Report 98-111

Train 2125

collision with pedestrian

Henderson

17 August 1998

Abstract

At about 1525 hours on 17 August 1998 a group of secondary school students were crossing the Henderson rail yard at the south end. A cyclist in the group dismounted to cross the rails, and while pushing his bicycle fell in front of train 2125, a southbound diesel multiple unit passenger train. The youth received serious injuries requiring amputation of one leg.

The safety issue identified was the established trespass in the area, despite the presence of a pedestrian overbridge. A number of safety actions were taken by the operator, the school, the local authority and other community groups to address the problem at Henderson, and 7 safety recommendations were made to address the general problem of established trespass.

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List of abbreviations

DMU	diesel multiple unit
LE	locomotive engineer
TAIC	Transport Accident Investigation Commission
Tranz Rail	Tranz Rail Limited
WCC	Waitakere City Council

Transport Accident Investigation Commission

Rail Accident Report 98-111

Train type and number:	Diesel multiple unit 2125
Date and time:	17 August 1998, 1525 hours
Location:	Henderson, 26.35 km North Auckland Line
Type of occurrence:	Collision with pedestrian
Persons on board:	Crew: 3 Passengers: 10 (approx.)
Injuries:	Crew: Nil Others[1]: 1 serious
Operator:	Tranz Rail Limited (Tranz Rail)
Investigator-in-Charge:	R E Howe

[1] A cyclist pushing his bicycle

1. Factual Information

1.1 Narrative

1.1.1 At about 1525 hours on Monday, 17 August 1998, a group of secondary school students were crossing the tracks at the south end of the Henderson rail yard from west to east.

1.1.2 The group included a cyclist who had dismounted to push his bicycle across the rails, and was walking south between the main line, on his left, and loop, on his right, towards a gap in the east boundary fence line. This gap was under the ramp of a pedestrian overbridge which crossed the tracks at this location. The general area is shown in Figure 1, and Figures 2, 3 and 4 show details.

1.1.3 Train 2125, a southbound (down), diesel multiple unit (DMU) service, had made a scheduled stop at Henderson on the main line.

1.1.4 On departure from the north (down) platform Train 2125 was routed from the main line to the loop about 220 m north of the accident site. This was standard operating practice when a northbound (up) train was approaching Henderson or standing at the south (up) platform at Henderson[2].

1.1.5 On the day of the incident Train 2126, a northbound DMU, was stopped at 4R signal waiting for Train 2125 to clear the main line and permit a proceed indication. Figure 5 shows the general arrangement and movements on the day.

1.1.6 As Train 2125 approached the student, who was pushing his bicycle away from the train and clear of the track on the left side, the student stumbled and fell onto the track and was hit by the front of the DMU.

1.1.7 The student was flung clear to the right side, and the impact caused severe injury to one leg. Emergency services were on the scene promptly. The student was taken to hospital where it was necessary to amputate the severely injured leg.

1.2 Witness accounts

1.2.1 The locomotive engineer (LE) of Train 2125 stated that following the stop at Henderson he blew the train whistle, as was usual, before making a normal departure. His train was routed to the loop, and as it entered the loop and passed under the signal gantry about 150 m from the accident site he saw a number of students crossing the track from west to east at the south end of the yard. He stated he gave a long blast on the train whistle to warn of the approach of the train and most of the students scattered clear of the line. However, as he got closer his attention was drawn to 2 youths who were separately pushing bicycles and continued to cross the tracks.

[2] Train 2125 and Train 2126 were both timed to depart Henderson at 1520 hours. The layout of track, platform and signalling ensured flexibility of operation depending on which train arrived at Henderson first.

