RAIB

Rail Accident Investigation Branch

Rail Accident Report

Fatal accident involving a track worker near Newark North Gate station 22 January 2014

Report 01/2015
February 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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Fatal accident involving a track worker near Newark North Gate station, 22 January 2014

Contents

Summary

At around 11:34 hrs on 22 January 2014, a track worker was struck by a passenger train as it approached Newark North Gate station. He was part of a team of three carrying out ultrasonic inspection of two sets of points at Newark South Junction and was acting in the role of lookout. The accident happened around 70 metres south of the platforms at the station.

A few minutes before the accident, the lookout and two colleagues arrived at the yard adjacent to the tracks in a van. One colleague was in charge of carrying out the inspections and the other, the 'controller of site safety' (COSS), was in overall charge of the safety of the team. They had planned to carry out the inspections on lines that were still open to traffic in accordance with a pre-planned safe system of work. All three had many years of relevant experience in their respective roles and were familiar with the work site.

Upon arrival at the yard, the lookout and tester proceeded to the track to start the inspection work; the COSS remained in the van. Shortly after they had started the inspection, the 10:08 hrs London to Newark North Gate passenger service approached. It was due to stop in platform 3, which required it to negotiate two crossovers. The train blew a warning horn and the two staff on site acknowledged the warning and moved to the nominated place of safety. However, just before the train moved onto the first crossover, the lookout turned to face away from the train, walked towards the station and then out of the position of safety. He moved to a position close to where he had been before the train approached, most probably to check for trains approaching in the opposite direction, having decided that the approaching train was proceeding straight into platform 1. Although the train braked and blew a second warning horn, the lookout did not turn to face the train until it was too late for him to take evasive action.

As a result of its investigation, the RAIB has identified one learning point and made two recommendations to Network Rail. The learning point relates to improving the implementation of Network Rail's competence assurance process by providing training and sufficient working time to enable front line managers to implement the associated procedures as intended by Network Rail. The recommendations relate to:

- improving work site safety discipline and vigilance, especially for teams doing routine work with which they are familiar; and
- improving the implementation of Network Rail's procedures for planning safe systems of work so that the method of working that is chosen minimises the risk to track workers so far as is reasonably practicable, as intended by the procedure.

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 any inquest or fatal accident inquiry and 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 speeds 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 around 11:34 hrs on 22 January 2014, a track worker was struck by a passenger train (reporting number 1B82) near Newark North Gate station (figures 1 and 2). He was part of a group of three carrying out *ultrasonic inspection* of two sets of *points* located at Newark South Junction near the station, and was acting in the capacity of a *lookout*. The inspection work they were doing at this location was a routine task with which everyone in the group was familiar.

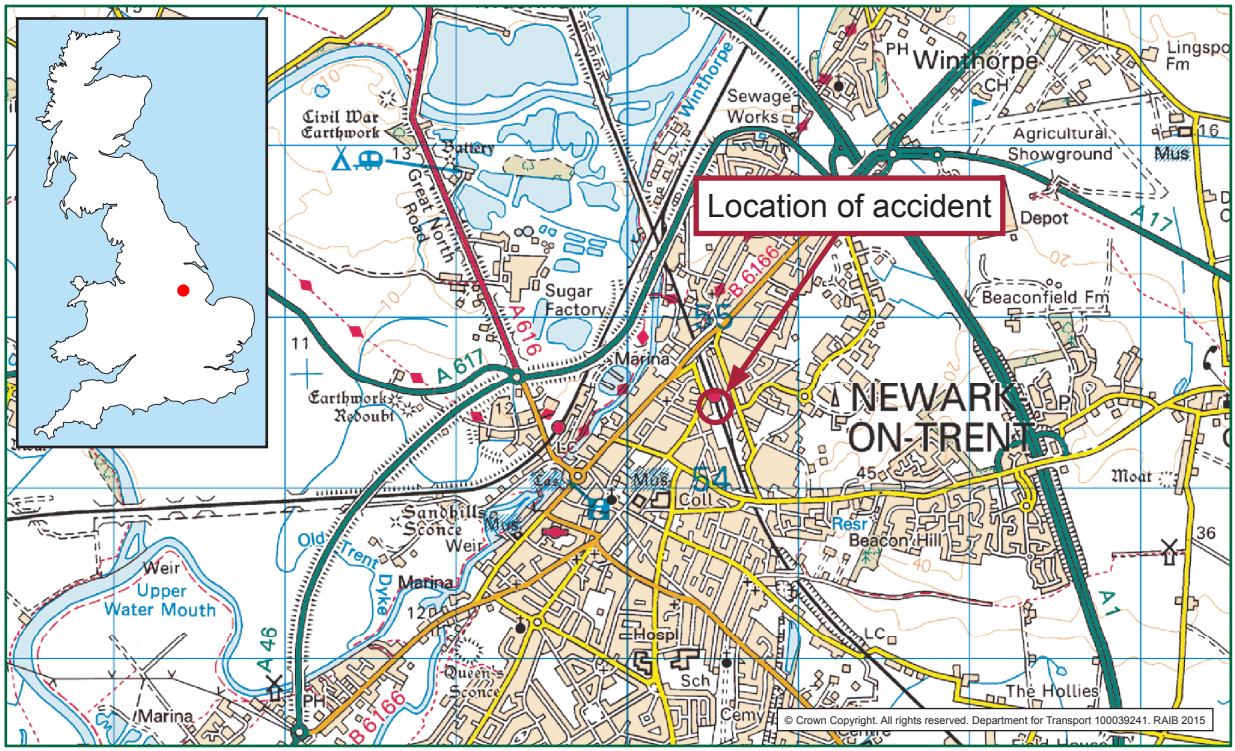

Figure 1: Extract from Ordnance Survey map showing location of the accident

7 Train 1B82 was the 10:08 hrs service from London Kings Cross to Newark North Gate and was due to terminate in platform 3. It approached the station from the south on the *down* main line at a speed of around 26 mph (42 km/h). It had to negotiate two *crossovers* to get onto the up/down Passenger Loop and into platform 3 (figure 3b).

8 Before the accident, there were two track inspection staff at the site on the *up* main line, the lookout and the operator of the ultrasonic test equipment (hereafter called the tester). As the train approached, it sounded its horn as a warning. The lookout and tester each acknowledged the horn by raising one arm above their heads (as required by the railway *rule book)* and moved to an adjacent siding which the *controller of site safety (COSS)* had reportedly nominated as the *position of safety*. Around 12 seconds later, as the train was crossing over from the up main line to the up/down Passenger Loop, the lookout moved from the position of safety and onto the second crossover where he was struck by the train. He suffered serious injuries and subsequently died in hospital on 31 January 2014.

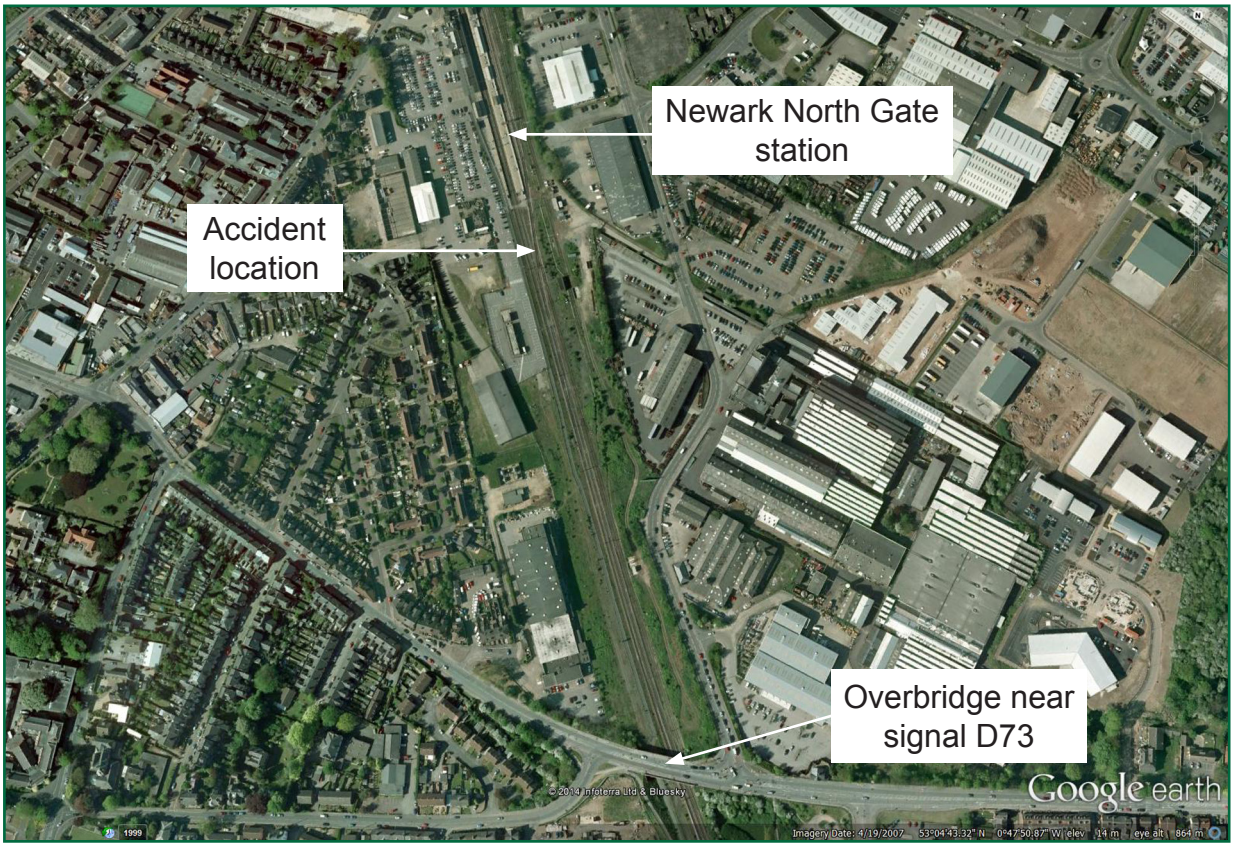

Figure 2: Google earth image of the accident site

Location

9 The accident occurred around 70 metres south of the platform ramps at Newark North Gate station (figure 3), which is located on the East Coast Main Line (ECML) at 120 miles 8 chains from London Kings Cross.

