



Rail Accident Investigation Branch

Rail Accident Report



Collision between a road-rail vehicle and a trolley near Brading, Isle of Wight 22 November 2023

Report 12/2024
October 2024

This investigation was carried out in accordance with:

- the Railway Safety Directive 2004/49/EC
- the Railways and Transport Safety Act 2003
- the Railways (Accident Investigation and Reporting) Regulations 2005.

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Preface

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In some cases factors are described as 'underlying'. Such factors are also relevant to the causation of the accident or incident but are associated with the underlying management arrangements or organisational issues (such as working culture). Where necessary, words such as 'probable' or 'possible' can also be used to qualify 'underlying factor'.

Use of the word 'probable' means that, although it is considered highly likely that the factor applied, some small element of uncertainty remains. Use of the word 'possible' means that, although there is some evidence that supports this factor, there remains a more significant degree of uncertainty.

An 'observation' is a safety issue discovered as part of the investigation that is not considered to be causal or underlying to the accident or incident being investigated, but does deserve scrutiny because of a perceived potential for safety learning.

The above terms are intended to assist readers' interpretation of the report, and to provide suitable explanations where uncertainty remains. The report should therefore be interpreted as the view of RAIB, expressed with the sole purpose of improving railway safety.

Any information about casualties is based on figures provided to RAIB from various sources. Considerations of personal privacy may mean that not all of the actual effects of the event are recorded in the report. RAIB recognises that sudden unexpected events can have both short- and long-term consequences for the physical and/or mental health of people who were involved, both directly and indirectly, in what happened.

RAIB's investigation (including its scope, methods, conclusions and recommendations) is independent of any inquest or fatal accident inquiry, and all other investigations, including those carried out by the safety authority, police or railway industry.

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Collision between a road-rail vehicle and a trolley near Brading, Isle of Wight, 22 November 2023

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Summary

At around 01:50 on Wednesday 22 November 2023, a road-rail vehicle, travelling in a work site, collided with a hand trolley being used by a work group on the Isle of Wight's Island Line. The road-rail vehicle was being used to clear vegetation and was travelling between its work locations when the collision occurred.

The road-rail vehicle was approaching the work group, who were repairing the track, on a descending gradient and was unable to stop before their site of work. When members of the work group realised that the road-rail vehicle was not stopping, they removed tools and equipment from the trolley and lifted it off the track. However, once removed, the trolley was inadvertently left too close to the track and remained foul of the road-rail vehicle's path. The road-rail vehicle then collided with the hand trolley.

As a result of the collision, the trolley struck two members of the track repair work group on the legs, pushing them into bushes beside the track. Both received minor injuries, attended hospital independently later that day and were then discharged. The collision was caused because the controller of site safety responsible for the track work group had not been informed of the road-rail vehicle's movement before it approached, and because the road-rail vehicle was unable to stop in the expected distance once the machine operator realised the work group was ahead.

Two underlying factors were that South Western Railway, the infrastructure manager for the track on the Island Line, did not have an effective process for planning and managing the risk of on-track plant movements, or for managing low adhesion risk for maintenance activities. A third underlying factor was that South Western Railway's assurance processes had not identified informal working arrangements in possessions.

Since the accident, South Western Railway has updated its risk assessment for machine movements and introduced new control measures to specifically manage the risks of conflicting sites of work within work sites and possessions. It has also addressed the deficiencies found within its assurance process for monitoring how possessions are managed.

As a result of the investigation, RAIB has made three recommendations, all addressed to South Western Railway. The first is to review how it manages safety during infrastructure work on the Island Line. The second is to review its assurance processes and the third is to provide its infrastructure maintenance staff and contractors with accurate information about its infrastructure.

Additionally, three learning points have been identified. The first reinforces the importance of transport undertakings and on-track plant operators applying industry codes of practice in the event of an accident or incident involving on-track plant. The second concerns the importance of promptly reporting notifiable accidents to RAIB, and the third the importance of well-established process and procedure for dealing with post-accident or incident evidence collection and testing.

Introduction

Definitions

- 1 Metric units are used in this report, except when it is normal railway practice to give speeds and locations in imperial units. Where appropriate the equivalent metric value is also given.
- 2 The report contains abbreviations and acronyms, which are explained in appendix A. Sources of evidence used in the investigation are listed in appendix B.

The accident

Summary of the accident

- 3 At around 01:50 on Wednesday 22 November 2023, a road-rail vehicle (RRV) weighing approximately 30 tonnes collided with a hand trolley between Smallbrook Junction and Brading on the Isle of Wight's Island Line (figure 1).
- 4 At the time of the accident, the Island Line was under possession and closed to normal rail services. The possession occurred during the 5th week of a 6-week major maintenance programme which saw overnight working involving additional track maintenance staff contracted in as well as the normally employed workforce, and equipment brought over from the mainland. The hand trolley was being used by a track repair work group to transport tools and equipment.
- 5 The collision occurred on a descending gradient. The RRV's machine operator (MO) saw the stationary hand trolley and intended to stop their vehicle a short distance from it to allow members of a track repair work group to lift the trolley off the track. However, when the MO attempted to slow the RRV, its rail wheels stopped rotating and started to slide. The RRV's speed did not immediately reduce so the MO sounded the horn to give a warning. The MO and machine controller (MC), who was travelling in the rear of the RRV cab, repeatedly shouted a warning to the work group ahead of them.
- 6 When the members of the work group realised that the RRV was not stopping, they quickly removed tools and equipment from the trolley and lifted it off the track. They then put the trolley down close to the track.
- 7 As the RRV passed at low speed, its leading right-hand rubber tyre struck a corner of the trolley, causing it to spin round. The trolley struck two members of the track repair work group on the legs. They were pushed into adjacent bushes, either after being directly struck or struck by the other person, with the trolley then landing on one person's legs. An ambulance was not required, but both staff members involved independently attended hospital later on 22 November after returning to the mainland. One person was diagnosed with a muscle injury to the upper back and soft tissue injury to the legs. The other was diagnosed with a minor head injury. Both were discharged the same day.
- 8 Neither the RRV nor the hand trolley were damaged in the accident. Witness evidence indicates that the RRV eventually stopped around 100 metres beyond the point of collision.



Figure 1: Extract from Ordnance Survey map showing location of accident near Brading.

Context

Location

- 9 The Island Line is a standard gauge railway that runs for 8 miles 31 chains (13.5 km) between Ryde Pier Head and Shanklin on the eastern side of the Isle of Wight. There are six intermediate stations (figure 2).
- 10 The accident occurred at 3 miles 37 chains (from a reference point at Ryde Pier Head station), on the line between Smallbrook Junction and Brading. On the Island Line, small metal plates are attached to some sleepers showing the location in miles and chains. There are 80 chains in a mile; each chain is 22 yards (20 metres). The single-track approach to this location, when travelling in the down direction towards Shanklin, is a left-hand curve with a falling gradient of 1 in 78.

Organisations involved

- 11 Network Rail is the owner of the Island Line's infrastructure and maintains its structures (such as bridges) and signalling. It is not responsible for maintaining the track or stations which are leased to South Western Railway (SWR).
- 12 SWR is a train operating company which operates rail services between London and the South/South-West of England. It is also the train operating company for the Island Line and infrastructure manager for its stations and track. It holds a lease to operate, maintain and renew Island Line infrastructure from Network Rail. It was the employer of the person in charge of possession (PICOP), the engineering supervisor (ES) in charge of the work site, and the controller of site safety (COSS) involved in the accident.

