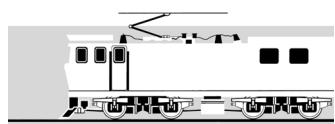
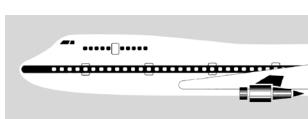


## RAILWAY OCCURRENCE REPORT

02-126      hi-rail vehicle 64892, occupied track section without authority,      18 November 2002  
near Kai Iwi



TRANSPORT ACCIDENT INVESTIGATION COMMISSION  
NEW ZEALAND

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## **Report 02-126**

**hi-rail vehicle 64892**

**occupied track section without authority**

**near Kai Iwi**

**18 November 2002**

### **Abstract**

On Monday 18 November 2002, a hi-rail vehicle overran its track authority from Westmere Intermediate Board to Symes Road Intermediate Board on the Marton-New Plymouth Line and continued a further 28.3 km to Brewer Road Intermediate Board.

The operator of the hi-rail vehicle had intended to proceed to Brewer Road but mistakenly made reference to Symes Road when seeking authority from the train controller.

There was no conflicting track occupancy between Symes Road Intermediate Board and Brewer Road Intermediate Board.

The safety issues identified were:

- the standardisation of language to describe physical locations
- the use of On Track Time Tracker forms or other means to record details of the authorised track occupancy as a defence against overrunning the limits of the authority.

In view of the safety actions with regard to track occupancy procedures taken by the Tranz Rail, no safety recommendation has been made.



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## **Abbreviations**

|            |  |
|------------|--|
| hr         | hour(s)                                    |
| HRV        | hi-rail vehicle                            |
| IB         | intermediate board                         |
| km         | kilometre(s)                               |
| km/h       | kilometres per hour                        |
| MNPL       | Marton-New Plymouth Line                   |
| Transfield | Transfield Infrastructure Services Limited |
| Tranz Rail | Tranz Rail Limited                         |
| TWC        | track warrant control                      |
| UTC        | coordinated universal time                 |

## **Data Summary**

|  |   |
|--|---|
| <b>Rail service vehicle type and number:</b> | hi-rail vehicle 64892                         |
| <b>Date and time:</b>                        | 18 November 2002, at about 1339 <sup>1</sup>  |
| <b>Location:</b>                             | near Kai Iwi, on the Marton-New Plymouth Line |
| <b>Persons on board:</b>                     | 1   |
| <b>Injuries:</b>                             | nil   |
| <b>Damage:</b>                               | nil   |
| <b>Operator:</b>                             | Tranz Rail Ltd (Tranz Rail)                   |
| <b>Investigator-in-charge:</b>               | P G Miskell                                   |

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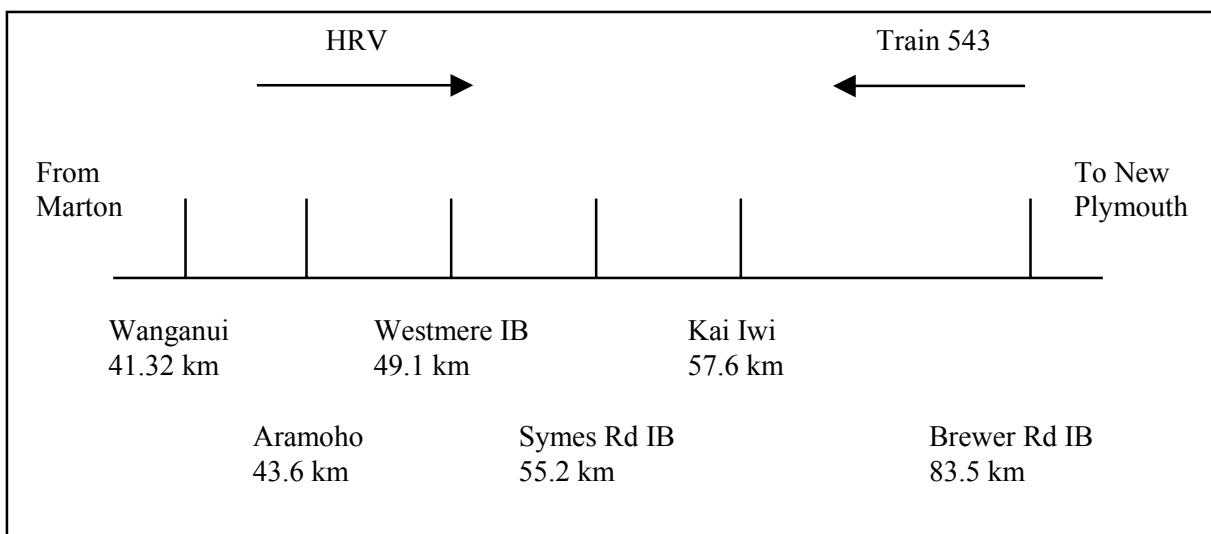
<sup>1</sup> Times in this report are New Zealand Daylight Time (UTC + 13 hours) and are expressed in the 24-hour mode.



