Report 98-104

Train 928

derailment

near Purakanui

9 March 1998

Abstract

On Monday 9 March 1998 at about 2359 hours, nine wagons of Train 928, a northbound Dunedin to Christchurch express freight, derailed near Purakanui at low speed. The train continued for approximately four kilometres before a brake application alerted the locomotive engineer to the problem. The point of the derailment coincided with that of an almost identical derailment involving Train 928 on 3 March 1998. Safety issues identified were the ability of track staff to identify and understand track related factors contributing to derailments and to make timely and safe decisions as to the remedial track work required before reopening the track to traffic.

Transport Accident Investigation Commission

Rail Incident Report 98-104

Train type and number:	Express freight 928
Date and time:	9 March 1998, 2359 hours
Location:	363.849 km Main South Line near Purakanui
Type of occurrence:	Derailment
Persons on board:	Crew: 1
Injuries:	Nil
Damage:	700 broken sleepers over four kilometres of track Nine wagons damaged
Investigator-in-Charge:	R E Howe

1. Factual information

1.1 Narrative

1.1.1 On Monday 9 March 1998 Train 928, a rostered northbound Tranz Rail Limited (Tranz Rail) express freight, was operating between Dunedin and Christchurch.

1.1.2 The train consist was locomotives DFT 7008, DFT 7092 and 29 wagons with an all up weight of 1166 t and length of 484 m. It was crewed by a locomotive engineer (LE) and had departed Dunedin at 2335 hours.

1.1.3 The LE stated that at about 2359 hours, after passing through Purakanui, the train brakes came on and his train came to a halt. He assumed the brake application was due to a burst brake hose but on investigating found that nine wagons had derailed. The nineteenth wagon behind the locomotives was the first wagon derailed. The last two wagons were unaffected.

1.1.4 Later investigation showed the point of derailment (POD) of the first wagon to derail was at 363.849 km Main South Line (MSL). The train had continued derailed for nearly 4 km before coming to a halt, with the other eight wagons derailing in the intervening distance.

1.1.5 Following the initial derailment the train had passed through the 1300 m long Mihiwaka Tunnel before the brake application alerted the LE to the problem.

1.2 Track details

1.2.1 The track in the area of the derailment consisted of 50 kg/m rail in 38 m lengths fixed by Pandrol fastenings onto concrete sleepers. The track was laid in 1981 and had been resleepered with concrete sleepers in 1996. The rail and sleepers were in good condition.

1.2.2 The derailment occurred in the body of a nominal 150 m radius left hand curve. The wear on the side and top of the outside (high leg) rail was within allowable Tranz Rail code tolerances.

1.2.3 The fastenings in the area of the POD were tight but up to 75% of the plastic gauge plates on the outside rail were reduced in width due to lateral pressure on the curve. Some gauge widening had occurred because of this.

1.2.4 The crushed metal ballast in the area of the POD was dirty and poorly drained and the track showed signs of vertical movement (pumping). The ballast in the area was last cleaned in 1980. There was approximately 150 mm of ballast below the sleepers.

1.2.5 As a result of track damage caused by a derailment in December 1997, a temporary speed restriction of 25 km/h had been in force over the length from 360.5 km to 366.3 km MSL. This restriction was to be lifted at 1000 hours on 3 March 1998 but following a derailment at 0100 hours on 3 March (refer paragraph 1.6) the POD area was still under a 25 km/h restriction on 9 March.

1.3 Site details

1.3.1 The derailment occurred on a nominal upgrade of 1 in 50 in a cutting. The terrain was geographically stable but the faces of the cutting showed signs of fretting. The cess drains were partially blocked and did not allow free drainage of water from the ballast section.

1.3.2 A light mark across the top of the outside rail at the POD indicated that the flange of the initial derailing wheel had ridden up and mounted the rail head over a distance of 4.70 m, before dropping down on the outside of the curve.

1.4 Track geometry

1.4.1 Tolerances

1.4.1.1 Tranz Rail Code instruction P.45 and P.46 defined "Upper Limit" and "Lower Limit" maintenance tolerances for field measurements of track geometry.

- Track that was at or beyond the "Upper Limit" had to be corrected without delay unless appropriate speed restrictions were imposed
- Track that was between "Lower" and "Upper" limits had to be programmed for corrective action, in conjunction with the Track and Structures Manager (T & SM).

