



**Report 00-111**  
**express freight train 630**  
**track warrant overrun**

**Tapuata**

**14 June 2000**

**Abstract**

On Wednesday 14 June 2000 at about 0100, Train 630 Wellington to Napier express freight overran its track warrant limit by about 1100 m. The overrun occurred when the locomotive engineer did not identify and stop at the limit of his track warrant authority at Tapuata and continued on before coming to a stop about 100 m from No 3 FI points indicator at the south end of Dannevirke station.

Factors which may have contributed to the incident included the possibility that the locomotive engineers lost situational awareness, and the resilience of the track warrant system to accommodate deviations from established patterns.

Safety issues identified included the effectiveness of procedures in place to monitor road knowledge on infrequently travelled routes and the cancellation of this certification where this knowledge was not maintained.

One safety recommendation was made to the operator.

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## List of Abbreviations

km	kilometre(s)
km/h	kilometre(s) per hour
LE	locomotive engineer
LE 1	locomotive engineer of Train 630
LE 2	assisting locomotive engineer of Train 630
m	metre(s)
PNGL	Palmerston North to Gisborne Line
TC	train controller

## Data Summary

<b>Train type and number:</b>	express freight train 630
<b>Date and time:</b>	14 June 2000 at about 0100
<b>Location:</b>	at about 51.50 km between Woodville and Dannevirke, Palmerston North to Gisborne Line (PNGL)
<b>Type of occurrence:</b>	track warrant limit overrun
<b>Persons on board:</b>	train crew: 2
<b>Injuries:</b>	nil
<b>Damage:</b>	nil
<b>Operator:</b>	Tranz Rail Limited (Tranz Rail)
<b>Investigator-in-charge:</b>	D L Bevin



