Final report RO-2015-101: Pedestrian fatality, Morningside Drive pedestrian level crossing, West Auckland, 29 January 2015

Final Report

Rail inquiry RO-2015-101
Pedestrian fatality,
Morningside Drive pedestrian level crossing,
West Auckland
29 January 2015

Approved for publication: August 2016

Transport Accident Investigation Commission

About the Transport Accident Investigation Commission

The Transport Accident Investigation Commission (Commission) is a standing commission of inquiry and an independent Crown entity responsible for inquiring into maritime, aviation and rail accidents and incidents for New Zealand, and co-ordinating and co-operating with other accident investigation organisations overseas. The principal purpose of its inquiries is to determine the circumstances and causes of occurrences with a view to avoiding similar occurrences in the future. Its purpose is not to ascribe blame to any person or agency or to pursue (or to assist an agency to pursue) criminal, civil or regulatory action against a person or agency. The Commission carries out its purpose by informing members of the transport sector and the public, both domestically and internationally, of the lessons that can be learnt from transport accidents and incidents.

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Important notes

Nature of the final report

This final report has not been prepared for the purpose of supporting any criminal, civil or regulatory action against any person or agency. The Transport Accident Investigation Commission Act 1990 makes this final report inadmissible as evidence in any proceedings with the exception of a Coroner's inquest.

Ownership of report

Citations and referencing

Information derived from interviews during the Commission's inquiry into the occurrence is not cited in this final report. Documents that would normally be accessible to industry participants only and not discoverable under the Official Information Act 1982 have been referenced as footnotes only. Other documents referred to during the Commission's inquiry that are publicly available are cited.

Photographs, diagrams, pictures

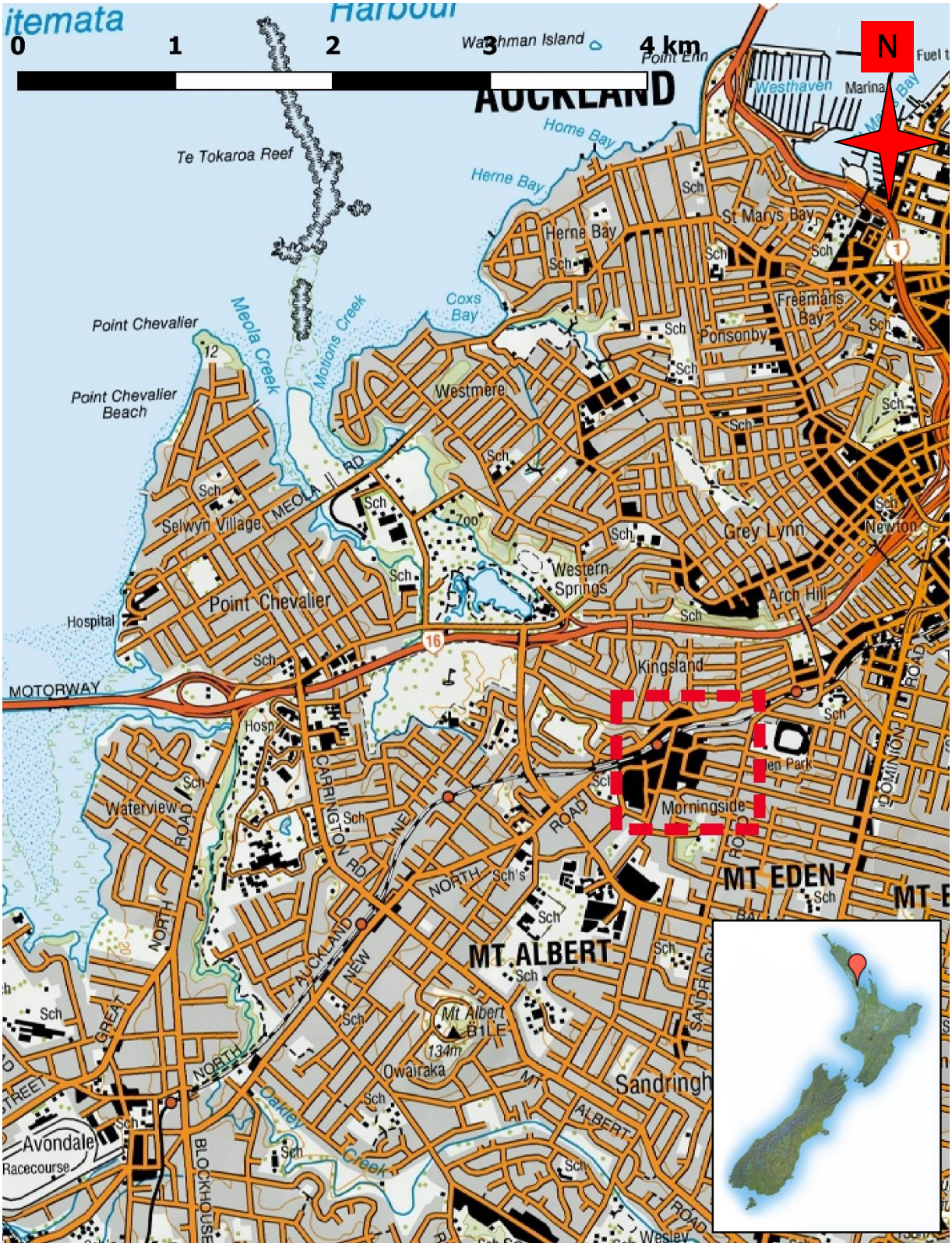
Unless otherwise specified, photographs, diagrams and pictures included in this final report are provided by, and owned by, the Commission.

Verbal probability expressions

The expressions listed in the following table are used in this report to describe the degree of probability (or likelihood) that an event happened or a condition existed in support of a hypothesis.

Terminology (adopted from the Intergovernmental Panel on Climate Change)	Likelihood of the occurrence/outcome	Equivalent terms
Virtually certain	> 99% probability of occurrence	Almost certain
Very likely	> 90% probability	Highly likely, very probable
Likely	> 66% probability	Probable
About as likely as not	33% to 66% probability	More or less likely
Unlikely	< 33% probability	Improbable
Very unlikely	< 10% probability	Highly unlikely
Exceptionally unlikely	< 1% probability	


MNS
809
LOOK
FOR
TRAINS
accident site



Morningside Drive level crossing site

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Abbreviations

ALCAM	Australian Level Crossing Assessment Model
Commission	Transport Accident Investigation Commission
KiwiRail	KiwiRail New Zealand Limited
km	kilometre(s)
km/h	kilometre(s) per hour
Transdev	Transdev Auckland Limited

Glossary

level crossing	a position where a railway line and a public or private road or public or private pedestrian walkway cross paths on the same level
metro	a term used globally to describe an urban rail passenger system
Safety Case	a document submitted, in this instance, by KiwiRail to the NZ Transport Agency that allows it to control access to and operate trains on the rail network.