10 In this area there are three running lines, the down and up Main lines which pass through platforms 1 and 2 respectively, and the up/down Passenger Loop which passes through platform 3 (figure 3b). The up main line through platform 2 and the up/down Passenger Loop through platform 3 are signalled for *bi-directional* running. There is also a siding, known locally as the 'Barrow Road', which runs parallel to the up main line to a buffer stop at its southern end and which was the siding reportedly chosen by the COSS as the position of safety (paragraph 8).

11 The maximum line speed on the up and down main lines is 125 mph (201 km/h) for trains running in the normal direction. For down direction (northbound) movements along the up line, the maximum speed is 30 mph (48 km/h). The maximum speed for the up/down Passenger Loop is 40 mph (64 km/h).

12 The train involved in this accident had been routed over two crossovers. The first is between 2179A points and 2179B points (figure 3a) and takes northbound trains (approaching from the left in figure 3) from the down main line onto the up main line. The second crossover is between 2181A points and 2181B points and takes northbound trains from the up main line onto the up/down Passenger Loop. The maximum permitted speeds through both crossovers is 30 mph (48 km/h). The lookout was standing on the right hand rail of the second crossover (viewed in the direction of travel of the train) at the position shown in figure 3c when he was struck by train 1B82.

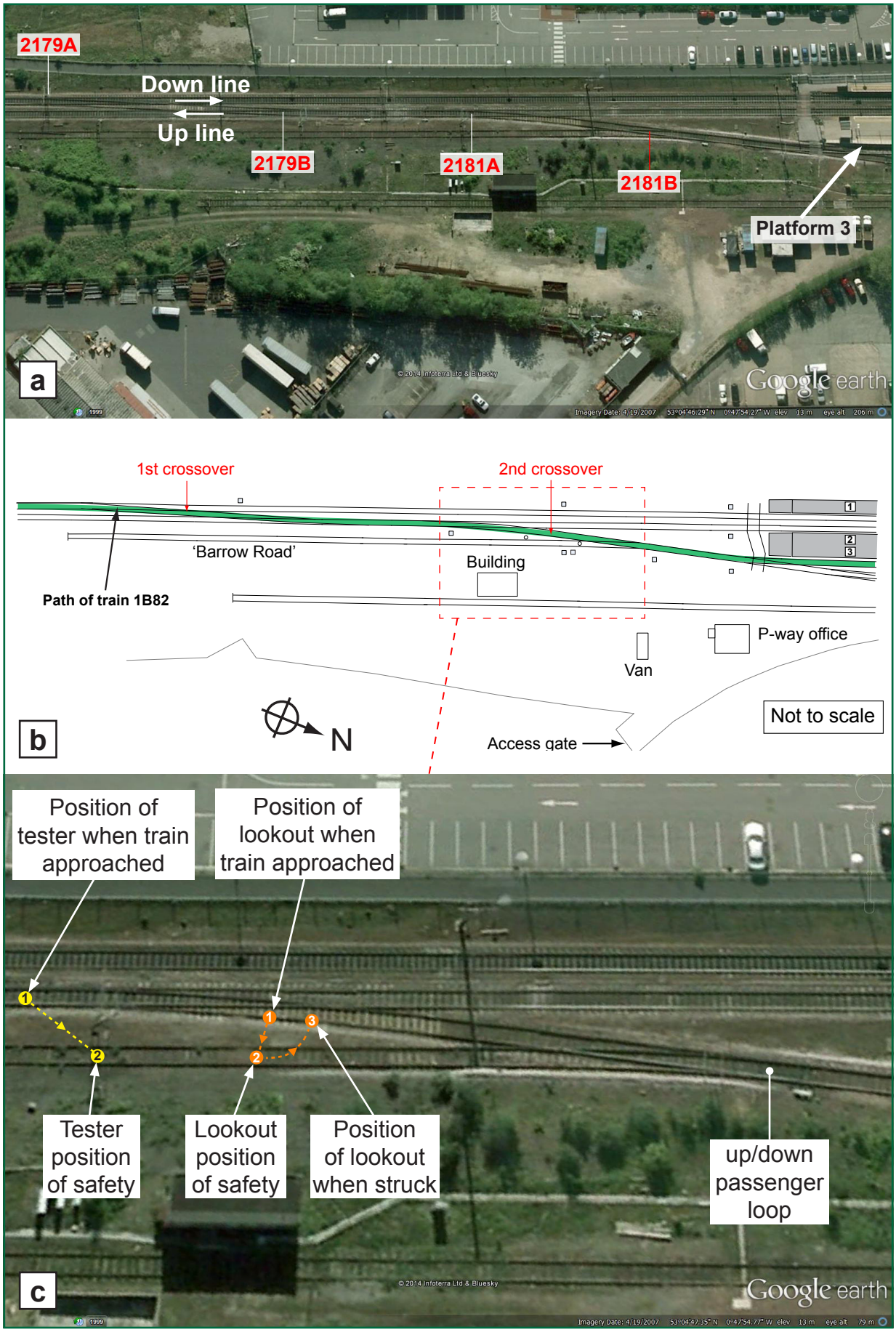

Figure 3: Layout of the tracks at Newark South Junction (located at 119 miles 73 chains)

Organisations involved

13 Network Rail owns, operates and maintains the ECML including Newark North Gate station. It was also the employer of the track staff involved in the accident.

14 East Coast Railways Mainline Company Ltd was the operator of train 1B82 and the employer of the train driver.

15 Both organisations freely co-operated with the investigation.

Train involved

16 Train 1B82 comprised a class 91 locomotive at the leading end (figure 4), nine coaches and a *driving van trailer* at the rear. It was the first of four off-peak services from London Kings Cross to Newark North Gate that day and was scheduled to arrive at Newark North Gate at 11:33 hrs.

Figure 4: Train 1B82

The staff involved

17 The lookout, Mr John Wright, had worked on the railway for around 30 years. He was based at Network Rail's Doncaster Marshgate Depot where he worked in the rail testing and lubrication team. His usual day-to-day work was as a lookout. He had been qualified to act as lookout since September 1999 and also held track safety qualifications in *personal track safety* (PTS) and as a COSS. His track qualifications were issued by Network Rail and valid until 13 March 2015. His medical certificate was valid until 1 October 2015. His last *assessment in the line* to verify his competency was carried out by his line manager on 14 March 2013 when he was passed as competent in these roles.

18 The lookout wore spectacles and was wearing them at the time of accident. According to his railway medical examination in 2009, he had a mild hearing impairment in his left ear, however, as explained at paragraph 57, this was not considered a factor in the accident. He had been involved in two previous safety related incidents (explained later at paragraphs 54 and 55).

19 The COSS involved had around 36 years experience as a track worker and 22 years experience in the ultrasonic inspection of rails. He was also based at Doncaster Marshgate Depot and worked in the rail testing and lubrication team. He had been a COSS since at least 2001, the earliest date for which Network Rail have records for him. He was also qualified in PTS and as a lookout. His track qualifications were issued by Network Rail and were valid until 13 March 2015. He was accustomed to working with the lookout.

20 The tester had around 13 years experience on the railway and 10 years experience in the ultrasonic inspection of rails. He was also based at Doncaster Marshgate Depot and worked in the rail testing and lubrication team. He had held track safety qualifications in PTS and as a lookout and COSS for about nine years. These qualifications were issued by Network Rail and were valid until 13 March 2015.

21 The person responsible for planning the *safe system of work* (SSOW) for the inspection work carried out by the team on 22 January 2014 had been with Network Rail since April 2009 and had been a planner since September 2009, initially at Sheffield and then at Doncaster Marshgate Depot. He had attended the relevant Network Rail training courses for planning safe systems of work and was passed by Network Rail as competent in that role until 17 March 2015.

External circumstances

22 CCTV footage from the train shows that it was overcast on the day of the accident with nothing significantly affecting the visibility of trains. The footage also shows the train's warning horns were acknowledged by the team working on site, indicating that there were no problems with the audibility of train horns at the time.

The investigation

Sources of evidence

23 The following sources of evidence were used:

- witness statements;
- site inspections;
- data from the on-train data recorder (OTDR) of train 1B82;
- forward facing and rearward facing CCTV from train 1B82 and four preceding trains through Newark North Gate station;
- train running information and timings from Network Rail's *Control Centre of the Future* (CCF) and East Coast Railway Co. Ltd;
- results of the post incident testing of train 1B82;
- Network Rail road vehicle tracker information which provides real time information on the location of vehicles fitted with the system;
- mobile phone records;
- training and competence records of relevant staff;
- Network Rail procedures on planning of safe systems of work;
- Network Rail statistical data on types of safe systems of work used by its rail testing and lubrication teams in its London North Eastern and East Midlands (LNE&EM) route; and
- medical information and occupational health records.

Key facts and analysis

Sequence of Events

Events preceding the accident

24 On Wednesday 22 January 2014, the COSS, the tester and the lookout, reported for work between 07:15 hrs and 07:30 hrs at Network Rail's Doncaster Marshgate Depot. Their rostered hours for the day were 07:30 - 14:30 hrs.