Figure 1
Overall perspective of the crossing point looking north from the footbridge span

Figure 2
Looking north to the footbridge and crossing point beyond

Figure 3
Open gateway entry to the west side of the yard

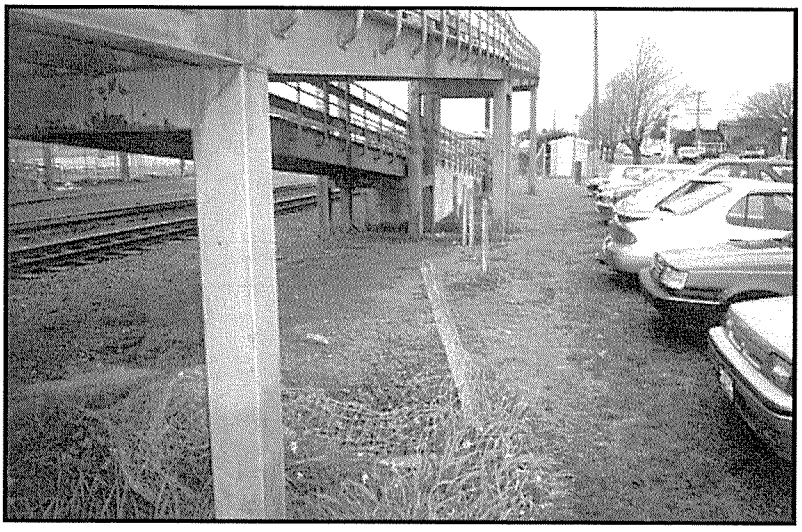

Figure 4
Foot and bicycle access to the east side of the yard

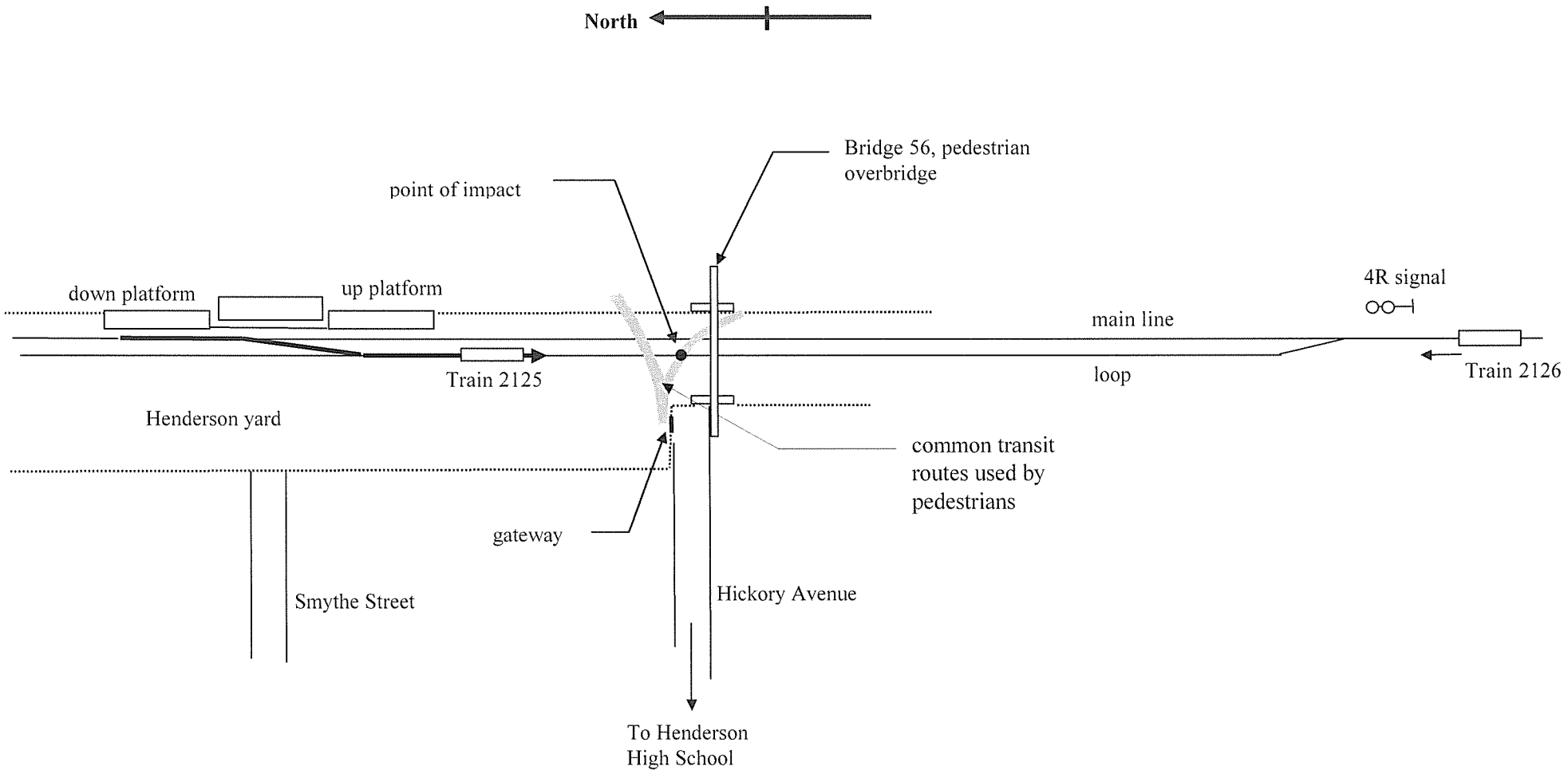

Figure 5
Diagrammatic layout of Henderson yard (not to scale)

1.2.2 The LE estimated they had walked across the loop some 20 m to 30 m ahead of the train. One continued over the main line clear of all tracks while the other turned and walked away from him between the loop and main line and clear of his train. As his train approached the second student he saw the bicycle tip over, which made the student stumble and fall onto the track some 5 m in front of the train. The LE stated he applied emergency braking but was unable to avoid a collision and the centre of the cowcatcher of the DMU struck the student as he was attempting to stand up. The LE estimated the speed of the train was 25 to 30 km/h when he applied the brakes.

1.2.3 Witness A was a student who had walked his bicycle across all tracks ahead of the student involved in the collision. Witness A recalled crossing the tracks when Train 2125 had just departed from Henderson Station. He stopped under the overbridge south of the accident site and saw a cyclist crossing the track diagonally toward him. Witness A could see Train 2125 approaching and yelled a warning to the cyclist. He stated the cyclist dismounted and witness A recalled a "big whistle" from the train before he saw the cyclist stumble and fall to the middle of the track. Witness A stated the train was not travelling fast, and described the speed as "medium or less".