# 1 Factual information

## 1.1 Narrative

- 1.1.1 On Monday 18 November 2002 at about 1045, a lubrication truck operator (driver) called train control and requested authority for his hi-rail vehicle (HRV) to travel from Wanganui to Symes Road Intermediate Board<sup>2</sup> (IB) on the Marton-New Plymouth Line (MNPL). The train controller authorised a 60-minute track occupation for the journey.
- 1.1.2 The HRV was a purpose-built Isuzu NKR truck used for the selective application of graphite grease lubricant to the gauge side<sup>3</sup> of the running rail. On this day the combination of lubricant and drizzle on the rail had reduced the traction of the HRV when the driver attempted to climb Westmere Bank, between Aramoho and Kai Iwi (see Figure 1).
- 1.1.3 After 3 attempts the driver gave up trying to negotiate the climb and instead reversed to Aramoho where he off-tracked the HRV at about 1130. He then advised the train controller that he was clear of the track at Aramoho.



**Figure 1**  
**Site plan of track section between Wanganui and Brewer Road**  
**(not to scale)**

- 1.1.4 At about 1145 the driver considered that the rail had dried sufficiently for him to make another attempt to reach Symes Road. He again contacted train control and was granted a 30-minute track occupation and instructed to be off and clear of the track at Symes Road IB by 1215 for the passage of Train 543, a Whareroa to Palmerston North express freight service.
- 1.1.5 However, near the crest of Westmere Bank the driver encountered light rain and the HRV again lost traction and its speed was reduced to about 2 km/h. At about 1210, the driver realised that he was again not going to reach Symes Road IB within the designated time<sup>4</sup>, so he off-tracked the HRV at Westmere IB, from where he advised the train controller and waited for Train 543 to pass.

<sup>2</sup> A notice board provided between stations to identify a location that may be used to designate the limit for the occupation of the mainline.

<sup>3</sup> The gauge side is the side of the railhead in contact with the flanged wheel of a rail service vehicle.

<sup>4</sup> The completion time agreed for the authorised movement.

- 1.1.6 At about 1246, after Train 543 passed, the driver requested and was given authority by the train controller for a further 60-minute track occupation to proceed from Westmere IB to Symes Road IB to continue with the rail lubrication. He concluded his communication with the train controller by saying that he would call from Symes Road by 1345.
- 1.1.7 At about 1339 the driver called the train controller from Brewer Road and requested further track time to continue on to Whareroa. The train controller advised the driver that he had overrun his track authority and instructed him to off-track his HRV where he was.
- 1.1.8 Train 544, a Palmerston North to Whareroa express freight service, was the next train into the section and was scheduled to arrive at Brewer Road at about 1635.

## **1.2 Site information**

- 1.2.1 Symes Road IB was located at 55.2 km MNPL, between Aramoho and Kai Iwi.
- 1.2.2 HRVs operating between Aramoho and Westmere IB were restricted to a maximum operating speed of 40 km/h because of the many tight-radius curves with non-standard transition lengths<sup>5</sup> and a constant 1 in 35 rising gradient between Aramoho and Westmere IB.

## **1.3 Operating system**

- 1.3.1 Track Warrant Control (TWC), which operated between Marton and Lepperton on the MNPL was an alternative to a signal system for trains operating on lines with low traffic density. TWC was a process for ensuring that one train or shunt service only had authority to occupy a particular section of track.
- 1.3.2 Although the HRV was operating within TWC territory, at the time of the incident there was no requirement for HRVs to operate with a track warrant<sup>6</sup>. The on-track movement of an HRV was governed by Tranz Rail Operating Rule 915 that stated in part:

### **915 Trolleys and Hi-Rail Vehicles - Requirements for On Track Movement**

#### **(a) Enquiries**

Every person in charge of a trolley, hi-rail vehicle, or group of such vehicles who proposes to on-track on the mainline, must personally advise Train Control of their:

- identity
- on tracking location
- off tracking location
- nature of work
- protection required
- time required for the work.