# 1. Factual Information

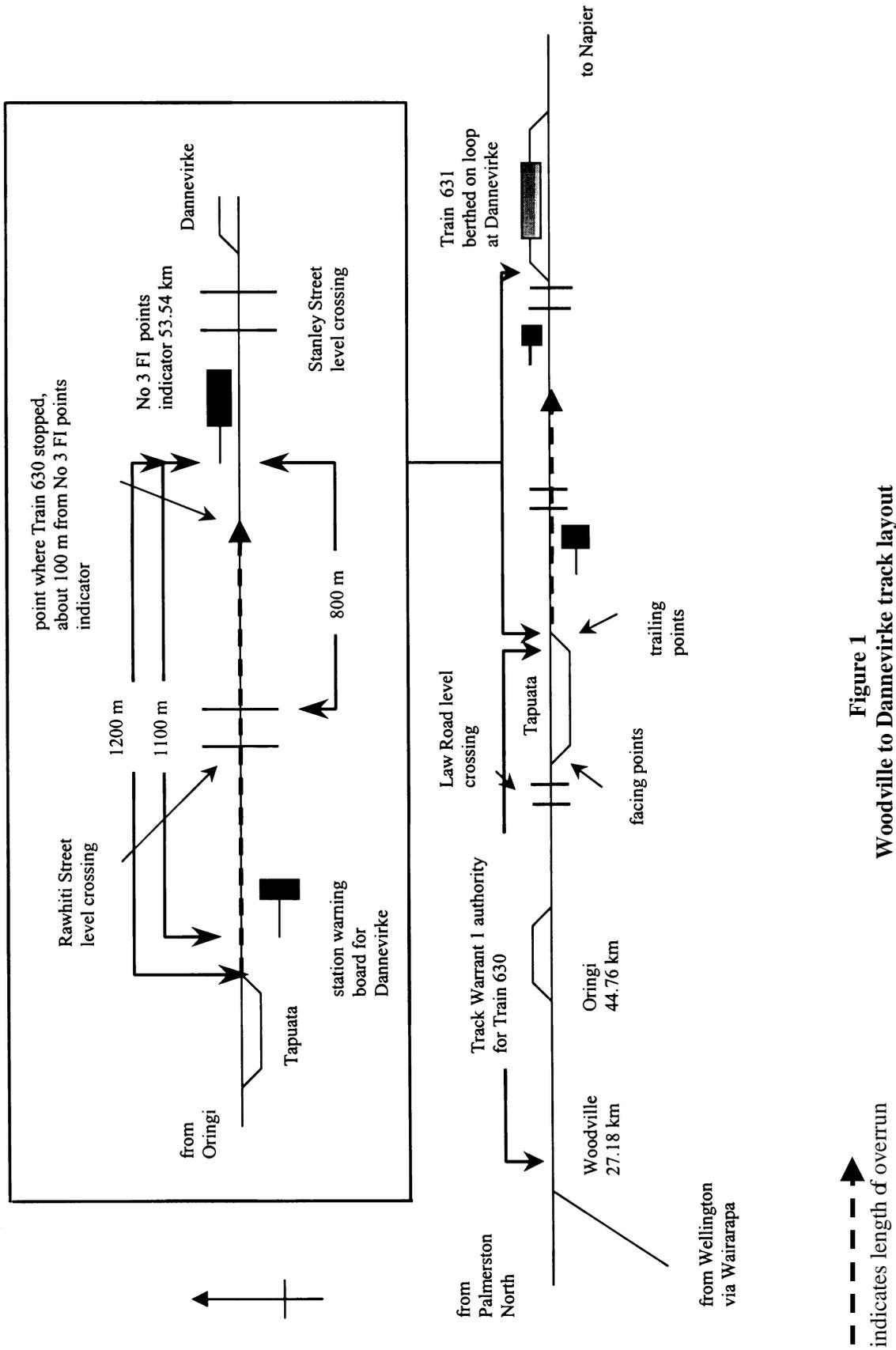
## 1.1 Narrative

- 1.1.1 At about 0100 on Wednesday 14 June 2000 Train 630, a Wellington to Napier express freight service, overran its track warrant limits at Tapuata by about 1100 m towards Dannevirke. The train was crewed by a Grade 1 locomotive engineer (LE 1) with an assisting Grade 2 locomotive engineer (LE 2). LE 1 commenced duty at his rostered book-on time of 1925 and LE 2 at his rostered book-on time of 1955 in Wellington for the running of Train 630.
- 1.1.2 LE 1 had driven Train 630 from Wellington to Masterton from where he took a new track warrant to proceed to Woodville. After a shunt was completed at Masterton LE 2 took over driving duties for the section to Woodville.
- 1.1.3 LE 2 made a required check call to train control as Train 630 passed through Pahiatua and was advised by the train controller (TC) that they would probably be going beyond Woodville to Dannevirke to cross with Train 631, their rostered return service to Wellington. The scheduled crossing place for Train 630 and Train 631 was Woodville but it was not unusual for the crossing to take place at either Oringi or Dannevirke, depending on the timekeeping of the respective trains on any given night.
- 1.1.4 On 13 June 2000, Train 631 was the Napier to Wellington express freight service. At 2300 the TC had issued Track Warrant 59 to the LE of Train 631, authorising his train to travel to Dannevirke where it was to berth on the loop to cross Train 628, a Palmerston North to Napier freight service. Train 628 was scheduled to run ahead of Train 630 from Woodville to Napier.
- 1.1.5 The TC was later advised that Train 628 would be late departing from Palmerston North so he decided to advance Train 630 from Woodville ahead of Train 628.
- 1.1.6 Because Track Warrant 59 stated that Train 631 would cross Train 628 at Dannevirke, the TC was not able to advance Train 630 to Dannevirke until either Track Warrant 59 had been cancelled enroute and a new track warrant issued to Train 631 to cover the change in crossing, or Train 631 had completed the requirements of the track warrant and berthed on the loop at Dannevirke. To cancel Track Warrant 59 and issue another track warrant would have meant stopping Train 631 before its arrival in Dannevirke, so the TC decided instead to advance Train 630 to a point short of Dannevirke, thereby avoiding an unnecessary stop for Train 631.
- 1.1.7 The issue of a track warrant to Tapuata did not occur often but it was an allowed track warrant location. The TC expected that by the time Train 630 arrived at Tapuata, Train 631 would be berthed in the loop at Dannevirke and he would then be able to issue another track warrant for Train 630 to continue on from Tapuata to Dannevirke to cross Train 631.
- 1.1.8 The TC was able to issue a track warrant for Train 630 to proceed from Woodville to either Oringi, Tapuata or to No 3 FI points indicator at the south end of Dannevirke. He decided that issuing a track warrant to Tapuata, which was about 1.5 km from Dannevirke, allowed for Train 631 to lose time enroute but still be berthed in the loop at Dannevirke by the time Train 630 arrived at Tapuata.
- 1.1.9 Train 630 arrived at Woodville at about 0020, where LE 2 cancelled the track warrant from Masterton and took Track Warrant 1 from the TC authorising Train 630 to travel from Woodville to Tapuata. Neither of the LEs could recall having received a track warrant from Woodville to Tapuata before. From their experience track warrants had always been issued from Woodville to either Oringi, the No 3 FI facing points indicator at Dannevirke or Dannevirke itself.

- 1.1.10 LE 1 stated that he had asked LE 2 if he was comfortable with driving to Dannevirke as LE 1 had not been up there for nearly 2 years. LE 2 stated that he “wasn’t too keen” as he didn’t know where Tapuata was but after a brief discussion said he was happy to carry on. When asked by LE 1 if he had been to Dannevirke in the last few weeks LE 2 confirmed that he had, so he continued to drive from Woodville.
- 1.1.11 LE 1 said that he knew that Tapuata was past Oringi and once they had passed Oringi he got his working timetable out and referred to it to assist with locating and identifying Tapuata. LE 2 stated that once they had left Woodville LE 1 had got his working timetable out and was calling the metrage points as they travelled along and did this as they approached Oringi.
- 1.1.12 After passing Oringi LE 2 said that he slowed the train and looked for a station warning board for Tapuata while LE 1 checked level crossing kilometrage locations using his working timetable references.
- 1.1.13 The locomotive event recorder showed that the speed of Train 630 as it approached Tapuata was increasing and reached 44 km/h as the train passed through Tapuata. It passed the station warning board for Dannevirke, 100 m beyond the trailing points at Tapuata, and continued a further 360 m at this speed before reducing gradually to 29 km/h over 200 m. Train 630 continued at 29 km/h for about 300 m before it started to slow over 100 m and finally stopped about 100 m before No 3 FI points indicator at Dannevirke.