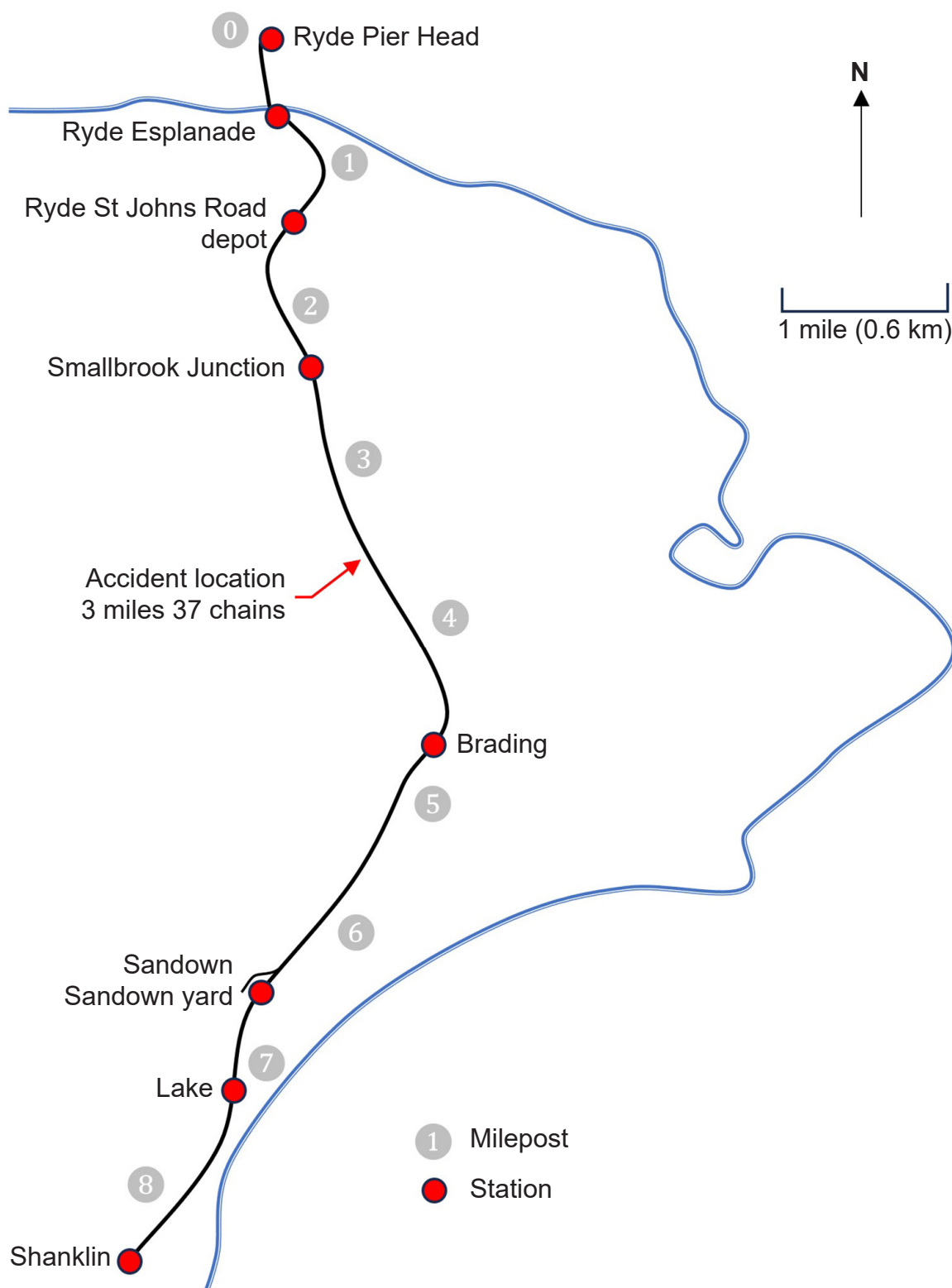


Figure 2: Simplified diagram showing Island Line route.

- 13 Sonic Rail Services (SRS) was the contracted supplier of the RRV and employer of the MO and MC.
- 14 SGC Rail Solutions Ltd (SGC) was the contracted agency supplying track maintenance staff, including those who were struck by the trolley. The Companies House website states that SGC Rail Solutions is now in liquidation.
- 15 These organisations freely co-operated with the investigation.

Rail vehicles involved

- 16 The RRV is equipped with rubber tyres and rail wheels and has a gross vehicle weight of 30.16 tonnes (figure 3). It is a Type 9A machine with its rail wheels powered by a hydrostatic drive, with three forward gears and a hydrostatic brake. It has a 20 mph (32 km/h) maximum permitted travelling speed on plain line track with an audible in-cab alarm if the maximum speed is exceeded. The machine is also fitted with a passive speed restrictor which removes drive power when this audible alarm sounds until the speed reduces. The machine is fitted with a data logger, although this does not record the speed of the vehicle. At the time of the accident, the machine was not fitted with a global positioning system (GPS) to record its location or a closed-circuit television (CCTV) system.



Figure 3: Road-rail vehicle used on 21 to 22 November (courtesy of Sonic Rail Services).

- 17 At the time of the accident, the RRV had no recorded defects. It subsequently passed a static brake test in the hours following the accident and passed a post-accident dynamic brake test on a later date (see paragraph 96). It was one of two similar machines which had been in use on the Island Line for 5 weeks preceding the accident as part of the major maintenance programme. The RRV was being operated with an on-track plant Engineering Conformance Certificate issued in 2018 and valid for 7 years. This certificate was issued in accordance with RIS-1530-PLT, 'Rail Industry Standard for Technical Requirements of On-Track Plant and Associated Equipment', issue 6 dated December 2015, which was in force when the certificate was issued.

- 18 The hand trolley, which was struck by the RRV, weighs 50 kg unloaded and has a carrying capacity of 1000 kg (figure 4). It had red lights affixed front and back as required by GERT8000 (the Rule Book) HB10, 'Duties of the COSS or SWL [safe work leader] and person in charge when using a hand trolley', issue 4.1, dated November 2022.
- 19 Before the accident, the hand trolley was being used to carry hand-tools, jacks, petrol-driven hand-tamping machines and fuel cans.



Figure 4: Hand trolley used on 21 to 22 November 2023.

Rail systems involved

- 20 The Island Line is a single-track railway, except for a 1.6 mile (2.5 km) section of double-track between Ryde Esplanade and Smallbrook Junction. Passing loops are provided at Brading and Sandown stations. The line is electrified via a 750 V DC third rail system, controlled from Eastleigh electrical control room. The line is signalled using colour light signalling which is controlled from Ryde St Johns signal box.
- 21 The accident occurred on the Brading single line which has a permanent speed limit for trains of 45 mph (72 km/h), reducing to 40 mph (65 km/h) just south of the point of collision. In this area, the track is curved and constructed from flat-bottom rail on timber sleepers (figure 5).

Staff involved

- 22 SWR employs a core team of seven infrastructure maintenance staff on the Island Line. Most members of this team are trained to undertake ES and COSS duties and had worked only, or mainly, on the Island Line infrastructure.



Figure 5: Location of accident looking north. The RRV approached from this direction.