1.4.2 Alignment

1.4.2.1 Tranz Rail Code Instruction P.46 (Code P.46) stipulated tolerances for track alignment. For curves 400 m radius and sharper on speed category 4 lines[1], the upper and lower limits were $\pm$ 35 mm and $\pm$ 30 mm respectively, and related to the variation from the specified bend (versine) on a 10 m chord. The specified bend on a 10 m chord for a 150 m radius curve is 83 mm.

1.4.2.2 The versine measured in a standard track measure up following a derailment recorded offsets from a 20 m fixed chord. These were then converted by computer programme to a standard versine over a 10 m moving chord length from which any alignment irregularities were assessed.

1.4.2.3 The track measure up following the derailment translated to a maximum versine measurement over a 10 m chord of 116 mm (coinciding with a rail joint 15 m before the POD), a variation of + 33 mm from the specified bend of 83 mm.

1.4.2.4 The last EM80 track evaluation car run was on 4 February 1998. No excessive alignment variations were recorded in the area, although a cyclic pattern of alignment irregularities was evident in the trace. This pattern was confirmed by the post-derailment measure up.

1.4.3 Gauge

1.4.3.1 The specified gauge for a 150 m radius curve was 1074 mm. Code P.46 gave a lower limit of 1088 mm and an upper limit of 1094 mm.

1.4.3.2 The track measure up after the derailment showed gauge varying between 1078 mm and 1089 mm in the area 25 m either side of the POD.

1.4.3.3 The last EM80 run gave an exception report which showed a 1091 mm class 2 gauge exceedance at 363.841 km.

[1] Although the MSL was nominally a speed category 1 line, (Passenger 110 km/h, express freight 80 km/h, freight 55 km/h) the tight curvature in the Purakanui area necessitated a permanent 50 km/h maximum speed restriction. The semi-permanent 25 km/h speed restriction applied in December 1997 meant that for practical purposes the POD area could be assessed on speed category 4 (25 km/h) tolerances when reopening the track for immediate traffic at reduced speed.

1.4.4 Cant

1.4.4.1 The standard cant for a 150 m radius curve was 70 mm with a lower limit tolerance of ± 20 mm and an upper limit tolerance of ± 25 mm.

1.4.4.2 Following the derailment a cant of 83 mm was measured three metres before the POD. However the reading was taken with the track unloaded and no account was taken of the vertical movement of the track under dynamic load.

1.4.4.3 On Wednesday 11 March, track measurements were retaken under a train live load so that all voiding was eliminated. These measurements showed a maximum cant reading of 90 mm at three metres before the POD.

1.4.5 Twist

1.4.5.1 Track twist is the difference of the cant readings over a specified base, usually four metres. Four metres was traditionally based on the wheel base of a four wheel wagon, but has been accepted as the standard applying to all vehicles. The twist measurement is the amount that the riding surface of one of the wheels on a set of four is out of the plane of the other three and is an indication of the amount that has to be absorbed by the springing system. Springing systems are essentially stiff and because they cannot react rapidly to sudden changes in cant, upper and lower limits are applied to the change of cant.

1.4.5.2 For a speed category 4 line, Tranz Rail Code P.46 set twist lower limits at ± 20 mm and upper limits at ± 25 mm. A footnote to the Code read:

> Twist : To be measured in conjunction with cant. Allow for voiding.
> Tolerances for cant must not be exceeded.

1.4.5.3 In addition to Code P.46 requirements, Tranz Rail's Code Supplement CSP/36 provided exceedance limits for twists as measured by the EM80 track evaluation car. The exceedances as detected by the track evaluation car are measured under dynamic loading with all voids and likely track movement under load taken into account. The twist limits for the various classes of line are set out below:

					Twist Limits	
speed category	**passenger**	**ex. freight**	**freight**	**Class 2**	**Class 1**	**Class 1****
1	110 km/h	80 km/h	55 km/h	16 mm	18 mm	24 mm
2	80 km/h	75 km/h	55 km/h	17 mm	19 mm	24 mm
3	40 km/h	40 km/h	40 km/h	18 mm	21 mm	26 mm
4	25 km/h	25 km/h	25 km/h	18 mm	21 mm	26 mm
5		less than 25 km/h		20 mm	24 mm	28 mm

