



Rail Accident Investigation Branch

Rail Accident Report



Accident to a track worker near Redhill 24 June 2014

Report 06/2015
June 2015

This investigation was carried out in accordance with:

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

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Any enquiries about this publication should be sent to:

RAIB	Email: enquiries@raib.gov.uk
The Wharf	Telephone: 01332 253300
Stores Road	Fax: 01332 253301
Derby UK	Website: www.gov.uk/raib
DE21 4BA	

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24 June 2014

Contents

Summary	5
Introduction	6
Preface	6
Key definitions	6
The accident	7
Summary of the accident	7
Context	7
The investigation	10
Sources of evidence	10
Key facts and analysis	11
Background information	11
Sequence of events	11
Identification of the immediate cause	14
Identification of causal factors	15
Factors associated with the emergency response	25
Observations	27
Previous occurrences of a similar character	28
Summary of conclusions	30
Immediate cause	30
Causal factors	30
Factors associated with the emergency response	30
Additional observations	31
Actions reported as already taken or in progress relevant to this report	32
Previous RAIB recommendations relevant to this investigation	33
Recommendations that are currently being implemented	33
Learning points	35
Recommendations	36

Appendices	38
Appendix A - Glossary of abbreviations and acronyms	38
Appendix B - Glossary of terms	39
Appendix C - Contents of First Aid courses	40
Appendix D - Recent RAIB investigations of workers struck by trains	41

Summary

At about 10:41 hrs on 24 June 2014, a track worker was struck by a passenger train travelling at about 80 mph (129 km/h), near Redhill on a section of the main line between Brighton and London known as the Up Quarry line. He was the leader of a team of twelve people who were fitting emergency clamp plates to lengths of rail where cracks had been identified during an earlier inspection. The accident happened on the top of an embankment about ten metres high, on a section of line where trains can travel at up to 90 mph (145 km/h).

The team were doing the work of fitting clamp plates to one of the two lines at the site while trains continued to run on both lines. They were protected by lookouts, whom the controller of site safety (COSS) had positioned at the site and at some distance away on both sides of the site of work, to warn the team of the approach of a train in sufficient time for them to stop work and move to a position of safety before the train arrived. At the time the accident occurred, the work had been in progress for about forty minutes. The other members of the team had completed their work, and the team leader was engaged in taking measurements for the lengths of replacement rail that would be required at the site. The lookouts had warned the team of the approach of a southbound train, and a short time after this had passed, and before the COSS had given permission for anyone to return to the track, the lookouts gave another warning, for a northbound train.

At about the time this warning was given, the team leader began to walk along the side of the line, with his back to the approaching northbound train. As he walked, he moved closer to the Up Quarry line, and the train struck him on his right shoulder and threw him down the side of the embankment. Other members of the team gave him first-aid treatment and called the emergency services, and an air ambulance helicopter landed on the railway. The casualty was airlifted to hospital, but he had suffered life-changing injuries.

The RAIB's investigation found that the position of safety the team were using was not adequate because there was no level place to stand, clear of the line. The team leader was unaware of the imminent danger from the approaching train.

The RAIB has identified three learning points and made three recommendations arising from this investigation. The learning points relate to staff speaking up if they feel unsafe, the need for train drivers to sound a warning as they approach each group of workers who are on or near the track, and the importance of first-aid training for staff working in high-risk areas. The recommendations are all addressed to Network Rail and cover suitable lineside positions of safety, the company's policy on first aid at work, and the training of people who act as lookouts.

Introduction

Preface

- 1 The purpose of a Rail Accident Investigation Branch (RAIB) investigation is to improve railway safety by preventing future railway accidents or by mitigating their consequences. It is not the purpose of such an investigation to establish blame or liability.
- 2 Accordingly, it is inappropriate that RAIB reports should be used to assign fault or blame, or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.
- 3 The RAIB's investigation (including its scope, methods, conclusions and recommendations) is independent of all other investigations, including those carried out by the safety authority, police or railway industry.

Key definitions

- 4 All dimensions in this report are given in metric units, except speed and locations which are given in imperial units, in accordance with normal railway practice. Where appropriate the equivalent metric value is also given.
- 5 The report contains abbreviations and technical terms (shown in *italics* the first time they appear in the report). These are explained in appendices A and B.

The accident

Summary of the accident

- 6 At about 10:42 hrs on Tuesday 24 June 2014 train 1U53¹, the 10:35 hrs service from Gatwick Airport to London Victoria, struck a person who was one of a team of twelve people maintaining the track that the train was travelling on, near Redhill in Surrey.
- 7 The train was travelling at about 80 mph (129 km/h), and struck the track worker, who was walking with his back to the approaching train, on his right shoulder and threw him down an embankment.

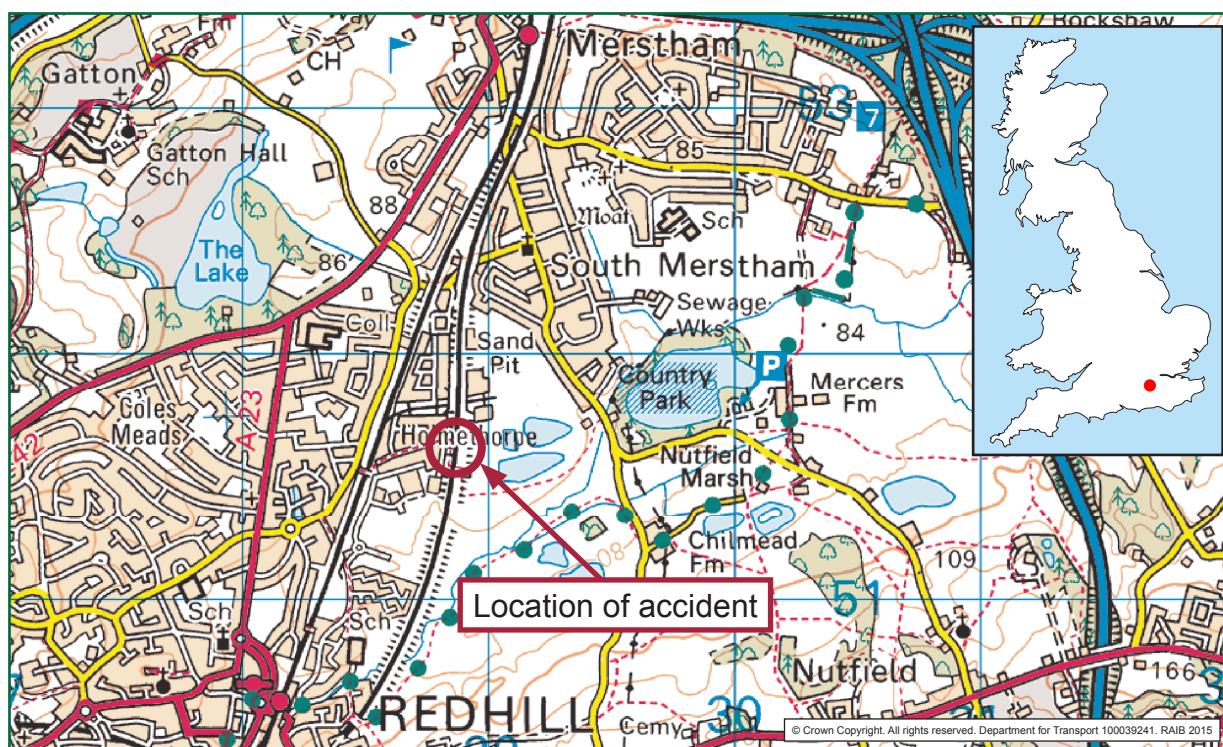


Figure 1: Extract from Ordnance Survey map showing location of accident

- 8 The track worker was seriously injured, and was airlifted to hospital.

Context

Location

- 9 The main line from London to Brighton has four tracks from London as far as Balcombe Junction, in Sussex, and two tracks from there to Brighton. Between Stoats Nest Junction, near Coulsdon, and Earlswood Junction, south of Redhill, the four lines run as two separate pairs of tracks which are up to 400 metres apart. The two tracks which enable fast trains to bypass Redhill are known as the Quarry lines.

¹ An alphanumeric code, known as the 'train reporting number', is allocated to every train operating on Network Rail's infrastructure.

- 10 The accident occurred on the *Up* Quarry line about 20 metres south of milepost 20², on an embankment where the railway is about ten metres above the level of the surrounding land. The line is on a gentle curve (towards the left for trains travelling towards London), and the maximum permitted speed for trains is 90 mph (145 km/h).
- 11 Both tracks are electrified at 750 V DC using the conductor rail system, controlled from the electrical control room at Brighton. At the site of the accident, the conductor rails are in the *six-foot*, between the up and down lines. The signalling in the area is controlled from Three Bridges signalling centre.