25 At 07:35 hrs, they set off together in a Network Rail van for the first of three jobs, which was at the Claypole loops, located around five miles south of Newark North Gate station on the ECML. The van was fitted with a vehicle tracking device which recorded its location and speed every five minutes, whether the vehicle was moving or stationary and whenever the ignition was switched on or off.

26 They arrived at the Claypole site at 08:57 hrs (according to the vehicle tracker data) and having carried out their inspections, left the site at 11:12 hrs to travel to Newark North Gate station for the second job. The tester drove the van.

27 At 11:17 hrs a passenger train (1D09) passed through the station in the down direction and at 11:20 hrs another passenger train (1E06) stopped at platform 2. CCTV cameras on both trains confirm that the van used by the inspection team had not yet arrived at Newark North Gate permanent way (Pway) yard, the access point for the work planned for the Newark site.

28 At 11:27 hrs, the vehicle tracker data from the van indicates that it was at a road junction around 0.3 miles (0.5 km) from Newark North Gate *Pway* yard. Allowing one minute to drive to the yard gates from that road junction and a further minute or two to unlock and open the gates, the RAIB has estimated the arrival time at the yard to have been between 11:29 and 11:30 hrs. The first data point recorded by the vehicle tracker as being at Newark Pway yard was at 11:32 hrs. This time was the first routine five-minute update after the data point at 11:27 hrs. The van's engine was not switched off on arrival, so no data point would have been created at around 11:29–11:30 hrs when the RAIB estimates the van arrived.

Events during the accident

29 The work that was planned for the team at Newark South Junction was the ultrasonic inspection of the rails at 2181A points and 2179B points (figure 3a). When the team arrived at Newark Pway yard, the lookout and tester got out of the van and headed for the up line on which they were going to be working. Contrary to the rule book (discussed later at paragraph 65), the COSS did not accompany them to the work site but remained in the van (reportedly to check which test procedure they should be using). The required COSS safety briefing (paragraph 67) was therefore not carried out on site prior to work starting. The COSS and tester have stated that the COSS gave the safety briefing in the van during the journey to the site at Newark North Gate.

30 The lookout took up his position near the up line (figure 3c). The tester started his inspection of the *cess* rail of the up line at 2181A points (figure 3a) and slowly moved towards 2179B, while pushing the ultrasonic testing equipment in front of him. If a train approached, the intention was that the lookout would shout a warning, in accordance with the rule book requirements that apply to working on lines that are still open to traffic.

31 At 11:33:45 hrs (around 28 seconds before the collision), train 1B82 drew up to the *overbridge* at the southern end of the site (figure 2). The driver had reduced the train's speed to 26 mph (42 km/h) in preparation for running over the two crossovers on the approach into platform 3.

32 The tester, who was facing south at the time, saw train 1B82 which was the first train that had approached them since they started work on site. He has stated that he shouted to the lookout that there was a train approaching and that it was "coming across" (meaning it was coming into platform 3). He recalled that even before he had seen the train, the points had already been set for the train on the down line to go into platform 3 (rather than straight on into platform 1). The tester reported that the lookout had agreed with him about the train which led the tester to believe the lookout had also seen the approaching train at about the same time, and that the lookout was also aware the train was going into platform 3.

33 Meanwhile, the train driver had seen the two track workers near the up line and he blew the train's warning horn as the train approached (as required by the rule book, module TW1, issue 9, section 45.3). The lookout and tester acknowledged the horn warning by each raising one arm above their heads and moved to the position of safety, located in the *four-foot* of the siding called the Barrow Road (figure 5). The train's CCTV shows that both the lookout and tester were standing in a position of safety by 11:33:57 hrs and were facing the approaching train. At this time the train was still on the down line and close to 2179A points (figure 3a).

34 At 11:34:01 hrs (around 12 seconds before being struck), the lookout turned towards the station and walked along the four-foot of the Barrow Road for a few metres with his back to the approaching train. Around two seconds later, he stepped out of the position of safety and walked toward the up/down Passenger Loop along the path shown in figure 6. Meanwhile train 1B82 had crossed from the down line to the up line and was heading onto the second crossover which would take it onto the up/down Passenger Loop.

35 The lookout reached the right hand rail of the second crossover (position shown in figure 3c) at 11:34:10 hrs (around 3 seconds before being struck). The proximity of the train to the lookout as he approached the crossover is shown in figure 7. The lookout stood on the right hand rail while continuing to look in the direction of the station. Data from the train's OTDR shows that at this time the train driver simultaneously blew the train's warning horn and applied the emergency brake. The speed of the train at that time, recorded by the OTDR, was 26 mph (42 km/h) and its distance from the lookout was around 35 metres. The tester has stated that when he heard the blast from the train horn as the train was passing him, he first wondered why the driver had used the horn a second time because he believed both he and the lookout were in the position of safety, and he had already acknowledged the first train horn a second time from the position of safety.

Figure 5: The lookout and tester in the position of safety (image courtesy of East Coast Railways Mainline Company Ltd)

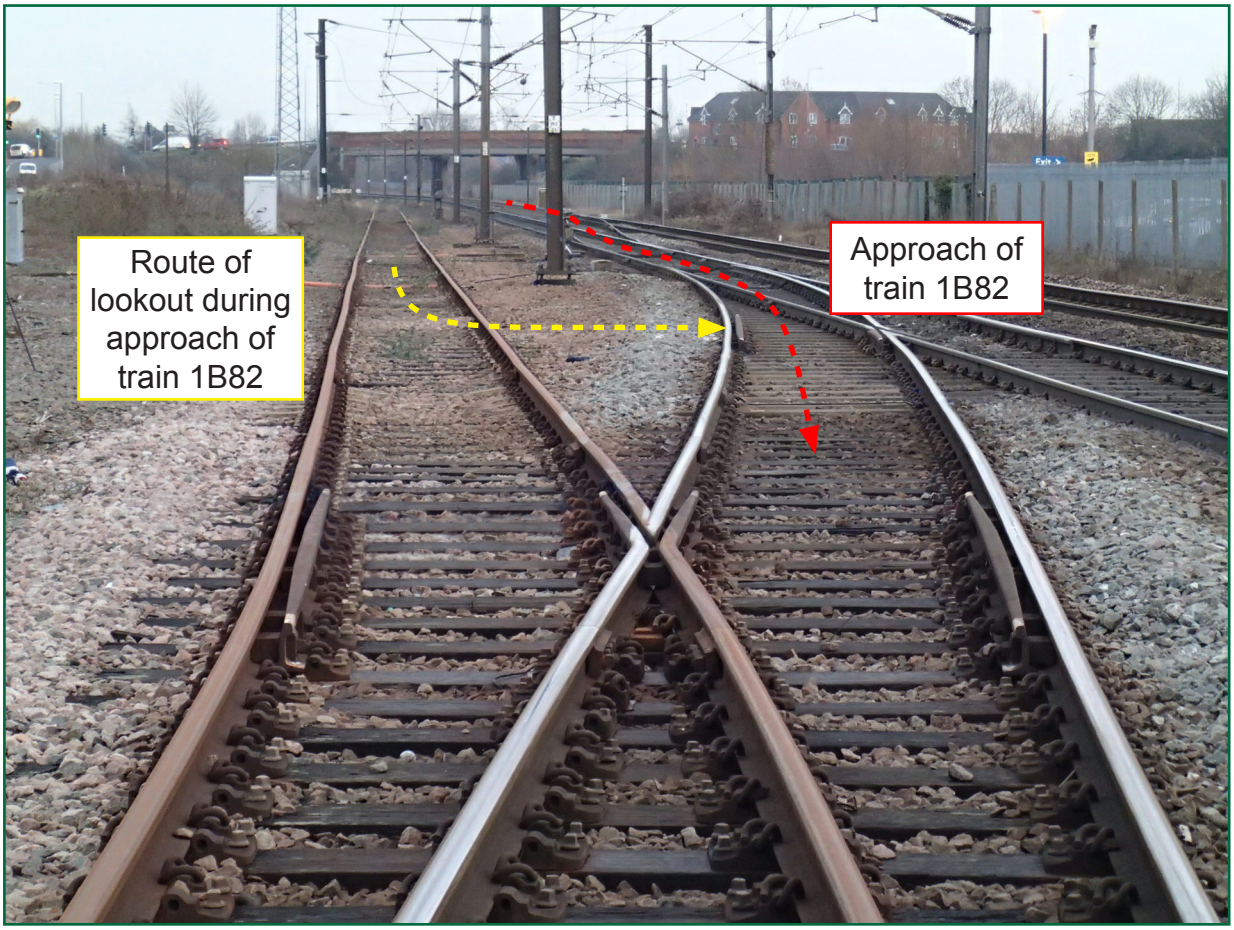

Figure 6: The path taken by the lookout toward the up/down Passenger Loop and the position he was struck.