- 23 The safe work pack (SWP) for the track repair work on 21 to 22 November 2023 was prepared and signed by the SWR route section manager who had overall responsibility for Island Line maintenance activities.
- 24 The ES for the work site had over 10 years' experience on the Island Line. They had taken over from a different ES part-way through the maintenance programme.
- 25 The track repair work group was led by a COSS who had 4 years' experience and was also qualified as an ES, regularly undertaking these duties. The track repair being undertaken comprised two tasks. These consisted of a group of two staff measuring and identifying where track needed to be lifted, and another larger group following in close proximity making the remedial repairs.
- 26 The track repair work group included a site supervisor, who had over 30 years' experience on the mainland and on the Island Line as a track worker and supervisor. The site supervisor had signed the SWP as the planner and was working with another member of infrastructure maintenance staff to measure the track geometry. Both were employed by SWR. The track repair work group also included four experienced track workers, based on the mainland, and were employed under contract by SGC.
- 27 The MO was employed by SRS and had over 10 years' experience in operating RRVs. The MC was also employed by SRS, was acting as COSS for the RRV and had 4 years' experience as a machine controller. Both had worked within numerous possessions on infrastructure managed by Network Rail on the mainland and had been working in possessions on the Island Line for the previous 5 weeks. The MC and MO were in the RRV undertaking lineside vegetation cutting during the possession. The MC travelled between sites of work in the rear of the RRV's cab which was provided for this purpose (figure 6).



Figure 6: RRV's double cab. The MC sat in the rear part of the cab with limited forward visibility (courtesy of Sonic Rail Services).

28 The MO is responsible for the RRV's safe operation. The MC, with permission from the ES, authorises safe movements of the RRV in a work site.

External circumstances

- 29 At the time of the accident, the weather was clear, cold (6°C) and damp with a light wind. There was no external lighting.
- 30 SWR had issued warnings of expected poor rail adhesion conditions (red adhesion status notices) covering their mainland network and the Island Line on 19 November and 20 November 2023. There was no equivalent warning issued for 21 or 22 November as this was not warranted by the prevailing weather conditions.
- 31 The accident occurred in a rural area with lineside trees and vegetation. There are also areas on the railway between Ryde and Brading known to have a poor mobile telephone signal.

Background information

- 32 SWR holds a lease from Network Rail to operate, maintain and renew the Island Line's railway infrastructure. As a condition of its safety certificate, SWR is required to comply with all relevant Network Rail and other standards applying to the mainline railway on the mainland (such as Railway Group Standards). However, these may be adapted to local circumstances on the Island Line if supported by a risk assessment.
- 33 SWR adopted the use of GERT8000 for its activities on the Island Line infrastructure. The possession on the night of the accident was set up in accordance with Rule Book Module T3, 'Possession of a running line for engineering work', issue 11 dated September 2022. Rule Book HB9, 'IWA, COSS or PC blocking a line', issue 8 dated September 2022, states that a work site is the portion of line within a possession of a running line where work will be undertaken. Each work site is under the control of an ES. The ES is responsible for authorising the entry of on-track plant (OTP) such as RRVs to the work site and for any OTP movements within it.
- 34 A possession with an isolation of the electrical traction supply is taken on the Island Line each Monday to Thursday night. Once the possession has been taken by the PICOP, it is then handed over to the ES who manages it as a single work site, extending the full length of the Island Line from the buffer stops at Ryde Pier Head to the buffer stops at Shanklin. This differs from many possessions taken on the mainland, which may be composed of several work sites.
- 35 Rule Book HB12, 'Duties of the engineering supervisor (ES) or safe work leader (SWL) in a possession', issue 9 dated September 2022, requires work site marker boards to be placed 100 m from each end of a work site. These are provided to control the movement of on-track machines and OTP entering or leaving a work site. These boards were not placed at the buffer stops during possessions on the Island Line, as it was considered that there would be no purpose in doing so in the circumstances.
- 36 Sites of work, each controlled by a COSS, are established within the work site. The limits of sites of work were not required to be marked on site as part of the agreed SWP.

The sequence of events

Events preceding the accident

- 37 During the week before the accident, the MC informed the ES that the RRV had had trouble ascending the gradient where the accident later occurred due to slippery rail conditions. On that occasion the RRV was towing a large trailer, and the MO had found it necessary to increase the RRV's speed at the bottom of the slope to keep it moving all the way up. The ES did not take any action in response to that report as there was no established process for doing so.
- 38 The ES arrived at Ryde St Johns depot at around 21:00 on Tuesday 21 November and was briefed by the site supervisor. The ES was informed that they would be responsible for 3 sites of work within the work site during the overnight possession, each with its own COSS. These consisted of the track repair work group, a group working on Ryde Pier and another working between Brading and Sandown. The ES was also responsible for two RRVs, one cutting back vegetation along the railway and the other working in Sandown yard, each with an MO and an MC also acting as a COSS. The ES did not make a written note of the plan but believed that the track repair work group was going to start work at Brading. The ES stated they briefed the COSSs for the three sites of work. The ES told them not to go onto the track until the RRV had gone past, and that it would be coming back during the possession.
- 39 The track repair work group assembled at Ryde St Johns depot before the possession to be briefed by their COSS and to sign the safe work pack covering the track repair task (referred to in this report as the SWP (track)). The SWP (track) stated that the site of work for the work group would extend from 3 miles 33 chains to 4 miles 40 chains. Brading station is outside this area at 4 miles 55 chains (figure 9). The SWP (track) had been prepared by the section manager for the repair of '*level 2 twists*'. This involved measuring the track and using jacks to lift the track and repack the ballast to improve track geometry. The SWP (track) identified that the site of work would be safeguarded, meaning that all lines would be blocked to normal trains, and that engineering train or OTP movements would be '*made at no greater than 5 mph (10 km/h)*' in accordance with Rule Book HB9 (paragraph 33).
- 40 At around 22:00, the MC for the RRV involved in the accident attended Ryde St Johns depot to sign in and receive a briefing from the ES, as they had done before possessions during the previous 5 weeks. The MO was not required to attend as their certificates had been checked previously by the ES. The MC (as COSS) was responsible for briefing the MO when they arrived at Sandown yard, where the RRV was stabled.

- 41 The MO and MC were required to work in accordance with their own safe work pack (referred to in this report as the SWP (RRV)) which covered RRV operations. This SWP (RRV) covered a series of possessions and had been signed by the MC on 15 November 2023 and authorised by an SRS manager the following day. A copy was signed again by the MC on 21 November 2023 to cover the possession that night. The SWP (RRV) showed all lines as being under possession with a speed limit of 5 mph (8 km/h), but the document was generic and did not contain any information about other work groups present during this possession. The MC then travelled to Sandown yard, where the RRV was stabled, to meet and brief the MO.
- 42 At 23:50, the COSS received a phone call from the ES informing them that the possession had been taken, but that the RRV would be passing through their site of work in 10 to 15 minutes' time. Members of the track repair work group were loading equipment onto a vehicle at Ryde St Johns Road depot at this time.
- 43 The COSS and the track repair work group then travelled by road to a track access gate at Rowborough Lane bridge (3 miles 60 chains) near the middle of their planned site of work (figure 7). The COSS phoned the ES at 00:25 to confirm they had arrived at the access gate, then briefed the work group that there would be an RRV in the area.



Figure 7: View from Rowborough Lane bridge looking north up the gradient towards location of accident.

- 44 During the briefing at Sandown yard, the ES gave the MC a handwritten list of six locations where lineside vegetation was to be cut back (figure 8). As the SWP (RRV) did not include details of any tasks or sites of work for the RRV, the ES instructed the MC to start cutting vegetation at 1 mile 42 chains, towards the north end of the line near Ryde St Johns station, and then travel back to the next location at Rowborough Lane bridge (3 miles 60 chains). The MC stated that the ES had told them that the track repair work group would be at Brading station. The first two RRV sites of work were both located north of Brading (figure 9).