Organisations involved

- 12 The injured track worker was employed by Network Rail, as were five of the other team members, including the *controller of site safety* (COSS). The other six track workers were contractors, employed by Keltbray Ltd.
- 13 The train was operated by Southern Railway Ltd, which employed the train driver and other members of the train crew.
- 14 The helicopter ambulance which attended the scene was operated by Specialist Aviation Services on behalf of the Kent, Surrey & Sussex Air Ambulance Trust; the air ambulance operations were controlled by the South East Coast Ambulance Service NHS Foundation Trust.
- 15 All of the organisations referred to in paragraphs 12 to 14 freely co-operated with the investigation.

Train involved

- 16 The train that struck the track worker was formed of a 5-car *electric multiple unit* of class 442. The condition and maintenance of the train were not factors in the accident.

Staff involved

- 17 The person who was struck was a track section supervisor, employed by Network Rail and based at the track maintenance depot at Three Bridges, near Crawley in Sussex. He joined British Rail in 1983 based at Earlswood, and had worked on track maintenance in the Sussex area ever since. He had been appointed section supervisor about 18 months before the accident. In that role he was responsible for organising and leading groups carrying out track maintenance in the area covered by the Three Bridges depot. He was considered by his managers to be highly experienced and competent in this role, with a positive attitude to his work. On 24 June 2014, he was in charge of the gang of eleven other track workers. He normally worked on the day shift, and on the day of the accident he considered himself to be in good health and not fatigued.
- 18 The COSS was a Network Rail employee. He had worked on the railways for eight years, and had been employed by Network Rail for six years. He was regularly appointed COSS for the Three Bridges maintenance gang, because his managers considered him to be confident and effective in that role.

² Distances on the Quarry lines are measured from zero at London Bridge station.

- 19 Of the other ten members of the gang, four were Network Rail employees and six were contractors, agency staff employed through Keltbray Rail. Four of these had worked regularly with the Three Bridges maintenance gang for several months, but the other two were working in the area for the first time that day.
- 20 Three of the Keltbray staff (who had worked with the Network Rail Three Bridges maintenance team before) were appointed by the COSS to act as *lookouts* for the gang on the day of the accident.

External circumstances

- 21 It was a warm, sunny day, with good visibility of approaching trains at the site of work. At the time of the accident the temperature at Gatwick airport, about 6 miles (10 km) away, was 20° C. There is no evidence that the weather was a factor in the accident.

The investigation

Sources of evidence

22 The RAIB used the following sources of evidence in this investigation:

- witness statements;
- the train's on-train data recorder (OTDR) data;
- forward facing closed circuit television (FFCCTV) recordings taken from the train;
- relevant Network Rail work planning documentation and railway procedures and standards;
- site photographs and measurements;
- weather reports and observations at the site; and
- a review of previous RAIB investigations that had relevance to this accident.

Key facts and analysis

Background information

- 23 Network Rail's maintenance depot at Three Bridges is part of the Brighton area maintenance delivery unit, within the Sussex route. It covers the London to Brighton main line from south of Purley to north of Haywards Heath, as well as the Uckfield branch line south of Hurst Green. The main line is very busy. In the off-peak periods, thirteen trains per hour in each direction are timetabled to pass over the Quarry lines between Stoats Nest Junction (south of Purley) and Earlswood Junction.
- 24 This intensive service limits the opportunities available for maintenance work. At the time of the accident, it was possible, by agreement between Network Rail and the train operating companies, to block one pair of lines at a time (either the Quarry lines or the lines that pass through Redhill station) between midnight and 04:00 hrs. All necessary work that required the lines to be blocked to trains (such as replacement of rails) normally had to be fitted into those periods. The formalities associated with taking possession of the lines, switching off the electric current and isolating the conductor rails, meant that the time available for work was limited to less than three hours each night. In the week that the accident took place, night-time *possessions* were planned each night for the Quarry lines.

Sequence of events

Events preceding the accident

- 25 Staff at Network Rail's track maintenance depot at Three Bridges were monitoring a section of the Up Quarry line where a rail defect, known as *rolling contact fatigue* (RCF), had been identified several months before the accident. Every four weeks staff carried out an inspection of the rails using ultrasound to detect and measure cracks. On Sunday 22 June 2014, one of these inspections showed that cracks in one of the rails at this site had grown to the extent that action was required to keep the line open for trains at normal speed. The immediate action prescribed by Network Rail's standards in this situation is to apply clamps to the rail, pending replacement of it (see paragraph 50).
- 26 The ultrasonic test team passed the results of their tests to the section manager's office on 23 June. The need for action was discussed at the review and planning meeting held by the section manager on that day, and the work of fitting clamps was allocated to the section supervisor.
- 27 He decided to do the work the next day, 24 June, as he believed that it was urgent (see paragraph 50) and he had the labour available for the task. He asked the section planner to produce the *safe system of work pack* (SSOWP) for the job, and indicated that the work would be done under lookout protection.
- 28 The planner produced the SSOWP on the morning of 24 June, and passed the pack to the section supervisor. He looked over the papers, and then passed them to the person he had chosen to act as COSS for the work, who was responsible for the safe system of work at the site. The section supervisor and the COSS were both familiar with the location where the work was to be done.

- 29 The gang, consisting of the section supervisor, the COSS and ten others, assembled at the Three Bridges depot on the morning of 24 June. They loaded tools and equipment into their road transport, and left at about 09:00 hrs, driving to an access point (a place where a gate and access route is provided for staff to reach the track from a road) on the *down* (east) side of the line at Holmethorpe, about 100 metres north of the site of work, arriving at about 09:30 hrs. The COSS then briefed the gang on the work to be done and the safe system of work, as required by the rules³ and Network Rail's standards (see paragraph 45). He indicated the *position of safety* which everyone should move to when warned of the approach of a train: the *cess* on the up (west) side of the line. He nominated three people to act as lookouts. One was positioned opposite the site of the work, on the down side of the line, and the other two were to act as *distant lookouts*, one to the north and one to the south. The north distant lookout stood about 550 metres from the site of work, and the south distant lookout stood about 450 metres from the site. They both used a horn and a blue and white chequered flag to signal to the site lookout when they became aware of an approaching train. This was intended to give the group at the work site 30 seconds warning of the approach of each train. The COSS had calculated that this was the time required for the group to stop work and reach a position of safety ten seconds before the train arrived, as required by the rules and the SSOWP.
- 30 The gang carried their tools and equipment up the embankment steps onto the lineside on the down side of the railway. The COSS briefed and positioned the three lookouts. Once they were in position, the COSS indicated that the work could begin, and the rest of the gang carried the tools and equipment along the side of the down line to the site of the work, and across to the up side of the line (because all the clamps had to be fitted to the six-foot (right-hand) rail of the up line, along a length of about 100 metres).
- 31 The gang began fitting the clamp plates soon after 10:00 hrs, and this part of the work took less than forty minutes. During this period sixteen trains (eight down and eight up) passed the site of work, and the gang ceased work, gathered their tools and equipment, and moved to the position of safety in the up *cess* for each one. Although they were only working on the up line, it was also necessary for them to move clear for down trains, because down trains obstructed the site lookout's view of the distant lookouts. By 10:40 hrs the clamp plates had all been fitted, and the section supervisor, the COSS and one other worker, were measuring and marking up the sections of rail that required replacing, near the south end of the work site. The rest of the gang were resting clear of the line on the slope of the embankment on the up side.

³ The rules are contained in the railway rule book, Railway Group Standard GE/RT8000. The rule book comprises a series of modules and handbooks. The handbooks describe the duties associated with the different roles performed by staff when working on the track. Rule book modules and handbooks can be found at <http://www.rgsonline.co.uk>.

Events during the accident

- 32 Train 1U53 left Gatwick Airport on time at 10:35 hrs. After crossing onto the up fast line it accelerated to 85 mph (137 km/h), before the driver reduced speed for the 80 mph (129 km/h) restriction over the junctions and curves at Earlswood, which was passed at 10:40 hrs at 75 mph (121 km/h). At Earlswood Junction the train was routed, as scheduled, via the Quarry line. It then passed through Redhill Tunnel, where the permissible speed changes to 90 mph (145 km/h), and approached the site where the gang was working, travelling at about 80 mph (129 km/h).
- 33 Shortly before this a train travelling in the down direction had passed. This was train 2T25, the 08:54 hrs service from Bedford to Brighton. It was running about three minutes late. The distant lookout to the north warned the gang of the approach of train 2T25, and the three who were still working stopped what they were doing and moved clear of the line. The COSS and the section supervisor remained standing, and the other person who was working with them (paragraph 31) sat down.
- 34 Witness evidence indicates that a few seconds after train 2T25 had passed the gang, the distant lookout to the south became aware that train 1U53 was approaching, and blew his horn and waved his chequered flag to signal to the site lookout. The site lookout acknowledged the warning with his flag, and blew his horn. (At this point the COSS had yet to indicate to the gang that it was safe to return to the track following the passage of train 2T25.) The group sitting beside the line, and the three who were discussing the next measurement, had remained in the position of safety. However, shortly before train 1U53 came into view at the site of work, the section supervisor began to walk north, away from the COSS and the other worker, alongside the line.
- 35 The COSS watched the approach of train 1U53. The section supervisor continued to walk north alongside the track, with his back to the approaching train (figure 2).