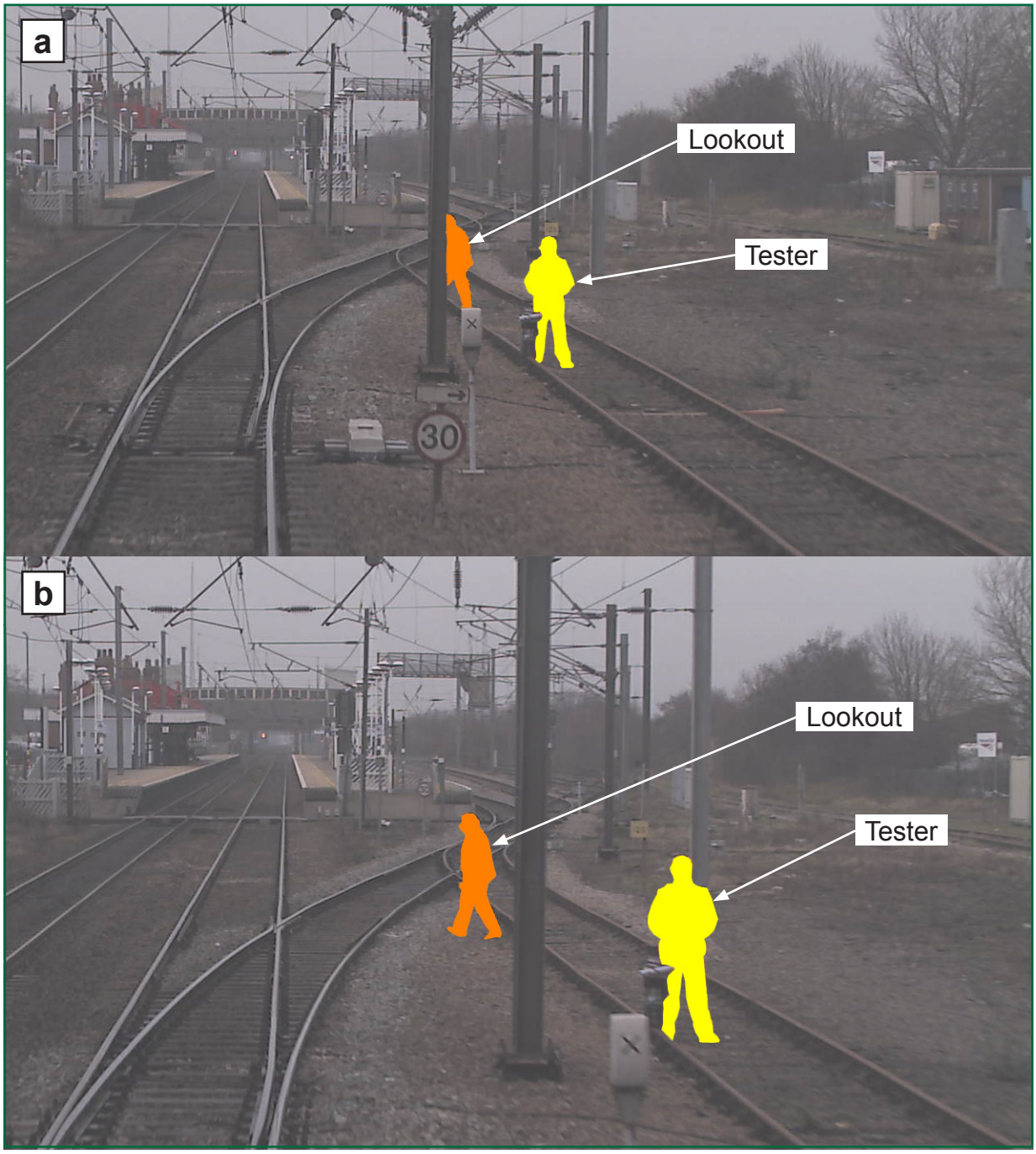

Figure 7: Forward facing CCTV images showing position of lookout approximately 2 seconds (a) and 1 second (b) before the train's second horn and emergency brake (images courtesy of East Coast Railways Mainline Company Ltd)

36 At 11:34:12 hrs (around 2 seconds after the second horn sounding and 1 second before the train struck the lookout), the lookout started turning to face the train and raising his left arm in what appears to have been an acknowledgement of the second warning horn. He remained standing on the right-hand rail as he did so and did not attempt to take evasive action. The train struck the lookout at around 11:34:13 hrs. The tester turned round toward the lookout to see why the driver was blowing his horn the second time and saw the accident.

37 The train came to a stop at 11:34:22 hrs, just short of the ramp at platform 3. It had moved a distance of around 94 metres from the emergency brake application and around 59 metres from the point of impact with the lookout.

38 During the lookout's movement from the position of safety to the point where he was struck, he did not look towards the train, except in the last second or so. The tester has stated that he had been facing the approaching train and was not aware that the lookout had moved from the position of safety. The COSS had remained in the van which was parked in the yard around 45 metres from the position where the lookout had been standing in the position of safety.

Events following the accident

39 The tester ran to the lookout to help him. He was a trained first aider and it quickly became apparent to him that the emergency services were required. He shouted to the COSS for help and when he arrived, told him to call 999 and bring a first aid kit from the van.

40 During this time the driver of the train left his cab and went to the tester who was attending to the lookout. The tester informed him that the emergency services had been called and the driver confirmed that he had spoken to the signaller and that all trains in the area had been stopped and that the site was safe.

41 The East Midlands Ambulance Service (EMAS) reported that it received the first call from the COSS at 11:35 hrs and another call from Network Rail's LNE&EM route control (who were aware of the accident via the driver and signaller) at 11:40 hrs. EMAS also reported to the RAIB that the first ambulance arrived at 11:40 hrs followed by further emergency vehicles at 11:58 hrs and 11:59 hrs. At 12:07 hrs a helicopter ambulance arrived on site. The lookout received medical attention on site until 13:11 hrs when he was airlifted to a hospital in Nottingham, arriving at 13:29 hrs.

42 The train was moved into platform 3 at around 12:50 hrs and passengers were detrained. The up line was reopened for normal service at 13:25 hrs, followed by normal service on the down line at 13:31 hrs. Normal working of platform 3 was resumed at 17:26 hrs.

Identification of the immediate cause[1]

43 **The lookout was in a position on the track where he could be struck by train 1B82.**

Identification of causal factors[2]

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

a) the lookout moved from the position of safety and into the path of train 1B82. This was most probably to check for trains approaching on the up line, having incorrectly decided that train 1B82 was going into platform 1 (paragraph 45);

b) the lookout did not take evasive action when the train sounded the horn a second time (paragraph 59); and

c) there was a breakdown in safety discipline and vigilance at the work site (paragraph 64).

Each of these factors is discussed below.

The movements of the lookout

45 **The lookout moved from the position of safety and into the path of train 1B82. This was most probably to check for trains approaching on the up line, having incorrectly decided that train 1B82 was going into platform 1.**

46 The forward facing CCTV from train 1B82 provided clear images of the actions of the lookout and tester. While it will never be possible to know conclusively why the lookout left the position of safety and went onto the up/down Passenger Loop, the RAIB has sought to use the available evidence to develop a plausible explanation, as far as possible, for the lookout's action.

47 The RAIB considers that the most likely explanation is that although he may have initially expected the train to go into platform 3 (paragraph 32), the lookout subsequently believed that the train was going into platform 1 and therefore it was safe to walk up to the position he chose on the up/down Passenger Loop. From there, he would have had good visibility of any trains approaching on the up line, in preparation for the resumption of the inspection work after the passage of train 1B82. This seems to be the most plausible explanation for his actions and is based on the following observations:

a) From the train's forward facing CCTV footage it can be seen that the lookout was looking towards the train until about one second before the train started to deviate from the down main line onto the first crossover. At that point he turned his head away from the train and the purposeful manner in which he did so is consistent with him believing that he knew the path of the train, which at that point still looked to be straight into platform 1.

b) He did not look back again at the train to check where it was heading, until just after the second blast of the train's horn and before being struck, which indicates he believed it was not going into platform 3.

[1] The condition, event or behaviour that directly resulted in the occurrence.

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

c) On-site investigation found that the position on the up/down Passenger Loop that he went to provided sufficient warning time for trains approaching on the up line and other lines which would have required him and the tester to move to a position of safety. However, from the position of safety, the lookout's visibility of the up line was not adequate. This suggests that it is likely there was a clear objective to his actions; to get into a position where he could check for trains, probably in preparation for resuming the inspection work.

d) He calmly acknowledged the second horn, prior to being struck by the train, which indicates that he was aware of the presence of the train, but he may have thought it was on the down line.

48 Handbook 1 of the railway rule book (Railway Group Standard GE/RT8000/HB1 'General duties and track safety for track workers') requires that no one should move out of the position of safety until the COSS has given permission to do so. It is the COSS's responsibility to check that it is safe to go back on the line and normally the COSS would ask the lookout to check whether the lines were clear and that it was safe for the team to resume work. In this case, the COSS was not present with the team and it is likely that the lookout decided he would check for trains without the permission of the COSS.

49 One alternative explanation is that the lookout believed the train was going into platform 3 (as he had reportedly agreed with the tester when the train first appeared) but he then forgot all about the approaching train once he had left the position of safety. This explanation cannot be discounted, but the RAIB considers it to be unlikely for the following reasons:

a) The lookout was watching the train approaching for several seconds from the position of safety before he turned away, and is therefore unlikely to have forgotten about it completely in the time that it took him to move from the position of safety to the position where he was struck.

b) In his role as a lookout he will have been familiar with seeing trains, looking away to warn his group and looking back again to watch the approaching train. Therefore even if he had mistakenly set out to check for trains on the up line while still believing train 1B82 was going into platform 3, he would probably have looked to check where the train was while he walked to the up/down Passenger Loop, which he did not do.

50 Another alternative explanation is that the lookout believed the train was going into platform 3 but had lost awareness of where he was in relation to the up/down Passenger Loop and thought he was still in a safe position until the last second. Again, this explanation cannot be discounted, but the RAIB considers this unlikely because the action the lookout took suggests he was heading to a specific position which he knew would give him good visibility of trains on the up line (paragraph 47c). That position was also close to where he had been standing before train 1B82 arrived on the scene.

51 Nobody saw the lookout move out of the position of safety to warn him. The tester was facing southwards towards the train at the time. Normally if a member of a track gang steps out of the position of safety, the COSS would shout a warning and tell him/her to get back. In this case the COSS was absent. The tester and lookout stood around 10 metres apart and were not engaged in conversation.

