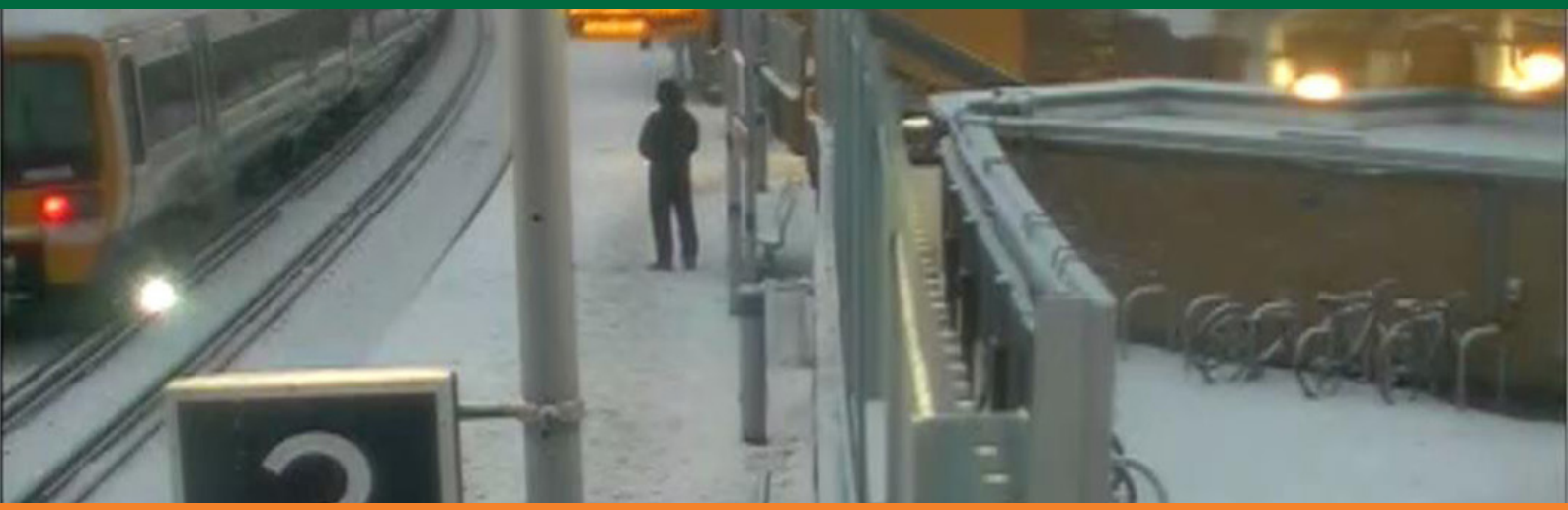
RAIB

Rail Accident Investigation Branch

Rail Accident Report



Self-detrainment of passengers onto lines that were still open to traffic and electrically live at Lewisham, south-east London 2 March 2018

Report 02/2019
March 2019

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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Cover image courtesy of London and South East Railway Ltd

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.

The RAIB's findings are based on its own evaluation of the evidence that was available at the time of the investigation and are intended to explain what happened, and why, in a fair and unbiased manner.

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

Information about casualties is based on figures provided to the 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. The 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.

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.

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Self-detrainment of passengers onto lines that were still open to traffic and electrically live at Lewisham, south-east London, 2 March 2018

Contents

Summary

At about 18:41 hrs on 2 March 2018, a passenger got out of Southeastern train 2M50 and went onto the track near Lewisham station when it was unsafe to do so. Adjacent lines were still open to traffic and the electric third rail traction power system was live. By the time that this had occurred the train had been held at a signal outside the station for over an hour because the train in front, 2M48, was having difficulty drawing power and being able to move forward due to ice accumulation on the conductor rail. Train 2M50 stopped across a key junction and caused the train that was following it, 2S54, to block another junction. This resulted in a further seven trains being unable to move.