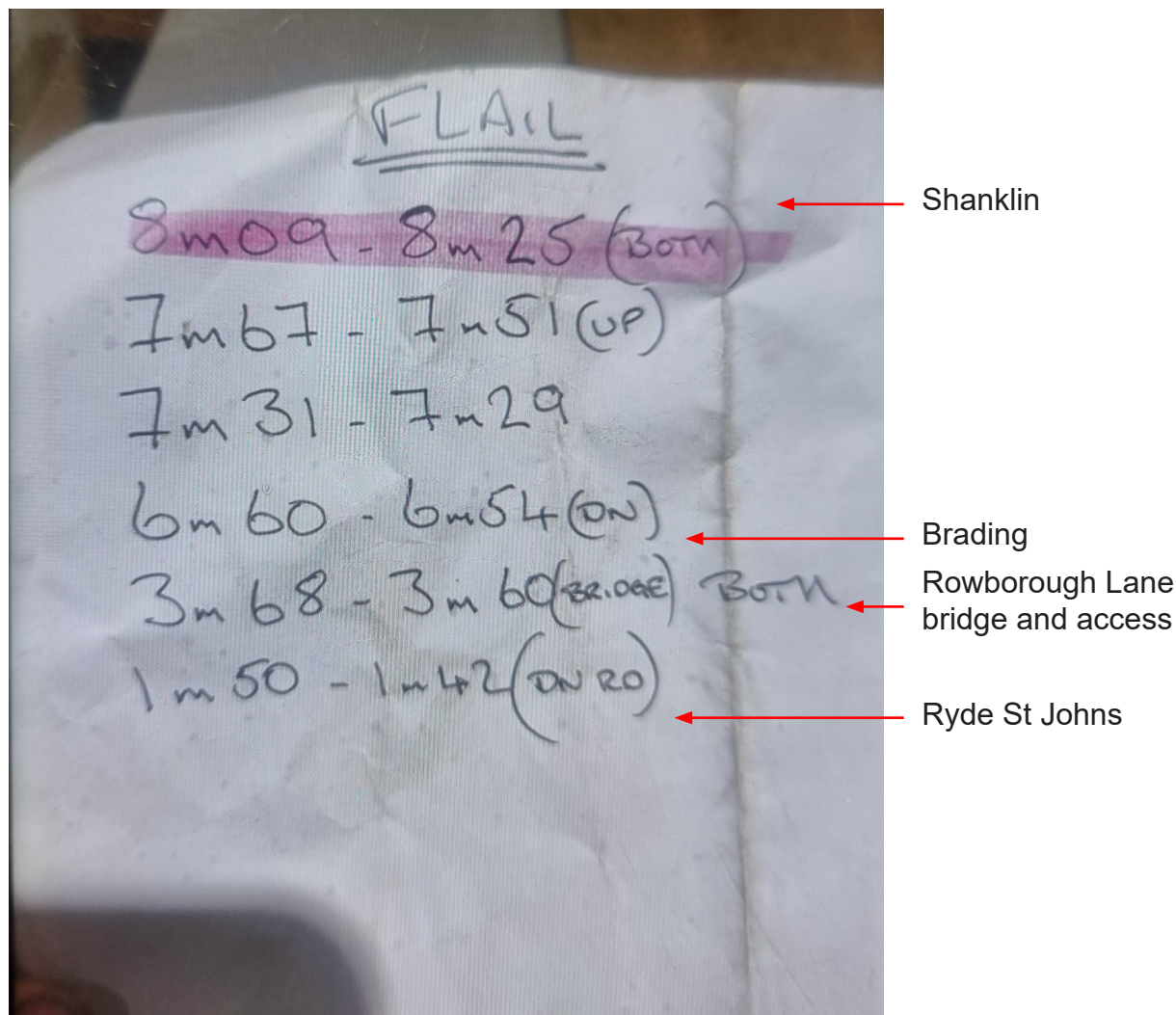


Figure 8: Handwritten list of sites of work which the ES gave to the MC.

- 45 At about 00:30 on Wednesday 22 November, the MO and MC travelled north in the RRV. After passing Brading station, they encountered members of the track repair work group by the track near the Rowborough Lane bridge access point. They stopped the RRV and waited until members of the work group were in a position of safety before passing them. The MO and MC acknowledged the work group and the RRV continued its journey.
- 46 As the RRV ascended the gradient in the area where the accident later occurred, the MO stated they heard a “crunching noise”. Although the wheels did not slip, they mentioned this to the MC. The MO believed the noise was caused by leaf mulch on the railhead. This was the first occasion within the maintenance programme where the RRV had climbed the gradient without towing a trailer.

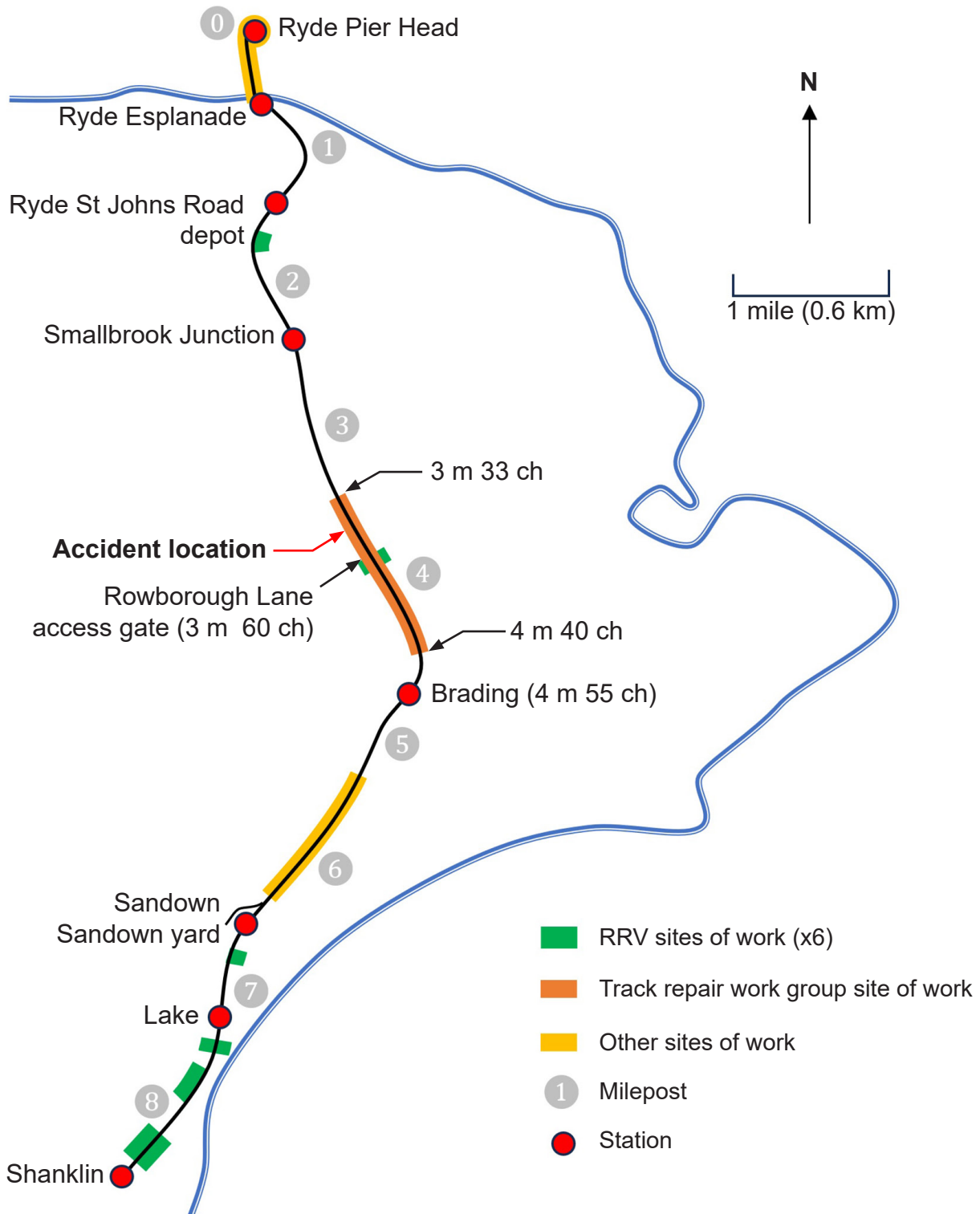


Figure 9: Sites of work on 21 to 22 November.

