



Rail Accident Investigation Branch

Rail Accident Report



Track worker struck by train near Chalfont & Latimer station, Buckinghamshire 15 April 2022

Report 05/2023
May 2023

This investigation was carried out in accordance with:

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

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Preface

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. 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.

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Where RAIB has described a factor as being linked to cause and the term is unqualified, this means that RAIB has satisfied itself that the evidence supports both the presence of the factor and its direct relevance to the causation of the accident or incident that is being investigated. However, where RAIB is less confident about the existence of a factor, or its role in the causation of the accident or incident, RAIB will qualify its findings by use of words such as 'probable' or 'possible', as appropriate. Where there is more than one potential explanation RAIB may describe one factor as being 'more' or 'less' likely than the other.

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

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

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

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

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

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

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Track worker struck by train near Chalfont & Latimer station, Buckinghamshire, 15 April 2022

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Summary

At around 09:28 hrs on Friday 15 April 2022, a London Underground passenger train travelling at around 25 mph (40 km/h) struck and injured a track worker who was working as part of a planned patrol near Chalfont & Latimer station on the Metropolitan line of the London Underground network.

The track worker was working as part of a group of three, undertaking the role of second lookout, and had been provided by a recruitment agency for the day's work. The patrol was planned to be undertaken during traffic hours when trains were running.

The accident happened because the track worker had moved from a place of safety and into the approaching train's path to get a better view of the track ahead, just as the train was about to pass her. She was walking with her back to the approaching train when she was struck and was not aware of the risk the train posed to her.

RAIB's investigation found that the track worker was not familiar with the exact location of the accident and that safety briefings provided to her on the day were not effective at giving her the information she needed to work safely.

Underlying factors to the accident were that London Underground's processes for managing track worker safety did not adequately control the risk to staff working on the line in traffic hours and that elements of the organisational culture at London Underground did not support effective management of track worker safety.

Although not relevant to the cause of the accident, RAIB observed that some designated places of safety on the Metropolitan line are sometimes obstructed, preventing them from being used as places of safety. RAIB also observed that the safety-critical communications after the accident were effective, and that an accurate understanding of information was reached by all the parties involved.

RAIB has made four recommendations, all addressed to London Underground Limited. The first relates to a review of the assessment and control of the risks arising from working on the line during traffic hours. The second requires a review of the need to work on the track during traffic hours, with the aim of reducing such work. The third recommendation seeks improvements to safety assurance processes and safety reporting. The fourth recommendation aims to ensure that places of safety are fit for purpose.

RAIB has identified two learning points. The first relates to the importance of clear and effective safety briefings, and the second acknowledges the importance of effective safety-critical communication in an emergency situation.

Introduction

Definitions

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

The accident

Summary of the accident

- 3 At approximately 09:28 hrs on Friday 15 April 2022, a track worker acting as the second lookout during a track patrol was struck by a London Underground passenger train travelling at approximately 25 mph (40 km/h). The train involved had just departed from Chalfont & Latimer station on the Metropolitan line of the LUL system (figures 1 and 2) and was heading towards Chesham when the accident occurred. The track worker sustained head and body injuries and was taken to hospital. She was released from hospital later the same day but has continued to suffer from the effects of the accident.
- 4 The second lookout was one of three staff involved in a planned track patrol. Immediately before being struck, the second lookout was not in a place of safety and was walking between a signal post and the track, facing away from the train's direction of approach.

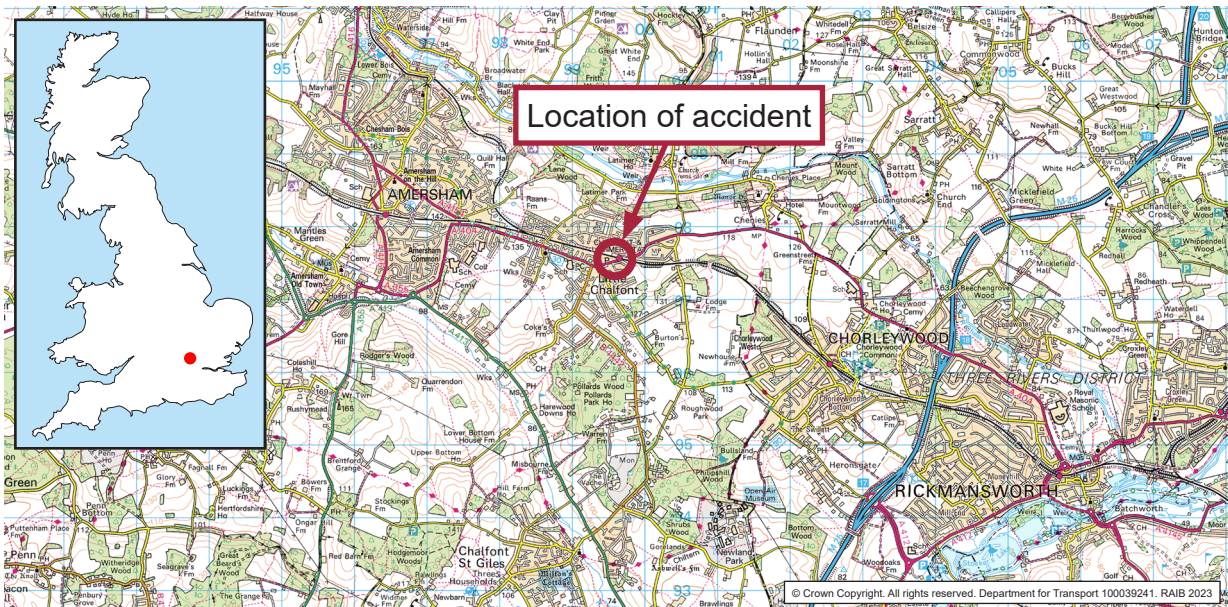


Figure 1: Extract from Ordnance Survey map showing location of accident, near Chalfont & Latimer station.

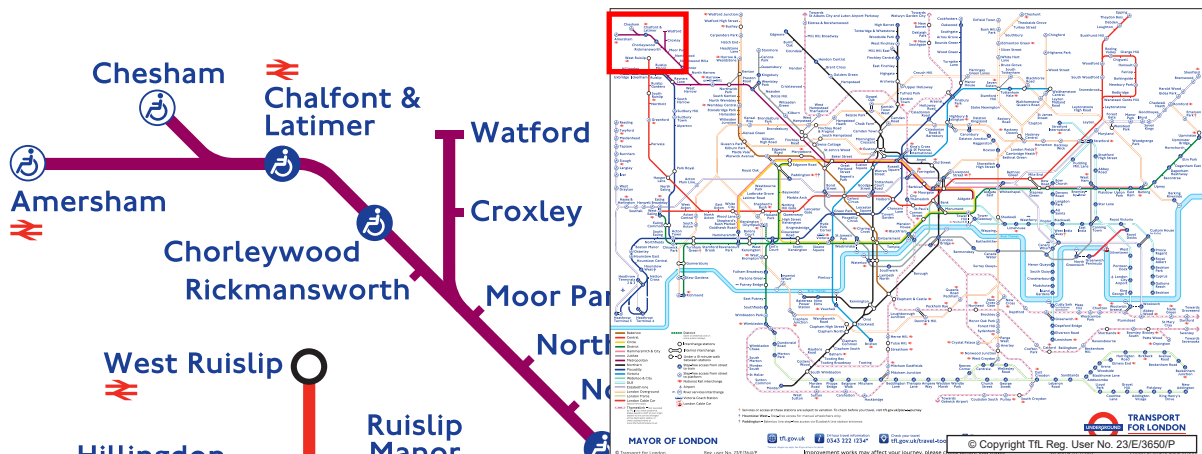


Figure 2: Transport for London map showing location of Chalfont & Latimer station.

Context

Location

- 5 The accident occurred on the Chesham branch of LUL's Metropolitan line, around 500 metres north-west of Chalfont & Latimer station. The Metropolitan line runs from Aldgate, in the City of London, and serves several destinations in north-west London and Buckinghamshire. The junction where the line to Chesham diverges from the Amersham line is located near the north-western end of Chalfont & Latimer station (figure 3). There are three platforms at Chalfont & Latimer, platform 1 serves the northbound line to Amersham and services to Chesham, platform 2 serves the southbound line towards Rickmansworth and central London, and platform 3 is now disused.
- 6 The mainline operator, Chiltern Railways, operates some of its London Marylebone services over the Metropolitan line between Harrow-on-the-Hill and Amersham (the north-western limit of the Metropolitan line), passing through Chalfont & Latimer station. LUL's infrastructure meets the national rail network at a boundary approximately 2.2 kilometres (1.37 miles) north-west of Amersham station.
- 7 The lines between Amersham and Chalfont & Latimer are the southbound (towards Chalfont & Latimer) and northbound lines (towards Amersham). Both have a maximum permitted speed of 60 mph (97 km/h) and each normally carries trains running in only one direction. The Chesham line has a maximum permitted speed of 35 mph (56 km/h) and is a single line on which trains can run in both directions. There is a cess (an area outside of the tracks which may provide a safe place to stand or walk clear of passing trains if there is adequate clearance) located north of the Chesham single line between it and the railway boundary, where it is safe to be positioned while trains pass. Trains in this area are controlled from the LUL signal cabin (equivalent to a signal box on the mainline railway) at Amersham.