**NOTE: Metrages to have stations, sidings, intermediate boards, signals between used to positively identify the exact location.**

#### **(b) Authority**

Train Control will refer to train movements plotted on the diagram and, after taking account of requested on track time will either authorise the movement or will instruct that the movement must not take place.

**For any movement authorised, then the completion time agreed for track occupancy will become the designated time for the movement to be clear of the line.**

---

<sup>5</sup> The transition length is that section of curved track between the circular curve and the straight track.

<sup>6</sup> An authority issued by train control defining limits and other instructions for the occupation of the mainline.

Before the movement proceeds Train Control will give the employee in charge full information regarding the running of all trains and the presence of all other maintenance activity that may affect the safety of the movement.

Where a proposed movement of a trolley or hi-rail vehicle is to be of considerable duration, Train Control and the Person In Charge should agree when the next enquiry is to be made.

The movements of all hi-rail vehicles are to be recorded on the train control diagram.

- 1.3.3 Instructions for train controllers relating to HRV operation were contained in Rail Operating Code section 6 and stated in part:

#### **15.1.2 Pre Authorisation check and use of Train Control Diagram for Track Occupancy**

Before an occupation is authorised the Train Controller must establish positively whether any conflict exists with either existing occupations, track maintenance machinery or trains within any part of the area requested.

All movements and work authorised MUST establish by reference to these plot lines that:

- There is no conflict with a train or trains for any part of the area covered by the plot line which is about to be authorised.
- There is no conflict with occupations already in effect for any part of the area covered by the plot line which is about to be authorised.

Should a conflict with an existing occupation or track maintenance machine exist the caller must be advised so that the arrangements can be made to pass through the area concerned.

### **1.4 Training and certification for HRV operators**

- 1.4.1 The operator of a HRV must hold a current Tranz Rail Level C operating certificate that was attained by attending a 5-day general knowledge engineering course and demonstrating competency in:

- General Rules
- Signal Rules
- All forms of protection and Engineering Rules
- Radio communication
- Trolley and HRV operation.

The theoretical training was supported by a period of on-the-job training where trainees worked with licensed operators for a period of time to demonstrate competence over a range of field exercises.

### **1.5 Personnel**

#### **The train controller**

- 1.5.1 The train controller held certification on the MNPL desk for more than 10 years. His bi-annual theory audit and 6-monthly voice playback audit was held during May 2002, while his most recent desk audit was conducted on 14 and 15 October 2002.

- 1.5.2 When the train controller authorised the 60-minute track occupation for the HRV from Westmere IB to Symes Road IB, there were no conflicting movements.

### The HRV operator

- 1.5.3 The HRV operator had been an employee of Transfield Infrastructure Services Limited (Transfield)<sup>7</sup> since 23 March 2002. Prior to that he had more than 30 years track and structures experience with Tranz Rail and its predecessors.
- 1.5.4 The driver usually worked a 10-hour shift each day from Monday to Thursday. The incident occurred approximately 7 hours into the first day of his working week.
- 1.5.5 He had held Level C operating certificate endorsed with trolley/HRV licence since 1986. Although Tranz Rail was unable to provide evidence of his most recent bi-annual theory assessment, he successfully completed such a theory assessment soon after the incident.
- 1.5.6 Although he was an appointed ganger<sup>8</sup>, on 31 August 2002 he assumed full-time responsibility for rail lubrication on various lower North Island lines. His regular weekly rail lubrication schedule included:

| From             | To        | km  | Frequency/week | km  |
|------------------|-----------|-----|----------------|-----|
| Paraparaumu      | Hihitahi  | 230 | 2              | 460 |
| Marton           | Stratford | 161 | 1              | 161 |
| Palmerston North | Napier    | 180 | 1              | 180 |
| Upper Hutt       | Masterton | 58  | 1              | 58  |

Additional to the weekly schedule, the driver carried out monthly lubrication of the 300 km of rail from Napier to Gisborne and from Masterton to Woodville.