- 47 After the RRV had passed the work group, the trolley was put onto the line by members of the work group and loaded with equipment. The work group then pushed it north up the gradient, following the direction of travel of the RRV. They stopped at around 3 miles 37 chains, 463 metres from the access point.
- 48 The work group started to measure and correct track faults. The work was undertaken using head torches which were considered adequate for this task.

- 49 Aware that the RRV would need to pass again at some point on its return journey, the COSS did not participate directly in the track repair work and they were anticipating a phone call from the ES notifying them that the RRV was travelling back towards their site of work. The COSS believed that the RRV would not approach the site of work without them receiving a call from the ES.
- 50 After completing vegetation trimming at the RRV's first site of work near Ryde St Johns, it started its return journey travelling south towards its second site of work next to Rowborough Lane bridge (figure 9). This required the RRV to pass through the track repair work group's site of work.
- 51 From Ryde St Johns, the line south climbs towards a summit at 3 miles 20 chains. The MO was aware of the incline and stated that they drove slightly faster than 5 mph (8 km/h) in second gear which allows a maximum speed of 15 mph (24 km/h) to make it up the incline. Although it was not discussed, both the ES and the MC believed that the RRV already had approval from the ES to travel at more than 5 mph (8 km/h) within the work site while moving to, or between, its sites of work as it had been doing so earlier in the major maintenance programme. An ES may permit movements at a speed above 5 mph (10 km/h) under certain conditions (see paragraph 71).

Events during the accident

- 52 Members of the track repair work group were correcting a track fault at 3 miles 37 chains when the COSS noticed a bright light approaching from the north. The COSS had not been contacted by the ES about the RRV's return journey, but recognised the lights as being those on the RRV. The COSS instructed the work group to remove all tools and the trolley from the track and move to a position of safety.
- 53 The RRV, on passing over the summit of the hill, started to descend. Analysis undertaken by RAIB has concluded that the MO would have been able to see the work group from the RRV cab from a maximum of 240 metres away, as sighting was obstructed by trees on the inside of the left-hand curve before this point (figure 10). As they came into view, the MO could see the reflective strips on the work group's protective clothing. The usual procedure when the RRV encountered work groups on the track during possessions was to stop close enough to the work group to allow the MC and COSS to communicate and arrange the safe passage of the RRV. The MO anticipated, therefore, that they would need to stop and wait until the track was clear and they could be waved through.
- 54 As the RRV approached the work group, witness evidence indicates that the MO lifted their foot off the RRV's accelerator pedal intending to slow the vehicle down using the hydrostatic drive. The MO stated that they had never had a reason to brake going down this gradient before. Instead of the vehicle quickly slowing down as expected, the MO could see that the front rail wheels had stopped rotating and, along with the MC, could feel that the RRV was sliding. Both the MO and MC stated that they had not experienced this before.



Figure 10: View looking south from 3 miles 25 chains, with first sighting of the accident location around 240m ahead.

- 55 The MO applied the brake which had no effect because the wheels were sliding. They tried briefly accelerating to restore grip to then stop the vehicle. The MO realised the RRV was not stopping and sounded the horn. The MO and MC both opened their cab doors and shouted warnings for the work group to clear the track.
- 56 Members of the track repair work group heard the horn and shouting from the cab and realised that the RRV was not able to stop. One witness reported that it appeared to increase in speed as it approached. Members of the work group quickly moved the tools and equipment off the trolley. Two members of the work group then lifted the trolley and threw it into the cess beside the track, where it landed at an angle and, unknown to the work group, it remained foul of the RRV's path.
- 57 All members of the work group were clear of the track as the RRV approached them. Witness accounts of the RRV's speed vary widely. Its likely speed is discussed further at paragraph 93. As the RRV passed, its front right rubber tyre, which extended beyond the rail (figure 11), clipped the corner of the trolley. The trolley spun round and struck two members of the work group.
- 58 The site supervisor and another member of the work group were measuring the track beyond the point of collision. They were not affected because they had heard the RRV's horn and the shouting and had moved to a position of safety.



Figure 11: An RRV of the same type showing the overhang of the rubber tyre in relation to the rail (courtesy of Sonic Rail Services).

- 59 The MO and MC believed the group and trolley were clear of the track when they started to pass them. The MO and MC were unaware that the RRV's tyre had struck the corner of the trolley as they did not feel the impact. They were also unable to see the collision due to the view from the RRV's cab being obstructed by part of the machine.
- 60 After the RRV came to a stop, the MC got out via the rear cab door to check the RRV wheels for a possible cause of the RRV's poor stopping performance. They did not find anything of concern.

Events following the accident

- 61 After the accident, the COSS went to the RRV and informed the MC that a collision had occurred. The RRV moved back towards the work group to shine its lights onto the area (figure 12). The MO and MC observed that all members of the work group were standing up and stated that they were not informed that there had been any injuries.



Figure 12: Location of accident looking south.

- 62 The ES had earlier been contacted by the work group on Ryde Pier and asked to pick up some track clips from Ryde St Johns depot and deliver them to Ryde Esplanade. They were fulfilling this task when the site supervisor phoned them and stated there had been an incident.
- 63 The COSS phoned the ES at 01:54 and reported the accident straight after the RRV hit the trolley. They also checked on the welfare of those who had been struck. The COSS decided that the track repair work group should stop work and return to the access point at Rowborough Lane bridge. The group subsequently returned to Ryde St Johns depot for welfare checks.
- 64 Although the ES had been informed of the circumstances of the accident, they were unaware of its severity and did not implement procedures to obtain or protect evidence. The RRV was allowed to carry on working, and subsequently moved to the next planned site of work close to Rowborough Lane bridge and started cutting vegetation. Work was stopped when the ES contacted the MC a short time later, having become aware of the full extent of the accident.
- 65 The accident was not reported internally promptly in accordance with SWR procedures, and RAIB was not notified until more than 12 hours after the accident. In addition to this late reporting, critical evidence from the accident was not preserved by SWR. These issues are discussed further in paragraph 111.

Analysis

Identification of the immediate cause

66 The track repair work group was given insufficient warning to be able to safely remove the trolley from the track when the RRV approached.

Identification of causal factors

67 The accident occurred due to a combination of the following causal factors:

- a. The COSS of the track repair work group had not been informed of the RRV's movement before it approached (paragraph 68).
- b. The RRV was unable to stop in the expected distance once the MO realised the track repair work group was ahead (paragraph 81).

These factors are now considered in turn.

Communication between ES and COSS

68 The COSS of the track repair work group had not been informed of the RRV's movement before it approached.

69 This causal factor arose due to a combination of the following:

- a. The ES was unaware that there was an RRV movement that created a potential risk to the track repair work group and so did not warn the COSS (paragraph 70).
- b. The safe system of work adopted by the work group relied on the ES warning the COSS of any RRV movements (paragraph 76).

Each of these factors is now considered in turn.

ES's risk awareness

70 The ES was unaware that there was an RRV movement that created a potential risk to the track repair work group and so did not warn the COSS.