1.2.4 The cyclist involved in the collision was wearing a helmet and carrying a backpack. He stated that he had dismounted to push his bicycle across the high rails on the loop and the main line. He had walked across the loop when he heard his name called, together with "look out". He looked south, saw Train 2126 standing on the main line at 4R signal some 400 m away, and turned south and walked between the main line and the loop toward Train 2126. He stated that as he walked he heard "wheels on the track" behind him and he stumbled and fell onto the loop. He did not look to the north at any time, or hear a train whistle, and was unaware of the approach of Train 2125 on the loop.

1.3 Site information

1.3.1 Ballast disturbance defined the point of impact as about 26.35 km, some 8 m north of the overbridge span.

1.3.2 Following the emergency brake application the front of Train 2125 came to rest at 26.302 km, some 48 m from the point of impact.

1.3.3 The distance between the centre line of the main line and the loop at the point of impact was 3.6 m, the standard for such installations on Tranz Rail.

1.4 Train event recorder

1.4.1 DMUs are not fitted with event recorders to establish train speed and other operational details following accidents.

1.5 Rail operations

1.5.1 All up (northbound) trains had to take the main line at Henderson to be able to stop at the designated platform. Down (southbound) trains could either take the loop or the main line following a stop at the designated platform, depending on opposing traffic. In general this resulted in down trains taking the main line during off-peak hours and the loop during peak hours.