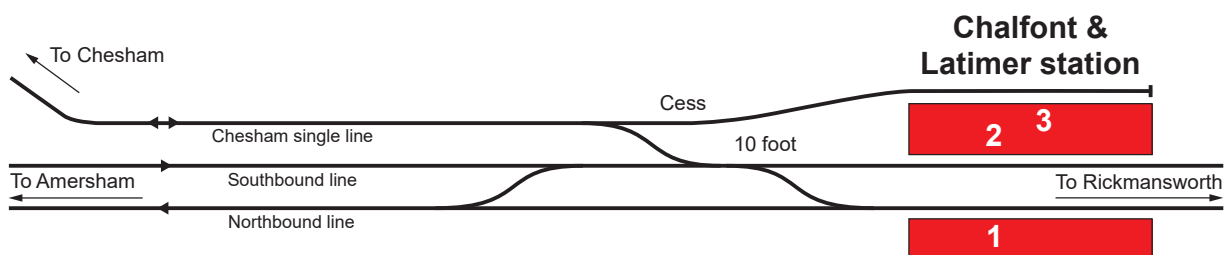


Figure 3: Track layout of the lines north of Chalfont & Latimer station.

Track patrols at Chalfont & Latimer

- 8 Track patrolling in the Chalfont & Latimer area is performed by staff based at Rickmansworth track depot. The track patrol being undertaken on the day of the accident was a pre-planned patrol undertaken twice a week and was carried out during traffic hours, while trains were running.
- 9 The team undertaking the track patrol on the day of the accident comprised three people. These were a patroller, a distant lookout and a second lookout.

Organisations involved

- 10 LUL, a wholly owned subsidiary of Transport for London, is the owner and operator of the Metropolitan line. It also employs the train operator (driver) of the Metropolitan line train involved. The patroller was employed by LUL and worked at Rickmansworth depot.
- 11 Morson Human Resources Ltd (referred to as Morson in this report) is the employer of the second lookout. Morson is a recruitment agency, contracted to supply a pool of qualified workers to LUL protection services (a division within LUL), which then allocates work to individuals from this pool on a temporary basis, as and when required. On the day of the accident, the second lookout was provided by Morson to work at LUL's Rickmansworth depot.
- 12 Cleshar Contract Services (Cleshar) is a supplier of track workers on a temporary basis. They normally provide resources directly to LUL protection services. On the day of the accident Cleshar had provided the distant lookout to work at Rickmansworth depot.

Train involved

- 13 The train involved was a northbound Metropolitan line service from Baker Street to Chesham, service number 701, which departed Baker Street at 08:45 hrs. It was formed of an eight-car 'S' stock train.
- 14 The train was fitted with on-train data recorders (OTDRs) but was not fitted with forward-facing closed-circuit television equipment (FFCCTV).

Staff involved

- 15 The second lookout, who was struck by train 701, had been working for Morson for eight years. Two lookouts were required because the track curvature present for parts of the patrol north of Chalfont & Latimer restricted the sighting of approaching trains (see paragraph 51). The second lookout is responsible for relaying warnings from the distant lookout to the work group, which in this case consisted only of the patroller. The second lookout held 'site person in charge, protecting workers on the track – traffic hours' (referred to as a PWT-TH) competency but was not acting in that role at the time of the accident. She was assessed as competent to perform PWT-TH duties (which included lookout competency) in July 2020. The second lookout had previously worked in the general vicinity of the accident a few years before, although she was not familiar with the exact location where the accident occurred.
- 16 The patroller has been employed by LUL since 2012. At the time of the accident, he had been in his current role working for the asset performance and capital delivery track patrol team at Rickmansworth depot for around five years. He was responsible within this team for carrying out track inspections. In accordance with LUL rules, he was also the PWT-TH for the patrol. As PWT-TH, the patroller was required to set up and maintain a safe system of work so that all members of the work group were aware of approaching trains and had sufficient time to go to a place of safety, a designated location where it is safe to stand safely while trains pass.

- 17 The patroller had undertaken patrols and provided protection in this area, including the patrol being undertaken on the day of the accident, throughout his employment at Rickmansworth depot. At the time of the accident, the patroller was certified as competent by LUL to patrol and inspect track and to act as a PWT-TH, having last been deemed competent in that capacity on 17 March 2020.
- 18 The distant lookout had been working for Cleshar since 2017. The duties of a distant lookout are to warn the others in the work group when a train is approaching that could put them in danger. Before a patrol starts, they are positioned by the PWT-TH to achieve at least the minimum sighting time of 25 seconds (see paragraph 48) necessary for everyone to move off the track and to be in the position of safety before a train arrives. The distant lookout had been assigned as a lookout at Rickmansworth track depot most weekdays for the previous two years. He had approximately 20 years' experience working on LUL infrastructure at the time of the accident, was familiar with the location where the accident occurred and was assessed as competent on 14 November 2019. There is no separate lookout competence on LUL; all lookouts hold the PWT-TH competence. The distant lookout was not acting in the PWT-TH role at the time of the accident.
- 19 The operator of train 701 had worked in the role for twenty-six years, seven years of which had been spent driving trains on the Metropolitan line.

External circumstances

- 20 The weather was sunny and dry with clear visibility. The sun was behind the train at the time of the accident, but none of the track workers stated that it was impeding their ability to see. There is no evidence that any other external circumstances affected the accident.

The sequence of events

Events preceding the accident

- 21 The patrol that was carried out on the day of the accident was normally undertaken by a permanent member of LUL staff acting as patroller and with lookouts usually provided by LUL protection services. However, it was identified a few days before the accident that one of the regular lookouts (an agency worker from Morson who regularly worked at Rickmansworth depot) was not available and so arrangements were made by LUL protection services to provide a different lookout for the team.
- 22 On 13 April, two days before the accident, the second lookout received a text message from LUL protection services to inform her about the possibility of undertaking the upcoming lookout duty, which she accepted. Later that day she received an email containing a briefing sheet with further details of the work.
- 23 On the morning of the accident, the second lookout booked on duty at around 07:15 hrs at Rickmansworth depot. She had not previously worked with the other two track workers who were going to be undertaking the patrol.
- 24 The patroller who would be acting as PWT-TH gave a safety briefing to the second lookout at the depot, where they had met. The safety briefing covered information about the track, the places of safety, the sighting times and the first aid arrangements for the day's work.
- 25 On the day of the accident, the patrol of the southbound lines from Rickmansworth to Amersham was split into three parts to make effective use of available resources:
 - Rickmansworth to Chorleywood
 - Chorleywood to Chalfont & Latimer
 - Chalfont & Latimer to Amersham.Each of the three parts of the patrol were undertaken by a different combination of staff.
- 26 The patroller and second lookout left Rickmansworth depot and travelled by train to Chorleywood station. They then undertook a patrol from Chorleywood to Chalfont & Latimer station along the southbound line.
- 27 The distant lookout booked on at Rickmansworth depot at 07:30 hrs and started work at 08:00 hrs. He undertook the Rickmansworth to Chorleywood part of the patrol with a different patroller. When this was complete, he travelled by train from Chorleywood to Chalfont & Latimer station where he met the patroller and the second lookout on the platform at around 09:00 hrs.

- 28 The patroller stated he gave another safety briefing on the southbound platform at Chalfont & Latimer station before the next patrol began. There is conflicting evidence about what was said in this briefing. Although the patroller stated that this was a full briefing to both lookouts, the distant lookout stated that he only arrived for the end of it. The second lookout stated that she did not consider this to be a full briefing in accordance with the Rule Books, but that she did not challenge the patroller about this. Immediately after this safety briefing, the group accessed the track from the station platform ramps and walked onto the southbound line to begin the patrol.
- 29 On accessing the track, the distant lookout was walking ahead of the others, followed by the second lookout and then the patroller. The patroller began inspecting the track and associated components. At this point, the second lookout was standing next to him while the distant lookout was positioned further along the track to look out for approaching southbound trains.
- 30 At approximately 09:15 hrs, train 2C13, a southbound Chiltern Railways train, approached the work group. Witness evidence suggests that when the distant lookout sounded a warning for this train, which was relayed to the patroller by the second lookout, all three track workers were in the four-foot¹ of the southbound line. FFCCTV images from train 2C13 showed that the second lookout moved to the Chesham single line cess, while the distant lookout and the patroller moved to the Chesham single line four-foot. This was not a recognised place of safety to stand in while the train passed (figure 4).

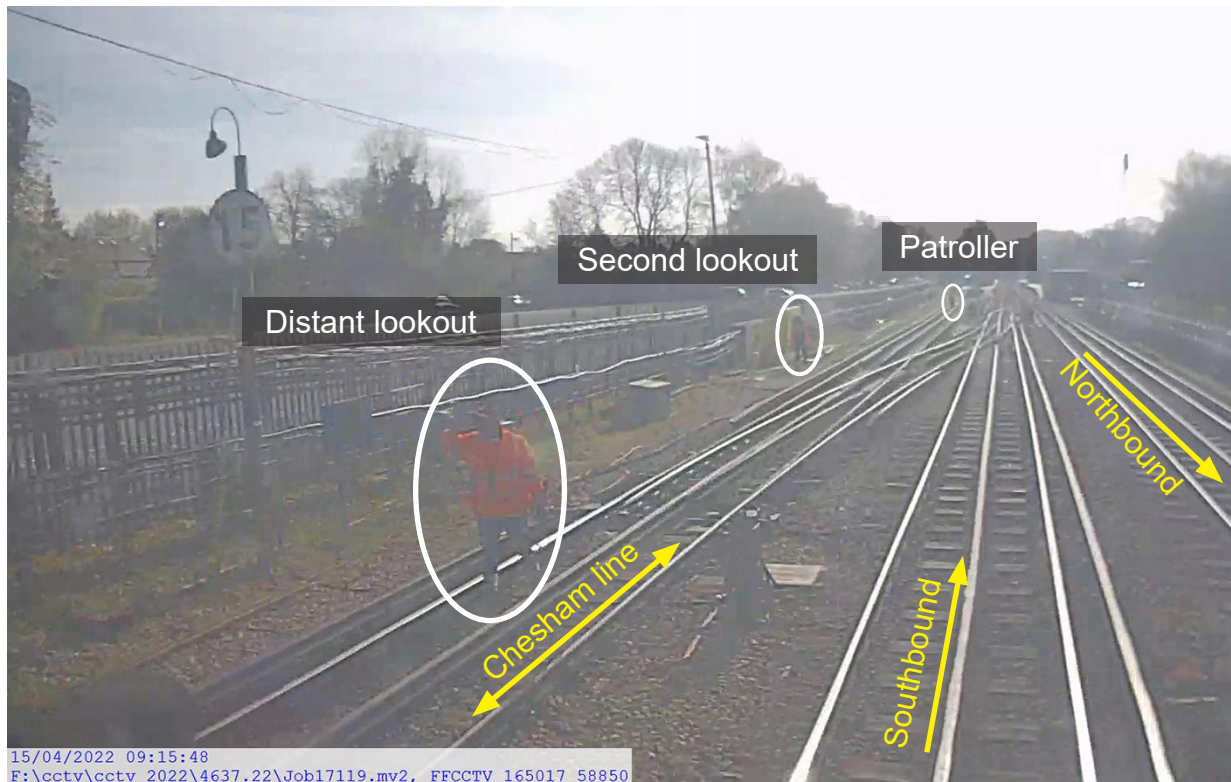


Figure 4: FFCCTV image from train 2C13 (courtesy of Chiltern Railways).

