu and Wellington Signal Boxes. Installation will follow the completion of consultation with stakeholders.

Approved on 17 November 2005 for publication

Hon W P Jeffries
Chief Commissioner

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