Figure 2: image from the train's forward facing CCTV, immediately before the accident, showing the section supervisor walking along the side of the line, the members of the gang sitting down on the embankment, and the site lookout on the extreme right of the picture

- 36 There were two people in the cab of train 1U53: a trainee driver and a driver-instructor. The trainee was driving, sitting in the left-hand seat. Witness evidence indicates that he sounded the train's horn when he saw the distant lookout. The driver and driver-instructor stated to their employer that they saw the distant lookout acknowledge this warning. The driver-instructor, sitting in the right-hand seat, had an earlier view of the work group than the driver because of the curvature of the line. About three seconds after the group came into view, he saw a person walking alongside the track and realised that he was probably too close to the line (see paragraph 81). The driver-instructor told the trainee driver to sound the train's horn again, but by the time the trainee driver reacted to this instruction, the train had struck the section supervisor.

Events following the accident

- 37 The train struck the section supervisor on the right shoulder, throwing him down the embankment. The train driver applied the train's service brake, the driver-instructor moved out of his seat and applied the emergency brake, and the train stopped about 600 metres past the point of impact.
- 38 No-one in the group actually witnessed the accident, because they were all facing away from the approaching train when the section supervisor was struck (track workers often turn away from passing trains, to protect their eyes from dust and flying objects). The site lookout heard a noise as the train struck the section supervisor, and as soon as he had received confirmation from the COSS that it was safe to do so, he crossed the line to assist him. The site lookout was qualified in first aid at work, and took prompt and effective action to treat the section supervisor's serious injuries, in particular stemming the bleeding from his upper arm. The COSS called the signaller and the emergency services.
- 39 The first responders from the emergency services called for an air ambulance to collect the casualty. A helicopter ambulance landed briefly on the track close to the accident site at about 11:12 hrs and dropped off medical staff. The helicopter then moved to a nearby field (see paragraphs 93 to 101).
- 40 After initial treatment on site, the casualty was moved to the helicopter, and was then taken to hospital at about 11:55 hrs.

Identification of the immediate cause⁴

41 The section supervisor was walking too close to the track with his back to the approaching train.

- 42 The FFCCTV from train 1U53 shows the section supervisor apparently unaware of the approach of the train, walking steadily along with his back to it. He is unable to remember exactly what he was doing, but witness evidence indicates that he had taken one measurement of lengths of rail to be replaced and was on his way to mark up and measure the next section. He was carrying a spray can of white paint in his right hand when he was struck; this burst and provided an indication of the location of the point of impact.

⁴ The condition, event or behaviour that directly resulted in the occurrence.

Identification of causal factors⁵

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

- the work was being carried out while trains were running;
- working under lookout protection was not prohibited (see paragraph 64) at this location;
- the cress at this location is narrow and treacherous, and not suitable as a place of safety;
- the section supervisor did not remain in a position of safety until the train had passed;
- the section supervisor was unaware of the imminent danger from the approaching train; and
- the actions of the section supervisor were not observed by anyone else, so no additional warning was provided.

Each of these factors is now considered in turn.

The work

44 **The work was being carried out while trains were running.**

The planning of the work

- 45 At the time the accident occurred, Network Rail was preparing to change the way in which work on or near the line is planned and delivered. This report describes the arrangements that were in place in 2014.
- 46 Network Rail standard NR/L2/OHS/019, 'Safety of People Working On or Near the Line' (standard 019), mandated that any work which required people to go on or near the line in normal circumstances (ie non-emergency work) must be planned and verified. The standard defined a process for doing this. Section 6.2 of the standard explicitly envisaged that the work would first be identified by a responsible manager, who would instruct an appropriately trained and experienced planner to plan the work and create a safe system of work (SSOW) for each task. The responsible manager should then review the planned SSOW, decide if it was acceptable, and allocate it to a COSS.
- 47 Various types of SSOW were identified, and there was a hierarchy based on the perceived level of safety offered by each SSOW. Section 7 of standard 019 required the planner to select the safest achievable SSOW consistent with the nature, location, and duration of the work, from a hierarchy listed in the standard. This hierarchy started with safeguarded work, ie in an area in which all rail traffic has been stopped. It proceeded downwards through fenced and separated areas (alongside lines where trains are running) to work with trains running, where warning of approaching trains was given by fixed or portable automatic systems, and finally to work with trains running where warning was given by lookouts. This was the method in use at Redhill on 24 June, and was the lowest level in the hierarchy. The planner was, however, obliged to follow any instructions given by the responsible manager.

⁵ Any condition, event or behaviour that was necessary for the occurrence. Avoiding or eliminating any one of these factors would have prevented it happening.

- 48 The planner should then prepare the SSOW plan and provide a part-completed 'Record of Arrangements and Briefing form' (RT9909) to the COSS as part of the SSOW pack.
- 49 Standard 019 required this pack to be issued to the COSS normally during the seven days prior to commencement of the work. Unless the plan had been verified by a responsible manager, it should always have been issued to the COSS at least one shift before the planned work, so that the COSS had sufficient time to verify the adequacy of the plan.
- 50 In the case of the work at Redhill on 24 June, the results of the ultrasonic inspection arrived in the depot at Three Bridges the previous day. The defects that had been found fell within category 2B as defined in Network Rail company standard NR/L2/TRK/001/mod07 (issue 6, December 2012). These defects (cracks) had increased in size since the previous ultrasonic inspection four weeks before, to the extent that immediate action was now necessary. Table 26 of this standard gave the required minimum action on discovery of this level of defect, which was to fit rail clamps, and remove the defect within seven days. If this is not done, an emergency speed restriction of 20 mph (32 km/h) must be imposed (the standard does not specify how soon rail clamps should be fitted after discovery of the defect). The section manager, at a meeting with the section supervisors, decided that clamps should be fitted the next day. The section supervisor who was allocated the job asked the planner on the morning of Tuesday 24 June to produce a SSOW pack. He instructed the planner that the work would be done under lookout protection, and the SSOW pack was produced and handed to the COSS a few minutes later. The section supervisor acted as 'responsible manager', as he was permitted to do, and took responsibility for reviewing the SSOW plan (standard 019 requires that a responsible manager must verify plans for work done at short notice). In this case the section supervisor was in a position to act as responsible manager, but he and the COSS did not sign the forms confirming that verification had been carried out.

The choice of protection

- 51 The decision to do the work during the day and while trains were running appears to have been made with little consideration of other possible ways of doing it, despite the requirement in Network Rail standard 019 to consider a hierarchy of protection methods (paragraphs 45 and 47). Evidence provided by Network Rail indicates that, on the Sussex route in 2014, 66% of maintenance tasks on or near the line were completed while trains were running, which was the highest percentage of any route in the country.
- 52 Other options would have been to do the work at night while the line was blocked in a pre-planned possession, or to take a line blockage to carry out the work during the day.
- 53 As described in paragraph 24, at the time of the accident there were possessions planned for the Quarry lines between midnight and 04:00 hrs, for maintenance work. Witness evidence indicates that these possessions were normally used for work that affected the safety of the line, such as changing rails. The presence in the area of a number of sections where rolling contact fatigue had been identified and was being managed meant that there was an ongoing need to replace rails to avoid the need for temporary speed restrictions. Because rail replacement requires the line to be blocked, this work was always done at night.

- 54 Witnesses told the RAIB that to use the night-time possessions to fit rail clamps would have involved diverting labour away from changing rails, whereas there was labour available during the day to fit the clamps without disrupting the train service. On 24 June 2014, the Three Bridges maintenance gang working on the day shift had planned to repair areas of contaminated ballast (known as wet beds) on the Uckfield branch, but the need to clamp the cracked rails on the Quarry line was seen by the managers at Three Bridges as more urgent.
- 55 It does not appear that the section manager and section supervisor actively considered asking for a blockage of the Quarry lines during the day. The train service is so intense that it is impossible to obtain a line blockage between trains⁶, and this is made clear in the 'Green Zone Access guide' which Network Rail publishes for the guidance of staff in this situation. The only other option involving a line blockage would have been to block both up and down Quarry lines completely for about 30 minutes, so that the work could be carried out without staff having to stop and move clear of the line every time a train approached. This option would have required all trains normally timetabled to operate over the Quarry lines to have been diverted through Redhill. The section manager and section supervisor knew that the disruption and congestion that this would have caused on this very busy section of line (with up to six additional trains in each direction having to pass through the Redhill station bottleneck) would have made it probable that the Route Control Manager would refuse a request for a line blockage. Disruption on this scale is normally only considered when it is unsafe to pass trains over a section of line. The section manager and section supervisor therefore decided to work with trains running normally and protection provided by lookouts who would warn staff when they needed to move clear of the line for an approaching train.