¹ The terminology used when describing railway lines includes: four-foot, to describe the distance between a pair of rails; six-foot, to describe the space between a pair of railway lines; and ten-foot, to describe a wider space often provided between pairs of lines, where there are three lines or more. The ten-foot may provide a position of safety from passing trains but did not do so at the location of the accident. Four-foot, six-foot and ten-foot are terms and not exact measurements.

- 31 After train 2C13 had passed the group, the patroller returned to the four-foot of the southbound line to continue the inspection. Witness evidence indicates that at this time the second lookout left the cess and took up a position standing near to the patroller in the ten-foot¹ between the southbound line and the Chesham single line. The distant lookout returned to the southbound line four-foot to look out for southbound trains. At this point, the second lookout decided to move away from the side of the patroller as she did not feel the ten-foot she was standing in was a place of safety. She then moved to the cess of the Chesham single line.
- 32 At approximately 09.19 hrs, four minutes after the first train had passed, a second train passed the work group. This was train 704, a southbound LUL train from Chesham that was travelling along the single line and heading for platform two at Chalfont & Latimer station. The distant lookout saw the train and gave a warning which was repeated to the patroller by the second lookout. Although train 704 was not fitted with FFCCTV equipment, witness evidence indicated that both the patroller and the distant lookout moved to the cess of the Chesham single line, the designated place of safety, where the second lookout was already positioned (figure 5).

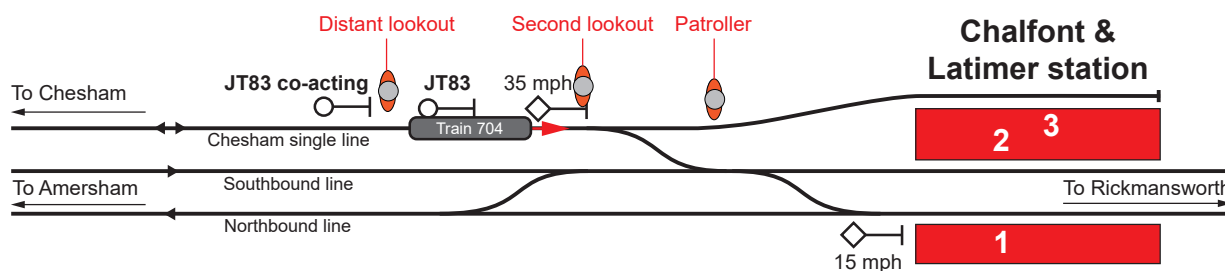


Figure 5: Positions of the track workers when train 704 passed them.

- 33 Once the train had passed, the group continued with the patrol. The patroller returned to carrying out an inspection of the points, with the second lookout remaining in the Chesham single line cess, while the distant lookout returned to the southbound four-foot.

Events during the accident

- 34 From their experience of the location, both the patroller and the distant lookout knew that, as a southbound train from Chesham had just passed them, a northbound train would soon be returning to Chesham along the single line. The second lookout, however, stated that she did not know that the Chesham line she was walking next to was bi-directional and that trains could approach from behind her.
- 35 The third train to approach the work group at approximately 09.28 hrs was train 701 which was heading to Chesham. As the train was leaving Chalfont & Latimer station, around one minute before the accident, the operator of train 701 sounded the train's warning whistle to warn the work group of the train's presence. He stated that he received acknowledgement of the warning from both the patroller and the second lookout. Although the second lookout did not remember hearing the warning from train 701, the patroller stated that he received a warning from the second lookout for the train and that he had acknowledged that warning.

36 The train operator stated that he saw there was one track worker nearest to him in the ten-foot walking northbound (the patroller), one in the Chesham cess (the second lookout) and one further away acting as a southbound lookout (the distant lookout) (figure 6).

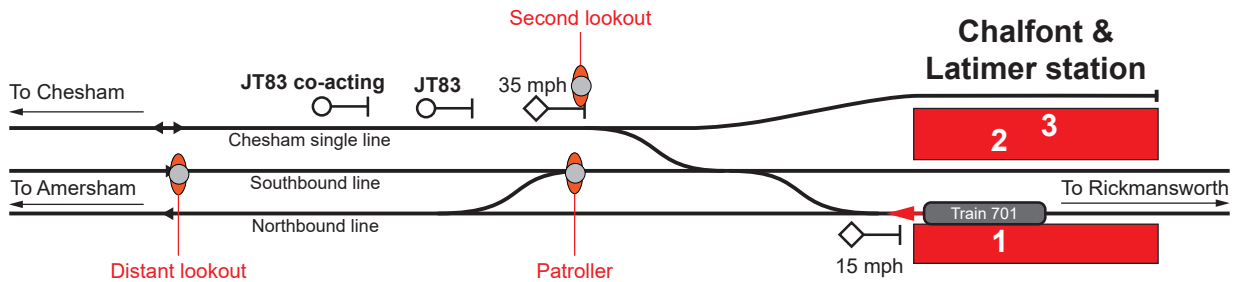


Figure 6: Positions of the track workers when train 701 sounded a warning.

37 The second lookout remained walking in the Chesham single line cess in a position of safety as train 701 approached her. However, in the final seconds of the train's approach, the second lookout moved from the cess and into a position between a signal post and the track to get a better view of the trains approaching from Chesham as she walked (figure 7). She was not aware that train 701 was approaching her from behind.

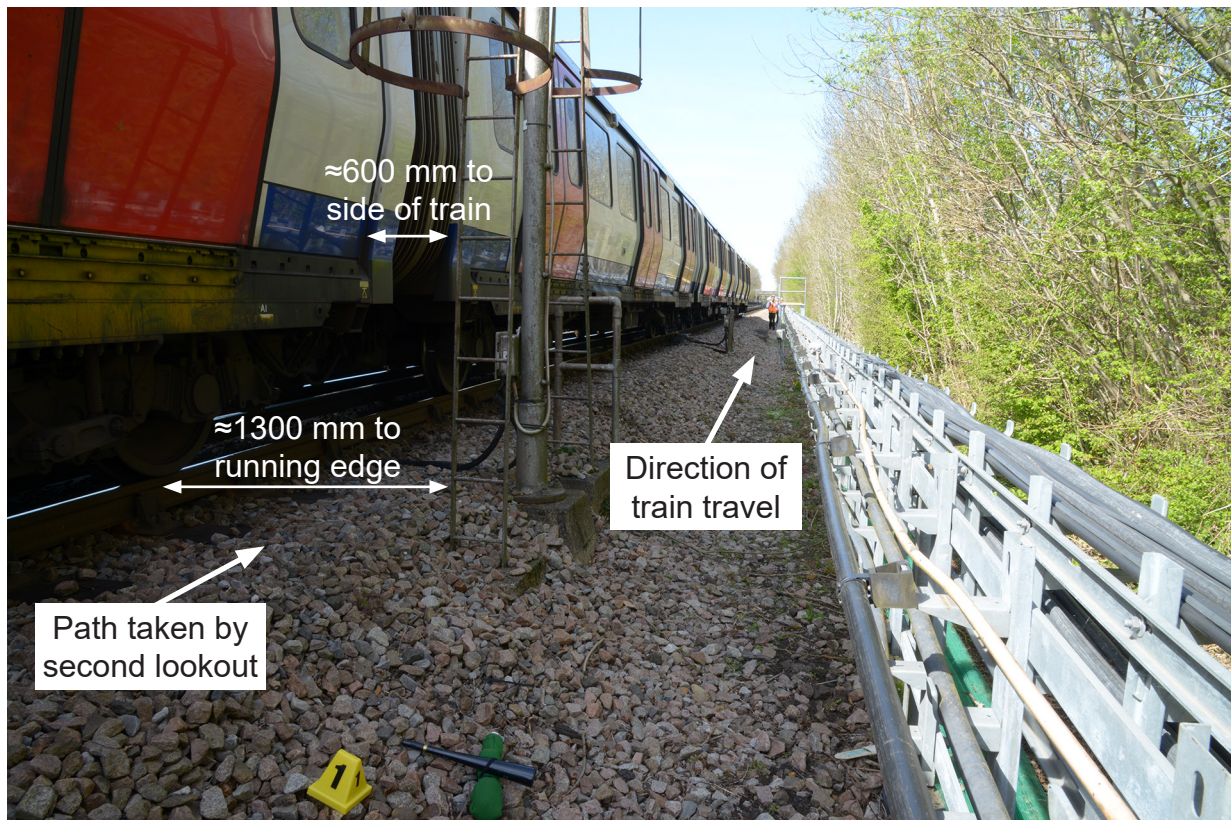


Figure 7: Space in which the second lookout walked as the train approached.