## **1.2 Crew reports and other information**

- 1.2.1 Section L3 Instruction 3.8 of the working timetable specified the kilometrage of each level crossing together with the names of the stations on either side of it. Section G1 General Instructions, Metrages of stations, sidings, intermediate boards etc, in the working timetable listed the location of Tapuata Siding as 51.59 km.
- 1.2.2 In his original report LE 2 said that a few kilometres past Oringi, “perhaps two or three”, they had seen a set of facing points amongst the long grass but had not seen any indication that it was Tapuata. LE 1 said in his original report that he had noticed a set of facing points as the train passed over them but had not seen any trailing points as the train carried on, and the next thing he had seen was the station warning board for Dannevirke. They then realised that they had overrun their track warrant limits and the train was brought to a stop “between the station warning board and the No 3 FI points indicator at Dannevirke”.
- 1.2.3 The distance between the facing points and the trailing points at Tapuata was 428 m (refer Figure 1). The siding between these sets of points was no longer visible as it had been overgrown, but where both sets of points connected to the main line they were free of any growth or vegetation and clearly visible (refer Figure 2 and Figure 3).



**Figure 1**  
Woodville to Dannevirke track layout  
(not to scale)

- 1.2.4 Both LEs confirmed that No 3 FI points indicator became illuminated as they approached and initially displayed a Red over Red indication before changing to a Purple over Red indication, and the level crossing alarms at Stanley Street, which was about 50 m beyond No 3 FI points indicator, also started to operate.
- 1.2.5 Tranz Rail advised that No 3 FI points indicator at Dannevirke was approach lit and only illuminated and displayed indications when an approaching train was within 440 m of it. The LE of Train 631, which had by then berthed in the loop at Dannevirke, estimated that Train 630 had stopped about 100 m from No 3 FI points indicator at Dannevirke. He also confirmed that No 3 FI was displaying indications and that the level crossing alarms at Stanley Street were operating at the time.
- 1.2.6 In interviews conducted later LE 2 said that Train 630 had passed over a set of facing points covered in grass but there had been no indication of what locality it was. LE 1 said that when they went through Tapuata they had all but missed the trailing points because of the undergrowth.
- 1.2.7 A station warning board for Dannevirke was positioned 1100 m before No 3 FI points indicator, and Rawhiti Road level crossing was located about 800 m before No 3 FI points indicator (refer Figure 1). During his interview LE 1 said that after the train had passed through Oringi he had begun checking metrages alongside the track and he had identified the State Highway 2 level crossing, the Law Road level crossing and the Rawhiti Road level crossing from metrages in his working timetable. He said that it was from the Rawhiti Road level crossing that he had seen the station warning board for Dannevirke and realised that they had gone past Tapuata, so they stopped the train and contacted train control.
- 1.2.8 Train 630 had overrun the limit of its track warrant, the trailing points at Tapuata, by about 1100 m and in so doing had travelled about 1000 m past the station warning board for Dannevirke before coming to a stop within 100 m of No 3 FI points indicator at Dannevirke.
- 1.2.9 LE 2 recalled that after the train had stopped LE 1's mobile telephone had rung and from the conversation that ensued he realised it was train control calling. He said that he heard LE 1 advise the TC that they had overrun their track warrant limits and were now at Dannevirke instead of Tapuata. LE 1 also recalled that the TC had contacted him by telephone.
- 1.2.10 The TC stated that the telephone call had been initiated by LE 1 and a transcript of the train control voice tape confirmed this. In a later interview both LE 1 and LE 2 said they could not discount that LE 1 may have made the initial telephone call to the TC.
- 1.2.11 An extract from the train control recording was:

Phone rings:

TC Giddy train control

LE 1 Hello

TC Train control

LE 1 Yeah I think we made a booboo here ah six three 30 here

TC ... (undecipherable)

LE 1 Actually we're at Dannevirke, on Track Warrant 1, supposed to enter main at Tapuata

TC Oh yeah

LE 1 Control, what happens now then?

TC What happened at Tapuata?

LE 1 I just woke up, ah well we're at Dannevirke anyway

TC Yeah, righto

LE 1 Made a booboo [name of TC]

TC Hang on

- 1.2.12 LE 1 later stated that his comment "I just woke up" meant that he had suddenly realised what had happened and did not mean that he had been asleep.
- 1.2.13 Train control radio coverage in the area was good and all communications between the TC and the LE of Train 631 were by that means.
- 1.2.14 The TC requested the LE of Train 631 to walk the short distance to where Train 630 had stopped and assume LE duties for the train. The original crew of Train 630 were relieved of duty pending an investigation by Tranz Rail.
- 1.2.15 Tranz Rail advised that because the locomotive was authorised to move before the network manager was advised of the incident the exact position of the train was not known and the short-term locomotive log, which contained details relating to locomotive control settings and the operation of the vigilance device, had been lost. Only the long-term information could be extracted.