Data summary

Accident detail

Date and time:	29 January 2015 at 1841 (New Zealand daylight saving time)
Person involved:	24-year-old male pedestrian
Injuries:	fatal
Damage:	nil

Accident site detail

Location:	the footpath on the western side of Morningside Drive level crossing, 12.80 kilometres (km) site, North Auckland Line
Industry/Regulatory title:	Morningside Drive Up pedestrian level crossing
North Auckland Line:	the track system that runs from the 0.00 km site at Westfield in South Auckland to the 280.76 km site at Ōtīria in Northland
Road controlling authority:	Auckland Transport, a council-controlled organisation of Auckland Council established under section 38 of the Local Government (Auckland Council) Act 2009
Rail access provider:	KiwiRail New Zealand Limited
Maximum authorised line speed:	70 kilometres per hour (km/h)

Accident train detail

Train operating company:	Transdev Auckland Limited
Type and number:	push/pull passenger Train 9142 operating in the push mode. This type of train was removed from service during the course of the investigation. Electric trains now operate all services between Swanson (West Auckland) and Papakura (South Auckland)
Origin/Destination:	Britomart-Waitākere, a distance of 33.00 km
Make-up:	SD5626 (lead carriage), SA5638, SA5730, SA5695 and DC4444 (locomotive at rear)
Weight (including locomotive):	210 tonnes
Length (including locomotive):	96.6 metres
Maximum authorised train speed:	90 km/h

1. Executive summary

1.1. Morningside Station in Auckland consists of an 'island platform' where the northbound and southbound rail tracks pass either side of the platform. At one end of the platform pedestrians have to walk down a fenced ramp to join a pedestrian level crossing, which is part of the Morningside Drive road level crossing. At the bottom of the platform ramp pedestrians have to turn either left or right to cross the relevant rail track.

1.2. At 1840 on 29 January 2015, a person alighted from a passenger train at Morningside Station. The person walked alone along the station platform to an electronic fare-payment device, where he recorded the end of his journey.

1.3. The train from which he had just alighted departed the station. Meanwhile, another train travelling in the opposite direction was approaching the station on the other track.

1.4. The person walked down the platform ramp and turned right, passing through an unguarded opening, and stepped out in front of the approaching train. The train struck the person, who was fatally injured.

1.5. The Transport Accident Investigation Commission (Commission) found that the train was being driven at below the maximum line speed and that the barriers and warning devices for the adjacent Morningside Drive road level crossing were working correctly. However, there was insufficient protection at the bottom of the platform ramp to prevent pedestrians inadvertently walking out in front of trains.

1.6. The Commission also found that it was very likely that the pedestrian was distracted by the use of his mobile phone when he stepped out in front of the train.

1.7. Early in the inquiry the Commission made three urgent recommendations to the Chief Executive of the NZ Transport Agency to liaise with the relevant parties to:

- upgrade the protection arrangements for pedestrians exiting the station platform onto the pedestrian level crossing at Morningside Station
- clarify who is responsible for controlling and protecting pedestrians as they cross the boundaries between railway stations and the rail corridor in the Auckland metro network
- review all pedestrian level crossings in the Auckland metro network and ensure that they have a level of protection commensurate with the level of risk currently and in the immediate future.

1.8. A fourth recommendation was subsequently made to the Chief Executive of the NZ Transport Agency that he liaise with KiwiRail New Zealand Limited and road controlling authorities to address the safety issue whereby currently many pedestrian level crossings located in provincial areas do not meet the guidelines laid down by the NZ Transport Agency.

1.9. A key lesson arising from the inquiry relates to the use of mobile devices by pedestrians, which has been found to make them less aware of hazards around them. Rail operators and providers of rail infrastructure must factor this into their risk assessments when designing safety into rail infrastructure.

2. Conduct of the inquiry

2.1. On 29 January 2015 the NZ Transport Agency notified the Transport Accident Investigation Commission (Commission) of the accident under section 13(4) of the Railways Act 2005. The Commission gathered further information, then on 3 February 2015 opened an inquiry under section 13(1) of the Transport Accident Investigation Commission Act 1990 and appointed an investigator in charge.

2.2. An investigator travelled to Morningside on 9 February 2015 where he conducted a site investigation. The investigator and the Chief Investigator of Accidents interviewed two Transdev Auckland Limited (Transdev) train drivers and representatives from Auckland Transport the next day. The investigator travelled in the driving compartment of a Waitākere-bound passenger train to record on camera the short journey from Kingsland Station to Morningside Station, which included travelling over the Morningside Drive level crossings[1].

2.3. The investigator visited 11 other island platform stations with ramps leading to pedestrian level crossings to assess the various layouts and safeguards installed. The investigator also visited three similar island platform stations with ramps connected to pedestrian crossings within the Wellington metro[2] network for the same reasons.

2.4. The Commission obtained recorded data from the Waitākere-bound train's event recorder, the signalling system that showed the precise times when the two trains travelled across the Morningside Drive level crossings, and the closed-circuit television system at Morningside Station that showed the pedestrian's movements. The three data streams were synchronised and used to determine the sequence of events leading up to the accident.

2.5. The investigator also obtained a number of records and documents pertaining to the accident:

- the train driver's recent performance records
- historical records for the level crossing that included the dates of previous pedestrian accidents
- lease agreements between Auckland Transport and KiwiRail New Zealand Limited (KiwiRail) pertaining to Morningside Station and environs
- assessment reports and working group meeting minutes referencing the Morningside Drive level crossings
- engineering records of the warning systems installed for both vehicular and pedestrian movements over the Morningside Drive level crossings
- the NZ Transport Agency's Traffic Control Devices Manual – Part 9 – Level Crossings and KiwiRail's Operations Group Infrastructure Code Supplement/Company Procedure for level crossings.

2.6. On 27 August 2015 the Commission issued three urgent recommendations to the Chief Executive of the NZ Transport Agency to address safety issues identified early in the inquiry.

2.7. On 22 June 2016 the Commission approved a draft report for distribution to interested persons for comment.

2.8. Written submissions were received from five of the interested parties during July 2016. The Commission has considered the submissions, and changes as a result of those submissions have been included in the final report.

[1] A level crossing is a position where a railway line and a public or private road or public or private pedestrian walkway cross paths on the same level.
[2] Metro is a term used globally to describe an urban rail passenger system.

3. Factual information

3.1. Narrative

3.1.1. Morningside Station is an island platform, with the usual track for Britomart-bound trains passing to the east of the platform and the usual track for Waitākere-bound trains passing on the opposite, west side of the platform. The Morningside Drive level crossing intersects both these tracks and a siding track close to the eastern end of the station platform. The level crossing is protected by flashing lights, bells and barrier arms directed at road and pedestrian traffic following Morningside Drive.

3.1.2. The station platform transforms into a fenced platform ramp at its eastern end leading down to a 'T' intersection with one of two pedestrian level crossings for Morningside Drive. The bells for the Morningside Drive level crossing are audible under usual circumstances to pedestrians walking down the ramp to join the pedestrian level crossing.

3.1.3. The flashing lights and barrier arms, however, are directed at vehicle drivers and pedestrians who are following Morningside Drive. The only visual cue warning pedestrians walking down the platform ramp to 'look for trains' is a yellow sign.

3.1.4. At 1840 on 29 January 2015, a 24-year-old male (the pedestrian) alighted from a Britomart-bound Transdev passenger train at Morningside Station platform.

3.1.5. The pedestrian walked alone along the platform to the eastern-end electronic ticket register, where he recorded his fare payment at 1841. He then walked down the platform ramp leading to the Morningside Drive pedestrian level crossing (see Figure 1).