- 38 As the train approached the second lookout, the train operator did not realise that she had moved nearer to the Chesham single line and was in the swept path of the train. As the train passed the group, the train operator heard a 'bang' and applied the emergency brake. The train's OTDR showed that the train stopped approximately 8 seconds after the emergency brake was applied, having travelled around 43 metres. At the time of impact, the train was travelling at approximately 27 mph (43 km/h).

Events following the accident

- 39 The patroller and the distant lookout became aware that something was wrong when the train stopped unexpectedly. The train operator opened the cab door after stopping and saw the second lookout lying injured on the ground.
- 40 The train operator made an emergency call to LUL control to report what had happened and requested an ambulance. LUL control contacted the emergency services, who arrived at the location at approximately 09:49 hrs. The second lookout was taken by ambulance to hospital and was released later the same day.

Background information

The patrol

- 41 The patrol that was being undertaken when the accident occurred is part of a cycle of inspections carried out from Rickmansworth depot. The purpose of track patrols is to monitor and inspect the track to ensure it is safe for the passage of trains and to identify, record and prioritise any maintenance work that is necessary. An inspection would look to identify defects including the following; damage to switch blades (the moveable rails used to direct trains to or from adjacent lines); missing bolts or fastenings that could cause the rails to lose support and move under the weight of a passing train; damage to sleepers; railhead damage and cracks in crossings (track components used to support and guide train wheels where two running rails cross each other).
- 42 Patrollers only inspect the track on which they are walking and are not required to undertake any measurements. Patrollers can also carry out minor repairs and adjustments to track components if it is safe to do so.
- 43 Patrols such as this are defined in the TfL management system standard S1158A10 '*Track inspection and maintenance*', as a 'PM1 inspection' or 'basic visual inspection' (BVI). A BVI can be undertaken either in engineering hours (when passenger trains are not running) or in traffic hours (when passenger trains are running) by walking in the four-foot of the track, when it is safe to do so.

Protection arrangements on LUL

- 44 The track on LUL infrastructure is divided into three areas for the purposes of work being undertaken on or near the track:
 - 'Line clear' areas - this includes sub-surface tunnels and tube tunnels and short open sections between two tunnel sections.
 - 'Line safe' areas - where track is not classed as a tunnel section and includes sidings (the location where the accident occurred falls into this area definition).
 - Other sections - these include non-electrified LUL track, Network Rail lines used by LUL trains, or depots and sidings where traction current remains switched on and is electrically live at all times.
- 45 Any work carried out in a line clear area is usually undertaken during engineering hours when passenger trains are not running, and traction current is switched off. Work in a line clear area can also be undertaken in traffic hours under a possession (a period of time where trains are prevented from running on the relevant line). Engineering hours normally start and finish at pre-published times.
- 46 Work during traffic hours (when passenger trains are running and traction current is switched on) is only permitted on line safe sections of LUL. Staff that are suitably qualified are allowed on the track in traffic hours to undertake certain activities as long as they are working under an authorised safe system of work, implemented and monitored by a qualified person, such as a PWT-TH.

- 47 To minimise the risk of track workers being struck by a moving train or vehicle, protection arrangements during traffic hours are controlled by one of the following methods:
- keeping out of the way of moving trains
 - stopping trains.
- 48 The principle of keeping out of the way of trains means that a safe system of work must be implemented and monitored so that the work group is separated from train movement, or, if the work is on any lines on which trains can approach, the group is warned in sufficient time to go to a place of safety. LUL processes require at least 25 seconds sighting time of an approaching train. Sighting time is defined by LUL as the time from first seeing an approaching train to when it passes people that are in, or have moved to, a place of safety.
- 49 The PWT-TH has overall responsibility for implementing and supervising the safe system of work in traffic hours and for making sure that the work group has the required warning time (Rule Book 20 states that the warning time should be sufficient for the work group to move out of the way of trains). It is permissible to use an additional lookout where necessary to achieve the required warning time, depending on available sighting distances at the location of the work.

Planning

- 50 The patrols undertaken on the day of the accident were cyclical and not subject to regular formalised planning meetings. Instead, the patrols were based upon a set of patrol diagrams and work instructions that were originally planned many years ago. The patrols were carried out in traffic hours, generally every Tuesday and Friday. The patrol information relevant to the accident is contained in document MD2 'Rickmansworth to Amersham southbound'. This document states what tasks need to be completed as part of the inspection and the items that need particular attention. There is also a track patrol plan which details the areas to be covered (figure 8) and a generic work instruction (W1328 'Patrolling the track', issue A5) which details how to carry out track patrolling duties, including inspecting the track and reporting irregularities and faults.
- 51 The part of the patrol where the accident occurred requires two lookouts, as track curvature means there is insufficient visibility of approaching trains to achieve the required 25-second warning times on parts of the track north of Chalfont & Latimer station.
- 52 Staff at Rickmansworth depot request lookouts from LUL protection services based on the number of patrols they have planned and the number of directly employed LUL staff available. To provide the resource for track work on LUL, it is normal practice for LUL protection services to identify possible workers from the pool provided by agencies, and send text messages to those workers offering the work. Once the work is accepted a follow up email providing details is sent to each individual. The message sent is a standard message with the same format for both lookouts and PWTs and asks if the person receiving the message is familiar with the location concerned, although, under LUL rules, location familiarity is not necessary when acting in the role of lookout.

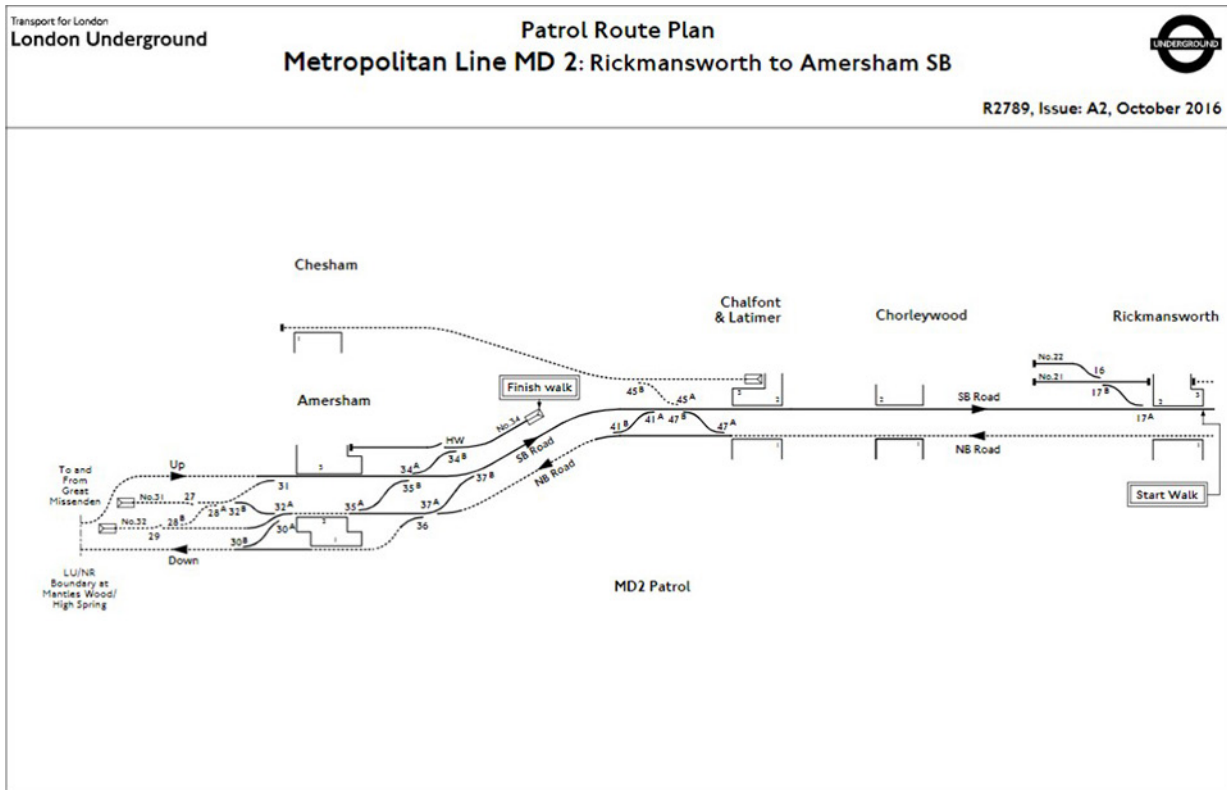


Figure 8: The diagram from the track patrol plan.

Documentation

53 In preparation for accessing the track, the PWT-TH has several documents that assist in organising a safe system of work. These include:

- Traffic circulars – which contain details about the operational railway and any changes that are taking place.
- Engineering notices – which provide details about nightly engineering work and similar activities.
- Scheduled train frequency tables – these provide train frequencies for each line, which determine whether the method of protection is acceptable.
- Line supplements – these contain information and rules additional to the LUL Rule Books and are a point of reference when working on a line.
- Additional documentation, including a method statement for the work being undertaken (if applicable) and the protection plan. The method statement should detail the safe system of work for managing the work on site. The protection plan is recorded in the PWT-TH's logbook.