### 1.3 Site information

- 1.3.1 Tapuata was a seldom-used double-ended siding<sup>1</sup> located at the 51.59 km, between Oringi and Dannevirke on the PNGL.
- 1.3.2 The siding connection between the 2 sets of main line points was overgrown with vegetation and therefore not visible from the main line.
- 1.3.3 Tapuata was not identified by any track-side notice boards or physical means other than the track in place.

### 1.4 Track warrant control regulations

- 1.4.1 Tranz Rail's Track Warrant Control Regulation 3, Limits of a Track Warrant stated in part:

(a) The limits of a track warrant will be designated by specifying stations, sidings, Intermediate boards, signals, Points Indicators, points or track metrage pegs...

(b) The authority of a track warrant which commences at a station or siding will extend from –

(i) *At an interlocked station* – the last main line to loop points met when leaving the station, or if there is no loop the last main line points. When the movement over these points is controlled by a signal the authority will extend from that signal ...

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<sup>1</sup> Sidings are defined as all lines other than main lines and crossing loops.

(c) The authority of a track warrant which terminates at a station or siding will extend to-

(i) *At a station* – Station limits at the entrance to the station

(ii) *At a siding* – the first main line points met approaching the siding

When the track warrant instructs the movement to enter the main the authority will extend to the last main line to loop points, or if there is no loop, to the last main line points...

1.4.2 Under track warrant control regulations Tapuata was classified as a siding and as such no station warning board was required.

## **1.5 Train 630**

1.5.1 Train 630 ran up the Wairarapa Line to Woodville where it joined the PNGL.

1.5.2 Tranz Rail advised that a crew of 2 was required because Alternative Train Crewing (single person crewing) could not be introduced between Upper Hutt and Woodville due to unreliable radio communication.

1.5.3 LE 1 stated that it was normal procedure for the LEs to share the driving although where a Grade 1 locomotive engineer was paired with a Grade 2 locomotive engineer the Grade 1 locomotive engineer remained responsible for the train and could, if he so desired, do all of the driving. Tranz Rail confirmed that in all situations the Grade 1 locomotive engineer retained responsibility for the operation of the train.

1.5.4 The rostered crew coupling was Train 630 for Train 631 and the crossing was scheduled for Woodville, but operational contingencies meant the crossing often took place at Oringi or Dannevirke. LE 2 advised that he regularly worked the Train 630/Train 631 coupling and from his experience the crossing of these trains occurred at Dannevirke about twice a week.

1.5.5 The assisting locomotive engineer position on Train 630 was one of the few rostered Grade 2 locomotive engineer shifts on the Wellington depot roster and was worked by a small number of suitably qualified staff. If a Grade 2 locomotive engineer was not available, either a Grade 1 locomotive engineer or a rail operator was rostered.

## **1.6 Road knowledge**

1.6.1 Tranz Rail's Operating Code Section 1 Instruction 5.5 Road Knowledge Certificate and Register in effect at that time stated that:

Road knowledge is the term used to describe a Locomotive Engineer's familiarity with sections of track. To have Road Knowledge the Locomotive Engineer must have a good understanding of the geography of the area, track geometry and track speeds, signal locations and special operating requirements and instructions.

A Road Knowledge Register giving details of Locomotive Engineers' route knowledge, obtained from STF 23/Loco Engineers certificates will be maintained in Network Control.

Locomotive Engineers must not be booked to run a train over a section for which they do not have Road Knowledge.

1.6.2 Tranz Rail's Operating Code Section 1 Instruction 5.6 Road Knowledge Training in effect at that time stated that:

### **5.6.3 Learning the Road**

To gain route knowledge, a Locomotive Engineer will travel as an additional person in the cab of a locomotive over each route common to the Terminal/Depot. This training will be for at least a minimum number of trips as determined by the M/STOP for the area.

### **5.6.4 Road Knowledge Certifications**

After having completed at least the minimum number of trips as determined by the M/STOP for the area and when satisfied that they are confident over the route to be worked, the Locomotive Engineer will certify to Network Control on the prescribed form that he is able to be booked to run trains over the route specified.

In the case of those routes which have been specified by the M/STOP as having special training requirements or certification mandatory steep grades, the Locomotive Engineers certification is to be supported by STF 23 issued by the M/STOP certifying that a satisfactory practical assessment has been completed before the Locomotive Engineer is deemed to have route knowledge.

Tranz Rail advised that there was no requirement for an LE to revoke road knowledge certification through lack of use.

1.6.3 On 2 February 2001 Tranz Rail advised that:

The present Rail Operating Code instructions were written on the basis that a Locomotive Engineer retains the initial road knowledge by regularly driving over the route as part of his normal rostered work.