- 1.5.7 In August 2002, during the driver's 2-week on-the-job training for the operation of the lubrication truck, he had been accompanied by an experienced lubrication truck operator. The driver had previous route knowledge for most of the lines except for the Woodville-Gisborne and Wairarapa track sections. However, at the end of the training period he was comfortable with his route and technical knowledge and was considered capable of operating the HRV on his own. To assist him, the trainer gave him reference material on a line by line basis that identified:
- the location of stations and intermediate boards
  - the location of level crossings
  - the running time between stations
  - the appropriate radio channel for vehicle to train control voice communication.
- 1.5.8 The driver had previously experienced excessive wheel slip and stalling when attempting to ascend Westmere Bank during wet weather. So, when he was given authority initially for a 60-minute track occupation to travel from Wanganui to Symes Road IB, he had asked the train controller to take precautionary measures and put blocks<sup>9</sup> in place at the limits of his occupation in case he had to reverse back to Aramoho.

<sup>7</sup> Transfield were responsible for the inspection, maintenance and renewal of the rail infrastructure.

<sup>8</sup> The ganger was responsible for the maintenance of a defined length of track.

<sup>9</sup> A block allows the train controller to flag portions of the track as not usable.

## **1.6 On Track Time Tracker form**

- 1.6.1 In 1995 Tranz Rail modified a form used by an American railroad company and introduced the On Track Time Tracker forms (see Figure 2) that allowed HRV drivers to write down the time they had to be clear of the track as well as the limits of their track authority. The form was revised about 5 years later to its present format, with an additional requirement for the driver to record whether or not the train controller had activated the timer or applied blocking commands.

|  |                              |            |           |
|--|------------------------------|------------|-----------|
| <b>Tranz Rail</b>                                      |                              |            |           |
| <b>On Track Time Tracker</b>                           |                              |            |           |
| <u>Line</u>  | <u>Date</u>                  |            |           |
| <u>Between</u>   | <u>Stn</u>                   | <u>Stn</u> |           |
| <u>Metrage</u><br><u>From</u>                          | <u>km</u>                    | <u>To</u>  | <u>km</u> |
| <u>Time Now</u>  | <u>Clear By</u>              |            |           |
| <u>Timer Activated</u>                                 | <u>Block Command Entered</u> |            |           |
| <b>Other Information (Trains, HRV, Staff on track)</b> |                              |            |           |
| _____<br>_____<br>_____<br>_____<br>_____              |                              |            |           |
| <u>Signature</u>                                       |                              |            |           |

**Figure 2**  
**On Track Time Tracker Form**

- 1.6.2 The use of such forms was not mandatory and the driver said he did not use them, instead regularly using a small whiteboard to record the time, his current location, limits of his track authority and the next conflicting movement. The information he recorded on the whiteboard was similar to that required on the form. However, he had not used his whiteboard on this occasion.

## **1.7 Train Control voice log recording**

- 1.7.1 When Train 543 had passed, the driver called train control and told the controller that he was at Westmere and wanted authority to be on-track for one hour to get to Symes Road.

- 1.7.2 The train controller sounded surprised and repeated the driver's request. In questioning the driver, the train controller gave the name and metreage (49.1) of Westmere, but only the metreage of the terminating limit (55.2) when asking for confirmation that the driver needed one hour.
- 1.7.3 The driver confirmed that he would probably take less time but wanted the extra in case he got caught on greasy rail. In saying this, the driver did not mention the limits of the authority by either name or metreage.
- 1.7.4 The train controller confirmed the time as 1246 and that Train 543 had gone past before giving the driver authority until 1345 to proceed from 49.1 through to 55.2. The train controller did not mention the names of the limits.
- 1.7.5 Fifty-three minutes later, at 1339, the driver base-called Train Control and received acknowledgement. The driver told the train controller that he was at Brewer Road and asked how long he could have to get to Whareroa.
- 1.7.6 At this point the train controller asked the driver how he had got to Brewer Road when his authority was to Symes Road only. The driver had no explanation.