Duties and responsibilities

54 The PWT-TH is responsible for managing the safe system of work and setting up any necessary protection. Section 4.1 of LUL's Rule Book 20 '*Engineering staff - Traffic Hours protection*' (issue 5, November 2021) describes the responsibilities of the PWT role. These state that the PWT should:

- '*be familiar with the area where you will be providing protection including a site visit for complex areas*

- *arrange and agree the protection arrangements required to provide sufficient warning time for the work group.*
- *position lookouts (if required) if you are unable to provide the protection*
- *give the required safety briefings*
- *make sure all staff are aware of the protection arrangements’.*

55 The duties of the lookout are defined in section 9 of Rule Book 20. These state that the lookout must:

- *‘agree the details of the journey to worksite with the PWT*
- *attend the safety briefing given by the PWT*
- *walk to the worksite with the PWT and other staff, when you get there go to a place of safety (indicated by PWT)*
- *attend the pre-work safety briefing given by the PWT*
- *go to the position to lookout as indicated by the PWT*
- *warn staff of approaching trains’.*

Briefings

56 Rule Book 20 also states that there are three different briefings that must take place:

- journey to site briefing
- pre-work safety briefing
- post-work safety briefing.

57 The journey to site briefing is intended to be a comprehensive briefing. It must include:

- The details of the work, its location and how to get there.
- The protection arrangements necessary, including a reminder to acknowledge all warnings, the warning codes to be used (to indicate which track trains are approaching on), any other work that might affect the work group and who will indicate to staff that it is safe to continue working after a train has passed.
- The physical conditions of the area (directions from which trains might come, obstructions, trip hazards and adjacent Network Rail infrastructure).
- A check that everyone has understood the briefing. This briefing provides information that is particularly important for someone who is not familiar with the location.

58 The pre-work safety briefing must be given to the work group on arrival at the work site. This briefing should cover any changes to the details given at the previous briefing, the extent of the work site and any trip hazards. If additional staff join the work group at this point, a full safety briefing must be given.

59 The post-work safety briefing takes place when the work has finished. It is needed to brief everyone on the arrangements necessary to safely return to the location to leave the railway.

60 Each PWT-TH has their own logbook which they must complete each time they undertake a protection activity such as acting as a PWT-TH. The logbook covers basic information about the planned protection. The logbook is regarded by LUL as a personal reminder for the PWT-TH about the safety arrangements. It is signed by the PWT-TH to say that they have given each of the applicable safety briefings, and the time the briefing was given, but there is no requirement for it to be signed by those receiving the briefings (figure 9).

Line: <input type="text"/>		Date: <input type="text"/>	
Location: <input type="text"/>			
Description of work: <input type="text"/>			
No of staff: <input type="text"/>		Weather conditions: <input type="text"/>	
Controller's <input type="text"/>	<input type="checkbox"/>	EM <input type="checkbox"/>	Start time: <input type="text"/>
		Getting to the worksite	At the worksite
Location of places of safety			
Warning time required			
Line speed			
Sighting distance required			
Number of lookouts: near the staff			
at distance			
Explain why lookouts are not being used <input type="text"/>			
Will handsignalers (engineering) be positioned		YES	NO
Will a separate PWT/SPC be used for worksite management		YES	NO
<input type="checkbox"/> By ticking this box you are confirming that you have considered exceptional hazards such as excessive noise, adverse weather, limited clearance, etc.			
Planning meeting: the undersigned have agreed a safe system of work			
PWT <input type="text"/>	Person responsible for worksite management <input type="text"/>		
The journey to site safety briefing		Signature	PWT
⌚ Time signed.....			
The pre-work safety briefing		Signature	PWT
⌚ Time signed.....			
The post-work safety briefing		Signature	PWT
⌚ Time signed.....			
If the briefings are not given, explain why <input type="text"/>			
⌚ Time work completed and staff clear of the track: <input type="text"/>			
25			

Figure 9: Copy of blank page from PWT's logbook

Analysis

Identification of the immediate cause

61 The second lookout was in the swept path of train 701 as it passed her.

62 Witness evidence confirmed that the second lookout was in the Chesham single line cess in a position of safety as train 701 approached her but moved from the cess and into a position between a signal post and the track just before the train reached her.

Identification of causal factors

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

- a. The second lookout moved from her place of safety and into the path of train 701 as it approached her (paragraph 64).
- b. The briefings given on the day to the second lookout did not lead to a sufficient understanding of the track layout, the method of working at the location or local practices to allow her to work safely (paragraph 81).
- c. The patrol, which the second lookout was part of, was planned for and implemented during traffic hours, when trains would be running (paragraph 91).

Each of these factors is now considered in turn.

The movement of the second lookout

64 The second lookout moved from her place of safety and into the path of train 701 as it approached her.

65 Before she was struck, the second lookout had been observed walking in the place of safety adjacent to the Chesham single line with her back to traffic. However, the second lookout subsequently moved from the place of safety and into the approaching train's path. This causal factor arose due to a combination of the following factors:

- a. The second lookout may have been aware of train 701 but did not appreciate the risk it posed to her (paragraph 66).
- b. The second lookout moved from a place of safety to get a better view of trains approaching from Chesham (paragraph 71).
- c. The patroller was not aware that the second lookout had strayed from the place of safety (paragraph 78).

Each of these factors is now considered in turn.

The second lookout's perception of risk

66 The second lookout may have been aware of train 701 but did not appreciate the risk it posed to her.

- 67 Although the second lookout was positioned primarily to relay the warning of southbound trains from the distant lookout, there was also an expectation during this part of the patrol that she would look out for northbound and southbound Chesham trains. However, she stated she was not aware that trains could approach the group from behind once the patrol had passed the northbound to southbound crossover (approximately 90 metres north-west of Chalfont & Latimer station).
- 68 As the second lookout was focused on looking out for southbound trains, her attention was not directed towards northbound train movements as she did not believe those to be relevant to her. This expectation may have overridden other visual and audible cues, such as the sound of the approaching train or that some railway signals were facing towards her.
- 69 Witness evidence is conflicting about whether the second lookout acknowledged the warning from train 701 (paragraph 35). It is possible that the second lookout had recognised the presence of train 701, but had not correctly identified its intended route. This would accord with the second lookout's stated belief that trains could not approach her from behind on the Chesham line. The second lookout had worked in that area two or three years before the accident but had not undertaken that specific patrol.
- 70 Rule Book 20 only requires a person who is providing their own protection or protection for others to be familiar with the location. A lookout's familiarity with a location should be gained through the safety briefings delivered by a PWT-TH. On the day of the accident, the second lookout stated that the fact that trains ran in both directions over the Chesham line was not made clear to her during the safety briefings she received. However, there is conflicting evidence between the three members of the work group concerning the content of the safety briefings on the morning of the accident (see paragraphs 81 to 89).

The position of the second lookout

71 The second lookout moved from a place of safety to get a better view of trains approaching from Chesham.

- 72 The safe system of work in place on the day of the accident identified the cess of the Chesham single line as the place of safety and the cess was recorded as such in the patroller's PWT-TH logbook. Due to track curvature limiting visibility as the patrol progressed, the second lookout decided to move from the place of safety and closer to the Chesham single line to get a better view of trains that could approach her on this line as she walked forwards.
- 73 There is no evidence to suggest that the second lookout had inadvertently moved from the cess towards the Chesham single line because she had become distracted by a personal or work-related issue. There was no witness evidence of mobile phone use and no evidence that the second lookout was fatigued.

74 Although there was no FFCCTV fitted to train 701, witness evidence indicates that the second lookout had been walking in a place of safety as train 701 was approaching. Therefore, neither the other members of the group nor the train operator considered her to be in danger of being struck by the train. However, the evidence is insufficient to determine exactly when the second lookout moved from the cess towards the track.

The operation of the train

75 The train operator did not sound an emergency warning as he was approaching the second lookout because he did not believe that the second lookout was at risk of being struck by the train. The train operator stated that he received an acknowledgement² of the warning whistle from the patroller and the second lookout when he was departing Chalfont & Latimer station (figure 10, paragraph 35). The train operator therefore believed that both track workers were aware that the train was approaching them, so concluded that he did not need to take any further action.



Figure 10: View from S stock train leaving Chalfont & Latimer station.

76 The train operator was unaware that the second lookout had moved towards the track. This may have been because his attentional focus was no longer on the second lookout, believing that she was safe and had acknowledged the warning whistle, and was switched instead to the view ahead. Alternatively, if the second lookout moved towards the track in the final seconds of the train's approach, it is possible that the train operator's view of her was obscured by the cab structure.

77 During a reconstruction of the train's path from Chalfont & Latimer station onto and along the Chesham single line, RAIB observed that the train operator generally has good forward visibility although there is some obscuration of the right-hand side view caused by a central console and structural pillar. RAIB's analysis, based on OTDR information and this reconstruction, suggests that the second lookout would have been visible to the train operator during the train's approach until the last seconds before impact (figure 11).

² On London Underground managed infrastructure, staff working on or near the track will acknowledge an audible warning from a train once they have moved to, or if they are already in, a place of safety.



Figure 11: Approximate point the second lookout would have last been visible to the train operator.

The patroller's awareness of the second lookout's position

78 The patroller was not aware that the second lookout had strayed from the place of safety.

79 There is no evidence that the second lookout moved from the cess and into the path of the train a long time before being struck. At the time she did move, the patroller was almost certainly involved in a part of the inspection that meant it was necessary for him to bend or crouch down to carry out checks on the junction. At this point, it is likely that he was focused on the work he was doing, rather than monitoring her position. It is also likely that the passing train would have blocked his view of the second lookout (figure 12).