Tranz Rail's internal investigation noted:

- Absence of provision for a Locomotive Engineer who works over a route periodically because, for instance, he relieves at another depot periodically or has otherwise had a prolonged absence from driving work (extended sickness, leave etc)
- The more complex issue is where a Locomotive Engineer has not actually operated over a section of track at the extremity of his "signed off" territory for some time. This is difficult to detect and therefore difficult to administer.

These issues are also included in our Road Knowledge Review which is likely to be closed out during February 2001.



**Figure 2**  
**South end facing points approaching Tapuata**



**Figure 3**  
**North end trailing points departing Tapuata**

- 1.6.4 Tranz Rail could not supply evidence that LE 1 was certified for road knowledge of the Woodville to Dannevirke section and LE 2 was not. However Tranz Rail's operating procedures allowed LE 2 to drive the train over the section under the supervision of LE 1.

## **1.7 Personnel**

### **Locomotive engineer 1**

- 1.7.1 LE 1 was certified as a Grade 1 locomotive engineer and had his most recent progressive assessment on 21 April 1999.
- 1.7.2 Although LE 1 was experienced in track warrant control he stated that the only regular track warrant operation in the Wellington Depot was the Train 630/Train 631 coupling, both of which ran via the Wairarapa under track warrant control from Featherston to Woodville or Dannevirke, wherever the crossing had taken place. As a result Grade 1 LEs did not work the roster very often and when they did it was likely that they would not go beyond Woodville.
- 1.7.3 Tranz Rail was unable to provide details of dates and the number of trips undertaken by LE 1 in attaining his route knowledge certification for the Woodville to Dannevirke section or to confirm his certification for the route and its date.
- 1.7.4 According to an update of the Road Knowledge Register, LE 1 had last driven the Woodville to Dannevirke route in November 1998, although his road knowledge particulars had been updated for the Road Knowledge Register and signed off by him on 31 August 1999.
- 1.7.5 This was the first shift LE 1 had worked after 3 days rostered off duty.

### **Locomotive engineer 2**

- 1.7.6 LE 2 was certified as a Grade 2 locomotive engineer and had his most recent progressive assessment on 8 March 1999.
- 1.7.7 LE 2 was experienced in track warrant control and regularly worked the Train 630/Train 631 coupling. It was his second night of a five-night roster on this coupling.
- 1.7.8 Tranz Rail advised it had failed to obtain any signed road knowledge certificates from LE 2.
- 1.7.9 Tranz Rail's records showed that LE 2's previous 2 trips from Woodville to Dannevirke on Train 630/Train 631 had been on Tuesday 18 April 2000 and Friday 2 June 2000.
- 1.7.10 This was the second consecutive night that LE 2 had been rostered on this shift. Prior to that he had been rostered off duty for the weekend.

### **Train controllers**

- 1.7.11 The TC was certified for the duties he was undertaking and was experienced in track warrant control.
- 1.7.12 The TC believed that all Grade 1 locomotive engineers from the Wellington Depot were certified for route knowledge for the Woodville to Dannevirke section as he had not had any LEs decline a request to take Train 630 beyond Woodville to either Oringi, Tapuata or Dannevirke.
- 1.7.13 The TC had not received any indication from the crew of Train 630 that they were apprehensive about travelling to Tapuata.

- 1.7.14 A survey of other train controllers certified for this train control position revealed that although Tapuata was used by them when required as a track warrant limit for shunting purposes at Oringi, none had used it as a track warrant limit for train movement purposes. Without exception they indicated they would have issued a warrant to No 3 FI facing indicator (ie just short of Dannevirke) in such circumstances.

## 2. Analysis

- 2.1 From reports and interviews with the LEs it appeared that the track warrant overrun occurred as the crew were attempting to locate Tapuata by slowing the train, looking for a station warning board or some sign of identification for Tapuata, and cross referencing known metrages with the working timetable. However, there were significant inconsistencies between the reports of the LEs and other factual information gathered during this investigation and these have raised other more probable causes of the track warrant overrun.
- 2.2 Although both LEs stated that they had discussed their concerns about travelling beyond Woodville between themselves, they had not communicated these concerns to the TC. It is difficult to accept that LE 1, who had ultimate responsibility for the train, would have gone beyond Woodville if he was unsure of the section ahead himself and was also aware of the concerns of LE 2, even after a discussion between them during which LE 2 said that he was happy to carry on. The fact that LE 1 did not consult with the TC while at Woodville regarding their concerns would suggest that no significant concerns existed.
- 2.3 If the concerns as stated by the LEs are correct, the overrun of the limits of Track Warrant 1 could have been avoided by the application of sound crew resource management by LE 1 consulting with the TC before departing from Woodville. LE 2 could have suggested such consultation.
- 2.4 After Train 630 had left Oringi the locomotive crew stated that they had worked as a team to locate Tapuata. LE 2 had slowed the train and looked ahead for a station warning board while LE 1 looked through his working timetable to identify track-side kilometrage points. Both of these tasks would have required the crew to look to the front and side of the locomotive and in doing so it is difficult to know how they failed to relate the facing points they saw as Tapuata. Had LE 1 referred to Section G1 of the working timetable as well he would have seen that Tapuata Siding was located only about 20 m beyond Law Road level crossing, which he said he had earlier identified from Section L3 of the working timetable. There was also a discrepancy in the LEs reports as to when LE 1 produced his working timetable and started to call reference points to LE 2.
- 2.5 Tapuata was approached from the south on a long, straight section of track with excellent visibility and there were no other sidings between Woodville and Dannevirke with which it could have been confused. There were prominent physical features in the form of a set of facing points and a set of trailing points, neither of which was overgrown as reported, which were connected to the main line, matched the definition of a siding and were reported as both being seen by the crew.
- 2.6 There was no station warning board in place for Tapuata, which was classified as a siding and not a warrant station. There was no requirement for such a board under Tranz Rail's Track Warrant Control Regulations. It is difficult to appreciate why an experienced crew expected to find a station warning board at Tapuata, and if so this indicated a lack of understanding of the difference between stations and sidings under track warrant operating conditions.