71 Rule Book HB12 states that only the ES can authorise a train movement to enter, or be made within, a work site. It also states the ES has to agree the safe system of work with each COSS, recording these details on their RT3199 'Work-site certificate'. HB12 also permits an ES to allow machine movements to run at caution (that is, be able to stop within the distance the operator can see above 5 mph (10 km/h)). But this is conditional on the ES giving specific instructions to the MC, and dependent on any agreement made with COSSs. No specific agreement was made with the COSSs during this possession.

- 72 Clause 7.1 of Rule Book HB15, 'Duties of the machine controller (MC) and on-track plant operator', issue 6 dated September 2022, states that OTP movements can only enter or take place within a work site when the ES gives permission. The ES stated however that they would not have required the MC to seek their authorisation to move the RRV between its sites of work if there were no other work groups on the track in those areas. In this possession, unlike in some possessions during the preceding 5 weeks, there was a work group moving within a site of work extending between 3 miles 33 chains and 4 miles 40 chains (paragraph 39). However, as the ES believed the track repair work group would be at Brading (4 miles 55 chains), they did not consider that there was a risk of a conflicting move due to the RRV having to pass the work group a second time.
- 73 No details of the position of the track repair work group were provided to the MC in the SWP (RRV), with this and the SWP (track) being separate documents, each covering covering several possessions and with limited cross-referencing (paragraphs 39 and 41).
- 74 The MC stated that their understanding from the pre-work briefing provided by the ES was that this gave them the necessary authorisation for movements between the sites of work listed, negating any requirement for the MC to call the ES before any RRV movements. This arrangement had been applied during previous possessions and the MC stated they would only expect to call the ES in exceptional circumstances, for example, if points needed to be moved. On this basis, the MC did not attempt to contact the ES before permitting the MO to move the RRV from its first site of work near Ryde to its second site of work located near the access point at Rowborough Lane bridge.
- 75 Despite having knowledge of the track repair work group's earlier location, from having previously passed them, the MC and MO believed that the work group would be moving south towards Brading. They were unaware that the RRV's second site of work was also within the track repair work group's site of work, so they were not expecting to need to stop. This meant that the presence of the work group ahead of the RRV was unexpected, reducing the time and distance available to the MC and MO to react to it.

Safe system of work

76 The safe system of work adopted by the work group relied on the ES warning the COSS of the RRV movements.

- 77 For a COSS to treat their safe system of work as safeguarded, Rule Book HB9 requires them to establish with the ES that either there will be no OTP movements at their site of work, or that any movements will be made at no greater than 5 mph (10 km/h). The COSS is also required to ensure that they and their group are in a safe position before any OTP passes through their site of work.
- 78 The list of sites where the RRV was due to work included two locations north of Brading. These required the RRV to pass the work group's location twice and the COSS was aware of this.

- 79 At the start of the possession, the ES instructed the COSS to wait until the RRV had passed on its outbound journey before going onto the track. The COSS stated that they were expecting the ES to call and warn them for any movements where the RRV was going to pass their work group. This understanding essentially reflects the requirements of Rule Book HB12 and HB15 that the ES authorises each OTP movement within a work site, and of HB9 which requires the COSS to establish if there are any OTP movements which could affect their group when working under a safeguarded system of work.
- 80 The COSS and ES worked together frequently but it is not clear if this specific issue had ever been recognised as a risk or if it had been briefed or discussed. In this case, the lack of a clear understanding about the process to be followed for OTP movements meant that these movements were not being specifically authorised by the ES, and that the COSS was not being warned about potentially conflicting moves with their group.

RRV braking

81 The RRV was unable to stop in the expected distance once the MO realised the track repair work group was ahead.

- 82 The MO and MC travelled in the RRV between sites of work. The MO drove using the line-of-sight principle, meaning they would stop the RRV and wait if they saw an obstruction or people on the line ahead. The speed would be low but not necessarily below 5 mph (8 km/h). Because they were working line-of-sight, the risk of an accident occurring at the location where the track repair group was working was increased as it was on a curve with restricted visibility. The risk was also increased due to the relatively steep descending gradient at the site, which would extend braking distances. Both SWPs indicated that there was a gradient of 1 in 78 where the accident occurred and identified the risk of RRV runaways on a gradient steeper than 1 in 100.
- 83 This causal factor arose due to a combination of the following:
- a. Low wheel/rail adhesion at the location was almost certainly created by environmental conditions on the night (paragraph 84).
 - b. The MO and MC were not aware that there was a risk of low adhesion conditions affecting the braking of the RRV to the degree that it did (paragraph 91).

These factors are now considered in turn.

Low adhesion conditions

84 Low wheel/rail adhesion at the location was almost certainly created by environmental conditions on the night.

- 85 On the return journey, as the RRV approached the work group and the MO took their foot off the RRV's accelerator pedal to slow it down, its rail wheels locked and began to slide (paragraph 54).

- 86 Wheel/rail adhesion conditions at the time of the accident are not known as no rail or wheel contamination samples were taken after the accident occurred (see paragraph 112). Weather conditions were cold and damp (paragraph 29) which was typical of an autumn night. It is likely that the relative humidity of the air was high, causing dew to collect on the rails. It is also possible that contamination of the RRV's rail wheels occurred during the earlier vegetation flailing activity and that this also affected the available wheel/rail adhesion.
- 87 The accident occurred during the autumn leaf-fall period and although no adhesion status notices were applied at the time of the possession, Network Rail and SWR had issued a red alert warning for poor railhead conditions for the two days before the accident (paragraph 30).
- 88 Although the MO and MC had never previously had any difficulty in stopping the RRV, they reported they had had trouble getting the RRV to climb the gradient at the location where the accident occurred during a possession the previous week (paragraph 37). Photographs taken the day before the accident by the section manager as part of an unrelated site inspection show no obvious railhead contamination (figure 13). However, guidance published by the Rail Delivery Group '*Managing low adhesion – seventh edition (May 2024)*' states that the adhesion profile along any stretch of line can vary within metres, and temperature and humidity levels can also change rapidly. As such, adhesion levels can vary rapidly in terms of both time and location.



Figure 13: Railhead condition near the site of the accident on 21 November. Image also shows a chainage marker plate provided at regular intervals along the Island Line (courtesy of South Western Railway).

- 89 There are no signals in this area and train drivers would not normally be required to apply their brakes approaching the location of the accident site. Any possible low adhesion conditions at this location would therefore possibly not be apparent to a train driver unless wheel slip occurred ascending the gradient. Documentary evidence supports this as there was no evidence of train drivers making reports of low adhesion (ROLA) on the Island Line in the period before the accident.
- 90 The Island Line has no recorded history of problems with low wheel/rail adhesion and its infrastructure team was not routinely informed of low adhesion conditions by SWR. This resulted in the Island Line having no effective low adhesion management process (see paragraph 102).

Risk awareness

91 The MO and MC were not aware that there was a risk of low adhesion conditions affecting the braking of the RRV to the degree that it did.

- 92 The MO was aware that there may have been leaf mulch on the railhead near the accident location on the RRV's outbound journey (paragraph 46). However, the RRV did not experience any slipping, and the MO and MC did not perceive any increased risk of poor adhesion.