Competence and medical fitness

52 The lookout's line manager reported that the lookout was competent to perform his lookout duties and that he had used him as a lookout himself from time to time when the line manager was the COSS.

53 Witness evidence indicates that the lookout had been involved in two previous safety related incidents, neither of which were formally documented by the lookout's line manager.

54 The most recent incident was reported to have been near Grantham station about one month before this accident and involved the same team of three. The lookout, who was reportedly walking around 100 metres ahead of the team, was switching off the *train operated warning system* (TOWS) in the section of track he was leaving even though the rest of the team was still in that section. With the TOWS switched off in their section, they would not have had warning of approaching trains, thereby placing them at increased risk. One of the team members (who was the tester at the time of this accident) complained to the lookout directly and also made a verbal complaint about the lookout's actions to his line manager, advising him that in his opinion the lookout needed re-training. The line manager reports that he spoke to the lookout about his actions and in his judgement no further action was necessary because the lookout understood that what he had done was unsafe.

55 The second incident was reported to have been about two or three years ago. Another track worker had raised a concern with the line manager about the lookout not doing what he had been told to do. The RAIB has not been able to determine any further details. However, as a result the line manager asked a safety representative to covertly watch the lookout on site during another task. The safety representative reported that the lookout did everything safely and correctly. The line manager decided that no further action was necessary.

56 The lookout's last railway medical examination was on 10 September 2012. The medical examiner noted that he was in generally good health but suffering with back pain for which he was taking medication. The medical examiner passed him fit for his duties until 1 October 2015. A report submitted by the lookout's doctor to the Nottinghamshire coroner did not mention any medical condition that is likely to have had a bearing on the accident.

57 The lookout's previous railway medical examinations on 13 February 2009 and 1 October 2009 indicated a hearing deficiency in his left ear. However, he was passed fit for his track duties, taking this into account. CCTV evidence from the train indicates that the lookout heard both horn warnings because he acknowledged the first horn and appears to have been raising his arm to acknowledge the second horn when he was struck. Therefore the RAIB considers that his hearing deficiency, noted in 2009, is unlikely to have been a significant factor in the accident.

58 The RAIB has found no evidence to indicate that the lookout was suffering from fatigue or felt unwell on the day of the accident. Examination of his shift patterns does not indicate that they would have induced abnormal levels of fatigue on the day of the accident. Earlier that morning he had undertaken his lookout duties at Claypole loops without incident. There is no evidence to indicate that he may have been under the influence of any drugs or alcohol at the time.

The lack of evasive action

59 The lookout did not take evasive action when the train driver sounded the horn a second time.

60 When the train driver simultaneously blew the train's horn the second time and applied the emergency brake, around 3 seconds before the lookout was struck (paragraph 35), the train was around 35 metres away and closing at 11.7 metres per second (42 km/h). At that time the lookout had one foot on the cess rail of the up/down Passenger Loop and was still looking away from the train. He only started to turn his head towards the train about one second before being struck. Had he looked round immediately the second horn sounded, he may have been able to take evasive action.

61 There are three possible explanations as to why the lookout did not immediately take evasive action:

a) He felt sure the train was not on the line on which he was standing. This seems the most likely, given that he tried to acknowledge the horn first before attempting to turn round, rather than instinctively take evasive action.

b) Another possible reason is that he believed the train was on the up/down Passenger Loop but had lost awareness of where he was in relation to the loop line and thought he was still in a safe position until the last second. However, as explained earlier at paragraph 50, this seems less likely than (a) above because the evidence indicates he was heading to a specific position where he knew he would have good visibility of trains on the up line.

c) A further possible reason is that the lookout believed the train was on the up/down Passenger Loop but thought it was still some distance away and that he had enough time to get out of the way after acknowledging the warning. However, the RAIB considers it implausible that an experienced lookout would intentionally stand directly in front of an approaching train that he had already seen and acknowledged without checking how far away it was.

Actions of the train driver

62 The RAIB considered whether the driver had responded to the lookout leaving the position of safety in a timely manner. The train driver would have seen the lookout acknowledge the first use of the horn and move to the position of safety and so would have believed the lookout knew the train was approaching. Later, he would have seen the lookout leave the position of safety and move towards the up/down Passenger Loop as his train approached. He had to quickly assess the hazard and decide to apply the emergency brake and blow the horn.

63 The expected reaction time for a driver responding to a familiar but unexpected hazard is likely to be around 1.5 seconds[3]. The positions of the lookout at one and two seconds before the emergency brake and horn were applied (based on CCTV images), are shown in figures 7a and 7b respectively. These indicate that the driver reacted as soon as it was clear the lookout had left the position of safety and was moving towards the up/down Passenger Loop.

[3] See RAIB report No. 10/201, 'Fatal accident at Mexico footpath crossing (near Penzance), 3 October 2011, published June 2012, paragraph 56. Research on road vehicle driver reaction times has shown that most drivers will respond within 1.5 seconds of the appearance of a familiar but unexpected hazard.

Safety discipline at the work site

64 **There was a breakdown in safety discipline and vigilance at the work site.**

65 The person responsible for establishing and overseeing the safe system of work on site was the COSS. Among his duties, the COSS was required by the COSS handbook[4] to:

a) Give his team a safety briefing, telling them the nature and location of the work and the safe system of work to be used. He should then have made sure each member of the group confirmed they had understood the safe system of work by signing the COSS's briefing form.

b) Stay with his group so that he is able to personally observe and advise everyone until work is completed and the group is no longer on or near the line or he/she is replaced by another COSS.

66 Network Rail standard NR/L2/OHS/019, 'Safety of people working on or near the line', Issue 8, 4 September 2010, and the COSS handbook require that once on site, the COSS should check that the planned safe system of work is appropriate for the conditions and can be implemented as planned. If the COSS considers the documented system of work to be inadequate, or determines that it cannot be implemented as planned (eg due to weather conditions, equipment failure or a problem with resources), the COSS should change the arrangements as necessary to establish an appropriate SSOW or abort the work until such time as an adequate SSOW can be established.

67 Only once the COSS is satisfied that a safe system of work has been established should he/she give the safety briefing to the team. This should include identification of the lookout, and where he/she should stand, the method of warning (horn, whistle, touch, shout), the position of safety, which lines are open to traffic, line speeds and any other particular hazards. The COSS handbook does not specifically state that the safety briefing should be done at site. However, a COSS cannot verify that the safe system of work is appropriate until he/she has examined the site, even if he/she believes everyone in the team is familiar with the location. Therefore the COSS's safety briefing should be given on site where he/she can clearly point out the position of safety, lines open to traffic and direction of traffic, hazards etc.

68 Witness evidence indicates that the COSS gave his safety briefing to the lookout and tester in the van as they drove to site from the previous job at the Claypole loops earlier that morning. The witness evidence is contradictory as to whether the COSS's briefing did or did not include that the team should watch out for trains coming into platform 3. However, the lookout and tester had worked at Newark South Junction many times before during similar routine ultrasonic inspections, and would therefore have been familiar with the area. Nevertheless, the opportunity was missed to start the job with a site based COSS safety briefing. Had the COSS been on site and carried out such a briefing, it may have increased the vigilance of the lookout.

[4] The COSS handbook is part of the rule book, Railway Group Standard, GERT8000-HB7 Issue 2, 'General duties of a controller of site safety (COSS)'

69 When they arrived at Newark North Gate Pway yard, both the tester and lookout, who were both qualified to act as COSS, signed the COSS's briefing form to acknowledge they had been briefed. They then proceeded immediately to start inspection work on the up line. The COSS did not go with his team to the up line but remained in the van and therefore there was no safety leadership or supervision on site as required by the rule book. The COSS relied on the experience and knowledge of the lookout and tester being sufficient to keep them out of danger.

70 The absence of the COSS was not challenged by either the lookout or the tester, which indicates that a degree of 'over-confidence' had developed in the way the team was operating, probably because they were familiar with each other and the site. The absence of the COSS removed one of the key safeguards built into every safe system of work on the railway involving two or more track workers, which is that there is a controller of site safety who is responsible for monitoring and maintaining a safe system of work at all times.

71 The ultrasonic inspection teams undertake the vast majority of their work in conditions of live traffic with lookout protection (using a system of work called '*red zone'* working[5]). This system is discussed further at paragraph 82. The safety of the teams is therefore dependent on maintaining high levels of vigilance on site and this in turn requires safety discipline to be maintained at all times. The non-compliances with the rule book at Newark North Gate (ie the lack of a proper site safety briefing, the absence of the COSS, and the consequent moving out of the position of safety without authorisation from the COSS), indicate that the level of safety discipline in the group had deteriorated well below that expected by Network Rail.

Identification of underlying factors[6]

Inadequate implementation of the assessment in the line process

72 **Network Rail's process for assessment in the line was not being followed as envisaged by its procedures, which may have led to a deterioration in the safety attitudes and discipline of individuals and teams going unaddressed. This was a possible underlying factor.**

73 The internal process by which Network Rail checks that the competence of its staff matches the requirements of their role is Network Rail standard NR/L3/CTM/306, Issue 1, September 2010, 'Competence Assurance – Assessment in the Line' (AiTL). The process is also intended to establish any training, support or development required to maintain competence.

[5] The term 'red zone' is used in some current Network Rail standards (eg NR/L2/OHS/019) and was a commonly used term at the time of the accident, hence its use in this report. The modern term for this type of work is 'working on a line open to traffic'.

[6] Any factors associated with the overall management systems, organisational arrangements or the regulatory structure.