Implementation of the safe system of work on site

- 56 The safe system of work set up by the COSS on site involved positioning the lookouts so that they could provide adequate warning of the approach of trains. The COSS used an algorithm provided on the form RT9909 'Record of work arrangements and briefing', which was issued to him as part of the SSOW pack, to work out what warning time was required, and hence what sighting distance for approaching trains was necessary.

⁶ On average, a train passes on each line every four minutes at this location. In order to set up a line blockage, it is necessary for the COSS and the signaller to discuss the arrangements, and agree when the line blockage is to be taken and when it is to be given up, which must normally be done in good time to avoid the driver of an approaching train receiving a restrictive signal (ie any signal other than green). Four minutes is just enough time to complete the formalities between the COSS and the signaller; it would not have allowed any time for work to take place.

- 57 The initial calculation done by the COSS showed that, with a line speed of 90 mph (145 km/h), and with a single lookout, the warning time required would be 25 seconds, for which the sighting distance would be 1100 yards (1006 metres). It was apparent that this distance was not available, because of the curvature of the line both north and south of the site. Consequently, the COSS did the calculation again, incorporating the use of distant lookouts, which significantly increased the distance that could be seen, but also increased the required warning time to 30 seconds (additional time is allowed for communication between site and distant lookouts). The sighting distance required to provide 30 seconds warning would be 1320 yards (1207 metres). The COSS also repeated the calculation for the use of intermediate and distant lookouts, which would have increased the warning time to 35 seconds, but he did not actually set up this system.
- 58 The COSS decided to use one lookout for each direction, and instructed the distant lookouts to position themselves as far as possible from the work site while still maintaining visual contact with the site lookout. This resulted in the south distant lookout being about 450 metres from the site, and the north distant lookout about 550 metres from the site. The RAIB estimates that, in the position where he was standing, up trains came into the view of the south distant lookout when they were about 450 metres away from him, giving a total warning distance of 900 metres (985 yards), and a warning time for up trains (at 90 mph (145 km/h)) of 22 seconds. In practice, because of the change in line speed at the south end of Redhill tunnel, trains travelled at about 80 mph, giving an actual warning time of 25 seconds (however, the distant lookout stated that it was possible for him to become aware of the approach of a train earlier than this, from glimpses of its headlight through vegetation).
- 59 Handbook 7, section 4.8 of the rule book required the COSS, having positioned the lookouts, to test the warning before starting work. There is no evidence that the COSS carried out this test, or took any action to reposition the lookouts to provide the required warning. The COSS was not provided with any equipment to measure distances (such as a range finder), and he did not try to verify how far each distant lookout could see.
- 60 The calculation of warning time included an allowance of 5 seconds for the time needed to stop work and down tools. The work that the gang was doing, fitting clamps to the running rail adjacent to the conductor rail, meant that they should have used yellow conductor rail shields (lightweight covers made of insulating material) placed over the live conductor rails at the site of work⁷. There is conflicting evidence as to whether they actually used these shields. If shields were used, they would have had to be removed before each train passed, and additional time should have been added to the calculated warning time to allow for this. If this had been done, it is likely that the required warning time would have been greater than the rule book permits when using lookouts, and the COSS could not have set up a suitable safe system of work.

⁷ Required by Network Rail company standards NR/L3/MTC/0152 'Working on or adjacent to conductor rail' and related document MR/L3/MTC/RCS0216/GA20 'Task risk control sheet'.

- 61 These deficiencies in the planning and implementing of the safe system of work, along with the readiness to carry out this work under lookout protection in a location where there was extremely heavy rail traffic and no suitable position of safety (see paragraphs 69 to 73), and the failure to complete the record of verification of the SSOW (paragraph 50) combine to indicate a weak safety culture at the Three Bridges depot. The RAIB has identified previous examples of a poor safety culture, leading to a lack of discipline during work on the track, and has made recommendations to address this (see paragraph 120).

History of working methods at this location

62 Working under lookout protection was not prohibited at this location.

- 63 Network Rail gives details of the various hazards associated with the railway infrastructure in its Hazard Directory, which is now available online to people working in the railway industry. Planners are required by Network Rail company standard 019 to use relevant information from this directory when preparing the 'safe system of work pack' for each item of work, which is issued to the COSS before the work starts.
- 64 At the time of the accident, working with lookout protection was permitted by Network Rail at the site where it occurred (at 20m 0c⁸). North of the site, such work was prohibited in Quarry tunnel (17m 24c to 18m 40c), and over the M25 and Nutfield Road bridges (18m 65c to 18m 70c, and 19m 15c to 19m 20c). South of the site, such work was prohibited in and near Redhill (Sand) tunnel (20m 20c to 21m 21c).
- 65 The reasons for these various prohibitions are:
- Quarry tunnel, Redhill tunnel: Work with lookouts is only permitted in tunnels if certain conditions specified in the rule book are met, including the speed of approaching trains being no greater than 20 mph (32 km/h). Close to the north end of the tunnel, the curvature of the line limits the available sighting distance.
 - M25 bridge, Nutfield Road bridge: restricted clearance (ie insufficient space to stand in safety between a structure and the track) over a length of more than 40 metres.
- 66 The RAIB has not been able to discover any evidence that anyone had ever raised concerns about the adequacy of the position of safety on the up side at 20m 0c on any previous occasion. The section supervisor, other local managers and members of the gang had all worked there before. Network Rail had no process for reviewing positions of safety other than those which were automatically deemed unsuitable by virtue of their location, such as tunnels and bridges (paragraph 65).
- 67 Following the accident, some members of the gang expressed concern that the location was not suitable for working with lookout protection because of the inadequate position of safety. However, none of them had spoken out about this at the time.
- 68 After the accident, the local infrastructure maintenance delivery manager reviewed the suitability of the location, and prohibited work while trains are running over the whole length from 19m 60c to 20m 62c (the north portal of Redhill tunnel), because of the limited positions of safety throughout this length.

⁸ 'c' denotes 'chains'. There are 80 chains in a mile, with each chain representing 22 yards or approximately 20 metres.

The position of safety

- 69 **The ccess at this location is narrow and treacherous, and not suitable as a position of safety.**
- 70 To be clear of the track and in a position of safety, a person must be⁹ at least 1.25 metres from the nearest rail (on lines where trains run at up to 100 mph). At the location of the accident, the ground drops steeply away from the track, less than one metre from the sleeper ends, as shown in figure 3.
- 71 At this location, to reach a position of safety requires scrambling down the slope of the embankment. The surface consists of loose earth and ballast, making it treacherous and difficult to stand on. To walk alongside the track, it is necessary to be on or just beyond the ends of the sleepers. Walking along the slope is almost impossible (after the accident, the emergency services passed the casualty, on a stretcher, under the train that was standing at the site. This was because it was not possible to carry it safely along the ccess to go round the front of the train (see figure 6)).



Figure 3: Location of accident, showing ground profile

- 72 On the other side of the line (the down side) there is a wider level area alongside the track, where the site lookout stood. It is possible to walk along that side of the line while remaining in a position of safety. This is not possible on the up side.

⁹ Rule book, Handbook 1, section1.

- 73 The COSS had specified the up cess as the position of safety because it was nearest to where the group was to work, on the up line. It would have been within the rules for the down cess to have been the position of safety, but to reach it, the group would have had to cross the two live conductor rails in the six-foot, and return the same way each time they resumed work. The risks of tripping, and of contact with the live rail, were considered by the COSS to be unacceptable compared with the perceived inconvenience of having to go part way down the bank on the up side.