1.5.2 It was not unusual for DMUs to cross each other near the accident site in peak hours, as the signalling design permitted 4R signal to clear as soon as the southbound train had entered the loop.

1.5.3 The LE of Train 2125 stated that trespassing was an everyday occurrence at Henderson, involving adults and students, and that student trespass was regular and heavy before and after school and at lunch times.

1.5.4 The LE of Train 2126 confirmed the high level of trespass and stated that in the last 3 years he had been involved in three "close calls" incidents where pedestrians had crossed "10 m to 20 m" in front of his train.

1.6 Pedestrian overbridge No. 56

1.6.1 Pedestrian overbridge No. 56 was built in 1982. Local community members advised this was partly as a result of public pressure following a fatal accident involving a Henderson High School teacher supervising students at the station.

1.6.2 The footbridge had ramped approaches and required a 200 m walk to cross the 50 m width of Henderson yard. Site checks showed this involved an average journey time of 2.5 minutes. The footbridge was the only legal means of access across the yard and gave access from the west side to the Henderson shopping centre, and to the platforms between 100 m and 350 m to the north.

1.6.3 An informal survey by the investigator a day after the accident revealed that almost as many people were crossing the tracks as were using the footbridge. Some reasons put forward by those trespassing were:

- time taken to traverse the footbridge and ramps
- the ease of alternative access across the yard
- the concern of some elderly pedestrians about the angle of the ramp, and the insecurity associated with side fencing across the main span.

1.6.4 A survey carried out by the Waitakere City Council (WCC) shortly after the accident showed over 700 crossings per day at the south end of Henderson which did not use the footbridge, a high percentage of which were students. It was reported that students spoken to were generally aware of the accident, but displayed an "it won't happen to me" attitude. Those conducting the survey observed strong peer group verbal pressure exerted on those using the footbridge by those making unauthorised crossings.

1.7 Fencing

1.7.1 Hickory Avenue provided public road access to the footbridge from the west side. The end of Hickory Avenue was fenced off from the railyard except for a vehicle gateway giving road access into the yard. The gate was always open and the gateway was used by all persons crossing the tracks at the south end of the yard.

1.7.2 Fencing on the east side opposite Hickory Avenue had been broken to permit access to and from the platform, carpark and shopping area.

1.7.3 Smythe Road provided public access to the fence line on the west side of the yard opposite the station. Holes had been cut in the fencing to provide access across the tracks at this point.

1.7.4 Tranz Rail advised that repairs to fencing were made periodically but that they did not last and that maintaining effective fencing against determined trespass was impracticable.

1.7.5 Issues related to fencing the railway in the vicinity of stations were raised by the Commission in 1993 (TAIC rail occurrence report 93-106 concerning a fatal accident at Naenae on 10 June 1993). The Commission is aware that maintaining secure fencing against determined trespassers is a difficult task. However the successful fencing at Stevies Lane in Henderson (1.10.1) has shown that selected actions for specific high risk locations can be effective.

1.8 Signage

1.8.1 The survey of warning signs regarding the danger of crossing the track showed:

- There was no signage near the gateway giving access to the south end of the yard on the west side
- The only signage on the west side was at the entry to the footbridge ramp and read:

  DANGER
  UNAUTHORISED CROSSING
  OF RAILWAY TRACKS
  MAY RESULT IN PROSECUTION
  OR LOSS OF LIFE
  USE THE OVERBRIDGE

- Apart from a "railways five tracks" sign there was no warning signage on the east side near the footbridge, although a sign "crossing tracks strictly prohibited" was on the wooden fence some 100 m north of the footbridge
- There was no signage in the Smythe Road area.

1.9 Previous accident history

1.9.1 There have been 5 accidents involving access across the tracks at the south end of Henderson since May 1995. Two of these involved adults, one of which was fatal. The remaining three involved serious injuries to secondary school students.