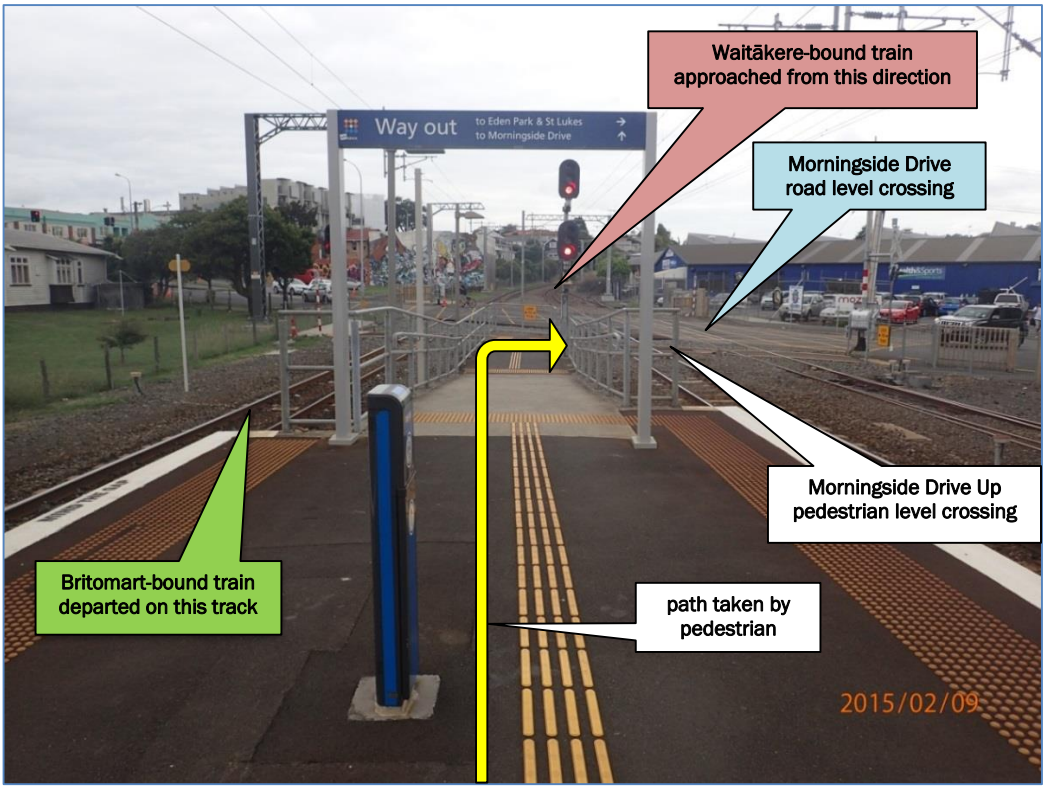

Figure 1
The fenced platform ramp at the eastern end of Morningside Station

3.1.6. The Britomart-bound train from which the pedestrian had alighted departed the station on the southbound track. It travelled over and had moved clear of the Morningside Drive level crossings by 1841:09. Twelve seconds later, a Waitākere-bound passenger train travelling in the opposite direction on the northbound track arrived at the level crossings travelling at 42 kilometres per hour (km/h).

3.1.7. Meanwhile the pedestrian had walked to the end of the platform ramp, during which time he was facing the direction of the approaching Waitākere-bound train. He turned right through an opening and stepped out in front of the train. The train struck the pedestrian at 1841:24 and he was fatally injured.

3.1.8. The pedestrian's movements were captured by several of the platform-mounted closed-circuit television cameras. He was seen to be using his mobile phone while he walked down the platform ramp and he had bud-style earphones inserted in his ears. The earphones were connected to his mobile phone.

3.1.9. Data recorders showed that the flashing lights, audible bells and physical barriers at the Morningside Drive road level crossing were operating correctly and continuously for both trains. The Waitākere-bound train was being driven at below the maximum line speed and the driver used the train whistle appropriately to warn pedestrians that the train was approaching.

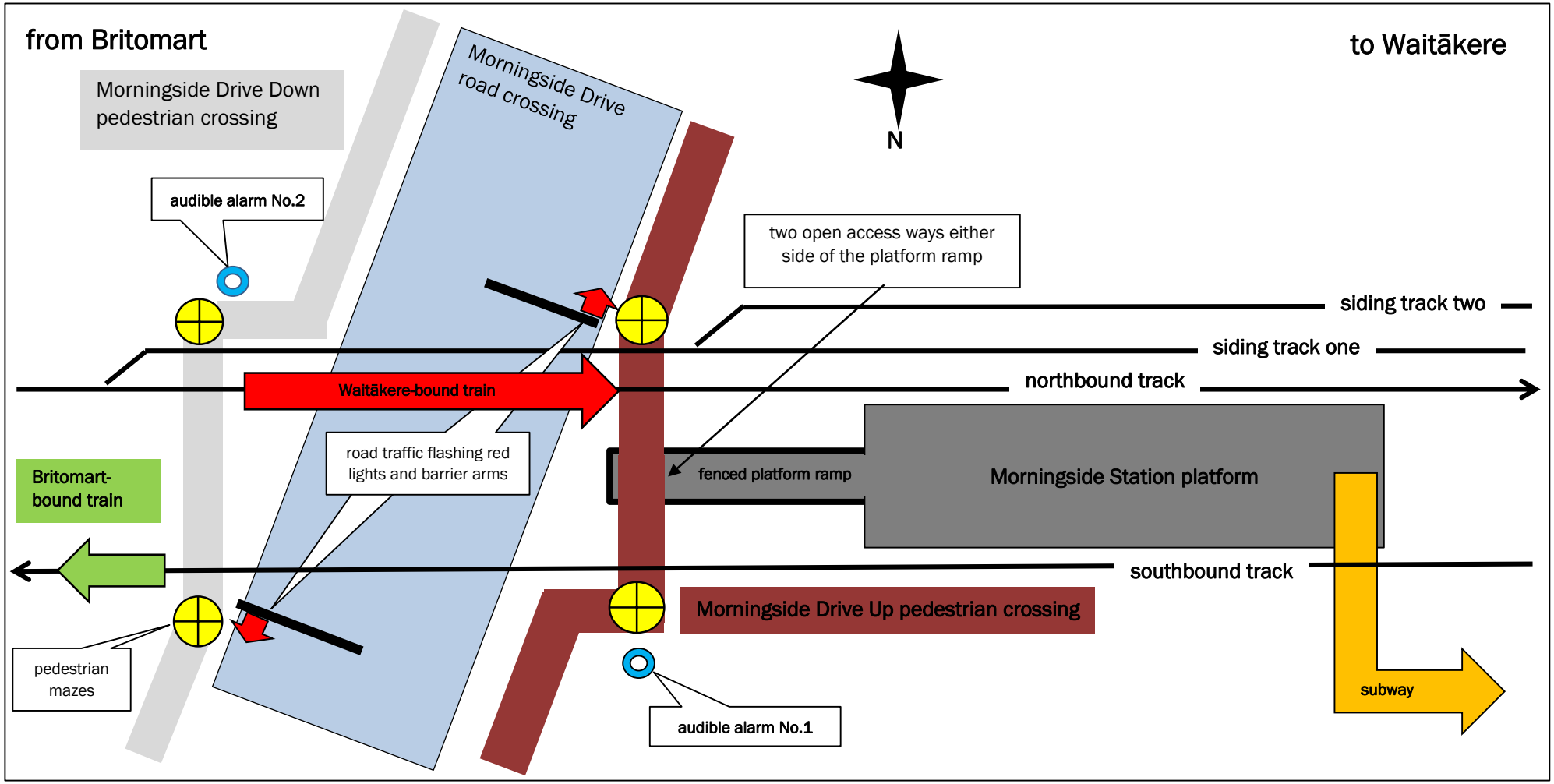

Figure 2
Plan of Morningside Station and the Morningside Drive level crossings (not to scale)

3.2. Morningside Drive level crossing

3.2.1. The Morningside Drive level crossing comprised one roadway and two pedestrian footpaths that flanked the roadway (see Figure 2). All three crossed both main line tracks and a siding track close to the eastern end of the station platform.