RRV braking performance

- 93 The speed of the RRV as it approached the track repair work group is unknown, but witness evidence was that the RRV was in second gear, so it was probably travelling at between 5 mph (8 km/h) and 15 mph (24 km/h). The MO and MC believed they had the ES's agreement to exceed 5 mph (8 km/h) (paragraph 51).
- 94 The relevant Rail Industry Standard for OTP, RIS-1530-PLT, 'On-Track Plant, Trolleys and Associated Equipment', issue 6 dated December 2015, states that a powered machine shall be capable of stopping a fully laden machine on level track and in dry and uncontaminated conditions in the following distances:
- 5 mph: stopping within 6 metres
 - 10 mph: stopping within 18 metres
 - 15 mph: stopping within 36 metres.
- 95 In the absence of evidence of the actual speed of the RRV, the exact location where the MO first attempted to slow the vehicle, or the prevailing level of wheel/rail adhesion, it is not possible to accurately estimate the braking performance of the vehicle on the 1 in 78 falling gradient on which the RRV was approaching the group. However, witness evidence shows that the location where the MO first attempted to slow the RRV was sufficiently far from the work group to allow the work group time to react, clear the trolley and lift it off the track before the RRV passed (paragraph 54). The RRV eventually stopped around 100 metres beyond the point of collision (paragraph 8).
- 96 A wheelset inspection, wheel torque test and static brake test were undertaken on the RRV later that same day and did not identify any immediate defect with the RRV's wheels or braking system. It passed dynamic brake testing requirements for OTP set out in RIS-1530-PLT, although this testing was not undertaken until late January 2024, 10 weeks after the accident. In the test, the RRV was able to stop well within the distances required by RIS-1530-PLT. Brake tests were also performed at 10 mph (16 km/h), which showed that the RRV was able to stop within the allowable limit as per RIS-1530-PLT.

- 97 This suggests that the normal stopping distance of the RRV was increased to a significant degree, by low wheel/rail adhesion and the effect of the gradient.

Identification of underlying factors

Possession planning

98 SWR's process for planning and managing possessions did not effectively manage the risk of OTP movements and the risk of OTP and trolley collisions.

- 99 Before the accident, the process used on the Island Line for planning possessions did not include a pre-possession review meeting to identify and deconflict works within the possession. There was also no recognised method to manage OTP movements.
- 100 This lack of a pre-planning meeting meant that those responsible for the planning and delivery of the work potentially missed an opportunity to consider the RRV's movements through other sites of work within the work site and to consider how these could be safely managed.
- 101 The lack of co-ordinated planning also meant that the track repair work group and the RRV personnel were using different safe work packs with minimal cross-referencing between them, resulting in a limited shared awareness of potential conflicts. For example, while the SWP (track) identified the risk from RRV movements and the gradient, effective control measures were not identified. The SWP (RRV) gave no information on the location of the track repair work group during the possession because it was a generic document covering multiple possessions.

Management of low adhesion risk

102 SWR had no effective process for managing low wheel/rail adhesion risk for maintenance work on the Island Line.

- 103 SWR operations manual IL-AP23 '*Autumn leaf fall arrangements*', dated August 2023, was marked as applicable to engineering and infrastructure as well as train service delivery. Despite this, it only contained instructions for the safe operation of service trains. It covered the period from 1 October to 13 December 2023 and was to be accompanied by briefings for train drivers and guards. A report of low adhesion would require the site to be inspected and cleaned if necessary. There were no high-risk sites listed for low adhesion on the Island Line.
- 104 The arrangements in this document were that low adhesion was to be managed by the on-call duty manager making spot checks and following up on driver reports. However, SWR believed that the Island Line was not affected by problems with low adhesion as the reporting system used by train drivers had not resulted in any reports being received. This may have been because train speeds on the line are relatively low, and it would be unusual for a train to need to stop between signals or stations.
- 105 The Island Line infrastructure maintenance team had hand scrubbers to remove leaf debris from the railhead, but no jetting equipment. There was no proactive cleaning programme, and the scrubbers had never been used before the accident, due to the lack of reports about low adhesion.

106 The autumn adhesion management process that is routinely used on the mainland by Network Rail and train operators was not applied to the Island Line. This was because SWR had no previous reports of low adhesion and did not believe that it was an issue on the Island Line. It may also be because SWR is primarily a train operating company, and so did not have a good awareness of low adhesion risk for OTP operating on the Island Line.

Possession assurance

107 SWR's assurance of possession management on the Island Line did not identify the extent of informal working practices present.

- 108 RAIB's investigation found that maintenance activities on the Island Line did not always comply with the requirements of the Rule Book modules relating to possession activities. For example, the ES did not correctly observe the rules for controlling RRV movements (paragraph 72). RAIB also found that the ES did not have a written record of the track repair work group's location or the limits of their site of work even though these should have been recorded by them on form RT3199, along with the safe system of work being used by each COSS (paragraph 71). Rule Book HB9 states that the ES must enter the agreed details on form RT3199 and get the COSS to sign it. This is to confirm shared understanding and agreement of the arrangements in place.
- 109 Informal work practices may have developed due to the isolated nature of the Island Line and because the work was organised and implemented by small teams who were familiar with working together.
- 110 The fact that processes were not always being applied correctly and that some informal work practices existed was not detected or corrected by SWR. This was because SWR did not undertake any assurance activities on how Island Line maintenance activities complied with the requirements of the Rule Book modules relating to possession activities.

Observations

Post-accident actions

111 The actions taken in response to the accident led to a loss of evidence and did not follow industry standards or legal requirements.

- 112 Following the collision, the COSS initially responded by ensuring the welfare of the work group. The site supervisor and the COSS both notified the ES of the accident by phone. Although now aware of the accident, the ES was unaware of its severity and did not take the lead or provide guidance to the COSS in identifying or protecting evidence. This meant that critical locations at the accident site were not marked or photographed, and the railhead was not examined for possible contamination. The requirement for drugs and alcohol testing for the staff involved was not considered until after some of them had left site.

- 113 The site supervisor took the lead in reporting the accident. After returning to Ryde St Johns depot, they rang the signaller to obtain details for the Island Line's on-call manager. The signaller advised this information should be found in the published weekly operating notice (WON). The site supervisor contacted the Island Line's on-call manager at 03:45 (the collision occurred approximately at 01:50) and informed them that a near miss had occurred and that no one was injured. At that point no member of the work group had reported an injury. The on-call manager requested drugs and alcohol testing but was told that the staff had left site.
- 114 The site supervisor was unaware that SWR's reporting arrangements had changed in 2020 to match arrangements on the mainland. Although the WON instructed that the on-call manager was to be contacted first, SWR required incidents to be reported to the SWR duty control manager first. The on-call manager reported the incident to SWR's duty control manager at around 10:30, the delay being attributed to the on-call manager managing the aftermath of an unrelated break-in at Ryde St Johns station. The on-call manager also assumed that the site supervisor had already reported the incident to the duty control manager.
- 115 Island Line infrastructure maintenance staff and contractors were not familiar with the M&EE Networking Group industry codes of practice for OTP, specifically COP0019, 'Code of Practice for action to be taken in the event of an accident or incident involving OTP', issue 6 dated March 2022, which includes the requirement to arrange post-incident dynamic brake testing. This meant that the dynamic brake test of the RRV was not undertaken until 10 weeks after the accident, in January 2024.
- 116 RAIB was not notified of the accident for more than 12 hours. The initial notification stated that an RRV had slid and struck a works trolley, but that neither vehicle had derailed, no injuries had occurred and that there was no damage. Further enquiries revealed that people had been struck in the accident.
- 117 Regulation 4 and Schedule 1 of the Railways (Accident Investigation and Reporting) Regulations 2005 (as amended) require that accidents and incidents, that in slightly different circumstances could have led to serious injury or worse, should be immediately notified to RAIB. RAIB would, therefore, expect the type of accident seen at Brading to have been notified immediately. RAIB's guide about notifying accidents states that if there is any doubt about whether an accident is notifiable to RAIB, then duty holders such as SWR should notify anyway.
- 118 Regulation 7 of the 2005 Regulations also requires duty holders to preserve evidence relating to accidents and incidents for examination by RAIB. Failing to preserve evidence can hamper safety investigations and reduce the opportunities to learn important lessons from accidents and incidents.