74 The process requires line managers to assess the competence of an employee using three different criteria, each of which involves considering different types of evidence as follows:

a) performance in the role, with evidence obtained from observation, inspections, work records, log books, mentoring records, witness testimony, irregularities and/or near misses;

b) behaviours (ie the way in which the employee conducts themselves), assessed by means of supervision and surveillance; and

c) underpinning knowledge, assessed by means of an on-line test.

75 The RAIB found that, in the case of the staff involved in the accident, the AiTL process was not working as intended:

a) There was an insufficient focus on the safety behaviours and attitudes of staff. The 'performance' and 'behaviour' criteria of the assessment (paragraphs 74a and 74b), which should capture these aspects, were not explicitly addressed in the competence review and records. The focus appears to have been on the computer test results and any actions necessary to improve the grade up to 'competent' if the member of staff did not pass the computer test. Witness evidence indicates that this situation arose from a combination of a lack of formal training of the line manager in the implementation of the AiTL process, and pressure of work which prevented the application of the process as intended by the AiTL procedure.

b) The lookout's previous safety incidents were not captured in the competency records together with the reasons for any action or inaction.

c) Front line managers are responsible for both managing the competence of their staff and delivering the work planned for their teams. This can result in a conflict of interest for the line manager. Setting up mentoring and/or extra supervision of staff may directly affect resourcing of the work teams and delivery.

76 Witness evidence indicates that generally, the current AiTL process is not considered by front line staff to be as effective as the previous system because it does not provide periodic refresher training for staff.

77 Network Rail reports that it is in the process of making improvements to its competence assessment procedures as part of the development of a programme that is intended to address the 'non-technical' skills and behaviours of safety leaders on site (eg COSS and *Safe Work Leader*). For this reason the RAIB has decided to not make a recommendation on a process that is about to change. However, a learning point is highlighted at paragraph 99.

Observations[7]

Planning safe systems of work

78 Network Rail standard NR/L2/OHS/019 sets out the procedure that should be followed for planning, accepting, verifying and implementing a safe system of work (SSOW). The SSOW plan was created by a planner (who held a specific Network Rail qualification of 'safe systems of work planner') under instruction from the manager requiring the work to be done. When creating a SSOW plan, planners were required by the above standard to consider a number of factors including the nature and urgency of the work, location and traffic characteristics, duration of the work, tools and equipment, and any specific requirements, such as the need for inspections to take place in daylight.

79 Planners were required to select a SSOW from a hierarchy of SSOWs listed in standard NR/L2/OHS/019. The hierarchy is reproduced at appendix D. The safest system of work (at the top of the hierarchy) was a *safeguarded green zone* in which all lines within the site of work are blocked to train movements. The least safe system (at the bottom of the hierarchy) was working on a line that is open to traffic (called red zone working in standard NR/L2/OHS/019) with lookout warning. It was this system that was adopted in this case. Planners were required to select the highest SSOW type practicable, and should only have selected a system from lower down the hierarchy once they have established that a higher system was impractical.

80 The SSOW for the work at Newark was *cyclical* (ie routine) and had a number of problems which are described below, but none of these contributed to the accident. They are however evidence that the SSOW planning system was not being implemented in accordance with standard NR/L2/OHS/019.

a) The SSOW was part of a plan for a 5 mile long section from 115 miles to 120 miles (from London) and was not specific to the task at Newark South Junction, contrary to the requirements of the Network Rail standard.

b) The access point specified was incorrect. The SSOW stated 'Osterfen LC' at 115 miles 45 chains as the access point, and that the team were to make their way to site by walking a distance of nearly five miles. However the access point should have been the Pway yard at Newark Station which is adjacent to the work site and does not require any red zone walking. The latter access point was used on the day of the accident.

c) The SSOW specified one site lookout and one intermediate/distant lookout. The team did not take an intermediate lookout with them because the COSS, in line with previous practice and with the agreement of his team, did not consider that the cyclical inspection tasks to be carried out at Newark South Junction required any more than one site lookout. The COSS was permitted by standard NR/L2/OHS/019 to make such a decision without seeking prior approval of his line manager because it did not change the position of the SSOW in the hierarchy of SSOWs (appendix D).

[7] 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.

d) The SSOW was not compliant with the railway rule book (Railway Group Standard GE/RT8000/HB7, 'General duties of a controller of site safety') in respect of the minimum *warning time*. The COSS had calculated the minimum warning time to be 20 seconds, comprising 10 seconds to see an approaching train, stop working and move to the place of safety, plus 10 seconds to be in the position of safety before the arrival of the train, as mandated by the railway rule book. However, the COSS should have allowed an additional 5 seconds to comply with the rule book because the lookout had to look out for both northbound and southbound trains, giving a minimum total warning time of 25 seconds. The RAIB's measurements of *sighting distances* indicate that the warning times for northbound trains and southbound trains were around 42 seconds and 25 seconds respectively, which were adequate.

e) The intention of Network Rail when the SSOW planner role was set up was that the planner would be familiar with the sites for which he was setting up SSOWs. The workload of the planner at Doncaster Marshgate was high (with up to 120 plans per week) and consequently there was insufficient time to improve his knowledge of the area of track for which he was planning SSOWs. As a consequence he only got out to sites a few times a year and he was not familiar with the Newark North Gate site.

f) The hierarchy of SSOW planning was not being applied as intended by standard NR/L2/OHS/019. At Network Rail's Doncaster Marshgate depot, the rail lubrication and test teams told the planner what type of SSOW they wanted and the planner aimed to provide it. Generally, the SSOWs used have evolved over the years to get the job done in the most flexible and expedient way.

81 Internal audits carried out by Network Rail on a sample of SSOW packs at Doncaster Marshgate depot, to check compliance with standard NR/L2/OHS/019, checked that the paperwork was in order but did not check that the hierarchy of SSOW was being implemented as intended.

82 Around 95% of the work done by Network Rail's LNE&EM route ultrasonic testing and lubrication teams, based at the Doncaster Marshgate Depot, was done by red zone working with lookout warning. This is the highest risk method of working that is permitted by Network Rail and is done with all lines open to normal traffic and under the protection of one or more lookouts, depending on the geography of the location and the sighting distances involved. Lookout warning red zone working is the preferred SSOW for the rail testing and lubrication teams at Doncaster Marshgate Depot for two reasons:

a) Ultrasonic inspection is easier to do in daylight hours when any defects that are found can be visually examined more easily. The alternative is to do the work at night under green zone conditions when one or more lines are blocked to traffic but this would involve the installation of portable lighting, which adds complexity and increases set up time at the site. Green zone working on the ECML during daylight hours is difficult due to the high frequency of trains.

b) Red zone working gives the teams the most flexibility with regard to when they carry out their work. Green zone working requires the COSS to pre-arrange line blockages and timings with the relevant signaller. If the team is early or late to site for any reason, the signaller may reject the blockage resulting in a postponement of the inspection. Even if the blockage is granted later than planned, it is unlikely to be allowed to run later to make up for a late start and this might result in only part of the work being done on that visit.

83 Over the last 10 years Network Rail has been aiming to reduce the extent of red zone working by encouraging staff to actively consider other ways of protecting track workers (such as temporary blockages of the line) and to limit the selection of red zone working to those cases where there is no practical alternative. Senior infrastructure managers (such as the Infrastructure Maintenance Engineers) are required by Network Rail standard NR/L2/OHS/019, Issue 8, December 2010, to monitor the level of work carried out under green zone and red zone conditions in their geographical areas of responsibility and compare these against internally defined targets.

84 Figure 8 shows data provided by Network Rail on the proportion of red and green zone working for the rail testing and lubrication teams of each *delivery unit* of the LNE&EM route between August 2013 and January 2014. For some units, such as Doncaster, Finsbury Park and Peterborough, which mainly service the ECML, the proportion of red zone working was around 95%. For others such as Bedford, the proportion was much lower at around 15%. The overall target for the proportion of red zone working in the LNE&EM route was 30% at the time of the accident[8]. However, the overall average proportion of red zone working for the rail testing and lubrication team, across the route, was 61%.

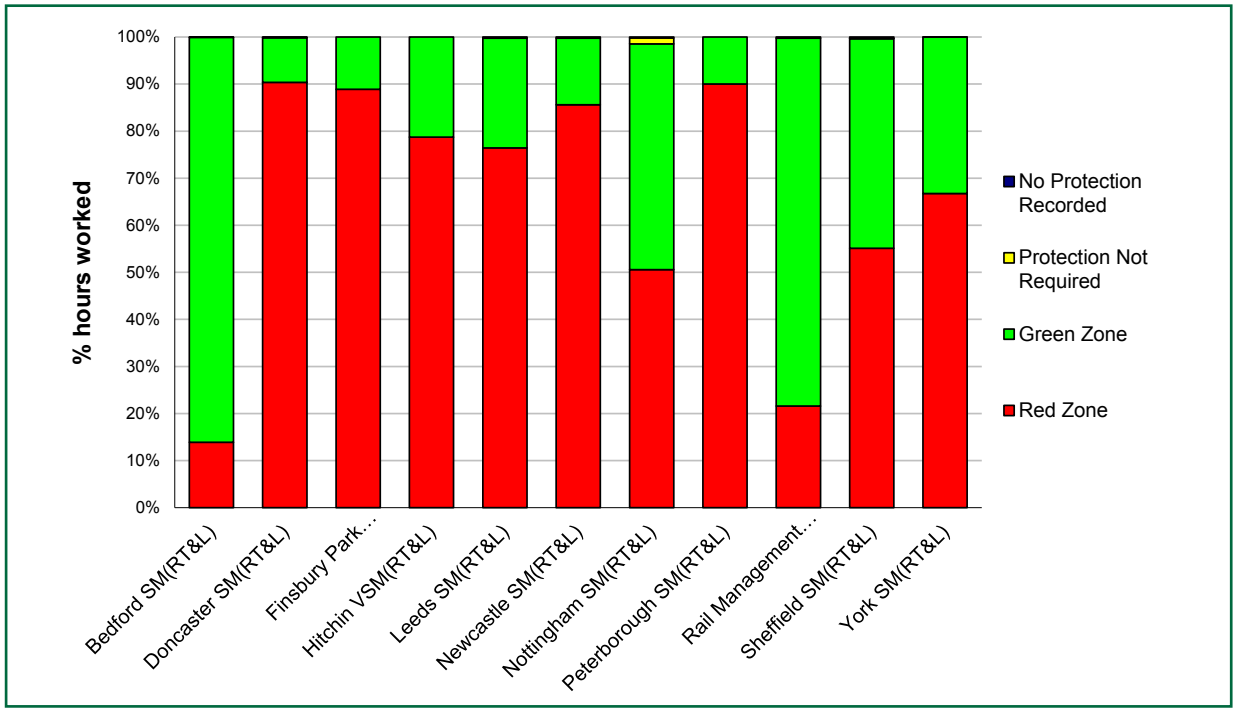

Figure 8: Proportion of red zone to green zone working on the Network Rail's LNE&EM route for each delivery unit