3.2.2. Mazes had been installed at the four entrances to the two pedestrian level crossings during 1986. The mazes had been upgraded in 2011. The mazes were designed to channel pedestrians along a nominal two-metre distance towards the direction that trains would normally approach the level crossing (see Figure 3).

Figure 3
A pedestrian maze

3.3. The train driver

3.3.1. The train driver underwent a post-accident drug and alcohol test in accordance with Transdev's policy and procedures. The test results were positive for cannabinoids. Further laboratory analysis provided a positive result for cannabis.

4. Analysis

4.1. Introduction

4.1.1. The following analysis discusses what happened in this case, then moves to a discussion of three broader safety issues:

- the lack of active warnings protecting pedestrians using the Morningside Road pedestrian level crossing when leaving Morningside Station
- the lack of clarity over who is responsible for safety and control at the boundaries between station platforms and the rail corridor in Auckland
- the ability of the risk assessment process for pedestrian level crossings to keep pace with infrastructure changes and increasing patronage on metro passenger trains.

4.2. What happened

4.2.1. The weather at the time of the accident was fine and clear. The sun was behind the pedestrian after he alighted from his train, so it was very unlikely to have obscured the train from the pedestrian's view. There was no one else walking on the platform ramp at the time and there were no fixed structures that would have totally obstructed his view of the train.

4.2.2. The train had its forward-facing upper and lower headlights illuminated. The lower headlights were known as 'ditch' lights and were mounted low down on each side of the driving trailer. They flashed alternately for 20 seconds whenever the train whistle was sounded in order to draw attention to the train's presence. These lights were operational and would have been flashing for the eight-second period from when the driver first sounded the train whistle until the time of the accident. Therefore, a clear view of the train headlights would have been available to the pedestrian had he been looking in that direction.

4.2.3. The barrier arms and warning lights and bells for the road level crossing were operating at the time. The lights were directed at road users rather than pedestrians walking down the platform ramp, so these would not have been visible to the pedestrian.

4.2.4. The level crossing warning bells would have been audible to people in the vicinity of the platform ramp. The train from which the pedestrian had just alighted had just departed the platform at the time he started walking down the platform ramp. It would have been possible for a person to assume that the road level crossing warning devices were for the departing train and not appreciate that they were also for the train coming from the opposite direction. It would have been equally possible that the noise of the departing train partially masked the sound of the warning bells. It was not possible to determine whether these were factors in this accident.

4.2.5. The train whistle was first sounded when the train was 137 metres and the pedestrian about 10 metres from the level crossing. The train would then have been visible to the pedestrian.

4.2.6. The train driver sounded a second and longer blast on the train whistle when he saw the pedestrian make a 90-degree turn and enter the level crossing without hesitation. The train was then about 25 metres and the pedestrian about 2.5 metres from the accident site. The train struck the pedestrian two seconds later.

The pedestrian was very likely distracted by his mobile phone

4.2.7. It is very likely that the train whistle would have been audible to the pedestrian. However, the pedestrian was wearing small, bud-type earphones connected to a mobile phone he was carrying at waist level. He was seen to be using his mobile phone while he walked down the platform ramp leading to the pedestrian level crossing. It was not possible to establish whether sound was emitting from the earphones. The possibility of sound emitting from his earphones masking the sound of the level crossing warning devices and the train whistle could not be excluded.

4.2.8. The use of mobile devices by pedestrians has been found to make them less aware of hazards around them. A research paper written by Marc Green (Green, M (2004)), Inattentional Blindness and Conspicuity, found that "mobile-phone-using pedestrians were less likely to notice other objects in their environment; they were also less likely to look for traffic before starting to cross a road or street". This finding can equally be applied to pedestrians crossing a railway track and is very likely to have been a factor in the present case.

Use of performance-impairing drugs

4.2.9. The driver undertook a drug and alcohol screening test following the accident, which returned a positive result for cannabinoids. The Commission could not determine whether drug impairment was a factor contributing to this accident. However, event recorders showed that the train was being driven at below the maximum line speed and the driver used the train whistle appropriately to warn pedestrians that the train was approaching. The driver could not have done anything further to prevent the accident.

4.2.10. Nevertheless, the use of performance-impairing drugs by a driver of a passenger train is a serious safety issue. Both Transdev and the NZ Transport Agency have taken action to address this issue (refer to Section 6, Safety actions). The Commission has issued two recommendations (007/13[3] dated April 2013 and 012/13[4] dated October 2013) regarding the use of performance-impairing drugs by anyone who has a safety-critical role in the aviation, rail or maritime transport industry. The positive test for cannabis for this train driver further highlights the need for the rail industry to address this safety issue.

Findings

1. It is very likely that the pedestrian was distracted while using his mobile phone when he stepped out in front of the train.
2. The train was being driven at an appropriate speed and the driver did all he could in the time available to warn the pedestrian that the train was approaching.

4.3. Morningside Drive pedestrian level crossing

Safety issue – There were no active visual alarms or physical barriers to prevent pedestrians exiting the Morningside Station platform and inadvertently entering the Morningside Drive pedestrian level crossing when trains approached.

4.3.1. Morningside Station was one of 20 stations in Auckland where the train tracks ran either side of an island platform.

4.3.2. Auckland Transport figures showed that passenger numbers through Morningside Station had increased by about 25% between 2013 and 2015, but the station was ranked only 35th on its list of 41 stations in terms of overall passenger numbers during 2015.

4.3.3. Subways that enable pedestrians to walk under, and bridges that enable pedestrians to walk over the tracks provide a good safeguard to segregate pedestrians from trains. There was one subway at Morningside Station, located at the western end of the station (refer Figure 2).

[3] Recommendation 007/13 contained in Rail Occurrence Report RO-2011-103, track workers nearly struck by passenger train near Paekakariki, 25 August 2011.
[4] Recommendation 012/13 contained in Aviation Occurrence Report AO-2012-001, hot-air balloon collision with power lines and in-flight fire, near Carterton, 7 January 2012.

4.3.4. Auckland Transport figures showed that 20% of its passengers at Morningside Station used the subway between January and April 2015. The other 80% of the passengers at Morningside station used the platform ramp at the eastern end of the station, which was where this accident occurred.

4.3.5. As previously mentioned, the use of mobile phones and other devices while on the move is commonplace. It is very likely that the pedestrian looking at, and possibly listening to, his mobile phone was a factor contributing to the accident. Transport operators need to factor in this risk when considering the protection of the travelling public.

4.3.6. In this case the only visual cue installed on the platform ramp to warn pedestrians was the yellow sign warning them to 'look for trains' as provided for in the NZ Transport Agency's Traffic Control Devices Manual – Part 9 – Level Crossings (see Figure 4). There were no active visual warning lights or barriers installed on the platform ramp to prevent people inadvertently stepping out in front of a train.

Figure 4
NZ Transport Agency's 'look for trains' sign

4.3.7. KiwiRail's records showed that there had been no accidents between trains and motor vehicles at the Morningside Drive road level crossing since 1965, the year the barriers were installed. Therefore, the activation of the barrier arms, together with the illuminated flashing lights and audible alarms, had been an effective safeguard in preventing motor vehicles entering the level crossing.