1.10 Local initiatives

1.10.1 The hazard at Henderson had been identified as a particular problem by the "Safe Waitakere Rail Safe Group", a local community group concerned with aspects of rail safety, and the group produced two specific reports detailing the problems and possible solutions. The first report, produced in late 1996, related to the north end of the yard and resulted in a joint WCC and Tranz Rail initiative to install a barrier fence along Stevies Lane leading to Henderson Valley Road overbridge. The second report, produced in October 1997, dealt specifically with the issue of trespass associated with Hickory Avenue and Smythe Road.

1.10.2 The second report had been sent to the WCC and to Tranz Rail. The Council's Road Safety Group had considered the report and were liaising with all parties concerned to initiate action when the latest accident occurred. The report became the basis of the safety actions carried out after the accident as detailed in section 4 of this report.

1.10.3 Henderson High School were aware of the Hickory Avenue problem and the accident history, and the hazard was a feature of the safety education programme within the school. The school advised that teachers used to be rostered on site to supervise pupils, but staff levels and consideration of the legal responsibility of teachers in such situations had resulted in this practice being discontinued.

1.10.4 The possibility of a wider problem was highlighted by the result of the surveys carried out following the accident. Key findings were:

- 70% of people who cross the tracks at Henderson walk across (i.e. they do not use the overbridge, at least some of the time)
- younger people appear to have riskier crossing behaviour than older people, with teenagers being the age group most likely to walk across the tracks at least some of the time
- younger teenagers are less likely to walk across the track than older teenagers. There appears to be a steady increase in this behaviour over the teenage years, with 56% of 13 year olds sometimes using the tracks to cross, compared to 82% of 18 year olds sometimes using the tracks
- people who walk across the track rate this behaviour as safer than those who do not walk across. On a scale of 1 (never safe) to 9 (always safe), track walkers gave a mean rating of 6.1 for how safe it was to walk across when no train could be seen or heard. Those who never use the track gave a rating of 2.8
- less than half the people who cross (by any means) know it is illegal to walk across. People who walk across the tracks are less likely to know this is illegal than people who never walk across the tracks. In the sample 82% of those who always use the overbridge knew it was illegal to walk across compared to 45% of those who sometimes walk across the tracks
- the most common reason given for walking across the tracks was that it was more convenient or quicker than using the overbridge. There were a large number of responses that indicated that the footbridge was poorly designed or in the wrong place. The majority of suggestions for improvement involved moving and/or redesigning the footbridge
- approximately 15% of people who cross the tracks were either going to catch trains or had just alighted from trains.

1.11 National initiatives

1.11.1 Issues related to education were raised by the Commission in 1993 (TAIC rail occurrence report 93-103 concerning a young cyclist who fell from a platform at Wingate).

1.11.2 Since 1994 Tranz Rail have been actively involved in "Rail Safe", an ongoing national safety programme for primary and intermediate school children using volunteer presenters. This has been developed to include a specific resource based programme "Tracks are for Trains". These initiatives have been effective in increasing awareness of the need for care in the vicinity of rail. However, this accident has revealed a major attitude problem at the secondary school level.

2. Analysis

2.1 The accident

2.1.1 The recollections of the student involved in the collision and the LE are consistent. The student was unaware of the approach of Train 2125 until it was almost upon him. Both of their reports indicate that the train whistle was not sounded just before the collision despite one witness's recollection of this.

2.1.2 Although the student heard the warnings being shouted to him he assumed they referred to Train 2126, which he could see ahead of him, and he delayed crossing the main line in response.

2.1.3 After sounding the train whistle to warn the group crossing the tracks 150 m ahead of him the LE saw them respond, and saw the last two cyclists push their bicycles clear of the loop. He had no reason to believe that the cyclist pushing his bicycle between the main line and loop was unaware of his approach.

2.1.4 The unexpected sound of the train behind him was the apparent catalyst which caused the student to stumble and fall in front of the train.

2.1.5 Allowing for reaction time the train brakes were applied at, or just before, the collision. Train 2125 stopped in approximately 50 m which is consistent with the reported speed of 25 to 30 km/h.