- 2.7 The speed of Train 630 as it approached and passed through Tapuata did not reflect the stated actions of a crew who, to all intents and purposes, said they were lost and trying to find out where they were, although the crew still said that they saw the facing and trailing points at Tapuata as they crossed over them. However, the train could have been brought to a stop after passing over the facing points and before reaching the set of trailing points 428 m further on, which defined the limit of their track warrant.
- 2.8 The station warning board for Dannevirke was positioned 1100 m before No 3 FI points indicator at Dannevirke and about 300 m before Rawhiti Street level crossing. Although LE 1 stated that he saw the station warning board from this level crossing he was by then already about 300 m past it. Had Train 630 stopped as soon as the locomotive crew saw the station warning board as stated, it could have done so about 200 m past the trailing points at Tapuata, but instead it travelled 1100 m beyond these points before stopping. A train had to approach to within 440 m of No 3 FI points indicator at Dannevirke for it to illuminate and display indications and this confirmed how close Train 630 was to Dannevirke when it stopped.
- 2.9 Several inconsistencies were identified, which raised questions about the scenario based on crew reports and interviews. These were:
- the conflicting memories of the LEs regarding events of the day
  - the failure of the locomotive crew who were supposedly looking for identifying features to relate the set of facing points to Tapuata
  - the statements that the facing points were covered in undergrowth when in fact they were clear of any obstructions and highly visible
  - the conflicting statements that the locomotive crew did not see any trailing points then did see them but nearly missed them because they were covered in undergrowth. These points were also clear of any obstructions and highly visible
  - the constant and relatively high speed of Train 630 when the LEs were reportedly unsure of their location as it approached and passed through Tapuata
  - the statement that the station warning board was visible from Rawhiti Road level crossing when in fact the station warning board was positioned about 300 m before the level crossing
  - as the train stopped about 1100 m past the station warning board for Dannevirke the board could not have been the point at which the crew commenced to stop the train.

As a result of these inconsistencies a scenario based on the reports of the crew is considered unlikely.

- 2.10 Although the scenario based on the reports and interviews of the crew was not considered likely it did raise issues relating to the road knowledge certification of LEs and a safety recommendation covering this issue is made in Section 5 of this report.
- 2.11 It is difficult to explain these inconsistencies other than to conclude that the locomotive crew were unaware of their surroundings. It is possible that LE 1 was asleep and that LE 2 lost situational awareness (he had no relevant road knowledge certification) or lost attention through the known phenomenon of short-term microsleep as the train approached Tapuata, and it was not until after the train had passed Tapuata, the station warning board for Dannevirke and Rawhiti Road level crossing, that the crew became alert to their situation and were able to stop the train as it approached No 3 FI points indicator at Dannevirke. Although LE 1 maintained that his statement “I just woke up” related to his sudden situational awareness on seeing the station warning board for Dannevirke, the sleep scenario would account for the inconsistencies identified in paragraph 2.9.