4.3.8. In contrast, there had been one pedestrian fatality (in 2002) and several reported near misses since pedestrian mazes were installed in 1986. All of the pedestrian accidents/incidents occurred at the same pedestrian level crossing where this accident occurred and all involved Waitākere-bound trains travelling on the northbound track.

4.3.9. On 30 July 2015 the Commission recommended to the Chief Executive of the NZ Transport Agency that he liaise with Auckland Transport to install some form of active warning device or barrier at the Morningside Drive pedestrian level crossing.

4.3.10. On 14 August 2015 the Chief Executive of the NZ Transport Agency replied in part as follows:

> KiwiRail and Auckland Transport are working on a solution to address the identified safety issues at the pedestrian level crossings at Morningside Station in West Auckland. The Transport Agency is actively monitoring this situation to ensure the resolution is implemented in an effective and timely manner.

4.3.11. On 27 July 2016 the Chief Executive of the NZ Transport Agency provided an update on progress. Refer to Section 7, Recommendations, for the full response.

Findings

3. The active barriers, lights and audible alarms for the Morningside Road level crossing were operating correctly.

4. There was insufficient protection at the Morningside Station platform ramp to prevent pedestrians inadvertently entering the rail corridor in front of approaching trains.

4.4. Responsibility for protecting pedestrians

Safety issue – The regulatory and operational accountabilities of the Auckland metro system do not expressly deal with responsibility for safety and control at the boundaries between station platforms and the rail corridor.

4.4.1. During this inquiry it became apparent that there was uncertainty about what entity was responsible for protecting pedestrians at the boundaries between station platforms and the rail corridor.

4.4.2. KiwiRail is required to have a rail licence and an approved 'Safety Case[5]' outlining its rail activities under the Railways Act 2005. KiwiRail has a resultant safety system that details how it will operate safely in accordance with its Safety Case.

4.4.3. KiwiRail considered that it owned and controlled all pedestrian level crossings in New Zealand, including those on the Auckland and Wellington metro networks in its Safety Case dated 1 August 2013. Pedestrian level crossing boundaries were recorded. However, the Safety Case did not consider who controlled the movement of pedestrians across the boundaries.

4.4.4. KiwiRail's safety system[6] was not explicit on who was responsible for, and who controlled, the boundaries between the rail corridor and adjacent land owners, which in the case of Morningside Drive was Auckland Transport. KiwiRail explained in a submission dated 17 June 2015 that it considered Auckland Transport to be responsible for controlling safety at the boundary of the two open entrances at the Morningside Drive Up pedestrian level crossing. Auckland Transport did not agree.

4.4.5. Auckland Transport is the owner of the Auckland metro passenger trains and also leases the railway stations in the Auckland metro network from KiwiRail. Auckland Transport is deemed to be a rail participant as defined in section 4 of the Railways Act 2005. When that Act became law, the predecessor of the NZ Transport Agency[7] advised the predecessor of Auckland Transport[8] that it was not a rail operator.

4.4.6. Consequently, Auckland Transport has neither applied for a rail licence nor applied for an exemption. Safety issues pertaining to the Auckland metro passenger services are managed through the licences and approved Safety Cases of Transdev Auckland Limited, which operates the trains, and Construccioes y Auxilar de Ferrocarriles, which built and currently maintains the electric trains.

4.4.7. Auckland Transport and KiwiRail had different understandings about their respective responsibilities and obligations in relation to safety controls at pedestrian level crossing boundaries. Consequently, the parties were operating on differing understandings about their responsibilities in relation to this issue.

4.4.8. The Commission considers there were differences between KiwiRail's Safety Case and the lease agreements that gave rise to uncertainty. In particular, the lease agreements gave a broad overview of which stakeholder held safety responsibilities for the Morningside Drive level crossings, but did not expressly articulate which party (or parties) was responsible for controlling and protecting pedestrians as they crossed the boundaries between railway stations and the rail corridor.

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[5] A document submitted by KiwiRail to the NZ Transport Agency that allows it to control access to and operate trains on the rail network.
[6] The underlying array of written policies, rules, processes, procedures and task instructions owned and maintained by KiwiRail for the safe operation of the business.
[7] Land Transport New Zealand.
[8] Auckland Regional Transport Authority.

4.4.9. Therefore, on 30 July 2015, the Commission recommended to the Chief Executive of the NZ Transport Agency that he take the necessary steps to remove any uncertainty.

4.4.10. On 14 August 2015 the Chief Executive of the NZ Transport Agency replied as follows:

> While the Transport Agency gives the Commission an undertaking to implement this recommendation, we must first consider the statutory and regulatory options in which to do this. This will involve engaging with a number of relevant parties in a process that will take time. We will advise the Commission of our progress in due course.

4.5. Risk assessments for pedestrian level crossings

Safety issue – The level of protection for people using pedestrian level crossings in the Auckland metro network is currently inadequate because the risk assessment process for pedestrian level crossings is not keeping pace with the infrastructure changes and increasing patronage.

4.5.1. There are 52 level crossings in the Auckland metro network that can be used by pedestrians. These level crossings are equipped with a mixture of active and passive warning devices. Records showed that there were 13 other pedestrian accidents within the Auckland metro network and five accidents within the Wellington metro network between 1 January 2006 and 30 January 2015.

4.5.2. In 2007 KiwiRail and the NZ Transport Agency had adopted a computer-based application to assess and rank risk levels at road and pedestrian level crossings, known as the Australian Level Crossing Assessment Model (ALCAM). KiwiRail and road controlling authorities use ALCAM to prioritise upgrade work at level crossings.

4.5.3. To make an assessment of a pedestrian level crossing, data is gathered relating to the number of trains that travel over the crossing, the number of pedestrians who use the crossing, and the level of protection provided at the crossing. Substantial changes in other data used to make the assessment will warrant a new risk assessment being undertaken for that level crossing.

4.5.4. Records also showed that monthly passenger numbers on the Auckland network increased from 300,000 in July 2005 to 1.5 million in March 2015. These figures compare closely with Auckland Transport's forecast increase made in the early 2000s. Auckland Transport and KiwiRail had undertaken the following upgrades to the metro network in recent years in preparation for the planned increase in passenger numbers:

- most of the network had been multi-tracked
- new lines to Onehunga and Manukau had been constructed
- a new bi-directional signalling system had been commissioned that allowed trains to use either line in multi-tracked areas at normal speed
- new electric multiple unit passenger trains had been introduced after the installation of a new electric overhead system
- the North Auckland Line peak-hour passenger train frequency had been increased to four trains per hour in each direction
- the maximum train speeds had been increased by between 10 km/h and 30 km/h.

4.5.5. On 9 May 2016 Auckland Transport further increased the passenger train frequency on the North Auckland Line from four to six trains per hour in each direction during the morning and afternoon peak-hour operations, and from two to three trains per hour during the inter-peak periods. The total number of trains per weekday on the line rose from 101 to 138 Monday to Thursday, and to 145 on Fridays.

4.5.6. Using the Morningside Drive level crossing as an example, the first ALCAM assessment was undertaken during May 2007. The site assessment was not repeated until December 2014, seven weeks before the accident. During those seven and a half years' significant changes occurred in the Auckland metro system that resulted in changes to the parameters that were used in making the first risk assessment. During that same period the ALCAM database was only updated for the number of trains per day travelling over the level crossing, which was only one of many parameters that were changing. The ALCAM risk process was not keeping pace with the changes affecting safety at the Morningside Drive level crossing.