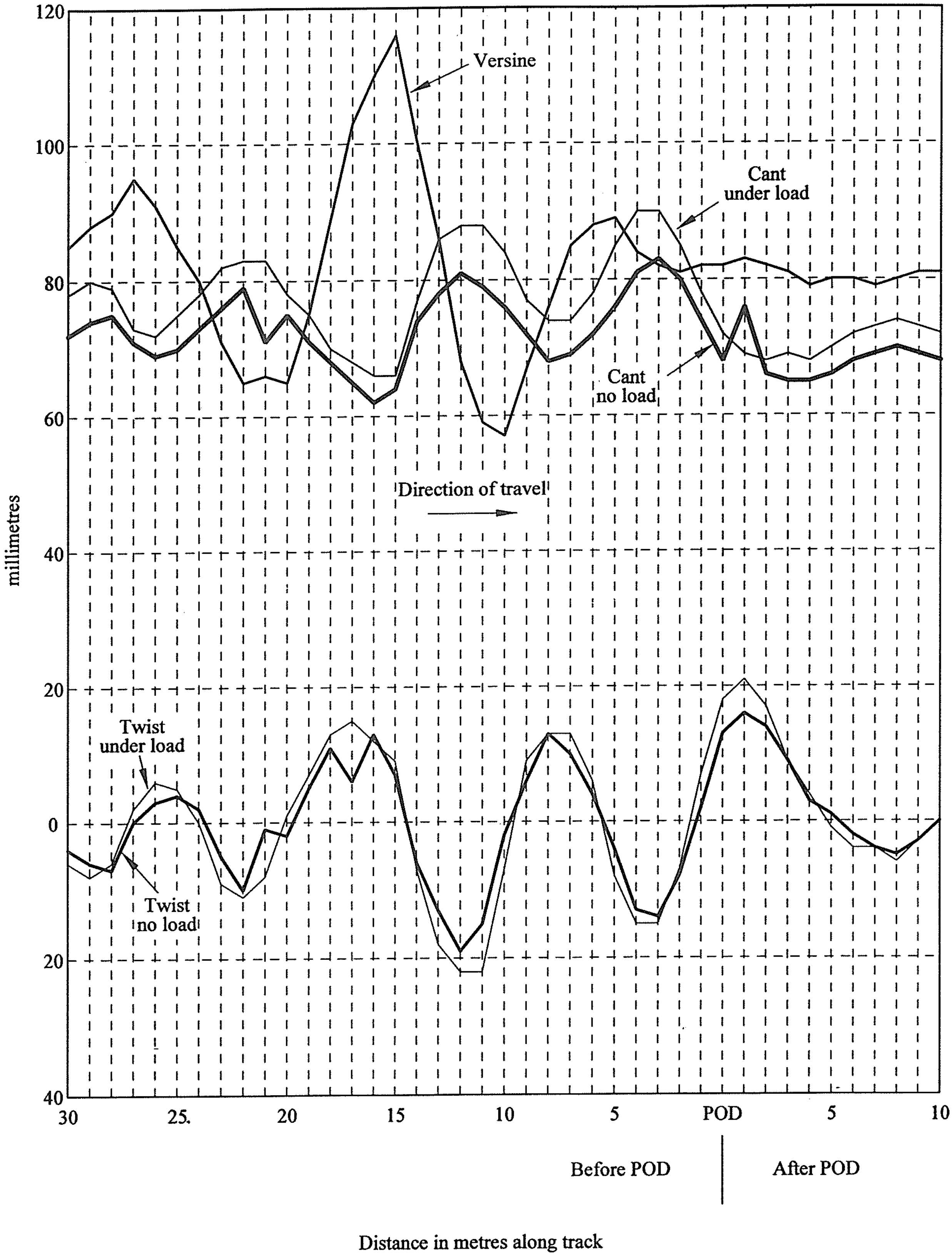

Figure 1
Track measurements taken following the derailment

Tranz Rail's Operations Code P.91, required that Class 1** priority exceedances be fixed "immediately", and if not fixed consideration given to imposing a Temporary Speed Restriction (TSR) within 24 hours. Class 1 exceedances were required to be fixed within four weeks with a similar consideration given to imposing a TSR if not fixed within that time. For Class 2 exceedances the required action to be taken was "T & SM to evaluate and forward supplementary list to ganger at a later stage, directing action to be taken".