The electric traction power was turned off in the immediate vicinity within about three minutes of the driver informing the signaller that a passenger was on the track. However, while the electrical control operator was finalising the isolation three passengers also got off train 2S54 and crossed lines that may have been live at the time. Around a further 30 passengers exited train 2M50 of their own accord and went onto the track; a few possibly did this when the lines were still live. Within 45 minutes passengers had got off at least two other trains. The uncontrolled nature of the detrainments delayed traction power reinstatement and resulted in trains being stranded for around four and a half hours. Emergency services attended and helped with incident management and recovery. Although no-one was seriously injured, conditions on all of the stranded trains became very difficult for passengers and staff.

The RAIB's investigation has focused on the safety learning relating to the initial unsafe passenger detrainments. While incident and recovery management actions are broadly described, they were not the subject of detailed examination by the RAIB.

The initial detrainment occurred because of the time the train had been held at the signal. Passengers were getting increasingly uncomfortable in crowded carriages with no toilet facilities. Ultimately the motivation of passengers to leave the train outweighed the effectiveness of encouragements to stay on board.

The accumulation of ice on the conductor rail, which prevented train 2M48 from drawing power, is a known problem that the railway industry seeks to mitigate with a range of measures. In this instance weather forecasts had warned Network Rail and Southeastern that there was a high risk of ice forming on the conductor rail and they had implemented arrangements to manage this. These arrangements proved ineffective for the following reasons:

- unlike many locations in Kent, the conductor rails in most of south-east London are not heated;
- the last application of anti-icing fluid was about 19 hours before the incident, and it is likely to have ceased to be effective;
- due to the implementation of a special timetable, and previous train delays, no train had operated over the affected route for 90 minutes – if trains had run during this period they would have removed ice from the conductor rail and helped prevent it accumulating; and
- a near-by mobile operations manager, who was trained and equipped to de-ice the conductor rail, was not alerted for 40 minutes.

The length of time during which train 2M50 was prevented from moving into a platform was extended due to a decision to route it directly behind train 2M48, which then struggled to move. This meant that train 2M50 came to a stand at a signal beyond the point at which it could have been diverted into another platform. Having made this decision the signalling staff still had the option of applying a Rule Book regulation known as emergency permissive working. This procedure would have allowed train 2M50 to pass the stop signal and enter the platform once train 2M48 had moved far enough clear. However, the first passenger left train 2M50 before signalling staff decided to implement this regulation. It is likely that the delay in making this decision arose because the train was not declared as stranded in a timely manner, and inadequate management of the disruption caused by the adverse weather.

Because the emerging situation at Lewisham was not recognised as a serious incident sufficiently quickly, key decisions were not made to define and implement plans to manage the circumstances. Other factors included informal communication using inappropriate channels, poor presentation of key operational information and ill-defined incident management processes.

The RAIB has made five recommendations:

- Three are directed jointly at Network Rail and Southeastern and concern:
  - the management of conductor rail ice risk;
  - the process for the timely identification and management of train stranding events; and
  - the visibility and communication of information to and within railway control centres.
- Two are directed at Southeastern and concern ensuring that it has a suitably large pool of staff to support train crews during incidents and that the essential needs of train passengers during extreme weather emergencies are reasonably met.

The RAIB has also identified two learning points. These concern:

- the timely application of emergency signalling rules, such as emergency permissive working, and of training and opportunities to apply such infrequently-used regulations; and
- signallers and staff in railway control centres following appropriate protocols when using voice communications.

The implementation of safety learning identified in this report would have greatly reduced the impact of the incident on other trains that became stranded, and the wider service disruption that occurred as a result.

Introduction

1 Metric units are used in this report. The directions left and right are relative to the direction of travel of the train concerned. 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.

2 This investigation has focused on the safety learning relating to the initial unsafe passenger detrainments that occurred during the incident. While incident and recovery management actions are broadly described, they were not the subject of detailed examination by the RAIB.