4.5.7. An ALCAM National Statistical Report, jointly published by KiwiRail and the NZ Transport Agency in March 2013, stated that the pedestrian accident risk was about 10 times higher in the Auckland and Wellington regions than in the rest of the country. The report concluded that the increased risk was due to metro systems operating in both cities.

4.5.8. Auckland Transport's draft Regional Land Transport Plan 2015-2025 recognised that rail infrastructure investment was needed to address safety issues at level crossings. However, the report did not elaborate on the nature of those safety issues and how they would be addressed.

4.5.9. An example of how the changes to the rail infrastructure have potentially compromised pedestrian safety is the design of existing pedestrian mazes. The NZ Transport Agency's Traffic Control Devices Manual – Part 9 – Level Crossings states that mazes have been constructed to force pedestrians to face in the direction of approaching trains before they turn and cross the tracks. With the ability for trains in the Auckland metro area to be routed in either direction along bi-directional lines, trains could now potentially be approaching from behind pedestrians.

4.5.10. The speed of change within the Auckland metro system means it is very likely that the current frequency of and output from ALCAM risk assessments will not meet the safety requirements at pedestrian level crossings. Although the rate of change in Wellington is slower, similar issues are very likely to arise there also.

4.5.11. On 30 July 2015 the Commission issued an urgent recommendation to the Chief Executive of the NZ Transport Agency that he address this safety issue.

4.5.12. On 14 August 2015 the Chief Executive of the NZ Transport Agency replied in part as follows:

> Throughout New Zealand, a wide range of level crossing-related activities and work is being undertaken by a variety of rail participants and agencies. This work encompasses level crossing infrastructure, planning, funding, risk review and risk mitigation.

4.6. Other pedestrian level crossings

Safety issue – A large percentage of pedestrian level crossings located in provincial areas do not fully conform with guidelines within the NZ Transport Agency's Traffic Control Devices Manual – Part 9 – Level Crossings.

4.6.1. Three further level crossing accidents, involving two pedestrians and a cyclist, occurred in other regions during the period of this investigation:

- on 6 August 2015 a pedestrian was fatally injured after being struck by a Papakura-bound Transdev passenger train at Walters Road pedestrian level crossing in South Auckland
- on 11 January 2016 a pedestrian was fatally injured after being struck by a KiwiRail freight locomotive at Weymouth Street pedestrian level crossing in New Plymouth
- on 11 February 2016 a cyclist was fatally injured after being struck by a KiwiRail freight train at Fendalton Road pedestrian level crossing in Christchurch.

4.6.2. The ALCAM National Statistical Report, published during March 2013, showed that in New Zealand there was an annual average of eight fatal/serious injuries to motor vehicle occupants involved in level crossing accidents. During the same period covered in the report there was an annual average of three fatal/serious injuries to pedestrians involved in level crossing accidents.

4.6.3. The report also stated that of 605 pedestrian level crossings on KiwiRail's provincial network, 50% were located near schools and 77% did not conform fully with the NZ Transport Agency's Traffic Control Devices Manual – Part 9 – Level Crossings. The manual contains a suite of guidelines within the traffic control devices manual prepared by the NZ Transport Agency and used by rail providers and road controlling authorities that have road and pedestrian level crossings within their jurisdictions.

4.6.4. However, the NZ Transport Agency advised that currently minor non-conformances, for example a narrow line marking, can trigger the 'non-compliance flag' within the survey process and the ALCAM reports do not explain or itemise what the specific non-compliances might be. Consequently, the nature of the non-conformances, as indicated in the 2013 ALCAM Level Crossing Statistical Report, are not fully understood.

4.6.5. Therefore, the Commission is recommending to the Chief Executive of the NZ Transport Agency that he liaise with KiwiRail and relevant road controlling authorities to assess and confirm which provincial level crossings have significant safety issues that do not align with the NZ Transport Agency's Traffic Control Devices Manual – Part 9 – Level Crossings, then work with the authorities to ensure safety improvements are prioritised and implemented.

Findings

5. Uncertainty existed over which entity was responsible for controlling pedestrian movements between station platforms and the rail corridor in the Auckland metro network.

6. The process for assessing risks at pedestrian level crossings around the Auckland, and to a lesser extent the Wellington, rail corridors has not kept up with the pace of change in these rail systems.

7. Seventy-seven percent of pedestrian level crossings in KiwiRail's provincial network did not conform fully with the NZ Transport Agency's Traffic Control Devices Manual – Part 9 – Level Crossings. However, the extent of the non-conformances has not been fully analysed.

5. Findings

5.1. It is very likely that the pedestrian was distracted while using his mobile phone when he stepped out in front of the train.

5.2. The train was being driven at an appropriate speed and the driver did all he could in the time available to warn the pedestrian that the train was approaching.

5.3. The active barriers, lights and audible alarms for the Morningside Road level crossing were operating correctly.

5.4. There was insufficient protection at the Morningside Station platform ramp to prevent pedestrians inadvertently entering the rail corridor in front of approaching trains.

5.5. Uncertainty existed over which entity was responsible for controlling pedestrian movements between station platforms and the rail corridor in the Auckland metro network.

5.6. The process for assessing risks at pedestrian level crossings around the Auckland, and to a lesser extent the Wellington, rail corridors has not kept up with the pace of change in these rail systems.

5.7. Seventy-seven percent of pedestrian level crossings in KiwiRail's provincial network did not conform fully with the NZ Transport Agency's Traffic Control Devices Manual – Part 9 – Level Crossings. However, the extent of the non-conformances has not been fully analysed.

6. Safety actions

6.1. General

6.1.1. The Commission classifies safety actions by two types:

(a) safety actions taken by the regulator or an operator to address safety issues identified by the Commission during an inquiry that would otherwise result in the Commission issuing a recommendation

(b) safety actions taken by the regulator or an operator to address other safety issues that would not normally result in the Commission issuing a recommendation.

6.2. Safety actions addressing safety issues identified during an inquiry

6.2.1. On 17 June 2015 Auckland Transport advised by email that it had requested its Acting Health and Safety Manager (City Rail Link Rail Safety and Assurance Manager) to carry out a risk assessment after the fatality at Morningside Station and a near miss soon afterwards at the same level crossing. The following three recommendations were suggested following that assessment:

- short term: provide a crossing keeper to help educate passengers on safety at level crossings
- medium term: provide electronic pedestrian gating off the platform
- long term: investigate grade separation/pedestrian bridge options.

6.2.2. On 19 May 2016 Auckland Transport advised that the following safety actions had been taken at the Morningside Drive level crossings in conjunction with KiwiRail and the NZ Transport Agency before the passenger train frequency increase on the North Auckland Line between Newmarket and Swanson:

- new level crossing 'keep track clear' signage installed at the pedestrian mazes
- vegetation cleared from around the level crossing perimeters
- road markings upgraded on the road surface at the boundaries and over the level crossing
- general signage reviewed and improved
- flexi-median post installed to prevent motor vehicles overtaking on the approaches to the level crossing.