Gradient information

119 Gradient reference information was inaccurate.

- 120 Gradient information available to SWR and SRS was not accurate in the area where the accident occurred. RAIB's post-accident measurements at the site indicate that the start of the gradient on which the accident occurred is around 300 metres north of the location stated in reference data held by Network Rail and used to prepare the SWPs.

121 Further discrepancies were identified in SWR document '601 complete map' which shows the track as level at the accident location, and a historical '5-mile line diagram' which shows the gradient as 1 in 300. The inaccuracy and disparity in these sources of information may reduce SWR's ability to plan work safely, particularly where vehicles and trolleys are involved.

Summary of conclusions

Immediate cause

122 The track repair work group was given insufficient warning to be able to safely remove the trolley from the track when the RRV approached (paragraph 66).

Causal factors

123 The causal factors were:

- a. The COSS of the track repair work group had not been informed of the RRV's movement before it approached (paragraph 68). This causal factor arose due to a combination of the following:
 - i. The ES was unaware that there was an RRV movement that created a potential risk to the track repair work group and so did not warn the COSS (paragraph 70, **Recommendation 1**).
 - ii. The safe system of work adopted by the work group relied on the ES warning the COSS of any RRV movements (paragraph 76, **Recommendation 2**).
- b. The RRV was unable to stop in the expected distance once the MO realised the track repair work group was ahead (paragraph 81). This causal factor arose due to a combination of the following:
 - i. Low wheel/rail adhesion at the location was almost certainly created by environmental conditions on the night (paragraph 84).
 - ii. The MO and MC were not aware that there was a risk of low adhesion conditions affecting the braking of the RRV to the degree that it did (paragraph 91).

Underlying factors

124 The underlying factors were:

- a. SWR's process for planning and managing possessions did not effectively manage the risk of OTP movements and the risk of OTP and trolley collisions (paragraph 98, **Recommendation 1**)
- b. SWR had no effective process for managing low wheel/rail adhesion risk for maintenance work on the Island Line (paragraph 102, **Recommendation 1**)
- c. SWR's assurance of possession management on the Island Line did not identify the extent of informal working practices present (paragraph 107, **Recommendation 2**).

Additional observations

125 Although not linked to the accident on 22 November 2023, RAIB observes that:

- a. The actions taken in response to the accident led to a loss of evidence and did not follow industry standards or legal requirements (paragraph 111, **Learning points 1, 2 and 3**).
- b. Gradient reference information was inaccurate (paragraph 119, **Recommendation 3**).

Actions reported as already taken or in progress relevant to this report

Actions reported that address factors which otherwise would have resulted in an RAIB recommendation

126 SWR has reported that it has:

- a. introduced a formal planning meeting for maintenance activities including the use of whiteboards during pre-possession planning showing the relative location of works and the works phase which has improved the management of possessions
- b. introduced an ES briefing form which is handed to the COSS in addition to the verbal briefing and requirement for the COSS to sign the RT3199 form to confirm their understanding
- c. provided a briefing to Island Line infrastructure maintenance staff on post-incident actions and the requirement to preserve evidence
- d. undertaken a new risk assessment for machine movements
- e. issued a briefing to all infrastructure staff on machine movements
- f. reviewed its post-incident response for Island Line incidents which has included establishing competency requirements
- g. taken steps to address the deficiencies found within its assurance processes for monitoring compliance with the requirements of the Rule Book modules relating to possession activities.

Recommendations and learning points

Recommendations

127 The following recommendations are made:¹

- 1 *The intent of this recommendation is for South Western Railway to review how it manages safety during infrastructure work on the Island Line.*

South Western Railway should undertake a risk-based review of its arrangements for:

- a) planning and management arrangements for possessions, work sites and sites of work
- b) the movement of on-track plant, including risks relating to gradients and low wheel/rail adhesion.

This should include the applicability of the provisions of GERT8000 (the Rule Book) for managing Island Line infrastructure works.

Following this review, South Western Railway should develop a timebound plan to make any appropriate changes identified to standards, processes and its organisational structure (paragraphs 123.a.i, 124.a, 124.b).

- 2 *The intent of this recommendation is for South Western Railway to review its assurance processes.*

South Western Railway should review assurance processes to understand if they are effective at detecting informal, non-compliant and unsafe practices during infrastructure work on the Island Line.

Following this review, South Western Railway should develop a timebound plan to make any appropriate changes identified to standards, processes and its organisational structure (paragraphs 123.a.ii, 124.c).

¹ Those identified in the recommendations have a general and ongoing obligation to comply with health and safety legislation and need to take these recommendations into account in ensuring the safety of their employees and others.

Additionally, for the purposes of regulation 12(1) of the Railways (Accident Investigation and Reporting) Regulations 2005, these recommendations are addressed to the Office of Rail and Road to enable it to carry out its duties under regulation 12(2) to:

- (a) ensure that recommendations are duly considered and where appropriate acted upon; and
- (b) report back to RAIB details of any implementation measures, or the reasons why no implementation measures are being taken.

Copies of both the regulations and the accompanying guidance notes (paragraphs 200 to 203) can be found on RAIB's website www.gov.uk/raib.

- 3 *The intent of this recommendation is for South Western Railway to provide its infrastructure maintenance staff and contractors with accurate information about its infrastructure.*

South Western Railway should establish the accuracy and completeness of gradient information used for planning possession works on its infrastructure so that the risks associated with runaways and low adhesion can be understood and managed. The revised information should be provided to Network Rail Technical Authority to enable industry reference information to be updated (paragraph 125.b).

Learning points

128 RAIB has identified the following important learning points:²

- 1 Transport undertakings and on-track plant operators are reminded of the importance of applying industry codes of practice in the event of an accident or incident involving on-track plant. This includes COP0019 'Code of Practice for action to be taken in the event of an accident or incident involving OTP', published by the Rail Safety and Standards Board (RSSB) on behalf of the M&EE Networking group (paragraph 125a).
- 2 Duty holders are reminded to promptly report serious and potentially serious accidents to RAIB in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005 (as amended). Failing to do so can result in evidence loss and reduced opportunities for safety learning (paragraph 125a).
- 3 Duty holders are reminded of the importance of having well-established processes and procedures for dealing with post-accident evidence collection and testing (paragraph 125a).

² 'Learning points' are intended to disseminate safety learning that is not covered by a recommendation. They are included in a report when RAIB wishes to reinforce the importance of compliance with existing safety arrangements (where RAIB has not identified management issues that justify a recommendation) and the consequences of failing to do so. They also record good practice and actions already taken by industry bodies that may have a wider application.

Appendices

Appendix A - Glossary of abbreviations and acronyms

Abbreviation / acronym	Full term
CCTV	Closed-circuit television
COSS	Controller of site safety
ES	Engineering supervisor
MC	Machine controller
MO	Machine operator
OTP	On-track plant
PICOP	Person in charge of possession
RRV	Road-rail vehicle
RSSB	Rail Safety and Standards Board
SGC	SGC Rail Solutions
SRS	Sonic Rail Services
SWL	Safe work leader
SWP	Safe work pack
SWR	South Western Railway
WON	Weekly operating notice

Appendix B - Investigation details

RAIB used the following sources of evidence in this investigation:

- information provided by witnesses
- safe work packs
- RRV test reports and certificates
- RSSB industry guidance including rule book handbooks
- site photographs and gradient measurements
- gradient reference information
- weather reports and observations at the site
- SWR red alerts and seasonal briefings
- SWR standards and procedures
- a review of previous RAIB investigations that had relevance to this accident.

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