1.4.5.4 The track measurements taken after the derailment recorded a maximum twist of 19 mm at 12 m before the derailment.

1.4.5.5 With the track remeasured under live load so that all voiding was taken out the maximum twist recorded was 22 mm at 12 m before the POD with a reading of 21 mm at one metre past the POD.

1.4.5.6 The EM80 track evaluation car output on 4 February recorded a Class 1 priority twist exceedance of 23 mm between 363.826 and 363.837 km.

1.4.5.7 The twist exceedances measured after the derailment showed a cyclic pattern just prior to the POD with peaks occurring at approximately 8 m centres (refer Figure 1).

1.5 Rolling stock

1.5.1 The most severely damaged wagon following the derailment was PK3294, the leading derailed wagon. Damage to running gear was consistent with this being the first wagon to derail. PK3294 was inspected for any out of tolerance following the derailment.

1.5.2 Friction wedges on the bogie bolster were noted as being worn but "OK". Float clearances were between 2 mm and 3 mm. The wear to bogie/horn liners was not measured but the Mechanical Field Services Manager (MFSM) stated that there were no visual signs of any abnormality. The wheelsets were new.

1.5.3 The wheel on the leading axle had moved out on its axle to give a back to back measurement of 1010 mm and on the adjoining axle some slight movement was noticeable. The standard distance was 998 mm. On closer examination of the axles it was noted that the movement of the wheel had revealed bright steel on the axle.

1.5.4 Historical tests taken on bogie wagons of this type had showed a natural period of oscillation about a vertical axis of approximately one second.

1.5.5 The locomotive event recorder was extracted following the derailment.

1.6 Derailment on 3 March 1998

1.6.1 On Tuesday 3 March 1998, at approximately 0100 hours, wagon PK2174 on Train 928 derailed within 200 mm of the same POD as the 9 March derailment. The event recorder was extracted following the derailment and showed a speed of 25 km/h at the POD.

1.6.2 The LE of Train 928 on 3 March 1998 stated that he noted a small leak in the air system shortly after leaving Sawyers Bay (368.5 km) and intended to correct it at Waitati. Just before reaching Waitati (352.5 km) however, all air was lost and on investigation the LE found that the leading bogie of wagon PK2174 was derailed.

1.6.3 Immediately following this derailment, a track measure up was carried out in the area of the POD as part of the standard Tranz Rail investigation procedures to establish the cause of main line derailments. The Dunedin area computer was being updated and not able to run a derailment analysis programme and the basic information was faxed to Wellington head office on 3 March for analysis. The full analysis from Wellington was received back in Dunedin on 10 March.

1.6.4 The track measurements recorded the same "peak" in the alignment at the joint 15 m before the POD, which was present following the 9 March derailment. Twists of 18 mm and 16 mm were measured at 12 m and 11 m before the POD respectively. The twist readings taken did not take into account any voiding that was present.

1.6.5 Wagon PK2174 was examined at Waitati by the MFSM immediately following the derailment. The only abnormality noted was widening of the wheel gauge on each of the axles of the derailed bogie. The leading wheel gauge had widened to 1006 mm and the trailing to 1008 mm. The standard dimension was 998 mm. The MFSM stated that the marks on the axle indicated that the movement may have occurred some time prior to the derailment. However, on subsequent checking of the marks left by the derailed wheels on the sleepers after the POD, the MFSM stated that these coincided with a wheel gauge of 998 mm and it was concluded that the wheel had moved as a result of the derailment.

1.6.6 The track geometry in the area of the POD was untouched following the derailment. The acting T & SM stated that while he was aware of a track twist in the area he "didn't think it was of such a magnitude on its own to cause the derailment". He also considered that with a 25 km/h speed restriction in place the track would be safe. Track staff at the site at the time of the measure up were advised of the moved wheel on the derailed wagon, but were not made aware that this possible cause had been eliminated shortly thereafter.

1.7 Personnel

1.7.1 Length ganger

1.7.1.1 The length ganger had almost 20 years rail experience, starting in a relay gang and then transferring to the line gang based on Waitati. For the last eight years he had been the ganger at Waitati. His area of track responsibility extended from 315 km (Palmerston) to 375 km (Ravensbourne), a total length of 60 km.