The incident

Summary of the incident

3 At 18:41 hrs on Friday 2 March 2018, passenger train 2M50[1] had been held at L445 signal on the entry to platform 4 at Lewisham station for 63 minutes when the driver made a call to the signaller to report that a passenger had got out of the train (figure 1). The weather was cold and wintry, and train 2M50, the late running 16:26 hrs service from Charing Cross to Dartford, had been following another late running Charing Cross to Dartford service, train 2M48. However, ice on the conductor rail at Lewisham station resulted in train 2M48 having difficulty picking up traction current when the driver tried to depart. This prevented train 2M48 making enough progress along the line to enable L445 signal to clear and allow train 2M50 to reach platform 4.

4 Platform 4 at Lewisham station is on the Down North Kent line. Trains 2M48 and 2M50 had been routed there from the Down Kent Fast line, via Tanners Hill Junction, the Down Tanners Hill line, Lewisham Vale Junction, the Down Lewisham line and Lewisham Junction. When train 2M50 was standing at L445 signal, it was occupying Lewisham Junction and extended back to the signal on the approach of the junction, L253 signal. This prevented train 2S54, which followed it, being able to proceed beyond L243 signal on the Down Tanners Hill line. Because of its length, the back of train 2S54 blocked Tanners Hill Junction, which prevented trains passing on either the Up Kent Fast line or the Down Kent Fast line. The result was that, within 18 minutes of train 2M50 stopping at L445 signal, a total of ten trains had come to a stand (figure 2). Only one of these was in a station platform[2].

5 The passenger got out of train 2M50 while work was progressing to de-ice the conductor rail in front of train 2M48 so it could move forward to allow L445 signal to show a proceed aspect. Around 70 passengers had already got out of train 2M48 while the driver was trying to depart, but they were able to alight onto platform 4 because progress out of the station was slow. The initial passenger egress from train 2M50 was onto track that was open to traffic and on which the conductor rail remained live. Two minutes before the first passenger door opened, another train passed alongside, travelling towards London on the Up Lewisham line.

6 The electric traction supply in the immediate area was switched off after around three minutes of the signaller receiving an emergency call from the driver of train 2M50, during which time it is possible that other passengers got out of the first open door. Confirmation of the wider isolation took longer. During this time three passengers got off train 2S54 and crossed lines that may have been live, and additional doors were opened on train 2M50. In all, more than 30 passengers initially got off train 2M50 of their own accord and went onto the track. Over the next 45 minutes passengers got out of at least two other trains. However, by this time the traction supply had been turned off on the lines on which they would have walked. The stranded trains were not able to move again until the power was restored, nearly four and a half hours later.

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

[2] Another train was later stranded at platform 1 in Lewisham station as a result of the isolation of the electric traction supply. This was train 2K43. It is also shown on figure 2.

7 The presence of electrically live conductor rails and moving trains presented a significant risk of harm to the first passengers who detrained. Once the traction supply had been isolated, the presence of passengers on the track prevented it from being re-energised, delaying the restoration of services. It also resulted in reliance on battery supplies and the progressive degradation and loss of on-train systems, such as lighting and public address.

8 Although no-one was seriously injured, minor injuries were reported. As the conditions on board the stranded trains degraded it became very difficult for some passengers and for railway staff to communicate with them. This added to the risk that other passengers would exit trains of their own accord, and go onto the track in the dark, where there were inherent slip, trip and fall hazards.