2.2 Crossing of the rail corridor at Henderson

2.2.1 Trespass at Henderson was common despite the pedestrian overbridge at the south end of the yard. The close proximity of Henderson High School on the opposite side of the rail to the shopping centre meant a high percentage of these were students.

2.2.2 A combination of perceived adverse features associated with the pedestrian overbridge (length of approach ramps and associated time to cross; grade of the ramp; side fencing) and open access to the west side of the yard resulted in trespass being the norm rather than the exception. Train operating staff expected this as part of normal daily operations.

2.2.3 The combination of possible crossing of DMUs on the main line and loop at the south end of Henderson, and the likelihood of restricted views from the west side looking north due to wagons standing in the Henderson yard, made this area a particularly hazardous site for unauthorised crossing of the track. Despite this approximately 700 crossings were still being made each day following this latest accident.

2.2.4 The main encouragement to unauthorised access was the open gate on the west side of the yard, and there was no signage near the gate to warn of the dangers of unauthorised crossings. Signage that was present in the area lacked impact and was not sited to best effect. One method of discouraging trespass is to prosecute, and Tranz Rail and the Police have considered such action. Signage should be to a standard to support any such prosecutions.

2.2.5 In light of the prompt and positive action taken by Tranz Rail, the WCC, and other parties, and the ongoing commitment to an integrated plan of improvement, the Commission has not found it necessary to make any specific safety recommendations in respect to Henderson. However, the size and nature of the trespass problem is unlikely to be unique to Henderson and the Commission is concerned that common and, by default, accepted high levels of trespass, particularly by students, may exist in other suburban areas.

3. Findings

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

3.1 Train 2125 and Train 2126 were operated correctly.

3.2 The student was making an unauthorised crossing of Henderson yard when hit by Train 2125.

3.3 Unauthorised crossing at Henderson yard was a daily practice by large numbers of adults and students.

3.4 The pedestrian overbridge at the site of the unauthorised crossings was not attractive to potential users, the majority of whom elected to make an unauthorised crossing of the rail yard.

3.5 Tranz Rail, Henderson High School, the WCC and local service groups were aware of the problem at Henderson, in particular because of the safety report produced in October 1997.

3.6 The student did not see or hear the approach of Train 2125 until it was almost upon him.

3.7 Although the student was walking clear of the tracks the sound of Train 2125 approaching from behind caused him to stumble in front of the train.

3.8 The LE's use of the train whistle, control of train speed and brake application were appropriate to the events which unfolded.

3.9 The level of unauthorised crossings at Henderson confirmed the known problem of controlling determined adult trespass and highlighted a particular attitude problem associated with the secondary school pupils.

4. Safety Actions

4.1 Immediately following the accident WCC formed an action group including the council, Tranz Rail, Police, Fire Brigade, the school and other interested community groups to look at an integrated and managed plan to address the Henderson problem. The action group took the 1997 report as its base and considered the following issues:

- Specific short term physical improvement, i.e. locking of the gate, repairing fencing and improvements to the footbridge.
- Education and supervision.
- Signage and enforcement.
- Long term alternative solutions or capital improvements.

4.2 The following action has been taken by Tranz Rail and the WCC as a result of the group involvement:

- Physical and attitude surveys were carried out to define the extent of the problem.
- The gate at the south end is now locked when not in use.
- Fences at Hickory Avenue and Smythe Road were repaired and strengthened (and have been repeatedly breached and repaired since).
- New signage has been installed.
- An extensive education campaign, comprising safety posters, use of the media, and involvement with the local community, has been completed.

The initial safety driven campaign is now being extended to a wider concept of improved environment and attitude, incorporating lighting and planting around the station, and community involvement to encourage pride in the station and its facilities.

4.3 Henderson High school has pursued an intensified education programme.

4.4 Despite the attention to fencing and locking of the gate, determined trespassers are still opening access for a wider group and the parties concerned are committed to an ongoing maintenance demand.