## **1.8 Another relevant occurrence investigated by the Commission**

### **Occurrence report 02-127, track warrant overrun, Waitotora, 17 November 2002**

- 1.8.1 On Sunday 17 November 2002, an express freight service overran its track warrant limit by about 1.5 km. While passing through Waitotora the locomotive engineer suddenly thought he was required to contact train control and report his progress, so he pressed the radio base call button that sent a train identifier signal to train control. At the same time he referred to his track warrant and saw that he was not required to make a call.
- 1.8.2 By the time the train controller responded to the radio base call the train had cleared Waitotora and the locomotive engineer explained that he thought he had a check call at Waitotora but had called in error. However, he confirmed that he had passed through Waitotora, at which point the train controller advised that the track warrant for his train was issued to Waitotora only. The locomotive engineer stopped his train, checked his warrant and found that the train controller was correct.
- 1.8.3 A contributing factor to the incident was the probability that the locomotive engineer had lost concentration and situational awareness, which supported a misperception as to the limits of the track warrant he held.
- 1.8.4 Included among the findings was:

by not referring to his track warrant when approaching Waitotora, the locomotive engineer deprived himself of an important visual cue for maintaining situational awareness.
- 1.8.5 Although the movement of the train was authorised by the train controller issuing a track warrant, the information recorded by the locomotive engineer on the track warrant and repeated back to the train controller was similar to that recorded on a On Track Time Tracker form by a HRV driver.

## **2 Analysis**

- 2.1 The safety of an HRV track occupation is dependent on the train controller providing complete, accurate information and the ability of the driver to understand and comply with the limits of the authority. An inherent risk of such occupation was the potential to overrun the limits of the authority by either time or distance. This risk was managed by having a range of defences available, understood and practised by both the driver and the train controller.
- 2.2 The first of these defences was the requirement for the driver to confirm the details of the track authority by repeating them back to the train controller. However, this defence only provided confirmation to the train controller that the driver could recall the limits of the authority. It gave no certainty that the driver would remember and comply with the track authority.
- 2.3 After Train 543 passed Westmere IB, the HRV driver anticipated an uninterrupted run to Whareroa to complete his schedule for the day. While he intended to ask for a 60-minute track occupation to Brewer Road IB, about halfway towards Whareroa, he inadvertently requested track occupation to Symes Road IB. His reference to Symes Road was likely to have been influenced by the events over the preceding hour when he had been focused on reaching Symes Road to off-track before 1215 for the arrival of Train 543. He probably experienced some anxiety as time slipped away and he was not making the necessary progress. This anxiety could have contributed to his preoccupation and fixation of thought on a specific outcome that prevented him from questioning his own actions.
- 2.4 Under normal operating conditions the driver would take about 12 minutes to travel the 6.1 km from Westmere IB to Symes Road IB and off-track his HRV. The train controller would have expected a request for a 30-minute track occupation to travel to Symes Road IB when allowing for required 15-minute buffer time.
- 2.5 From the train controller's voice tone on the audiotape it appeared that he thought the request for a 60-minute track occupation to travel such a short distance was unusual and probably excessive. Given the driver's response that he might make the trip more quickly, but also might get caught by the greasy areas as he had been previously, the train controller's acceptance of the explanation was appropriate, particularly as there was no opposing traffic to create any urgency. Although not required to by procedures, had the train controller asked why it required an hour to travel 6.1 km only, the driver may have realised that he had requested an incorrect limit.
- 2.6 When requesting track authority, the driver referred to the physical locations by name only, Westmere and Symes Road. The train controller used both name and metrage references for Westmere IB and metrage only, 55.2, for Symes Road. Using different terms to describe the same location required those involved in the communication to mentally translate from one description to the other in order to understand the message. However, even if the train controller had identified the requested outer limit as both Symes Road and 55.2 km, it was unlikely that the incident would have been avoided because of the driver's fixation with Symes Road rather than Brewer Road as a destination. At no time did the driver mention Brewer Road to the train controller.
- 2.7 The driver's intention to travel beyond Symes Road to Brewer Road was confirmed when he arrived at Brewer Road within the designated time and contacted the train controller. He identified his location then requested further track time to continue on to Whareroa before the arrival of Train 544. He was surprised when the train controller advised that his track authority was from Westmere to Symes Road only, as he thought he had requested Brewer Road.
- 2.8 Neither the driver nor the train controller fully followed the procedures laid down for authorisation of track occupancy. Had they done so, one or both may have realised the error.
- 2.9 A second defence was the opportunity for the driver to write the details of his track authority on the On Track Time Tracker form or his whiteboard before repeating the limits back to the train

controller. Had he done so, the discrepancy between where he wanted to go and where he actually requested may have been brought to his attention at that time. However, because the driver had not recorded details on either the form or his whiteboard, the second defence was not available to him leaving him totally reliant on his memory to maintain situational awareness.