- 2.12 The vigilance device operated on a 60-second cycle and was cancelled either manually or by the LE operating the controls. If LE 2 had lost situational awareness and entered a microsleep at the start of a vigilance device cycle as Train 630 approached Tapuata, at 44 km/h the train would have travelled about 700 m before he was awakened by the next vigilance device cycle. There was ample time and distance for the train to travel through Tapuata and pass the station warning board for Dannevirke before LE 2 was awakened. Having been alerted by the vigilance device cycle, he was unsure where he was and continued on until he saw something he identified. It was not until No 3 FI points indicator at Dannevirke became illuminated, about 400 m in front of him, that he realised where he was and brought the train to a stop.
- 2.13 Alternatively, it is possible that LE 1 was asleep and that LE 2, perhaps because of habit, had assumed that the track warrant in his possession authorised Train 630 to travel up to No 3 FI points indicator at Dannevirke instead of Tapuata. LE 2 had never experienced a track warrant issued to Tapuata in these circumstances before. This belief by LE 2 that he was in possession of a track warrant to No 3 FI points indicator at Dannevirke would account for why he did not react either when the train passed over the facing and trailing points at Tapuata or when it passed the station warning board for Dannevirke, although the point at which Train 630 stopped was not close enough to No 3 FI points indicator at Dannevirke to be consistent with a train stopping there at the end of its authorised track warrant limits.
- 2.14 The speed profile from the long log supports both scenarios in that the train was brought to a controlled stop about 100 m before No 3 FI points indicator at Dannevirke.
- 2.15 There appeared to be no advantage gained by issuing a track warrant to Tapuata as against one to No 3 FI points indicator at Dannevirke, a significantly more easily recognised feature. It has been shown that the use of correct but unusual procedures in track warrant operation contributes to human error incidents. Based on the scenario that LE 2 believed he had a track warrant to No 3 FI points indicator at Dannevirke, it is probable that the choice of Tapuata as the track warrant limit was a catalyst to the overrun. If, on the other hand, the locomotive crew were asleep then the choice of Tapuata as the track warrant limit had no bearing except that if the track warrant had been issued to No 3 FI points indicator at Dannevirke and all circumstances had been the same, the train would have stopped without overrunning its track warrant limits.
- 2.16 LE 1 had signed off his route knowledge for Woodville to Dannevirke 9 months earlier but he had not travelled the route for 19 months. The process that allowed him to remain road knowledge certified for the Woodville to Dannevirke section under these circumstances is questionable. Because of the relatively few opportunities that Wellington-based LEs had to operate on that particular route, it was possible that they could forget little-used facilities such as Tapuata and become unaware of any “field changes” since their last trip through the area. Although LE 1 had signed off on route knowledge he had not driven the Woodville to Dannevirke section for such a length of time that when he was required to do so he stated he did not feel confident about it.
- 2.17 LE 2 had travelled the Woodville to Dannevirke section more often than LE 1 in the course of his assisting role working the Train 630/Train 631 roster and probably did so more than most LEs in the Wellington Depot, and yet Tranz Rail had not required a signed road knowledge certification from him. However, as the Grade 1 locomotive engineer LE 1 was responsible for the train and he should not have based his decision to proceed beyond Woodville on LE 2’s knowledge, given his own stated uncertainty and concerns.
- 2.18 Tranz Rail’s records were incomplete and did not include information relating to whether and when LE 1 was certified for road knowledge. It was therefore not possible to determine what opportunities, if any, LE 1 had to travel the route in accordance with Tranz Rail’s Operating Code Instructions before his original route knowledge certification some 19 months earlier.

- 2.19 Both LEs had had rostered time off duty in the days leading up to the incident: LE 1 was on his first shift after 3 days off and LE 2 was on his second shift after 2 days off. Both LEs maintained that they had spent the off duty time wisely regarding rest and recreation and were not fatigued.
- 2.20 All track warrant control procedures were correctly followed and, although the issue of a track warrant authorising Train 630 to run from Woodville to Tapuata was unusual, it was allowed for within the regulations and the locomotive crew were satisfied as to its legitimacy and intent. LE 1 saw no reason to question the track warrant with the TC or to not act on it. The problem was, they stated, they did not know where Tapuata was, or how to recognise it.
- 2.21 The TC had no reason to question the road knowledge certification of the locomotive crew. In particular he had no reason to doubt that they were suitably qualified to proceed beyond Woodville. His expectation was that if the locomotive crew had any problems with doing so they would contact him to discuss them. The TC had advised them of his plan to advance Train 630 to Dannevirke some time before they had arrived in Woodville, so there had been ample time for the crew to respond if there had been any issues.
- 2.22 The use of a mobile telephone to advise the TC of the overrun was unusual given the availability of radio communication with train control. There was nothing to suggest that the train control radio was not operational at the time of the incident.
- 2.23 It was regrettable that Tranz Rail allowed the locomotive to be moved before the short-term log was disconnected, thereby removing evidence relating to the extent of the overrun, use of controls and particularly to the vigilance device activity. Although the importance of this data was not immediately evident, its subsequent availability would have assisted in this investigation. There was however no reason to suspect that the vigilance device was not operating correctly.
- 2.24 The issue of downloading locomotive event recorder data following serious operating incidents was raised in an investigation into an express freight train passing a signal at danger at Plimmerton (rail occurrence report 00-102). As a result of that investigation it was recommended to the managing director of Tranz Rail that he:

Publish criteria for staff involved in occurrence investigation which ensures locomotive event recorder extraction follows serious operating incidents such as signal overruns. (095/00)

On 15 November 2000 Tranz Rail responded by saying that it accepted this recommendation and that a code amendment would be issued in the Rail Operating Code on 27 November 2000. That code amendment is included in Section 4.1 of this report and in view of the action already taken by Tranz Rail no safety recommendation covering this issue has been made in this report.