5. Safety Recommendations

5.1 On 12 October 1998 it was recommended to the general manager of the New Zealand School Trustees Association that he:

5.1.1 Advise all secondary school boards of the circumstances of the Henderson accident and suggest that boards in the vicinity of a rail corridor, which may have similar problems, raise the issue of potential hazards in the rail environment with students and co-operate with Tranz Rail, local authorities, and other affected local groups to develop and implement specific local action plans to minimise or eliminate hazards. (091/98)

5.2 On 28 October 1998 the general manager, New Zealand School Trustees Association, responded as follows:

5.2.1 The Association will be implementing and adopting the safety recommendation.

Advice to secondary school boards will be given once the Commission has publicly released the final report and provided the Association with a copy.

I can advise that the Association already has an article in its magazine to members (STAnews) warning boards in generic terms of the hazards associated with rail corridors and of the need to liaise with Tranz Rail and appropriate local authorities. The issue of STAnews will be with boards of trustees early next month.

5.3 On 12 October 1998 it was recommended to the chief executive of Local Government New Zealand that he:

5.3.1 Advise all authorities of the circumstances of the Henderson accident to alert those which may have similar problems to the desirability of taking action with their local schools, Tranz Rail and other affected local groups to develop and implement locality specific action plans to reduce hazards, (092/98); and

5.3.2 Bring to the attention of all suburban authorities with rail corridor access within their boundaries the desirability of working with Tranz Rail to provide effective fencing at recognised high risk areas. (093/98)

5.4 On 1 December 1998 the chief executive, Local Government New Zealand, responded as follows:

5.4.1 You will be aware that Local Government New Zealand promotes the national interests of local government in New Zealand. It has 86 voluntary members, consisting of all the local authorities in New Zealand, and is funded primarily on a subscription basis.

Transport safety issues are of considerable concern to our sector. Accordingly, we would be pleased to make mention of this recent case to our members in our regular newsletter to members.

5.5 On 12 October 1998 it was recommended to the managing director of Tranz Rail that he:

5.5.1 Liaise with local authorities and schools to develop and implement specific action plans to reduce hazards at defined high risk localities, (094/98); and

5.5.2 In conjunction with the appropriate local authorities reviews the effectiveness of the current policy with respect to the provision and maintenance of fencing in areas such as North Auckland, the Hutt Valley and other similar suburban areas to minimise trespass at known high risk areas. (095/98)

5.6 On 16 November 1998 the general manager, Tranz Rail, responded as follows:

5.6.1 **094/98**
Tranz Rail has adopted the safety recommendation.

Tranz Rail is actively working with the local authority and other interested community parties on two key initiatives. Immediately following the accident the working party, with our assistance, has developed initiatives to encourage people to use the overbridge. A communication campaign has been developed and was launched during November. This campaign will be followed by a formal evaluation in the new year.

5.6.2 **095/98**
Tranz Rail intends to adopt this safety recommendation.

Tranz Rail plans to review the evaluation of the Henderson project before considering other sites.

5.7 On 12 October 1998 it was recommended to the Director of Land Transport Safety Authority that he:

5.7.1 Review the effectiveness of the Tranz Rail safety system to provide safe access for rail service users at suburban commuter stations, (096/98); and

5.7.2 Consider the use of key performance indicators to define trespass problems at high risk localities and assess the effectiveness of any improvements made to reduce risk. (097/98)

5.8 On 2 November 1998 the Director of Land Transport Safety Authority responded, in part, as follows:

5.8.1 Your proposed recommendations will be adopted and we expect to have discussions with Tranz Rail on the provisions of their Safety System with respect to the safety of rail service users at suburban stations and the recording of trespass data in the near future. Until these discussions have taken place we are unable to indicate when implementation is expected to be complete but will keep you informed as progress is made.

Approved for publication 11 August 1999

Hon. W P Jeffries
Chief Commissioner