The actions of the section supervisor

74 The section supervisor did not remain in a position of safety until the train had passed.

- 75 The evidence relating to the actions of the small team who were measuring up (the section supervisor, the COSS and one other worker) is not entirely consistent regarding exactly what they did just before the accident. It seems clear that the section supervisor was aware of the down train (2T25) that passed less than a minute before the accident, because witness evidence indicates that the group stopped work and moved clear of the line. After this train passed, about fifteen seconds elapsed before the site lookout warned them of the approach of the up train, 1U53. During this time, it is likely that the section supervisor was considering his next task. He had been measuring up, holding one end of a tape with the other end held by the COSS. After the warning of the up train was given, he began to walk north along the line, unnoticed by the COSS, who had turned to face the train (see paragraph 92).
- 76 The section supervisor has no clear recollection of his actions immediately before the accident, but he has stated that he was aware of the up train. The RAIB considers it likely that he was walking close to the line because the slope of the ground made it very difficult to walk any further away. He was speaking to the COSS as the down train went past, and witness evidence indicates that at that time he was in a position of safety, clear of the line. As he walked north, and the cess got narrower, the edge of the area on which he could walk got closer to the line. It is not possible to say with any certainty whether he thought he was still clear of the line, or whether, in fact, he was unaware of the train's approach. There was no evidence that he was distracted (he had a mobile telephone in his pocket, but he had not used it at all on the day of the accident), but it is possible that he was preoccupied with the next measurement he was intending to take (paragraph 42).
- 77 The rules relating to work under lookout protection are in Handbook 1, 'General duties and track safety for track workers'. Section 5.4 says:

'You must stop any work, acknowledge the warning and move to the position of safety immediately the lookout gives the warning.'

If someone does not acknowledge or move to the position of safety when the lookout gives the warning, the lookout will give an urgent warning. This urgent warning is a series of short sharp blasts on the whistle or horn.'

You must not leave the position of safety until the COSS gives you permission.'

The approach of the train

78 The section supervisor was unaware of the imminent danger from the approaching train.

79 It is clear from the FFCCTV (figure 2) that the section supervisor acted as though he was unaware that the train was approaching. If he had heard the sound of the train's horn as it approached the group, or a warning from one of his colleagues, he might have become aware of the imminent arrival of the train, and been prompted to move clear.

The train's horn

80 Witness evidence indicates that the driver of train 1U53 sounded the train's horn as the train approached the site of the work. It is likely that this was as the train approached the distant lookout. It is not possible to be certain about the exact timing because the OTDR on the class 442 is not configured to record the use of the horn. However, if the sounding of the horn was on the immediate approach to the distant lookout, the train would then have been about 450 metres and 12 seconds running time from the work site.

81 The train approached the work group round a left-hand curve. The group became visible to the train crew about seven seconds before the accident occurred (figure 4, left). The site lookout acknowledged the train's approach by raising his flag. From the FFCCTV evidence, it appears that only when the train was about four seconds' running time from the group did the position of the section supervisor, separate from the others, become visible to the trainee driver and the driver-instructor. The driver-instructor then realised that the person he could see to the right of the other figures was possibly too close to the track (figure 4, right).

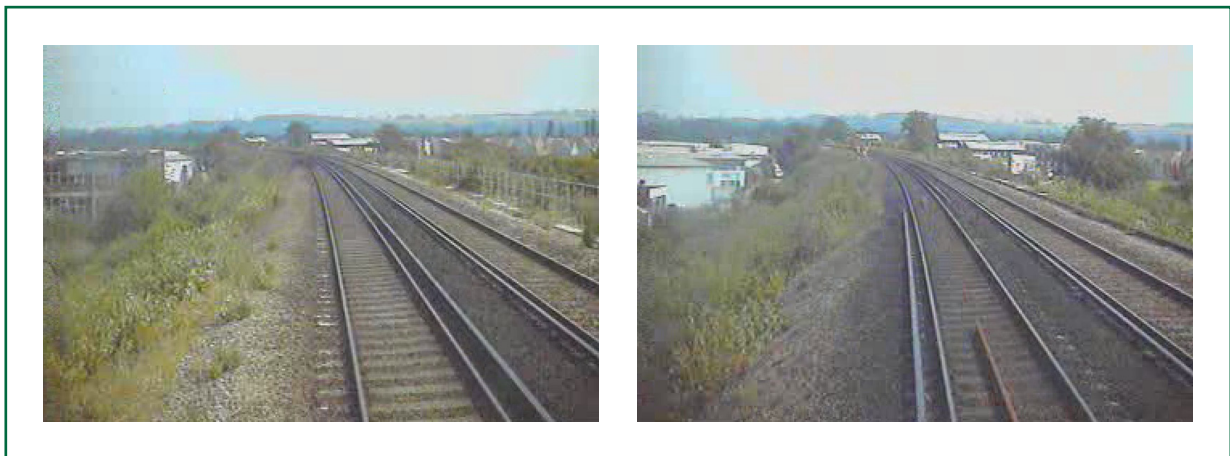


Figure 4: FFCCTV images, seven seconds before the accident (left) and four seconds before the accident (right)

82 Unlike some other types of train, the class 442 does not have a horn control on the right-hand side of the cab where the driver-instructor was sitting. He shouted to the trainee driver to sound the horn. By the time the trainee driver reacted to this instruction, the accident had happened.

- 83 In relation to the use of the train's horn to warn people who are on or near the line, the rule book (module TW1 section 45.3) says:

'Sounding the horn as a warning

Anyone on or near the line

You must sound the horn to warn anyone who is on or near the line on which you are travelling.

Give a series of short, urgent danger warnings to anyone who is on or dangerously near the line who does not:

- *acknowledge your warning by raising one arm above the head, or*
- *appear to move clear out of the way of the train.'*

Implicit in this is the principle that it is important that, where people working on the track are in separate groups or remote from each other, the train driver uses the horn sufficiently to warn the whole of the work party. Drivers should never assume that it will be sufficient to give a warning on the approach to a distant lookout, because they have no way of knowing whether the next group that they see are being protected by that lookout, or are working under a different system (such as site warden protection, with an adjacent line blocked).

- 84 The RAIB has noted in a previous investigation¹⁰ that it can be difficult for a train driver to judge whether someone standing by the side of the track is, or is not, actually in danger of being struck. This can be particularly difficult when the line is curved. However, if there is any doubt at all about whether someone close to the line is aware of the train's approach, the driver should sound the horn.

The other members of the gang

85 The actions of the section supervisor were not observed by anyone else on site, so no other warning was given.

- 86 The section supervisor began walking north along the side of the line, probably just before the up train came into view. Most of the other members of the gang stated that, at the time, they were unaware of what he was doing.
- 87 The distant lookout to the north was looking towards down trains, away from the gang. Witness evidence indicates that the distant lookout to the south, having seen that his warning had been acknowledged by the site lookout, returned to looking for up trains, away from the gang.
- 88 Six members of the gang were sitting or standing on the side of the embankment, facing away from the line (figure 5). A further member of the gang was sitting near the COSS, facing the approaching up train.
- 89 The required actions of the site lookout are defined in the rule book. When a site lookout gives a warning of an approaching train, they are required by the rule book (Handbook 3, section 5) to see that everyone in the group that they are looking out for acknowledges the warning and moves to a position of safety. If anyone does not do so, the lookout must give a series of short sharp blasts on the horn.

¹⁰ Fatal accident at Whitehall West Junction, Leeds, on 2 December 2009 ([report 15/2010](#)).

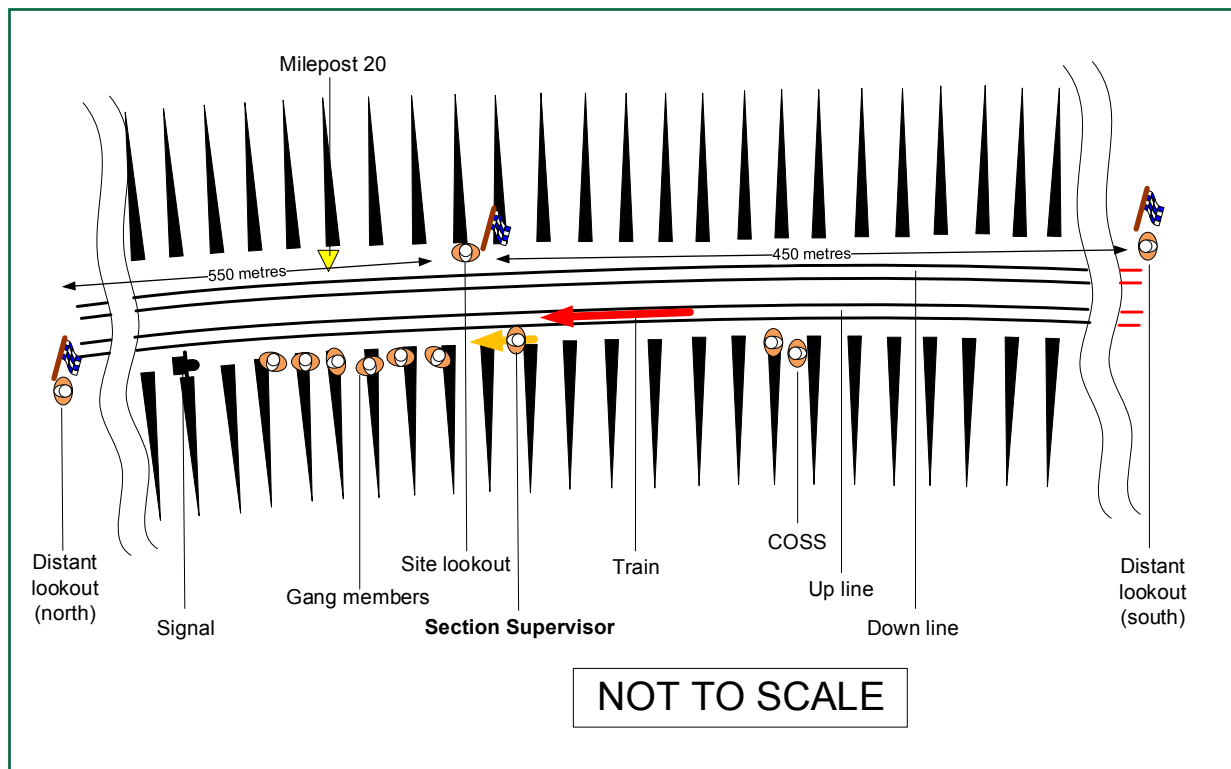


Figure 5: The accident site, showing the relative positions of the people involved