Previous occurrences of a similar character

85 Since October 2005, the RAIB has investigated 15 accidents involving track workers struck by trains and six other incidents involving near misses. A list of these accidents and incidents is given in appendix E. Those relevant to this accident are discussed further at paragraph 90.

[8] Data collected by Network Rail indicates that by the end of the 2012-13 financial year, around 30% of all track work on its infrastructure was carried out under red zone conditions.

Summary of conclusions

Immediate cause

86 The lookout was in a position on the track where he could be struck by train 1B82 (**paragraph 43**).

Causal factors

87 The causal factors were:

a) The lookout moved from the position of safety and into the path of train 1B82. This was most probably to check for trains approaching on the up line, having incorrectly decided that train 1B82 was going into platform 1 (**paragraph 45, Recommendation 1**).

b) The lookout did not take evasive action when the train sounded the horn a second time, probably because he believed the approaching train was on another line (**paragraph 59, Recommendation 1**).

c) There was a breakdown in safety discipline and vigilance at the work site (**paragraph 64, Recommendation 1**).

Underlying factor

88 A possible underlying factor was that Network Rail's process for assessment in the line was not being followed as envisaged by the procedure, which may have led to a deterioration in the safety attitude and discipline of individuals and teams going unaddressed (**paragraph 72, Learning point 1**, **no recommendation**).

Additional observations

89 Although not linked to the cause of this accident, the RAIB observes that the SSOW planning at Doncaster Marshgate Depot was not being implemented in accordance with the hierarchy of risk set out in Network Rail standard NR/L2/OHS/019. The intention of the standard is that the planner should choose the safest practicable system of work. However, in the case of the rail testing and lubrication teams, this was being disregarded in favour of the most flexible and convenient system of work for the availability of staff and equipment or one that fitted with custom and practice. The amount of red zone working undertaken by the rail testing and lubrication teams based in the Doncaster delivery unit was significantly higher than the target for the LNE&EM route (**paragraph 84, Recommendation 2**).

Previous RAIB recommendations relevant to this investigation

90 The RAIB has made several recommendations directly related to various aspects of track worker safety as a result of its previous investigations listed in appendix E. The recommendations relevant to this accident are:

Regarding safety behaviour and leadership

91 Stoats Nest Junction, 12 June 2011, RAIB report 16/2012:

Recommendation 1

'Network Rail should develop a time based programme which expedites the implementation of its existing activities designed to improve safety culture and qualities of safety leadership for:

a. track maintenance staff; and

b. their managers.

Activities covered by this programme should include steps to enhance the quality of safety leadership provided by the COSS, and to address the behaviour of managers when working on site such that this role of the COSS is not undermined.'

In response to this recommendation, Network Rail reported to the Office of Rail Regulation (ORR) in July 2014 that it had launched the COSS non-technical skills (NTS) programme both internally in January 2013 and to the wider industry in June 2013. The purpose of the programme is to reinforce core non-technical skills in individuals selected to be COSS and to enable them to manage, challenge and make decisions in accordance with the technical rules in both planned and unplanned situations. Network Rail has reported that 7000 COSSs had attended training by May 2014. It also advised that its Planning and Delivering Safe Work programme had also devised a new role of Safe Work Leader, discussed further at paragraph 95. This new role replaces the role of COSS and is being implemented progressively across Network Rail's routes with rollout scheduled to be completed by January 2015. At the time of the accident the COSS had not been trained in the new role of SWL.

Regarding assessment in the line

92 Washwood Heath, 6 March 2010, RAIB report 01/2011:

Recommendation 3

'Network Rail should extend the work it is undertaking to improve the methods and criteria used when selecting staff to undertake safety leadership roles to include consideration of the training and assessment of those staff who are already qualified in those roles.'

In response to this recommendation, Network Rail reported to the ORR that it had introduced pre-selection criteria into its training course for new COSSs in December 2010 and this would be extended to cover the recertification of existing COSSs from June 2011. Network Rail also reported that it had developed a training course entitled 'Managing Site Safety', which was mandatory for front line supervisors and team leaders and which was intended to help such staff understand the role they have in developing and leading a safety culture within Network Rail. The first course took place in May 2011. Based on these responses, the ORR considered in November 2012 that this recommendation had been implemented. The COSS involved in this accident had received the training on managing site safety by the time of the accident.

Regarding SSOW planning

93 Acton West, 24 June 2008, RAIB Report 15/2009:

Recommendation 1

'Network Rail should:

a. re-brief the requirements (now in standard NR/L2/OHS/019) for the COSS pack to be prepared and checked by individuals who have geographical knowledge of the relevant area and for COSSs to have geographical knowledge of the area in which they are to work;

b. take steps to achieve compliance with the requirements defined in 1a; and

c. conduct a compliance audit after a suitable period of time to confirm that these requirements defined in 1a are being implemented satisfactorily.'

In response to this recommendation, Network Rail reported to the ORR that it had re-briefed the requirement for the COSS to have sufficient geographical knowledge to verify the adequacy of the SSOW pack and to implement it in a safe manner. This was recorded in a national briefing document and distributed to all parts of the industry including contractors and training organisations. The contents of the briefing document were incorporated into issue 8 of standard NR/L2/OHS/019. Network Rail also reported that compliance to standard NR/L2/OHS/019 had also been included within audits of Infrastructure Maintenance Delivery Units and Infrastructure Projects Programmes. Based on these responses, the ORR reported to the RAIB in June 2010 that this recommendation had been implemented.

Regarding monitoring red and green zone working

94 Bulwell, 6 August 2012, RAIB Report 20/2013:

Recommendation 2

'Network Rail should review the effectiveness of the current arrangements in place to monitor the usage of Red and Green Zone safe systems of work. It should identify and implement any appropriate measures identified as necessary for this monitoring to be effective.'

The RAIB has not yet received a response from the ORR about what action has been taken in response to this recommendation.

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

95 During 2013, Network Rail began a major review of the way work activities on the track are controlled, called the 'Planning and Delivering Safe Work' programme in order to improve track worker safety. As a result of this programme, training for a new role of Safe Work Leader (SWL) is currently being introduced. This role is intended to provide better safety leadership on site. Initial operation of this role is currently scheduled for mid 2015, in the East Midlands region. All SWLs will have selection, training and mentoring requirements which will include non-technical skills and other safety leadership requirements. There will be three types of SWL role (SWL1 – SWL3) ranging in responsibility from that of a current COSS (SWL1) to managing complex work sites (SWL3). New processes for planning and implementing work activities on the track will also be introduced, including the use of an electronic work permit system, linked to electronic maps. Network Rail also intends to introduce a role of Safe Task Leader (STL) to replace the COSS role within *engineering possessions*.

96 On 10 Feb 2014 Network Rail issued a safety bulletin to all staff about this accident. It encouraged internal discussion between staff about what could be done to reduce risks associated with working on or near the line under lookout warning red zone conditions and posed the following questions:

- 'Safe System of Work – Can your work be done other than red zone with lookouts? What would you need to do to plan it at a higher level in the hierarchy next time?
- Positioning site lookouts – When your COSS positions your site lookout, is consideration given to positioning them in a permanent position of safety?
- Staying vigilant – If you are doing routine work you have done numerous times before in that location with the same safe system of work how do you make sure that you stay focussed on the risks?
- Recommencing work – When you stop work for a train to pass, do you always wait for the permission of the COSS before you leave your position of safety?'

97 On 2 and 3 April 2014, Network Rail reports that it held a national safety briefing event for all of its track maintenance staff, including COSSs and lookouts. A video reconstruction of the accident was shown at the briefings, followed by discussion on the learning points and areas of improvement.

98 Network Rail has indicated that it is progressing the following actions in its LNE&EM route as a result of this accident.

- A trial of a non-technical skills programme for lookouts, which aims to assess the individual's capabilities and aptitude for effectively and consistently performing the role of lookout (completed in June 2014).
- Assessed briefing sessions for lookouts and COSSs on challenging the safe system of work (completed in June 2014).
- A trial of the use of trained safety mentors to develop the non-technical skills of existing lookouts (ongoing).

- The use of standard, fenced, lookout ‘stations’ at track locations such as junctions, where lookouts are required on a frequent basis (RAIB report 15/2010, Whitehall West Junction, recommendation 1) (ongoing).
- The development of co-ordinated maintenance work programmes in junction areas so that multiple maintenance activities are carried out during one visit rather than several separate visits (ongoing).
- Investment in the procurement of semi-automatic track warning systems to provide early warning of approaching trains (RAIB report 19/2009, Grosvenor Bridge, recommendation 2) (to be started in early 2015).