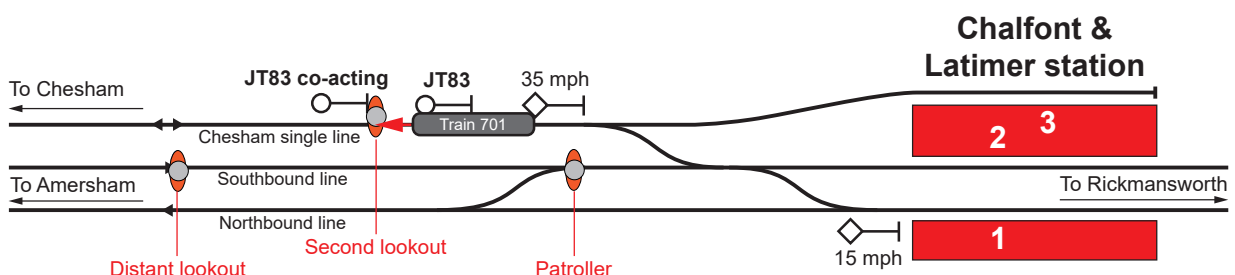


Figure 12: Location of the track workers immediately before the second lookout was hit by train 701.

80 The patroller was aware that the second lookout was in the Chesham single line cess as the train approached. The patroller believed that the second lookout was familiar with the location as he stated it had been discussed during the 'journey to site' briefing at the beginning of the day at Rickmansworth depot, and before starting the patrol at Chalfont & Latimer station, in a second 'journey to site' briefing. During the first part of the patrol from Chorleywood to Chalfont & Latimer, the patroller had concluded that the second lookout was competent and was working to a good standard. For these reasons, he saw no reason to need to continue to monitor her movement as he believed she was working safely.

The safe system of work

81 The briefings given on the day to the second lookout did not lead to a sufficient understanding of the track layout, the method of working at the location or local practices to allow her to work safely.

Safety briefings

- 82 The patrol during which the accident occurred is unusual because it includes a short section of the bi-directional Chesham line (bi-directional lines make up only a small percentage of lines on the London Underground network). This means that during the first part of the patrol the second lookout is required to look out for northbound trains crossing over to the Chesham branch from Chalfont & Latimer station, as well as relaying warnings from the distant lookout about southbound trains approaching from either Amersham or Chesham.
- 83 Witness evidence suggests that it would be difficult to safely undertake the role of second lookout for this patrol without a complete and thorough understanding of the track layout at this location. For lookouts, LUL expects this understanding to be gained through effective safety briefings before starting the work, because prior familiarity with the location is not a requirement. The second lookout stated that she was not aware that trains could travel in both directions on the line to Chesham (paragraph 34). The patroller stated that he believed that the second lookout was familiar with the location because she had told him that she had worked there previously, and he had described the work site in his initial briefing.
- 84 The second lookout had worked in the area before, but it had not been for a few years and did not include the exact location where the accident occurred. Levels of familiarity (for example, the last time someone was at a specific location) are not defined in the text message offering work so declaring familiarity at this stage is subject to considerable interpretation by those responding. Witness evidence suggests that some agency staff who may not be familiar with a location say that they are familiar when offered work to ensure that they are not replaced. The person being offered the work may also think that they will have the opportunity to increase their level of familiarity with a location to an appropriate level through a conversation with other staff or via the briefing from the PWT-TH.

- 85 LUL expects that the PWT-TH will give a journey to site briefing every time that the work group accesses the track (often referred to as a 'platform briefing'). The patroller stated that he gave the journey to site briefing to the second lookout before they left Rickmansworth depot. The patroller said that this included information about the Chesham bi-directional single line. The second lookout stated that this information was not included in that briefing. Following this briefing, the patroller and the second lookout undertook the first part of the patrol from Chorleywood to Chalfont & Latimer station. This patrol involved just two lines where trains only run in one direction on each.
- 86 When the patroller and the second lookout arrived at Chalfont & Latimer station, they were joined by the distant lookout. Witness evidence indicated that often only one journey to site briefing is given, at the start of the day, and that this was normal practice and considered sufficient for regular track workers who were familiar with the location. However, the patroller stated he gave another journey to site briefing to the distant lookout and second lookout before starting the patrol at Chalfont & Latimer. The second lookout stated there was no journey to site briefing at Chalfont & Latimer, while the distant lookout said he arrived at the end of the briefing and did not hear all of it.
- 87 As the second lookout was an agency worker and new to the group, she may not have felt that she could have asked for clarification or questioned the content of any of the briefings if she had not understood something or believed that it was incomplete. Witness evidence suggests that agency staff feel that if they challenge or complain, they may not be asked back to work.
- 88 The patroller recorded details of the protection arrangements and the briefings given on the day of the accident (figure 13) but stated that some of the details were incorrect, including the location of the work and times of the briefings. It is not possible to know exactly what time the briefing at Rickmansworth depot took place, but as it was before the patrol started at Chorleywood, it is likely to have been at least 90 minutes before the accident.
- 89 There is conflicting witness evidence as to whether this briefing included information about the Chesham bi-directional single line (paragraph 85) and whether a further briefing was given by the patroller before starting the patrol at Chalfont & Latimer (paragraph 86). However, even if the briefing given before the patrol had included information about the Chesham line then the elapsed time between this briefing and the patrol starting means it is possible the information had been forgotten by the time it was relevant.
- 90 There is no requirement for the details of the briefings to be recorded and there was no positive record that the safety briefing had been given as those receiving the briefings are not required to, and did not, sign to confirm they had received them.

Line: <i>M&L</i>	Date: <i>15/04/22</i>	
Location: <i>Chalfont to Amersham</i>		
Description of work: <i>inspection boarding</i>		
No of staff: <i>3</i>	Weather conditions: <i>good</i>	
Controller's: <i>110</i> <i>EM 910</i>	Start time: <i>09:00 am</i>	
	Getting to the worksite	At the worksite
Location of places of safety	<i>CESS</i>	<i>CESS</i>
Warning time required	<i>25 sec</i>	<i>25 sec</i>
Line speed	<i>60 mph</i>	<i>60 mph</i>
Sighting distance required	<i>700 m</i>	<i>700 m</i>
Number of lookouts: near the staff		
at distance		
Explain why lookouts are not being used		
Will handsignalers (engineering) be positioned	YES	<input checked="" type="radio"/> NO
Will a separate PWT/SPC be used for worksite management	YES	<input checked="" type="radio"/> NO
<input checked="" type="checkbox"/> By ticking this box you are confirming that you have considered exceptional hazards such as excessive noise, adverse weather, limited clearance, etc.		
Planning meeting: the undersigned have agreed a safe system of work		
PWT	Person responsible for worksite management	
The journey to site safety briefing		
① Time signed... <i>08:09 am</i>	Signature	PWT
The pre-work safety briefing		
① Time signed... <i>08:00 am</i>	Signature	PWT
The post-work safety briefing		
① Time signed.....	Signature	PWT
If the briefings are not given, explain why		
① Time work completed and staff clear of the track:		

Figure 13: Page of the patroller's logbook completed for the patrol on the day of the accident.

Working on open lines that are open to traffic

91 The patrol, which the second lookout was part of, was planned for, and implemented during, traffic hours, when trains would be running.

92 At the time of the accident there were sixteen separate patrols per week carried out during traffic hours on the Metropolitan line. LUL stated that the reason some track patrols are undertaken in traffic hours is that daylight makes inspection of track and components easier and allows the movement and noise of the track to be examined under the dynamic load of trains. LUL standard S1158 A10 2019 'Track inspection and maintenance' states that:

'Where it is safe and practicable the opportunity should be taken to observe the track under traffic where this may reveal behaviour that can be seen only with the track in service.'

LUL stated that work during traffic hours may also be easier to resource as it takes place during the day rather than at night.

- 93 LUL stated that there were several things to consider before transitioning to night patrolling, including:
- Potential changes to overall safety risk. This includes the potentially increased risk associated with carrying out track patrolling at nights (such as fatigue, slips, trips and falls) as well as a need to ensure that the quality and effectiveness of inspections was maintained.
 - Willingness of staff to transition from days to nights.
 - Training required.
 - Changes to patrol routes due to available engineering hours.
 - Logistical considerations such as the availability of staff and equipment at specific depots.
- 94 On parts of the LUL network, including the Metropolitan line, there are large sections of older, bullhead, jointed rail, and although technology to monitor and measure track condition is available and is in use on other rail networks, LUL does not consider it suitable for this type of track.
- 95 LUL also stated that the requirement to carry out some patrols in traffic hours had arisen after a derailment at Hammersmith in 2003, which was caused by a rail defect which was not identified during an engineering hours inspection. The subsequent investigation found that halogen head torches which were in use at that time for the inspection did not provide sufficient lighting to identify track defects.

Identification of underlying factors

96 LUL's processes for managing the safety of track workers were not effective at controlling the risks to staff working on the line during traffic hours.

Risk assessment

- 97 LUL had not undertaken a specific risk assessment for the patrol being undertaken on the day of the accident but had undertaken a general risk assessment that included hazards associated with patrolling during traffic hours. The risk assessment covers all BVI duties and rates the risk to a patroller from accessing the track, carrying out a visual inspection and rectifying faults. It documents the hazard '*collision with vehicle*' and describes it as '*contact with moving train*'. The risk rating applied to this hazard before the effect of control measures was deemed to be high. When the control measures were considered, including protection arrangements, training and certification and pre-site briefing, the residual risk was assessed to be 'low', defined by LUL as '*risks are broadly acceptable, and risks should be monitored to ensure the level does not change*'.