6.3. Safety actions addressing other safety issues

6.3.1. Transdev signed off a random drug and alcohol testing policy on 29 April 2016.

6.3.2. On 23 June 2016 Transdev advised that it had taken the following actions in regard to the train driver having tested positive for cannabinoids in his system:

- the train driver attended a Transdev-sponsored drug and alcohol rehabilitation programme during a six-week stand-down period after the accident
- the train driver returned a negative test for cannabinoids in his system at the end of his rehabilitation on 11 March 2015
- the train driver returned to driving duties on 12 March 2015.

6.3.3. The NZ Transport Agency's Rail Safety team conducted a review of Transdev's guidelines, policies and procedures pertaining to drug and alcohol use by employees upon notification that the train driver had tested positive for performance-impairing drugs. The review examined Transdev's Safety Case and safety system documentation to ensure that its processes were being adhered to and were fit for purpose.

6.3.4. The NZ Transport Agency's findings were as follows:

- Transdev's independent investigation of the Morningside fatality, which included discussions with staff who dealt with the train driver on the day, and the management team who supervised him generally, suggested that the train driver's behaviour provided no indication that he had been undertaking his role while under the influence of either drugs or alcohol
- Transdev was adhering to its guidelines, policies and procedures pertaining to drug and alcohol use by employees, and as outlined in its Safety Case and safety system, but they were not well defined or concise
- Transdev had a multi-layered approach for mitigating the risk of drug and alcohol use by staff performing safety-critical roles, which it believed was controlling the risk to "as low as reasonably practicable". The proposed introduction of random testing would be a further important layer that would act as a deterrent, and may identify staff who had not come to attention for drug and alcohol use by any other means
- Transdev did not have a system for employees to discreetly report concerns relating to serious wrong-doings that could act as a further layer to mitigate the risk.

7. Recommendations

7.1. General

7.1.1. The Commission may make such reports and recommendations to transport sector regulators as may be necessary in the interests of transport safety, and give notice of those recommendations to any other person or organisation as it considers appropriate. In this case recommendations have been made to the NZ Transport Agency, as the rail regulatory body, with notice of the recommendations issued to KiwiRail, Auckland Transport and Transdev.

7.1.2. In the interests of transport safety, it is important that these urgent recommendations are implemented without delay to help prevent similar accidents or incidents occurring in the future.

7.2. Recommendation one

Safety issue – There were no active visual alarms or physical barriers to prevent pedestrians exiting the Morningside Station platform and inadvertently entering the Morningside Drive Up pedestrian level crossing when trains approached.

7.2.1. The active warning lights, bells and barrier arms protecting the Morningside Drive level crossing are positioned to warn vehicle drivers and pedestrians on Morningside Drive. Pedestrians exiting Morningside Station platform to the south have only a yellow sign reminding them to 'look for trains'. The platform pedestrian egress can be used by a high number of passengers during peak periods.

7.2.2. There has been one previous pedestrian fatality at the Morningside Drive level crossing, in 2002. On 8 April 2015 the driver of a Waitākere-bound passenger train said that his train had missed two pedestrians by about one metre at the same pedestrian intersection. Anecdotal information received by the Commission indicates that similar near-miss incidents are very likely to have gone unreported. All of the reported incidents involved Waitākere-bound trains at the same pedestrian level crossing.

7.2.3. On 30 July 2015 the Commission recommended to the Chief Executive of the NZ Transport Agency that in the interests of passenger and pedestrian safety he liaise with the appropriate authorities to ensure that they address the safety issue whereby some form of active warning device or barrier is installed that will prevent pedestrians inadvertently stepping out in front of trains when entering or exiting the Morningside Station platform. (010/15)

7.2.4. On 14 August 2015 the Chief Executive of the NZ Transport Agency replied:

> KiwiRail and Auckland Transport are working on a solution to address the identified safety issues at the pedestrian level crossings at Morningside Station in West Auckland. The Transport Agency is actively monitoring this situation to ensure the resolution is implemented in an effective and timely manner.
>
> We cannot yet provide a definitive timeframe for when these changes will be completed but give an undertaking to update the Commission once the next stages of this work have been determined by KiwiRail and Auckland Transport.

7.2.5. On 27 July 2016, the Chief Executive of the NZ Transport Agency replied further:

> A number of safety improvements have now been completed at Morningside Drive which fulfil the intent of the recommendation and will help ensure pedestrians do not inadvertently step out in front of trains when entering or exiting the Morningside station platform. The safety improvements are:
>
> - the installation, testing and commissioning of eight automatic gates at each crossing point.
> - the main lines have been installed with STRAIL flangeless rubbers.
> - new mazes.
> - supplementary lights and bells have been installed at each new maze.

- the footpaths have been re-aligned from 70 degrees to 85/90 degrees.
- the main road has been made smaller to accommodate the change to the footpath.
- moving of the HAB/FLBs [warning devices], allowing the footprint of the maze foundations to be moved to allow the pedestrian crossings to be moved from a 70-degree angle towards a 90-degree angle, thus allowing the mobility and wheelchair units to cross more safely, i.e. a more direct (perpendicular) route than at an oblique angle, which reduces the risk of the mobility device wheels becoming stuck in the gaps.

7.2.6. The NZ Transport Agency is currently awaiting confirmation from KiwiRail and Auckland Transport that some minor outstanding work has been completed.

7.3. Recommendation two

Safety issue – The regulatory and operational accountabilities of the Auckland metro system do not expressly deal with responsibility for safety and control at the boundaries between station platforms and the rail corridor.

7.3.1. KiwiRail is required to have a rail licence and an approved 'Safety Case' outlining its rail activities under the Railways Act 2005. KiwiRail has a safety system that details how it will operate safely in accordance with its Safety Case.

7.3.2. Auckland Transport is the owner of the Auckland metro passenger trains and leases the railway stations in the Auckland area from KiwiRail. Auckland Transport is deemed to be a rail participant as defined in section 4 of the Railways Act 2005. When the Railways Act became law, the predecessor of the NZ Transport Agency advised the predecessor of Auckland Transport that it was not a rail operator. Consequently, Auckland Transport has neither applied for a rail licence nor applied for an exemption.

7.3.3. The KiwiRail Safety Case and resultant safety system, including the deed of lease and access agreements for Morningside Station, does not expressly deal with who is responsible for controlling and protecting pedestrians crossing the boundaries between railway stations and the rail corridor. Consequently, KiwiRail and Auckland Transport have been operating on differing understandings about their responsibilities in relation to this issue.

7.3.4. On 30 July 2015 the Commission **recommended** to the Chief Executive of the NZ Transport Agency that from a regulatory perspective he take the necessary steps to ensure that the relevant Safety Case(s) and resultant safety system(s) (including any lease or access agreements made under that system(s)) expressly articulate which party or parties is responsible for controlling and protecting pedestrians as they cross the boundaries between railway stations and the rail corridor. (012/15)

7.3.5. On 14 August 2015 the Chief Executive of the NZ Transport Agency replied:

> While the Transport Agency gives the Commission an undertaking to implement this recommendation, we must first consider the statutory and regulatory options in which to do this. This will involve engaging with a number of relevant parties in a process that will take time. We will advise the Commission of our progress in due course.

7.4. Recommendation three

Safety issue – The level of protection for people using pedestrian level crossings in the Auckland metro network is unlikely to be adequate because the risk assessment process for pedestrian level crossings is not keeping pace with the infrastructure changes and increasing patronage.

7.4.1. There are 52 level crossings in the Auckland metro network that can be used by pedestrians. These level crossings are equipped with a mixture of active and passive warning devices. Records show that there were 13 other pedestrian accidents within the Auckland metro network and five accidents within the Wellington metro network between 1 January 2006 and 30 January 2015.