Learning point

99 The RAIB has identified the following learning point[9] for the railway industry:

1 The implementation of the 'assessment in the line' (AiTL) process to monitor and manage staff competence at Doncaster Marshgate depot was not compliant with the relevant procedure for reasons set out at paragraph 75. Deficiencies in the implementation of the AiTL process were also found by the RAIB in its investigation of an incident involving a train collision with a trolley at Bridgeway User Worked Crossing (RAIB report 25/2014, November 2014). The learning points arising from the accident at Newark North Gate regarding competence assurance are:

a) front line managers should be adequately prepared to apply the competence assurance process, and should be provided with sufficient space and time in their workloads to implement the system as intended; and

b) the operation of the process should be adequately monitored to check that it is working as intended.

[9] '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

100 The following recommendations are made[10]:

1 *The intent of this recommendation is that Network Rail improves work site safety discipline and vigilance, especially for teams doing cyclical or repetitive tasks with which they are familiar.*

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 (paragraph 87).

2 *The intent of this recommendation is to improve the implementation of Network Rail's procedures for planning safe systems of work, so that the hierarchy of risk is used in the intended way.*

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 (paragraph 89).

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[10] 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 Regulation 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.raib.gov.uk.

Appendices

Appendix A - Glossary of abbreviations and acronyms

AiTL	Assessment in the Line
CCF	Control centre of the future
COSS	Controller of site safety
ECML	East Coast main line
LNE&EM	London North Eastern & East Midlands
OTDR	On train data recorder
PTS	Personal track safety
Pway	Permanent way
SSOW	Safe system of work
SWL	Safe Work Leader
TOWS	Train Operated Warning System

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.

Assessment in the line (AiTL)	A system used by Network Rail to manage the competence of its employees involved in work that can affect operational safety or performance.
Bi-directional (line)	A track on which trains may be worked in either direction under normal signalling arrangements.*
Cess	The part of the track bed outside the ballast shoulder that is deliberately maintained lower than the sleeper bottom to aid drainage, provide a path and sometimes (but not always) a position of safety.*
Control Centre of the Future	A computerised system used by Network Rail and train operating companies as a source of real time train running and performance information.
Controller of site safety	A person certified as competent to implement a safe system of work for a group of persons on Network Rail controlled infrastructure.
Crossover	Two turnouts connected to permit movements between parallel tracks.*
Cyclical (inspection or maintenance)	An inspection or maintenance task which is performed to a frequency schedule specified in Network Rail standards.
Delivery unit (Network Rail)	Geographically based teams within Network Rail which are responsible for carrying out maintenance and renewal work.
Down (line)	Direction of northbound trains on the ECML (away from London).
Driving van trailer	A non-passenger carrying vehicle fitted with a driving cab and used to carry light cargo such as bicycles and parcels. It is fitted to one end of some types of trains such as the IC225 ECML train sets and HSTs.
Engineering possession	A section of the line which is under exclusive occupation of an engineer for maintenance or repairs.
Four-foot	The area between the two running rails of a standard gauge railway.*
Green zone	A site of work on or near the line within which there are no train movements (other than within work sites where there may be movements of engineering trains or on-track plant at walking pace) or where a safe distance from the line can be maintained.
Lookout	A competent person whose duties are to watch for and to give an appropriate warning of approaching trains by means of whistle, horn or lookout operated warning system.*

On train data recorder	Equipment fitted on the train which records the train's speed and the status of various controls and systems relating to its operation.
Overbridge	A bridge that allows passage (eg road) over the railway.*
Personal track safety	A basic track safety competency required by staff who need to go on or near the line.
Points	An assembly of two movable rails called the switch rails, and two fixed rails called the stock rails. It is used to divert vehicles from one track to another and is also known as a set of switches.
Position of safety	If the maximum permitted line speed is 100 mph or less, a position of safety is defined within GE/RT 8000 Module G1, Issue 4 as being at least 1.25 metres from the nearest line on which a train can approach. If the maximum permitted line speed is more than 100 mph, the minimum distance from the nearest line is 2 metres.
Pway	A commonly used abbreviation for the permanent way or track.
Red zone	Defined by Network Rail standard NR/L2/OHS/019 as a site of work on or near the line, which is not protected from train movements.
Rule Book	The publication detailing the general responsibilities of all staff engaged on the railway and the specific duties of certain types of staff such as train drivers and signallers.*
Safe system of work (SSOW)	Arrangements to make sure a workgroup that is required to walk or work on or near the line is not put in danger by the movement of trains.
Safeguarded green zone	A work site in which all lines are blocked to rail traffic.
Safe Work Leader	A new role being introduced by Network Rail as part of its reorganisation of arrangements for work site safety. SWL1 will be an employee of Network Rail or the principal contractor for the work and will be accountable for task and operational risk and undertake the rule book duties previously known as COSS. Other levels of SWL will have higher levels of safety responsibility.
Sighting distance	The distance at which an approaching train becomes visible, which is dependent on the location of the lookout in relation to the track(s)
Train operated warning system	A system which detects an approaching train automatically via signalling equipment and gives a warning to track workers via lineside sirens.

Ultrasonic inspection (of rails)	A means of inspecting rails for internal and small surface defects which are not visible to the naked eye, using ultrasound waves. The ultrasonic equipment is contained in a box which is wheeled along the rail head by an operator. The equipment emits a warning sound when a defect is detected.
Up (line)	Direction of southbound trains on the ECML (towards London).
Warning time	The amount of time needed to ensure everyone is in a position of safety, including at least 10 seconds before the arrival of an approaching train.

Appendix C - Key standards current at the time

Railway Group Standard GE/RT8000/ TW1 issue 9, dated 7 September 2013, issued by RSSB.	Preparation and movement of trains.
Railway Group Standard GE/RT8000/ HB7 issue 2, dated 3 March 2012, issued by RSSB.	General duties of a controller of site safety (COSS).
Railway Group Standard GE/RT8000/ HB1 issue 2, dated 1 September 2012, issued by RSSB.	General duties and track safety for track workers.
NR/L2/OHS/019, Issue 8, 4 September 2010, issued by Network Rail.	Safety of People Working On or Near the Line.
NR/L3/CTM/306, Issue 1, 4 September 2010, issued by Network Rail.	Competence Assurance – Assessment in the Line' (AiTL).

Appendix D - Hierachy of Safe Systems of Work defined in Network Rail standard NR/L2/OHS/019, Issue 8, 4 September 2010

1	**Safeguarded Green Zone, unless:** • the required blockage(s) of the line(s) are not available **or** • the time required to take the line blockage is disproportionate.
2	**Fenced Green Zone, unless:** • the required blockage(s) of the line(s) are not available **or** • the time required to erect and dismantle fencing is disproportionate.
3	**Separated Green Zone, unless:** • the required blockage(s) of the line(s) are not available **or** • the time required to set up a separated Green Zone is disproportionate**.**
4	**Red Zone with warning given by Automatic Track Warning System (ATWS), unless:** • the time required to plan, install and remove ATWS is disproportionate **or** • the required equipment is not available **or** • the equipment is not suitable for the location (see NOTE 7 below).
5	**Red Zone with warning given by Train Operated Warning System (TOWS), supplemented where necessary by other methods of warning, unless:** • TOWS is not available at the location or does not provide an adequate warning for the work.
6	**Red Zone with warning given by Lookout Operated Warning System (LOWS), unless:** • the time required to plan, install and remove LOWS is disproportionate **or** • the required equipment is not available.
7	**Red Zone with warning given by one or more Lookouts or COSS/IWA working alone and looking out for him/herself.** THIS SHALL ALWAYS BE REGARDED AS THE LAST RESORT.

NOTE 7 - ATWS guidance

The required equipment may be unsuitable for the location if:

• the track layout is complex, involving multiple lines, junctions, crossovers etc.;

• trains normally stop at a point between the strike in point and the site of work; and/or

• radio based ATWS is intended to be used in an area of radio interference.

Appendix E - Previous RAIB investigations involving track workers (reverse date order)

	Location	Date	RAIB report/ bulletin ref.	Injury
Accidents in which track workers were struck by trains				
1	Poole	12/07/2013	B04/2013	Minor
2	West Drayton	22/03/2013	B05/2013	Serious
3	Saxilby	04/12/2012	21/2013	Fatal
4	Bulwell	06/08/2012	20/2013	Serious
5	Stoats Nest	12/06/2011	16/2012	Serious
6	Cheshunt Junction	30/03/2010	06/2011	Serious
7	Whitehall West Junction	02/12/2009	15/2010	Fatal
8	Dalston Jcn	30/03/2009	30/2009	Serious
9	Stevenage	07/12/2008	23/2009	Serious
10	Kennington Jcn	23/05/2008	29/2009	Serious
11	Reading station	29/11/2007	21/2008	Fatal
12	Grosvenor Bridge	13/11/2007	19/2009	Serious
13	Leatherhead station	29/08/2007	19/2008	Serious
14	Ruscombe Jcn	29/04/2007	04/2008	Fatal
15	Trafford Park	26/10/2005	16/2006	Fatal
Near miss incidents				
1	Bridgeway	16/01/2014	25/2014	Minor
2	Roydon Station	16/07/2012	07/2013	None
3	Clapham Junction & Earlsfield	08/03/2011	03/2012	None
4	Acton West	24/06/2008	15/2009	None
5	Bishops Stortford & Stansted Mountfitchett	20/01/2008	26/2008	None
6	Tinsley Green	17/03/2007	43/2007	None

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