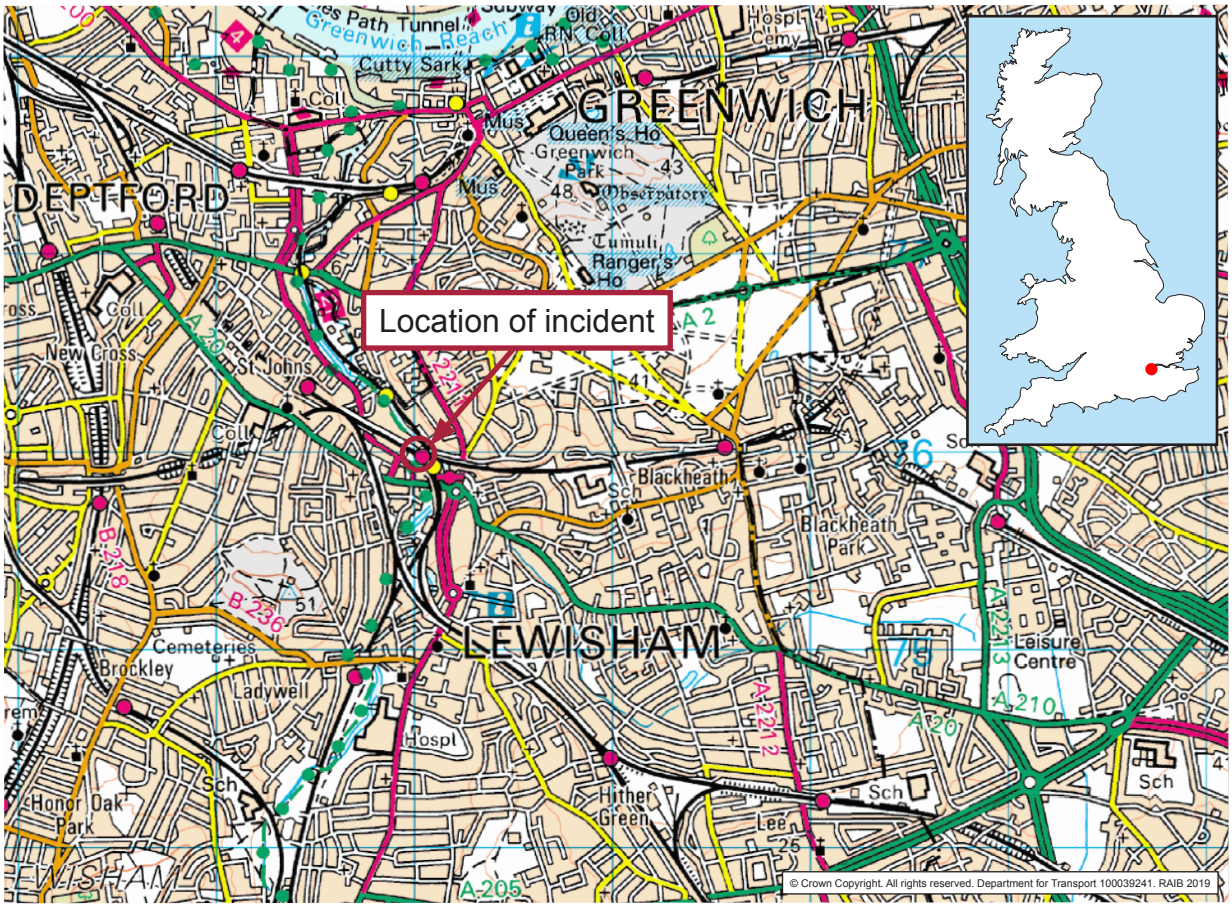

Figure 1: Extract from Ordnance Survey map showing location of the incident

Context

Location

9 Lewisham station is located around seven kilometres (four and a half miles) south-east of central London, within a complex arrangement of railway junctions. Four lines pass through the station. Figure 2 shows the layout of the track in the area.