1.7.1.2 Prior to the derailments, his gang had been involved in correcting the track exceedances that had been recorded by the EM80 track recording car run of 4 February 1998. They had completed all of the Class 1** exceedances and were working through the section from Palmerston correcting all the Class 1 exceedances. They had reached the area just north of the POD when the derailment of 2 March occurred.

1.7.1.3 On examining the track after the 3 March derailment, the ganger stated that he checked about 10 m either side of the POD but did not find any "major fault" in the track that would have caused the derailment. He stated that at the time he was led to believe by the MFSM that the derailment was caused by a wagon defect.

1.7.1.4 The ganger was aware of the Class 1 EM80 track exceedances in the area of the derailment and stated that while they were of concern, they were not right at the POD and therefore "not of major concern to do with the derailment". He stated that they were led to believe the derailment was due to a wagon defect, "so we worked on that basis".

1.7.1.5 After the second derailment on 9 March at the same location, the ganger stated that while he looked over the track in more detail he was still not aware of "the mixture of things that could have been wrong". The EM80 faults were nevertheless corrected.

1.7.2 Acting Track and Structures Manager

1.7.2.1 At the time of the first derailment on 3 March, the position of the T & SM was filled in an acting capacity by the Line Inspector. He had started with New Zealand Railways in 1970 as a drafting cadet, progressing to Senior Engineering Officer, Senior Engineer and for the last four years as Line Inspector. All of his time had been spent in Dunedin. He had been acting as the T & SM since 10 February 1998. He stated he had limited experience of derailments, but had attended two previous derailment during his acting period. One of these was caused by an overheated axle and the second was a track buckle investigated by the Commission (Report 98-102).

1.7.2.2 On Monday 2 March he had retired at his normal time (about midnight) and was called out at about 0100 hours following an hours sleep.

1.7.2.3 He drove directly to the site where he and the ganger inspected the area and identified the POD. Cant and gauge measurements were taken. He understood the track alignment in the vicinity of the POD had been affected by some spot resleepering work carried out following the December 1997 derailment. He stated he did not consider the combination of readings he took at the POD and his visual appreciation indicated a track related derailment. He considered the track would be safe with the 25 km/h TSR that was already in place and did not arrange for any track adjustment at the POD.

1.7.2.4 Derailment damage was heavy and he stated his prime concern had been to organise and achieve the necessary repairs to allow the line to be reopened. This was achieved at approximately 1100 hours on 3 March.

1.7.2.5 He also examined the detailed track measure up on the afternoon of 3 March and while acknowledging there was a twist fault, "did not think it was of such a magnitude on its own to cause the derailment". There was no communication between Tranz Rail Head Office in Wellington and the Dunedin Office on any interpretation of the alignment track measurements taken at the POD following the 3 March derailment.

1.7.2.6 The acting T & SM stated that he considered in hindsight that his judgement was "a bit wrong" in determining that the track at the POD would be safe to reopen with a 25 km/h TSR, and that his tiredness and his knowledge of a possible wagon defect may have contributed to this.

1.7.2.7 He stated he was in good health and under no personal or work related stress that would have affected his work performance. His work and recreational patterns were normal in the days preceding 3 March.

1.7.3 Track and Structures Manager

1.7.3.1 The T & SM had 25 years rail experience in various track gang positions in a number of locations with the last seven years in Dunedin as T & SM (or equivalent). His area included all main line and branch track south of Temuka, and covered approximately 600 km. He resumed his position from annual leave on Monday 9 March.

1.7.3.2 On examining the area following the derailment on 9 March, the T & SM stated that in his opinion there were track irregularities at the POD that would have contributed to the derailment. Using a track gauge he ascertained there was a twist in the track and arranged for corrective measures to be carried out at the POD before opening the track.

1.7.3.3 The T & SM stated that irrespective of what part a track exceedance may have contributed to a derailment, it was his practice to remove the track exceedance component after the measure up.

1.7.4 Acting Area Manager

1.7.4.1 The Acting Area Manager at the time of both derailments was a Senior Engineering Officer who had been acting since 19 January 1998. The officer joined New Zealand Railways in 1977 as a drafting cadet and had advanced through to Engineering Officer and Senior Engineering Officer. He had previously acted as T & SM in Dunedin on a number of occasions.