- 90 In this case, the site lookout gave the initial warning of the up train and saw that everyone was still in the position of safety after the passing of the previous down train. He says that he then turned towards the north to maintain visual contact with the distant lookout in that direction, in case another down train was approaching. He turned back towards the up train and raised his flag to acknowledge it as it came close. He states that he was not aware that the section supervisor was walking along the other side of the line. Even if he had noticed him, it would have been difficult for the lookout to tell how far the section supervisor was from the track because of the angle of vision, but he states that he would have given a further warning had he realised that the supervisor was in an unsafe position.
- 91 The required actions of the COSS are also defined in the rule book. When a site lookout warns of an approaching train, the COSS is required by the rule book (Handbook 7, section 4.8) to '*make sure everyone goes to the position of safety when the warning is given*'. The work group must not leave the position of safety again until the COSS gives them permission (Handbook 1, section 5.4).
- 92 In this case, witness evidence indicates that the COSS was talking to the section supervisor at the time the warning of the up train was given. He checked that the rest of the gang were still in the cess, and then turned to look south towards the train. When the up train approached, the COSS thought that the section supervisor was aware of it, and did not realise that he had begun to walk away, alongside the line. The COSS had not indicated to anyone that it was safe to return to the track. The section supervisor was senior to the COSS, and much more experienced: it did not occur to the COSS that the section supervisor might do anything to put himself in danger.

Factors associated with the emergency response

- 93 Following the initial response to the accident by the Surrey Fire & Rescue service and the South East Coast Ambulance service, a Helicopter Emergency Medical Service (HEMS) aircraft was mobilised to the scene to extract the casualty rapidly to a specialist trauma unit.
- 94 The helicopter landed briefly on the track, to drop off medical staff, close to a train which had been stopped at a signal near the scene of the accident (figure 6). It then took off again and moved to a field at the side of the line.



Figure 6: HEMS helicopter landing on the railway near the scene of the accident. Paramedics treating the casualty can be seen on the extreme right. The train in the picture was following the train that was involved in the accident, and had come to a stand at the signal visible in the photograph (reproduced with kind permission of the Surrey Advertiser ©Trinity Mirror group).

Helicopters landing on rail tracks

- 95 The helicopter landed on the track without permission from Network Rail. A railway line is a potentially hazardous place on which to land a helicopter. If trains have not been stopped, or if the electrical power to the conductor rails has not been cut off, there is the possibility of a serious accident. In this case, the power had been switched off soon after the accident. Even if these hazards have been taken into account, the tracks and ballast make up an uneven and treacherous surface, where there may be fragile troughing runs and drain covers which may not be able to support the weight of an aircraft. For these reasons, Network Rail strongly discourages helicopter ambulances from landing on or near railway lines.

- 96 There have been previous occasions on which helicopters have landed on railway tracks. Following an incident at Burnham, Buckinghamshire on 2 July 2006, when a helicopter landed between two sets of tracks, Network Rail sent the Civil Aviation Authority a letter which it described as 'mandatory advice', that, in the event of an air ambulance being deployed to a rail incident '*under no circumstances will the helicopter land on or within 3 metres of the railway track*'.
- 97 Despite this, a further incident occurred in the same area on 29 April 2007, when an air ambulance landed on the track near Ruscombe, Berkshire, following a fatal accident to a welder working on the railway. In its investigation into this accident (report 04/2008), the RAIB recommended that '*Network Rail and the National Health Service should take steps to correctly implement the existing protocol governing the landing of air ambulance helicopters at rail incidents and accidents*'.
- 98 The safety authority (the Office of Rail Regulation (ORR)) reported to RAIB on 24 July 2008 that this recommendation had been implemented. The report included information about action taken by the Confederation of Helicopter Ambulance Services, a body which was dissolved in 2008.
- 99 The RAIB has been able to find two documents implementing this recommendation:
- within the railway industry, Network Rail issued a Letter of Instruction (NR/BS/LI/273).
 - the Confederation of Helicopter Ambulance Services issued its Guideline number 11 'Mandatory Advice for Air Ambulance Flight crews Attending a Rail Incident', which repeated the Network Rail advice quoted in paragraph 96 above.
- 100 Witness evidence indicates that the pilot of the helicopter ambulance which attended the accident at Redhill was fully aware of the policy of not landing on railways. However, he considered, from the terms of the guideline that he had seen (paragraph 99), that this was only advisory, and he assessed that the only suitable place which would give the medical team reasonable access to the incident was on the track, because of the need for the doctor (who is part of the HEMS team carried by the helicopter) to reach the casualty quickly. He asked for confirmation that the electric power had been switched off, and could see for himself that trains had been stopped in the area and there were many people on the tracks. At this stage the Rail Incident Officer, who is appointed by Network Rail to take charge of the site, had not yet arrived on the scene, and the pilot's questions were answered by the helicopter emergency medical service controller by reference to the land ambulance crew who were already on site. The pilot made a 'skids-light' landing (in which the weight of the helicopter does not come fully onto the ground), the medical team got out, and the pilot then moved the helicopter to a field near the railway.
- 101 The pilot and medical crew planned that the helicopter would return to the track to pick up the casualty. However, by that time the Rail Incident Officer was on site, and he made it clear to the doctor that it would not be safe for the helicopter to land on the track. As a consequence of this the plan was changed, and the casualty was carried off the track on a stretcher, and transferred to the helicopter where it stood in the field.

Observations¹¹

The lookout arrangements

- 102 The COSS and the lookouts were aware that trains going away from the work site in each direction would pass the distant lookout and then block the distant lookout's view of approaching trains, and so the lookouts had arranged that each would use his flag to indicate to the site lookout that, while he was unsighted in this way, the work group should not return to the track. On each occasion after a train had passed the site, the site lookout confirmed to the COSS and the other members of the work group that it was safe for them to return to the track.
- 103 Witness evidence indicates that this practice is widespread among lookouts, although it is not referred to in any rule book or published instructions. Although this unofficial system was being used by the lookouts on this occasion, the RAIB believes that it did not have any influence on the sequence of events that led to the accident. To reduce risk to people working on the track, it would seem to be desirable that consideration is given to referencing the use of this technique in the training given to lookouts and those acting in the role of COSS.

First aid

- 104 The injured person was given first aid by one of the other members of the gang (paragraph 38). This person, the site lookout, was one of the six contractors working with the gang. The paramedics who attended the casualty told railway staff on site that this first aid treatment had been important in saving the life of the injured person. The staff who were on site on 24 June told RAIB that it was purely fortuitous that a person qualified in first aid at work was present.
- 105 Employers are required by law¹² to ensure that such equipment and facilities are provided as are adequate and appropriate in the circumstances for enabling first aid to be rendered to their employees if they are injured or become ill at work. Subject to the nature of the undertaking, the number of employees at work, and the location of the establishment, this requirement is normally satisfied by ensuring that a suitable number of employees are trained and qualified in first aid at work. Guidance issued by the Health & Safety Executive¹³ indicates the criteria that employers should use to decide on the level of first aid provision.
- 106 Network Rail's current policy is defined in its company standard NR/L2/OHS/00110 issue 5 (March 2010) 'First Aid at Work'. This states that '*The level of first aid provision is risk based and is defined by the number of Network Rail employees in the workplace or worksite and the level of health and safety risk posed by the work activities undertaken*'. For work on or near the line, the standard states (section 5.4) '*Any activity on or near the line or in a confined space shall normally be classified as high risk unless a thorough risk assessment has been carried out and found otherwise.*' If an activity is classified as high risk, the same section of the standard requires that where the maximum number of people working is between 5 and 50, at least one full first aider (a person trained in first aid at work) should be present, although this requirement is qualified by a note '*depending on the type of injuries that might occur*'.