98 The low residual risk which LUL assessed as existing after the identification of risk control measures showed that LUL believed it was adequately managing the hazard of patrolling staff being struck by trains. The effectiveness of the identified control measures is, however, entirely dependent on human performance. Many factors can influence human behaviour and whether rules and procedures are followed in everyday working. This uncertainty was not reflected in LUL's assessment of the residual risk, which assumed the control measures would be consistently and effectively applied. Additionally, the risk assessment for the patrol is generic and is the same for all BVIs across the network, and therefore did not identify any additional hazards from the unusual layout at Chalfont & Latimer. Following the accident, LUL reviewed the risk assessment, but RAIB notes that some of the control measures identified post-accident are still subject to variations in human performance. The new risk assessments have, however, included moving patrols to engineering hours and the introduction of traffic hours inspections as additional control measures.

The Margam accident

- 99 RAIB made eleven recommendations following its investigation into the accident resulting in two track worker fatalities on the mainline railway at Margam ([RAIB report 11/2020](#)). Although the recommendations were not addressed to LUL, it undertook a review of these recommendations in July 2021.
- 100 One of these recommendations required Network Rail, in consultation with the Department for Transport, relevant transport authorities, the Office of Rail and Road (ORR) and other railway stakeholders, to explore ways of reducing the risk to staff who work on or near the track by creating opportunities for safe access to the track when trains are not running. LUL's resulting action recommended a 'full review' of the justification for working on 'live track' (that is, working on the track during traffic hours).
- 101 As a result of the Margam review, LUL had focused on moving inspections from traffic hours to engineering hours and several workstreams existed to help this. On the Metropolitan line, a review was started in 2021 to identify what was required to transition the majority of work and inspections from traffic hours to engineering hours. At the time of writing this report, LUL stated that 95% of patrols on the Metropolitan line have been moved to engineering hours. LUL also stated that there were a number of issues which delayed this transition including the length of some of the patrols, the necessary change in staff contracts and the Covid pandemic. Consequently, the transition has progressed slowly and at different rates for different lines on the network.
- 102 Following the review of the Margam recommendations, LUL also identified issues with duplication and inconsistency within its Rule Books and with its risk assessments. This included some risk assessments being too generic, with authors who were not always qualified, control measures that were not sufficiently detailed, and some of the content being left open to interpretation.
- 103 Although LUL's review of the Margam recommendations had identified issues, it had not yet taken action to correct many of them at the time of the accident at Chalfont & Latimer on 15 April 2022. This included, in particular, updating and reviewing all of the relevant workplace risk assessments for people working on track.

Safety assurance by LUL

- 104 LUL has a safety assurance regime intended to identify compliance with rules, procedures and safe behaviour. Although spot checks and site visits were undertaken, LUL had not identified some of the non-compliances or unsafe behaviours before the accident occurred that were identified during RAIB's subsequent investigation.
- 105 For example, RAIB found evidence that PWT-TH logbooks and equipment were not being routinely checked. In addition, although it was not causal to the accident, there was evidence that the patroller did not always call the line controller before accessing the track, and there were only two logbook entries made for 2022, which was fewer than the number of patrols the patroller had undertaken in that time, given that he patrolled most weekdays. There was also considerable witness evidence that track workers regularly walked in the four-foot instead of the place of safety; Rule Book 20 states that this should only be done when it is not practical to walk in the cess.
- 106 The LUL assurance regime includes spot checks and site visits undertaken by depot managers. RAIB noted, however, that site visits and spot checks were normally combined with track quality inspections, which meant that the focus of visits was not always on rules compliance and safe behaviours. Witness evidence also indicated that any non-compliance or unsafe behaviour that was seen was often resolved through conversations with depot management. These conversations were not recorded, and no official reports were made as it was not seen as necessary by local management. A system to record incidents does exist but was not routinely used, which meant that managers did not have an overview of any emerging incident patterns or trends (see paragraphs 115 to 119).
- 107 LUL's assurance inspections were also undertaken by access compliance inspectors. However, LUL stated that these inspections did not take place in traffic hours, partly as this was seen as potentially exposing the inspectors to a high level of risk due to trains running. In addition, there was a focus on the risks arising from the daily transition from traffic hours to engineering hours (and vice versa) where data showed there to be a high level of incidents and irregularities.
- 108 Outside of LUL's assurance inspections, Morson also has its own safety assurance regime. This consists of Morson's managers carrying out unannounced site inspections on their traffic hours agency staff. These include checks of equipment, personal protective equipment (PPE) and certification and observations of site protection arrangements. In the quarter before the accident there were 19 inspections, with two minor non-compliances being identified. These included issues with PPE, and the labelling of equipment. Non-compliances recorded by Morson are shared with LUL.

Organisational culture

109 Elements of LUL's organisational culture did not support effective management of track worker safety.

Relationship between LUL employees and agency staff

- 110 Witness evidence suggests that the relationship between LUL track workers and agency staff is often perceived as unequal and hierarchical with contract staff feeling that they were not treated as well as permanent staff. This type of power differential can affect safety practices. Witness evidence gathered during this investigation suggests that some agency staff feel that they cannot question or challenge LUL staff because this could affect the likelihood of further work with a particular group of people or at a particular depot.
- 111 It is important in an organisation that people engaged in safety-critical work can challenge and question unsafe practices without fear of reprisals, and that they are actively encouraged to do so by the people responsible for their safety. Organisations need to ensure that people can speak up on safety matters and that there is an effective mechanism to do this.
- 112 Non-technical skills (NTS) have been defined as '*the cognitive, social and personal resource skills that complement technical skills, and contribute to safe and efficient task performance*'.³ The Rail Safety and Standards Board (RSSB)⁴ states that 'The safety of task performance can be improved by proactively developing NTS and integrating them into competence management systems and training or briefing programmes.'⁵ NTS can enable safety-critical workers to identify, manage, mitigate and recover from errors and other threats to operations by using all available resources.
- 113 Elements of NTS training can provide people with the understanding of what safe and effective teamwork means, and can give people the opportunity to practise assertive communication, giving feedback or challenging unsafe acts. It can also help people to accept suggestions and comments from team members and receive constructive criticism. Guidance from the Office of Rail and Road⁶ (ORR) recommends that '*companies commit to on-going development and reinforcement of staff NTS*'.
- 114 Although the training for PWT-TH covers some communication skills, it does not explicitly cover NTS.

³ Flin, R., O'Connor, P. & Crichton, M. (2008). 'Safety at the Sharp End: A Guide to Non-Technical Skills.' Aldershot: Ashgate.

⁴ A not-for-profit company owned and funded by major stakeholders in the rail industry, and which provides support and facilitation for a wide range of cross-industry activities to help the rail industry work together to drive improvements in the rail system'.

⁵ <https://www.rssb.co.uk/safety-and-health/improving-safety-health-and-wellbeing/understanding-human-factors/non-technical-skills/introduction-to-non-technical-skills>.

⁶ ORR is the independent safety authority for Britain's railways. Its main activities include the oversight of the industry's safety performance, the enforcement of health and safety law in the railway industry, and the provision of advice.

Reporting culture

- 115 Before the accident, LUL stated it had received very few reports of track worker incidents during traffic hours and that the level of reporting has not changed since the accident. This could indicate that there are indeed few such incidents or that staff were reluctant to report incidents, particularly if they felt they had done something wrong. As issues would often be dealt with locally and not recorded (paragraph 106), opportunities for organisational learning are missed (see paragraph 117). At a much higher level, RAIB observes that LUL submits few reports regarding track worker near misses as only ten have been reported between 2005 and the accident occurring at Chalfont & Latimer in 2022.
- 116 An example that illustrates that this type of incident may be under reported arose when a train operator reported a near miss with a track worker between Rickmansworth and Moor Park on 26 May 2022. In the train operator's report, they stated that they had "had enough" of track workers not moving to places of safety and referred to the accident at Chalfont & Latimer. The report implied that reporting such incidents had not been usual practice.
- 117 For safety trends to be effectively identified, incidents must be reviewed and analysed. It is also important that this safety information is circulated throughout an organisation so that safety lessons are learned. The learning process relies on people reporting incidents and irregularities, but incident report data provided by LUL shows no previous track worker reports of near misses during traffic hours were received from internal LUL staff or agency staff. This lack of reporting means that at a strategic level it is not possible to analyse trends and understand safety issues. Consequently, safety learning will be limited. A lack of reporting of incidents may also lead to those responsible for undertaking risk assessments to believe that existing risk control measures are effective.
- 118 Although LUL was monitoring safety incidents, its focus was on harm caused to staff in general, and at a senior management level was represented by the number of accidents per period, rather than their cause. Use of lagging indicators, like the number of accidents, is not an effective safety management strategy when trying to determine reasons why accidents and incidents occur. More importantly, LUL was not actively monitoring track worker near misses, mainly because of a lack of data about them. Near miss reporting is essential for an organisation as it provides a leading indicator of risk and allows lessons to be learned to prevent near misses becoming future accidents.
- 119 Although a reporting system existed at LUL, for it to be effective it is necessary to have a reporting culture throughout the whole organisation that recognises the importance and value of reporting incidents and near misses as well as accidents at work.

Observations

Suitability of the cess as a place of safety

- 120 Where designated as a place of safety, the cess on the Metropolitan line is not always suitable for this purpose.

121 A cess is often provided adjacent to railway lines and is frequently designated as a place of safety for people on the track to wait while trains pass. LUL booklet *Protecting workers on the track traffic hours and depots – learning information booklet* (issue 3, December 2018) section 8, states that a place of safety must:

- ‘have a reasonably good surface to walk on
- not be liable to cause slips and trips
- allow you to walk facing approaching trains
- be wide enough to stand whilst trains pass’.

122 Witness evidence, supported by photographs (figure 14), show that, despite being a designated place of safety for track workers undertaking patrols in traffic hours, some places of safety in the cess do not meet these criteria.



Figure 14: Photographs of the cess on the Metropolitan line north of Rickmansworth.

Safety-critical communication

123 The safety-critical communication after the accident was calm and professional and a clear and accurate understanding of information was reached by all the parties involved.