2. Analysis

2.1 General

2.1.1 A derailment to the outside rail of a tight curve occurs when the flange of a wheel is no longer guided by the running edge of the rail on which it is running. This can happen due to one or more of a variety of defects in both vehicle and track. Tolerances are therefore established for both vehicles and track parameters to ensure that any variations from standard do not allow separation of the wheel from the rail. Derailments can be attributed to a single factor or to a combination of factors. Derailments can also result from the dynamic interaction of variations in both rolling stock and track, even when each variation is within allowable limits.

2.1.2 Comparison of the EM80 recording car output and the track geometry details following the derailments of 3 March and 9 March showed the track geometry was substantially unchanged over this five week period.

2.1.3 Analysis of the event recorder output for the 9 March derailment showed a speed of 25 km/h, similar to that of the 3 March derailment.

2.2 Track alignment

2.2.1 The "peaky" rail joint at 15 m before the POD was a significant alignment exceedance. The standard versine (or bend) over a 10 m chord for a 150 m radius curve was 83 mm with an upper limit tolerance of $\pm$ 35 mm. The measured versine was 116 mm and therefore only 2 mm inside the upper limit. The effect of a "peaky" joint is to induce a sideways lurch onto a vehicle and create uneven loadings on the wheels.

2.2.2 Although the misalignment would have been obvious to an experienced eye on site, it would not have been immediately evident from remote examination of the initial track measure up following the derailment. The site procedure was based on measuring versines from a fixed 20 m chord. These were then converted to a standard moving 10 m chord equivalent using a computer programme.

2.2.3 The sharpest alignment "peak" (least radius) coincided with a minimum cant reading. At a point where the instantaneous track radius was reduced, the cant should have increased to assist even loading on the wagon wheels, but the reverse was the case. This would have had the effect of intensifying any lurch in the wagon as it traversed this point.

2.2.4 In addition to the one maximum alignment variation, there was a cycle of lesser misalignments prior to the POD.

2.3 Track gauge

2.3.1 The variation in the track gauge in the area of the derailment (1078 to 1089 mm) was within the upper level tolerances of the required gauge for track laid on a 150 m radius curve.

2.3.2 Even under the dynamic loading of the EM80 track evaluation car on its run on 4 February, the 1091 mm class 2 gauge exceedance recorded in the area was not outside Tranz Rail's upper limit.

2.4 Track cant

2.4.1 The maximum cant of 90 mm allowing for voiding under the sleeper, was 5 mm below the defined upper limit. In isolation this would not normally create a potential derailment hazard unless associated with a significant twist.

2.5 Track twist

2.5.1 The maximum twist of 22 mm at 12 m before the POD was 3 mm under the code upper limit.

2.5.2 The presence of the twist was detected during the 4 February EM80 track recording car run which recorded a 23 mm twist between 363.826 km and 363.837 km as a Class 1 exception.

2.5.3 The 25 km/h TSR in force over the area at the time of the derailment did not significantly reduce the potential consequence of such a twist.

2.6 Cyclic interaction

2.6.1 Figure 1 shows the track measure up in graphical form and illustrates the cyclic nature of the twist and alignment readings just prior to the POD.

2.6.2 At a train speed of 25 km/h (7 m/sec), the distance between each twist cycle (approximately 8.5 m) represents 1.2 seconds. This time is very close to the 1 second natural oscillation period of a loaded bogie wagon and the series of cyclic twists encountered would have emphasised any rolling action set up in the wagons.

2.6.3 There was also a similar, although not so pronounced, cyclic variation in the track alignment prior to the POD. Apart from the major "peak" in the alignment 15 m before the POD, there were cyclic variations at approximately 10 m intervals and generally in synchronisation with the twist peaks. This would have accentuated any rolling action.

2.7 Interpretation of track measure up

2.7.1 Gauge and cant are measured directly by track staff and results can be quickly assessed, with due allowance for possible movement under load. The measurement and interpretation of alignment is not so direct. Although individual alignment peaks can be obvious to the eye, cyclic alignment variations may only become apparent when field measurements are translated to the 10 m moving chord base. The late return of the reformatted field measurements to the Dunedin office resulted in a lack of information which could have assisted them to appreciate the significance of cyclic exceedances.

2.7.2 The track evaluation car output trace from the 4 February run would have indicated the cyclic nature of line and twist. There was no indication that local staff had referred to this trace following the 3 March derailment.