¹¹ An element discovered as part of the investigation that did not have a direct or indirect effect on the outcome of the accident but does deserve scrutiny.

¹² The Health & Safety (First Aid) Regulations 1981, SI 1981 No. 917, Regulation 3.

¹³ <http://www.hse.gov.uk/pubns/priced/l74.pdf>.

- 107 In 2009, Network Rail's Brighton area maintenance delivery unit (of which Three Bridges depot is a part) produced a document to support its risk assessments relating to provision of first aid during maintenance activities. This document, which was compiled using material produced by other maintenance delivery areas, concluded that manual work on the line including patrolling, manual packing of ballast and manual wet bed maintenance (ie the type of work being done on 24 June), was low risk, and therefore did not require the presence of a full first aider, regardless of the size of the work group. The RAIB has found that this approach, which takes account of the nature of the task, but not the environment (the active railway) in which the work takes place, is not consistent with that taken by some maintenance delivery units in Network Rail.
- 108 Witness evidence indicates that all Network Rail staff in the Brighton area maintenance delivery unit who are permitted to go on or near the line are given training in basic emergency first aid as part of their induction when they join the company, but this competency is not kept up by refresher training. A smaller number of people are trained and qualified in the full first aid at work competency (the different requirements for these two competencies are shown in appendix C). In mid-2014, the number qualified in first aid at work was 72 out of a total of 325 staff.
- 109 Voluntary first aid training has a long history on Britain's railways. Within local maintenance depots, there is no compulsion on individual staff to acquire a full first aid qualification, but many do. However, the extent to which this is encouraged by local management can lead to uneven and inconsistent levels of first aid cover across different depots. In this situation, it may be difficult to ensure that every gang working on the track includes a first aider, but Network Rail's risk assessment (paragraph 106) indicates that where there are more than five people in such a gang, a full first aider should normally be provided.
- 110 The difference between emergency first aid training (one day) and the full first aid at work course (three days) lies largely in the amount of practical training that trainees can be given in treating different kinds of injury. Although the emergency first aid course covers this topic, the limited time available means that people taking this course have very limited opportunity to practice the skills needed to respond effectively to a casualty with a serious injury.

Previous occurrences of a similar character

- 111 Since it became operational in 2005, the RAIB has investigated 19 incidents in which workers have been struck by trains. According to information from the Office of Rail and Road (ORR), on 37 occasions over the last ten years infrastructure workers have been struck by trains, resulting in 11 fatalities, 18 major and 9 minor injuries.
- 112 In the seven years to June 2015, the RAIB has published reports on investigations into ten accidents in which workers were struck by trains, and a factor in the cause of the accident was that the person who was struck was distracted and unaware of the approach of the train. The RAIB made recommendations for safety improvements in all of these cases, but none of these recommendations were relevant to the circumstances of the accident at Redhill. These accidents are listed in appendix D.

113 The RAIB also investigated an accident to a track worker, acting as lookout, who was struck and seriously injured near West Drayton on 22 March 2013 (RAIB bulletin 05/2013). In that accident, the lookout was positioned as an intermediate lookout about 280 metres beyond the main group of workers, and was struck by a train that had already passed the main group. It is possible that the person who was injured was unaware of the approach of the train. The train driver sounded the horn when the train was about 1 km away from the lookout. It was difficult for the train driver to see that the lookout was standing too close to the track, because of the curvature of the line. The RAIB published a learning point in this bulletin which is relevant to the accident at Redhill:

Train operating companies are advised, as part of their routine briefings, to remind all drivers that:

- *When sounding warnings to people on or near the line, they should pay particular attention to lookouts and other staff who may be remote from a main group; warnings should start with a blast on the high and the low tone horn (in the loud setting where soft or loud settings are provided), followed by short sharp blasts where no acknowledgement is received or the track worker remains in a dangerous position; and*
- *Train drivers approaching track workers in areas of curved track should appreciate that it can be difficult to see whether these people are in a position of safety until they are close to the individual concerned. If there is any doubt a warning should be sounded.*

The RAIB does not receive formal feedback on the industry's response to learning points, but understands that most train operating companies have incorporated this reminder in their briefings to train drivers.

Summary of conclusions

Immediate cause

114 The section supervisor was walking too close to the track with his back to the approaching train (**paragraph 41**).

Causal factors

115 The causal factors were:

- a. the work was being carried out while trains were running, and there were deficiencies in the planning, choice and implementation of the safe system of work used on the day which indicate that there was a weak safety culture at Network Rail's Three Bridges maintenance depot (**paragraph 44**);
- b. working under lookout protection was not prohibited at this location (**paragraph 62, see paragraph 118, Learning point 1 and Recommendation 1**);
- c. the cess at this location is narrow and treacherous, and not suitable as a position of safety (**paragraph 69, see paragraph 118 and Recommendation 1**);
- d. the section supervisor did not remain in a position of safety until the train had passed (**paragraph 74**);
- e. the section supervisor was unaware of the imminent danger from the approaching train (**paragraph 78, Learning point 2**); and
- f. the actions of the section supervisor were not observed by anyone else on site, so no other warning was given (**paragraph 85**).

Factors associated with the emergency response

116 Factors associated with the emergency response were as follows:

- a. the helicopter ambulance landed on the track without permission from Network Rail (**paragraph 94, see paragraph 119**); and
- b. the pilot of the helicopter understood that the 'mandatory advice' that he had been issued with still gave him discretion on where to land, and judged that the situation was sufficiently safe given the nature of the emergency, his analysis of the events he could see on the ground, and the advice he received from his control authorities (**paragraph 100**).

Additional observations

117 Although not linked to the accident on 24 June 2014, the RAIB observes that:

- a. The working practice used by the lookouts to reduce the risk that the gang might return to the track while a lookout was unsighted by a moving train is not documented in any of the railway industry's rules, instructions or training material (**paragraph 102, Recommendation 3**).
- b. The assistance of a trained first aider was, in the opinion of medical staff on site, important to the survival of the injured person. The implementation of Network Rail's policy on the provision of first aiders is inconsistent across the company (**paragraph 104, Learning point 3, Recommendation 2**).

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

- 118 Following the accident, Network Rail prohibited working under lookout protection in the area where the accident occurred, where the embankment does not provide a suitable position of safety (paragraph 68).
- 119 Network Rail has issued a revised Letter of Instruction to control managers and operations managers, stating that there are no exceptional circumstances in which helicopters are allowed to land on or near the line. It has also asked the Civil Aviation Authority and the British Helicopter Association Emergency Services Committee to re-brief crews in the sector that there are no circumstances in which helicopters may land on or near railway tracks.

Previous RAIB recommendations relevant to this investigation

120 The following recommendations, which were made by the RAIB as a result of its previous investigations, have relevance to this investigation.

Recommendations that are currently being implemented

[Accident at Newark North Gate, 22 January 2014, RAIB report 01/2015 \(published February 2015\), Recommendations 1 and 2](#)

121 The above recommendations addressed one of the factors identified in this investigation (paragraph 115a). So as to avoid duplication, they are not remade in this report. The RAIB has not yet received a response from the safety authority (the Office of Rail and Road) (ORR) on progress being made in the implementation of these recommendations.

Recommendation 1

Network Rail should:

- a) *systematically brief and where appropriate rebrief its COSS/Safe Work Leaders that they must be on site at all times, even when working with experienced staff, and that they must provide a full site based safety briefing once the safe system of work has been verified by them as being appropriate for the conditions at the time of the work;*
- b) *rebrief its lookouts about not leaving the position of safety until the COSS has given permission;*
- c) *actively monitor the degree to which work site discipline is being maintained, and take appropriate corrective action if any issues are found; and*
- d) *investigate how best to maintain vigilance and safety discipline for cyclical and repetitive tasks and implement any practicable measures into its working procedures.*

Recommendation 2

Network Rail should:

- a) *introduce sufficient managerial supervision and audit checking to confirm that the standards governing the safety of track workers are being correctly implemented by its delivery units in the planning of safe systems of work (SSOW), particularly in those areas where staff regularly work on lines that are still open to traffic.*
- b) *take steps to strengthen any weaknesses it finds, including the re-training of staff involved in planning safe systems of work.*

[Dangerous occurrence involving track workers near Roydon, 16 July 2012, RAIB report 07/2013 \(published June 2013\), Recommendation 1](#)

122 This recommendation also addressed one of the factors identified in this investigation.

Recommendation 1

Network Rail should review, and then improve as appropriate, the methods by which controllers of site safety assess both the required and the available sighting distance when at sites of work. The review should include:

- *the accuracy, availability and presentation of information concerning the available sighting distances at sites of work (particularly in those areas where sighting is limited, or too short to permit a sufficient warning from one or more lookouts);*
- *identification of recommended methods of assessing sighting distance when on site (including the use of special equipment); and*
- *the adequacy of existing training and assessments of competence related to the assessment of sighting.*

On 14 October 2014 the ORR advised the RAIB that Network Rail was taking action (which was still in progress) to implement this recommendation. Network Rail has advised the RAIB that, since the accident at Redhill, all its staff at the Three Bridges depot who are qualified to act as COSS have been issued with equipment for measuring sighting distances.