- 2.25 The resilience of the track warrant system to accommodate deviations from established patterns was raised in an investigation into an express passenger train overrunning its track warrant limits at Mosgiel (rail occurrence report 00-109). As a result of that investigation it was recommended to the managing director of Tranz Rail that he:

improve the resilience of the track warrant system to accommodate deviations from standard patterns, taking particular account of the need for:

- an improved method of providing an LE with a continuous and conspicuous visual display of his track warrant limit

- introducing a system to identify the position of trains in track warrant territory which would increase the situational awareness of LEs as they approached the limit of their track warrant, and limit the possible consequence of any overrun which may occur. (001/00)

On 28 March 2000 Tranz Rail responded:

the first recommendation is on the agenda of the Track Warrant Working Party agenda as a RMTU initiative.

On 6 July 2000 an update was received from Tranz Rail which stated that:

Part two of this recommendation has been considered by the Track Warrant Steering Committee following a recommendation from the TWC Working Party to implement mandatory calling. Subsequently a new procedure for calling limits when approaching Warrant and Interlocked Stations in TWC has been implemented. The intention of this new procedure is to reinforce in Locomotive Engineers minds the terminating limits of their warrants and their current location by increasing their situational awareness.

On 2 February 2001 Tranz Rail advised that:

The outcome of the issue raised concerning the combined Tranz Rail/RMTU Track Warrant Control Working Party initiative was:

- An enhanced Track Warrant form that shows the limits of the track warrant in a bold box. These have been issued to all staff.
- Provision of illuminated clipboards. This is being allocated to the combined Tranz Rail/RMTU Cab Committee for action. Present status is installation for two prototypes by the end of February 2001 and evaluation at the end of March.

In view of this, no further safety recommendation on this issue is contained in this report.

- 2.26 The issue of lost situational awareness through microsleeps is the subject of a concurrent investigation where more positive evidence of this phenomenon being a contributing factor is available. No safety recommendation regarding this issue has therefore been made in this report.

### 3. Findings

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

- 3.1 LE 1 and LE 2 were certified for the driving duties they were undertaking.
- 3.2 There was no documented evidence available to verify LE 1's road knowledge certification of the Woodville to Dannevirke section.
- 3.3 LE 1 was not sufficiently familiar with the Woodville to Dannevirke section.
- 3.4 Train 630 was being operated normally prior to the overrun.
- 3.5 The identifying features of Tapuata should have been easily recognised by locomotive crews using it as a track warrant limit.
- 3.6 One of the following set of factors probably contributed to the incident:  
  
Either:
  - LE 1 was asleep at the time
  - LE 2 experienced a microsleep while passing through Tapuata  
or
  - LE 1 was asleep at the time
  - LE 2 believed he had a track warrant to No 3 FI points indicator at Dannevirke.
- 3.7 All track warrant procedures were in accordance with track warrant control regulations but the issue of a track warrant to Tapuata was unusual and may have been a contributing factor in one of the scenarios.
- 3.8 Fatigue and external issues were not considered to be contributing factors to this incident.

### 4. Safety Actions

- 4.1 Tranz Rail advised that the following instruction was incorporated into the Rail Operating Code Section 2 and was effective from 18 December 2000:

#### 1.3 Locomotive Event Recorder Extraction

- Significant operating incidents require the extraction of information from event recorders of locomotives involved in the accident/incident.
- The Network Control Manager is responsible for ensuring arrangements are made to have this information extracted.
- In the case of a serious occurrence locomotives/trains involved should only be moved after the following requirements have been completed:

Kaitiaki type fitted locomotives must not be moved forward or reverse until it has been marked on or alongside the line where the leading end of the locomotive initially stopped. This can be done by the Locomotive Engineer if the locomotive needs to be moved urgently.

Old type log fitted locomotives must not be moved until the log is disconnected or short term information will be lost. The stopping position of the locomotive is also to be marked as outlined above.

Seek guidance from the Manager Train Operations if in doubt.

- 4.2 Tranz Rail advised that following this incident the road knowledge process had been reviewed and areas for improvement had been identified. It was anticipated new procedures would be in place by February 2001. Concurrently the Crew Register in the Crew Management System was being modified to better identify currency of route knowledge over routes infrequently travelled by locomotive engineers.

## **5. Safety Recommendation**

- 5.1 On 13 March 2001 the Commission recommended to the managing director of Tranz Rail that he:

5.1.1 introduce a system to ensure road knowledge certification is for a limited, finite time and that subsequent recertification requires a defined criteria of route usage by individual LEs to remain current. (004/01)

- 5.2 On 23 March 2001 the managing director of Tranz Rail replied:

5.2.1 Tranz Rail are in agreement with the Final Safety Recommendation, however as per our letter of 5 March 2001, consider this to be a Safety Action rather than a Safety Recommendation.

Tranz Rail enclosed a copy of the draft Operating Code Instructions for Road Knowledge which addressed the issues raised in this report. Tranz Rail said that these instructions will be incorporated into the Rail Operating Code and effective from 30 April 2001.

Approved for publication 23 March 2001

Hon. W P Jeffries  
**Chief Commissioner**