2.7.3 There appeared to be no special circumstances to explain the lack of appreciation and effective action with respect to the track faults which contributed to the derailment. The T & SM's stated tiredness is understandable considering the call-out circumstances. However such call-outs are not uncommon for track staff and are an expected part of railway operations.

2.7.4 Tranz Rail advised that it considered individual lapses were responsible for the failure to remove track exceedances before and around the POD before reopening the track. Tranz Rail considered all staff involved to be technically competent. The circumstances revealed by the Commission's investigation did not fully support Tranz Rail's contention in relation to this incident.

2.8 Wagons

2.8.1 During investigation of the 3 March derailment the 10 mm movement of the wheel on the axle of wagon PK2174 was initially considered by Tranz Rail to be a long standing displacement because of the dullness of the metal that had been exposed on the axle. The apparent refuting of this by assessment of the derailment marks on the sleepers after the POD left a doubt as to the possible influence of the wagon on this derailment. However the circumstances of the 9 March derailment indicate the wagon was unlikely to have been a factor in the 3 March derailment.

2.8.2 The movement of the wheels on the leading bogie of wagon PK3294 was clearly established as a result of the derailment because of the brightness of metal that was exposed and no such doubt exists in relation to the derailment of 9 March.

2.8.3 Although it is considered a loose wheel was unlikely to have contributed to either derailment the number of loose wheels after the derailments is unusual, notwithstanding the distance run derailed in each case. While not directly related to the incident under investigation it would be desirable for Tranz Rail to satisfy themselves as to the validity of the procedures used in the assembly of these wheelsets.

2.9 Passenger services

2.9.1 Passenger trains are regularly scheduled over this section of the MSL. Although the possibility of a locomotive or passenger carriage derailment was very low due to their superior suspension and springing characteristics any deterioration in track condition following the derailment which occurred on 3 March could have lowered this safety factor.

2.10 Proximity of tunnel

2.10.1 It was significant that the derailment resulted in derailed wagons being hauled through the Mihiwaka Tunnel. Tunnel clearances are minimal and the potential existed for more serious consequences to this incident had any derailed vehicles fouled the tunnel entrance.

3. Findings

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

3.1 Train 928 on 9 March 1998 was being operated normally prior to the incident.

3.2 The track conditions resulting from the earlier derailment damage of December 1997 and requiring a 25 km/h TSR over the area did not contribute to the derailment.

3.3 The likely cause of the derailment was dynamic interaction between vehicle and track as a result of a combination of cyclic track tolerance exceedances in alignment and twist.

3.4 The underlying cause of the derailment on 9 March 1998 was the failure to correctly interpret and action the derailment of 3 March.

3.5 Local track staff had sufficient evidence available to indicate that the track geometry should have been improved immediately following the 3 March derailment.

3.6 The ability to fully appreciate the cyclic nature of the track geometry exceedances was delayed by not having the appropriate computer programme available in the area.

3.7 Track staff displayed a lack of experience in understanding the possible consequences of the known interaction of cyclic track exceedances on vehicle ride, and in taking the appropriate corrective action.

3.8 The high incidence of wheel movement on the two wagons initially derailed raises some doubt as to the appropriate fitting of the wheels to the axles.

4. Safety Recommendations

4.1 On 16 June 1998 it was recommended to the Managing Director of Tranz Rail that he :

4.1.1 Review the training, knowledge, and experience of Track and Structures Managers, Gangers, and those required to act in such positions, in respect to their ability to identify and understand the track related factors contributing to derailments and to make timely and safe decisions regarding the track geometry improvement required, and speed to be applied, before the track is reopened for traffic, (037/98); and

4.1.2 Ensure systems are in place to assess the competency of any appointed or acting Track and Structures Manager or Ganger who make such decisions, (038/98); and

4.1.3 Ensure that any necessary track geometry improvements required following derailments which show obvious signs of likely track related factors are carried out based on an understanding of the detailed site measurements taken following the derailment and take appropriate account of the latest track evaluation car data available. (039/98)

4.2 On 17 July the Managing Director of Tranz Rail responded as follows:

4.2.1 **037/98 and 038/98**
Tranz Rail intends to review its current process to ensure that any improvement opportunities are realised.

4.2.2 **039/98**
As part of our ongoing track-related training, the issues raised in the recommendation will be included.

Approved for publication 5 August 1998

Hon. W P Jeffries
Chief Commissioner