- 2.10 The On Track Time Tracker forms were introduced specifically to reduce the risk of the driver of a HRV overrunning the limits of his track authority. The current completed form pertinent to the driver's activities at the time served as a ready reference with details of the track authority. Had the use of these forms been mandatory it was probable that this incident would not have occurred.
- 2.11 While the driver had been operating the lubrication truck for about 10 weeks before the incident, he had been driving HRVs since their introduction some 15 years previously. However, his route knowledge on the MNPL was limited and it was possible he had not understood the difference between Symes Road and Brewer Road even though he had reference material available listing available off-tracking locations.
- 2.12 The rail lubrication programme required the lubrication of at least 860 km of track per week or an average of 215 km per day for each of the driver's 10-hour shift. At an average speed of 30 km/h, this was equivalent to about 7 hours of on-track time each day. Any delays caused by mechanical failures, environmental issues such as wet rail on steep gradients, or late running trains were likely to contribute to further pressures to maintain the work programme and could elevate the driver's anxiety leading to a lapse in concentration unless all available defences were used.
- 2.13 The issuing of track warrants authorising HRV and train movements is intended to prevent the train controller authorising conflicting movements. The recording and repeating the conditions of the authority was designed to re-enforce a driver's knowledge of that authority. However there were no physical constraints or warnings to prevent an overrun should a driver forget the limits.

### **3 Findings**

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

- 3.1 HRV 64892 was operating under the authority of train control, in accordance with Tranz Rail's operating procedures. The track occupancy authority issued by the train controller to the driver of HRV 64892 was in accordance with the driver's request and did not conflict with any vehicle movements.
- 3.2 Inconsistent use of terminology to describe the same location created an opportunity for error.
- 3.3 Because the driver of the HRV did not record the limits of the track occupation on the On Track Time Tracker form or his whiteboard, he was solely reliant on his memory to maintain situational awareness.
- 3.4 The use of the On Track Time Tracker form was a valuable defence that may have prevented this incident, but at the time its use was not mandatory.
- 3.5 The HRV overrun of the track authority by 28.3 km did not conflict with any other train movement or track occupation.

## **4 Safety Actions**

4.1 On 9 December 2002 Transfield Services issued Toolbox Topic No.28 relating to track occupation, which stated in part:

As a result of many [track occupation] incidents it is now compulsory to write down the track occupancy information you receive from Train Control for all HRV movements and all work occupancies.

Any time you receive information from Train Control regarding working on the track or signalling that fouls the track it must be written down.

Writing down the information can be in a number of forms:

- On Track Timer Tracker pads
- Trial Track Occupancy Permit forms
- In your diary

Forms, pads should be kept for 1 month.

Repeating back exactly the written down information is mandatory.

Your acknowledgement to Train Control must include:

- Your location
- Your destination
- Time of occupancy
- Any other information.

When travelling by HRV you must also check your written information at each station as you approach and call on radio channel 1 advising the information you have recorded.

Advising Train Control that you are off and clear of the track closes the communication cycle and confirms the end of the track occupation.

If you are unable to clear the track by the [designated] time then you must contact Train control, or if you cannot contact Train Control then you must establish protection before the time elapses.

In view of this safety action, no safety recommendation regarding the mandatory recording of track occupancy detail has been made.

4.2 On 1 July 2003 Tranz Rail advised that enhanced Track Occupancy Procedures had been phased-in on the network from 17 March 2003 with implementation scheduled for completion early November 2003. These procedures essentially consisted of 4 specific categories:

- Protection by track warrant for HRV movements which included mandatory channel 1 calling of authority limits when approaching stations.
- Protection by signal blocking in centralised traffic control and double line automatic signal territory for HRV movements.
- Protection in single line automatic signal territory for HRV movements.
- Individual train protection for authorised personnel when fouling mainlines and interlocked areas when moving on foot, making minor maintenance corrections or driving close to railway lines in these areas.

From 17 March 2003, all HRV movements within TWC territory on the MNPL have been authorised by the train controller issuing a track warrant.

In view of the safety action no safety recommendation regarding the authorisation of HRV movement by track warrant has been made.

Approved for publication 29 January 2004

Hon W P Jeffries  
Chief Commissioner



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