Learning points

123 The RAIB has identified the following learning points¹⁴:

- 1 Although some staff said they considered that they were working in an unsafe location, none of them expressed their concerns to the COSS. It is important that Network Rail emphasises to its staff that it is imperative, for everyone's safety, for them not to work in dangerous locations, and that they must voice their concerns when they consider the working environment to be unsafe (**paragraph 115b**).
- 2 It is important that train operating companies periodically remind all drivers, as part of the routine briefing process, of the Rule Book requirement to sound a warning to **anyone** who is on or near the line on which their train is travelling, and that a warning sounded for the first person they encounter may not be sufficient for the whole of a group which is spread out along the line (**paragraph 115e**).
- 3 Being trained in first aid might enable someone to save a life. Participation in such training might increase if railway companies provided incentives to encourage employees to become qualified in first aid at work, and emphasised to their employees the potential value of this qualification (**paragraph 117b**).

¹⁴ 'Learning points' are intended to disseminate safety learning that is not covered by a recommendation. They are included in a report when the RAIB wishes to reinforce the importance of compliance with existing safety arrangements (where the 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.

Recommendations

124 The following recommendations are made¹⁵:

- 1 *The intent of this recommendation is that all locations which are used as positions of safety should be suitable for that purpose, to minimise the risk when staff need to clear the line for the passage of trains.*

Network Rail should:

- Review each section of line where work while trains are running is authorised, and assess the availability and suitability of the locations that are required to be used as a position of safety. Where these are found to be inadequate, Network Rail should prohibit work while trains are running.
- Ensure that staff responsible for establishing a safe system of work on site are explicitly prompted to consider potential hazards that might call into question the suitability of the position(s) of safety throughout the site (such as the number of people required to use it/them, and whether the ground is reasonably level, in good condition underfoot and free of obstructions) before permitting work to commence (paragraphs 115b, 115c).

- 2 *The intent of this recommendation is that a consistent and appropriate level of first aid cover is provided for people working on the track.*

Network Rail should review its policy on first aid provision, as defined in company standard NR/L2/OHS/00110, and the way in which this policy is implemented, so that a consistent and appropriate level of first aid cover is provided for people working on or near the line, taking into account the nature of the work and the environment in which it takes place (paragraph 117b).

continued

¹⁵ 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 that there should be a defined and suitable method to address the risk that, after a train has passed a work site, the work group might return to the track while their lookout is still unsighted by that train, and that COSS/SWL and lookouts should be given appropriate training.*

Network Rail should review the training of Controllers of Site Safety (or Safe Work Leaders) (COSS/SWL) and lookouts relating to setting up work under lookout protection. This review should cover the way which the lookout(s) and the COSS/SWL interact to confirm that it is safe for the work group to go on or near the line (particularly after a train has passed), and should include the definition of suitable methods by which lookouts may positively indicate to each other and to the COSS/SWL that the lookout(s) are unsighted and that work may not resume (paragraph 117a).

Appendices

Appendix A - Glossary of abbreviations and acronyms

COSS	Controller of Site Safety
FFCCTV	Forward facing closed circuit television
HEMS	Helicopter Emergency Medical Service
ORR	Office of Rail Regulation (now the Office of Rail and Road)
OTDR	On-train data recorder
RCF	Rolling contact fatigue
SSOW	Safe system of work
SSOWP	Safe system of work pack
SWL	Safe Work Leader

Appendix B - Glossary of terms

All definitions marked with an asterisk, thus (*), have been taken from Ellis's British Railway Engineering Encyclopaedia © Iain Ellis. www.iainellis.com.

Cess	The space alongside the line or lines.*
Controller of site safety	The holder of a qualification demonstrating the holder's competency to arrange a safe system of work, ie protecting staff working on the line from approaching trains.*
Distant lookout	A lookout (qv) who is positioned some distance away from the site of work, to permit them to obtain an earlier view of approaching trains.
Down	The direction away from London, and the line normally used by trains travelling in that direction.
Electric multiple unit	A train consisting of one or more vehicles (semi-permanently coupled together) with a driving cab at both ends, that can be driven and controlled as a single unit from the driving cab at the leading end and whose motive power is electricity supplied externally from overhead line equipment or conductor rails.*
Lookout	A competent person whose sole duty is to watch for and to give an appropriate warning of approaching trains by means of whistle, horn or other means.
Position of safety	A place far enough from the track to allow a person to safely avoid being struck by passing trains. On Network Rail infrastructure this is 1.25 m (4 feet) where trains approach at speeds of up to and including 100mph, 2m (6 feet 6 inches) at speeds of up to 125 mph, and 2.75 m (9 feet) at speeds of over 125 mph.*
Possession	A formal temporary closure of a line to trains for safety reasons or to allow engineering work to take place.*
Rolling contact fatigue	Collective term for all rail defects directly attributable to the rolling action of a rail wheel on the rail.*
Safe system of work pack	A hard copy version of the planned arrangements for carrying out work on or near the line, including forms for recording the arrangements when they are put in place, and the names of the members of the work group covered by the plan.
Safe Work Leader	A role introduced by Network Rail during 2015 as part of its Planning and Delivery of Safe Work programme. Among other things, the role replaces the COSS as the person responsible for safety at the site of work.
Six-foot	The colloquial term for the space between two adjacent tracks, irrespective of the distance involved.*
Up	The direction towards London, and the line normally used by trains travelling in that direction.

Appendix C - Contents of First Aid courses

Source: Health & Safety Executive, Guidance on the Health & Safety (First-Aid) Regulations 1981 (L74, 2013 edition).

Emergency first aid at work

On completion of training, successful candidates should be able to:

- understand the role of the first-aider, including reference to:
 - ◆ the importance of preventing cross infection;
 - ◆ the need for recording incidents and actions;
 - ◆ use of available equipment;
- assess the situation and circumstances in order to act safely, promptly and effectively in an emergency;
- administer first aid to a casualty who is unconscious (including seizure);
- administer cardiopulmonary resuscitation;
- administer first aid to a casualty who is choking;
- administer first aid to a casualty who is wounded and bleeding;
- administer first aid to a casualty who is suffering from shock;
- provide appropriate first aid for minor injuries (including small cuts, grazes and bruises, minor burns and scalds, small splinters).

First Aid at work

On completion of training, whether a full FAW course or a FAW requalification course, successful candidates should have satisfactorily demonstrated competence in all of the subject areas listed [above] and also to be able to:

- administer first aid to a casualty with: injuries to bones, muscles and joints, including suspected spinal injuries;
 - ◆ chest injuries;
 - ◆ burns and scalds;
 - ◆ eye injuries;
 - ◆ sudden poisoning;
 - ◆ anaphylactic shock;
- recognise the presence of major illness (including heart attack, stroke, epilepsy, asthma, diabetes) and provide appropriate first aid.

Appendix D - Recent RAIB investigations of workers struck by trains

Report	Event date	Location	Details
04/2008	29/04/2007	Ruscombe Junction	Welder working on points struck and killed
19/2009	13/11/2007	Grosvenor Bridge	Track patroller (COSS) struck and seriously injured
29/2009	23/05/2008	Kennington Junction	Technician working on points struck and seriously injured
30/2009	30/03/2009	Dalston Junction	Lookout struck and injured
15/2010	02/12/2009	Whitehall West Junction	Lookout struck and killed
06/2011	30/03/2010	Cheshunt Junction	Track worker struck and seriously injured at junction
16/2012	12/06/2011	Stoats Nest Junction	Section supervisor struck and seriously injured
20/2013	06/08/2012	Bulwell	Trackside inspector struck and seriously injured ¹⁶
21/2013	04/12/2012	Saxilby	Track worker (COSS) struck and killed
01/2015	22/01/2014	Newark North Gate	Lookout struck and killed

¹⁶ The RAIB made a recommendation (Recommendation 1) in this report, directed to Network Rail, relating to the provision of information for work planners about the appropriate safe system of work for specific locations and circumstances. This recommendation is still in the process of being implemented by Network Rail. The RAIB does not consider that full implementation of this recommendation would have affected the course of events at Redhill, because the area where the accident took place had not previously been identified as unsuitable for working with lookout protection (paragraph 66).

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Any enquiries about this publication should be sent to:

RAIB	Telephone: 01332 253300
The Wharf	Fax: 01332 253301
Stores Road	Email: enquiries@raib.gov.uk
Derby UK	Website: www.gov.uk/raib
DE21 4BA	