124 Good safety-critical communication is dependent on not only the use of correct protocols, standard words and phrases but also the delivery of messages in a calm and professional manner. Although this was a difficult situation which probably resulted in increased stress, the safety-critical communication remained clear and accurate during the immediate aftermath of the accident.

Previous occurrences of a similar character

125 RAIB has not previously investigated any accidents or near misses between trains and track workers on LUL infrastructure. RAIB has, however, investigated such events on Network Rail infrastructure, including investigations into the following fatal accidents:

- A track worker struck by a train near Surbiton station, south-west London, 9 February 2021 ([RAIB report 05/2022](#)). The accident occurred while trains were still running. The investigation examined whether having members of the work group undertaking multiple tasks could compromise risk controls and identified the need to understand the extent and nature of any non-compliances relating to safe systems of work and their related rules, procedures and behaviours.

RAIB's investigation also found that the work being undertaken was planned to be completed while trains were running, with a safe system of work that used human lookouts. This was the least safe type of system of work which could be implemented, but its ongoing use had not been challenged in the years before the accident. RAIB also found that Network Rail had a programme in place to eliminate this form of working but this had not yet led to changes at the depot where the team involved worked.

- A track worker struck by a train near Roade, Northamptonshire, 8 April 2020 ([RAIB report 03/2021](#)). The investigation found that performance monitoring for track workers was inadequate, and that the system of work in place for the site was inadequate for the work being undertaken.
- Two track workers struck by a train at Margam, Neath Port Talbot, 3 July 2019 ([RAIB report 11/2020](#)). The accident occurred while trains were still running. The investigation recommended examining ways of reducing risk to staff who work on or near the track by creating opportunity for safe access to the track when trains are not running. Other recommendations included the need to improve NTS training for those working on or near the track and promoting an open and objective approach to the reporting and improvement of safety performance. The recommendations also highlighted the need to improve the assurance process related to the safety of the staff working on or near the track.

Summary of conclusions

Immediate cause

126 The second lookout was in the swept path of train 701 as it passed her (paragraph 61).

Causal factors

127 The causal factors were:

- a. The second lookout moved from her place of safety and into the path of train 701 as it approached her (paragraph 64, **Recommendation 2, Learning point 1**). This causal factor arose due to a combination of the following:
 - i. The second lookout may have been aware of the train but did not appreciate the risk it posed to her (paragraph 66, **Recommendation 2**)
 - ii. The second lookout moved from a place of safety to get a better view of trains approaching from Chesham (paragraph 71, **Recommendation 2**)
 - iii. The patroller was not aware that the second lookout had strayed from the place of safety (paragraph 78, **Recommendation 2**)
- b. The briefings given on the day to the second lookout did not lead to a sufficient understanding of the track layout, the method of working at the location or local practices to allow her to work safely (paragraph 81, **Recommendation 1, Learning point 1**)
- c. The patrol, which the second lookout was a part of, was planned for and implemented during traffic hours, when trains would be running (paragraph 91, **Recommendations 1 and 2**).

Underlying factors

128 The underlying factors were:

- a. LUL's processes for managing the safety of track workers were not effective at controlling the risks to staff working on the line during traffic hours (paragraph 96, **Recommendations 1 and 2**)
- b. Elements of LUL's organisational culture did not support effective management of track worker safety (paragraph 109, **Recommendation 3**).

Observations

129 Although not linked to the accident on 15 April 2022, RAIB observes that:

- a. Where designated as a place of safety, the cess on the Metropolitan line is not always suitable for this purpose (paragraph 120, **Recommendation 4**).

- b. The safety-critical communication after the accident was calm and professional, in difficult circumstances. A clear and accurate understanding of information was reached by all the parties involved (paragraph 123, **Learning point 2**).

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

130 On 21 December 2022, ORR issued an improvement notice⁷ to LUL because it had:

'...failed to ensure, so far as is reasonably practicable, the safety of their employees and persons not in their employment who may be affected thereby on Metropolitan line MD 2 Rickmansworth to Amersham track patrol by failing to provide a system of work that is, so far as is reasonably practicable, safe'.

131 The improvement notice required LUL to consider a range of measures intended to provide a safe system of work for the track patrols between Rickmansworth and Amersham.

132 ORR reported to RAIB on 14 March 2023 that, following a review of the information and documentation provided by LUL, improvement notice IN/EG/20221221 had been complied with.

133 LUL reported to RAIB that since the accident it has:

- Introduced traffic hours compliance checks. In addition to inspections already being carried out by contractors in traffic hours (paragraph 108) LUL now also undertakes similar inspections.
- Begun work by the culture and behaviour workstream within the safe track access group on improving the relationship between agency and internal LUL staff. As part of the workstream, seminars and workshops have been held with the aim of gaining feedback about the concerns and issues of agency staff. LUL has stated that the work is ongoing, and it will aim to address the issues identified.
- Stated that feedback from an anonymised survey undertaken by them in early 2023 suggested that 92% of PWTs believed that if a safety concern was raised, then action would be taken to resolve the issue.
- Produced site specific risk assessments for the location of the accident. The revised risk assessments have actions to increase active monitoring and to move the patrols to engineering hours, but RAIB considers that these are still reliant on mitigation measures which are vulnerable to variations in human performance (paragraph 98).

⁷ An improvement notice is one of ORR's formal enforcement means by which it can request a duty holder to make a specific improvement within a set timescale.

Recommendations and learning points

Recommendations

134 The following recommendations are made:⁸

- 1 *The intent of this recommendation is that London Underground Limited improves its understanding and management of the risk from people being struck by trains while working on the line during traffic hours.*

London Underground Limited should review how it assesses and controls the risk of people being struck by trains while working on the line during traffic hours. This review should consider available research and good practice from other parts of the rail industry and should specifically examine:

- If its current understanding of risk accounts for the uncertainty inherent in the use of controls that rely principally on human performance for their effectiveness (such as compliance with training, rules and procedures).
- Whether the current risk control measures in place need to be modified, or additional measures adopted, to reduce the risk to staff working on the track so far as is reasonably practicable. This should include consideration of the way in which safe systems of work are planned, documented and briefed to staff.
- Defining and delivering appropriate non-technical skills training for track workers.
- Working with organisations that provide agency or contract staff to seek improvements in team working between internal and external staff.

London Underground Limited should develop a timebound programme for the implementation of any appropriate measures identified (paragraphs 127b, 127c and 128a).

⁸ 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.

- 2 *The intent of this recommendation is for London Underground Limited to minimise the requirement for staff to work on the line in traffic hours.*

London Underground Limited should carry out a review of track work undertaken during traffic hours. This review should consider the amount of, and reasons for, traffic hours working and the additional risks to which it exposes staff when compared to working where lines are closed to traffic.

London Underground Limited should develop a timebound programme for the implementation of any opportunities identified to reduce work undertaken in traffic hours and take appropriate actions to control the associated risks where such a reduction is not possible (paragraphs 127a.i, 127a.ii, 127a.iii, 127c and 128a).

- 3 *The intent of this recommendation is to seek improvements in safety assurance and safety reporting on London Underground.*

Taking into account the findings of this investigation, London Underground Limited should review its current processes for:

- Assuring that safe systems of work are being correctly planned, implemented and followed, and that the intended control measures to manage risk are performing as expected.
- Ensuring there is an effective reporting system which allows all staff to report incidents and accidents, so that safety issues are properly identified and appropriate and timely actions are taken in response.
- Fostering a culture that encourages all staff (employees and contractors) who work on or near the line during traffic hours to challenge and report unsafe practices without fear of any form of reprisal (paragraph 128b).

- 4 *The intent of this recommendation is that the cess is in an appropriate condition to be used as a designated place of safety on the Metropolitan line.*

London Underground Limited should review its track assets on the Metropolitan line to ensure that, where the cess is expected to serve as a place of safety for staff working on the line, it is suitable for this purpose (paragraph 129a). This review should consider:

- whether there is sufficient space from passing trains
- the condition of the lineside
- obstructions which may cause staff to move closer to lines which are open to traffic on which trains may run.

Note: this recommendation may apply to other parts of London Underground Limited's organisation.

Learning points

135 RAIB has identified the following important learning points:⁹

- 1 This accident highlights the importance of targeted and effective safety briefings, and of reaching a clear understanding about safe systems of work before work begins on or near lines on which trains are still running (paragraph 127b).
- 2 The immediate aftermath of this accident demonstrated the contribution that good safety-critical communication can make to the effective handling of an emergency (paragraph 129b).

⁹ Learning points' are intended to disseminate safety learning that is not covered by a recommendation. They are included in a report when RAIB wishes to reinforce the importance of compliance with existing safety arrangements (where RAIB has not identified management issues that justify a recommendation) and the consequences of failing to do so. They also record good practice and actions already taken by industry bodies that may have a wider application.

Appendices

Appendix A - Glossary of abbreviations and acronyms

BVI	Basic visual inspection
FFCCTV	Forward-facing closed-circuit television
LUL	London Underground Limited
NTS	Non-technical skills
ORR	Office of Rail and Road
OTDR	On-train data recorder
PPE	Personal protective equipment
PWT	Protecting workers on the track
PWT-TH	Protecting workers on the track – traffic hours
RAIB	Rail Accident Investigation Branch
RSSB	Rail Safety and Standards Board

Appendix B - Investigation details

RAIB used the following sources of evidence in this investigation:

- information provided by witnesses
- information taken from the train's OTDR
- CCTV recordings taken from trains operated by Chiltern Railways
- site photographs and measurements
- on-site reconstruction
- weather reports and observations at the site
- a review of previous reported incidents
- London Underground Rule Books, processes and training materials
- a review of previous RAIB investigations that had relevance to this accident.

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