7.4.2. In recent years the following changes have occurred in the Auckland metro network:

- most of the rail network has been multi-tracked
- a bi-directional signalling system has been installed to allow trains to use tracks in either direction
- more new electric multiple unit trains have been introduced
- the frequency of passenger trains has increased
- there has been a substantial increase in train patronage in Auckland (25% for Morningside Station) and it is projected to increase further as passenger train services are increased.

7.4.3. Some of the changes listed above also apply to the Wellington metro network.

7.4.4. The NZ Transport Agency and KiwiRail use ALCAM to assess the risk factors for road and pedestrian level crossings in New Zealand. The default frequency for the assessment is every two years. The model considers 130 variables at all types of level crossing, including the five factors referred to above. The most recent assessment report for the Morningside Drive pedestrian level crossing was undertaken during December 2014, seven weeks before the accident.

7.4.5. An example of how the changes to the rail infrastructure have potentially compromised pedestrian safety is with the design of existing pedestrian mazes that have been constructed to force pedestrians to face in the direction of approaching trains before they turn and cross the tracks. With the ability for trains to be routed in either direction along bi-directional lines, trains could now potentially be approaching from behind pedestrians.

7.4.6. On 30 July 2015 the Commission **recommended** that the Chief Executive of the NZ Transport Agency liaise with the relevant road controlling authorities in Auckland and Wellington, and KiwiRail, to review all pedestrian level crossings and ensure that they address the safety issue whereby they have a level of protection commensurate with the level of risk currently and in the immediate future. (013/15)

7.4.7. On 14 August 2015 the Chief Executive of the NZ Transport Agency replied:

> Throughout New Zealand, a wide range of level crossing-related activities and work is being undertaken by a variety of rail participants and agencies. This work encompasses level crossing infrastructure, planning, funding, risk review and risk mitigation.
>
> Consequently, the Agency is commencing a stocktake of this work and the parties responsible for it to give us a greater knowledge base about the solutions being developed and by whom. When this work is completed and the Transport Agency has a comprehensive picture of the scope of activities underway, it will be in a clearer position to provide the Commission with information about this recommendation.

7.5. Recommendation four

Safety issue *– A large percentage of pedestrian level crossings located in provincial areas do not fully conform with guidelines within the NZ Transport Agency's Traffic Control Devices Manual – Part 9 – Level Crossings*

7.5.1. There are 605 pedestrian level crossings on KiwiRail's provincial network outside the Auckland and Wellington metro networks covered in previous sections. Records show that 50% of these level crossing are located near schools and 77% of these level crossings do not conform fully with the NZ Transport Agency guidelines.

7.5.2. On 25 August 2016 the Commission recommended to the Chief Executive of the NZ Transport Agency that he liaise with KiwiRail and relevant road controlling authorities to assess and confirm which provincial level crossings have significant safety issues that do not align with the NZ Transport Agency's Traffic Control Devices Manual – Part 9 – Level Crossings, then work with the authorities to ensure that safety improvements are prioritised and implemented. (018/16)

7.5.3. On 8 September 2016 the National Manger, Rail Safety of the NZ Transport Agency replied:

> The Transport Agency, in its capacity as rail safety regulator, will formally write to the appropriate entities, including KiwiRail and advise them of the recommendation 018/16 and request that they advise the Agency of how they plan to:
>
> 1. Review the level crossings in their areas to establish if there are safety issues that need addressing – in alignment with the NZ Transport Agency's Traffic control devices manual – Part 9 – Level Crossings
> 2. Ensure safety improvements are prioritised and implemented.
>
> We will ensure the Commission is kept informed of the progress made relating to this recommendation.

8. Key lesson

8.1. The use of mobile devices by pedestrians has been found to make them less aware of hazards around them. Rail operators and providers of rail infrastructure must factor this into their risk assessments when designing safety into rail infrastructure.

9. Citations

ALCAM in Detail. An introduction to the new ALCAM models (2013) dated 21 August 2012.

ALCAM Level Crossing Statistical report published March 2013 by KiwiRail Limited and the NZ Transport Agency.

Auckland Network Access Agreement between New Zealand Railways Corporation trading as KiwiRail and Auckland Transport dated 20 June 2012.

Auckland Transport Level Crossing Evaluation Criteria, Revision 2 summary report dated 12 September 2013.

Auckland draft Regional Land Transport Plan 2015-2025 published by Auckland Transport and the NZ Transport Agency.

Common Access Terms schedules 1 to 13 inclusive that record common rights and obligations of the access provider [KiwiRail] and of Operators [Transdev and others] in respect of the exercise of access rights to the Rail Network.

Deed of Lease, Morningside Station, between the Minister of Finance, the Minister for State-Owned Enterprises and New Zealand Railways Corporation as the lessor, and Auckland Regional Transport Network Limited dated 29 September 2003.

KiwiRail's Operations Group Infrastructure Code Supplement/Company Procedure Number CSG 417-Q517 approved on 18 December 1997.

KiwiRail's Safety Case approved by the NZ Transport Agency on 1 August 2013.

Marc Green (Green, M (2004), Inattentional Blindness and Conspicuity.

Paul Metaxatos and P S Sriraj 2016, Pedestrian Safety at Rail Grade Crossings: Focus Areas for Research and Intervention.

Terms of Lease incorporated by reference between the Minister of Finance, the Minister for State-Owned Enterprises and New Zealand Railways Corporation as the lessor, and Auckland Regional Transport Network Limited dated 29 September 2003.

The NZ Transport Agency's Traffic Control Devices Manual – Part 9 – Level Crossings effective from December 2012.

Recent railway occurrence reports published by the Transport Accident Investigation Commission (most recent at top of list)

RO-2014-101	Collision between heavy road vehicle and the Northern Explorer passenger train, Te Onetea Road level crossing, Rangiriri, 27 February 2014
RO-2012-103	Derailment of freight Train 229, Rangitawa-Maewa, North Island Main Trunk, 3 May 2012
RO-2012-105	Unsafe recovery from wrong-route, at Wiri Junction, 31 August 2012
RO-2013-107	Express freight MP16 derailment, Mercer, North Island Main Trunk, 3 September 2013
RO-2012-104	Overran limit of track warrant, Parikawa, Main North line, 1 August 2012
RO-2013-104	Derailment of metro passenger Train 8219 , Wellington, 20 May 2013
Urgent Recommendations RO-2015-101	Pedestrian fatality, Morningside Drive level crossing, West Auckland, 29 January 2015
RO-2013-105	*Capital Connection* passenger train, departed Waikanae Station with mobility hoist deployed 10 June 2013
RO-2014-102	High-speed roll-over, empty passenger Train 5153, Westfield, South Auckland, 2 March 2014
RO-2013-106	Track occupation irregularity, leading to near head-on collision, Otira-Arthur's Pass, 10 June 2013
RO-2012-102	Train control power failure, 26 April 2012
Interim Report RO-2014-103	Metropolitan passenger train, collision with stop block, Melling Station, Wellington, 27 May 2014
RO-2013-108	Near collision between 2 metro passenger trains, Wellington, 9 September 2013
11-106	Hi-rail vehicle nearly struck by passenger train, Crown Road level crossing near Paerata, North Island Main Trunk, 28 November 2011
11-102	Track occupation irregularity, leading to near head-on collision, Staircase-Craigieburn, 13 April 2011

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