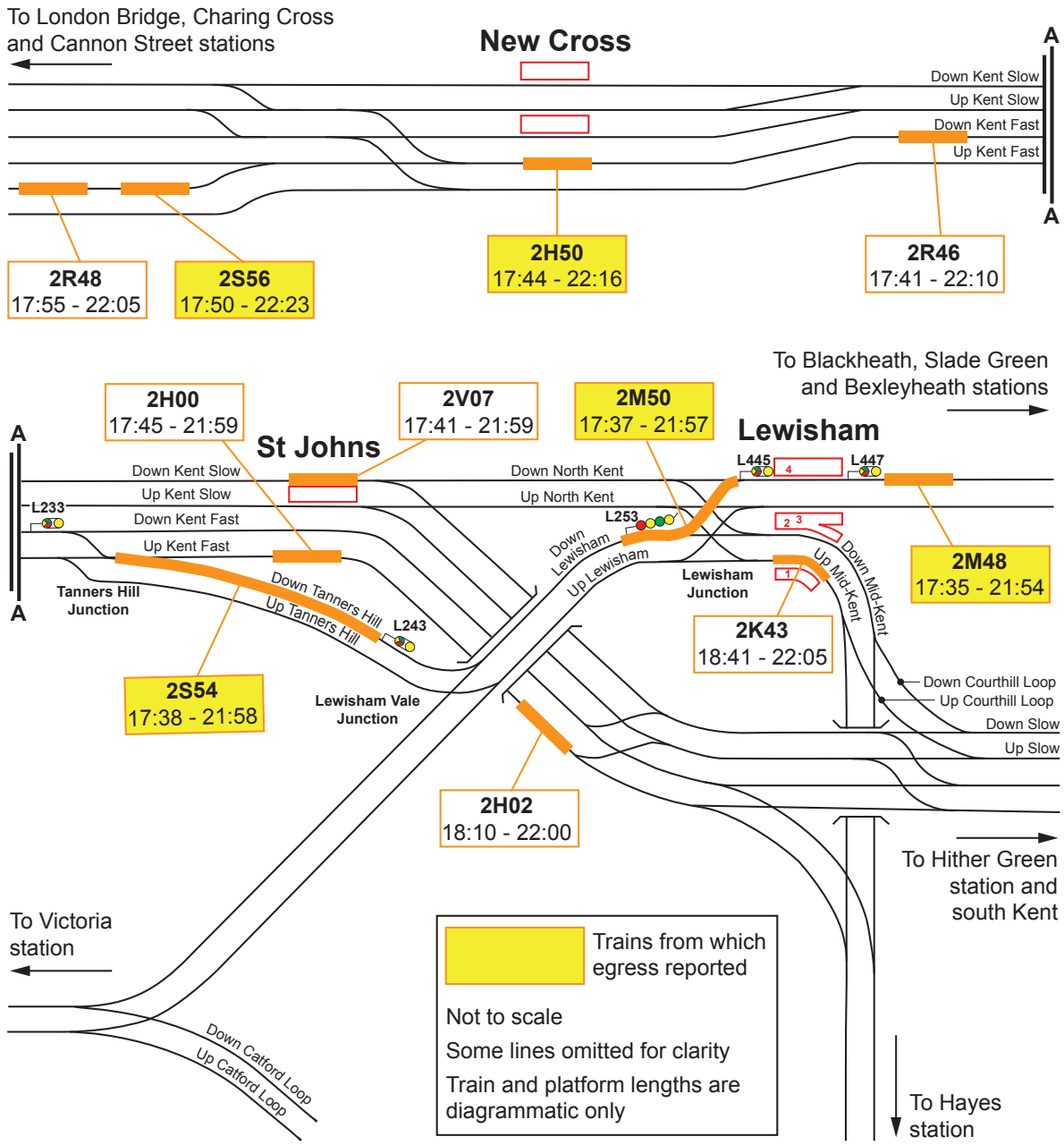

Figure 2: Track layout of Lewisham station and the lines approaching from London. The figure shows the key signals, the position of the stranded trains and the time over which they were at a stand, and where passenger egress was reported.

10 Platform 4 is on a left-hand curve and is fitted with closed-circuit television (CCTV) cameras and monitors for driver-only operation trains (figure 3). This means that, independent of their train's length, all the drivers have to stop in the same position so that they can check the platform CCTV monitors and confirm the safety of the passenger doors before departing. The CCTV monitors are located adjacent to the stopping markers at the end of the platform furthest from Lewisham Junction.

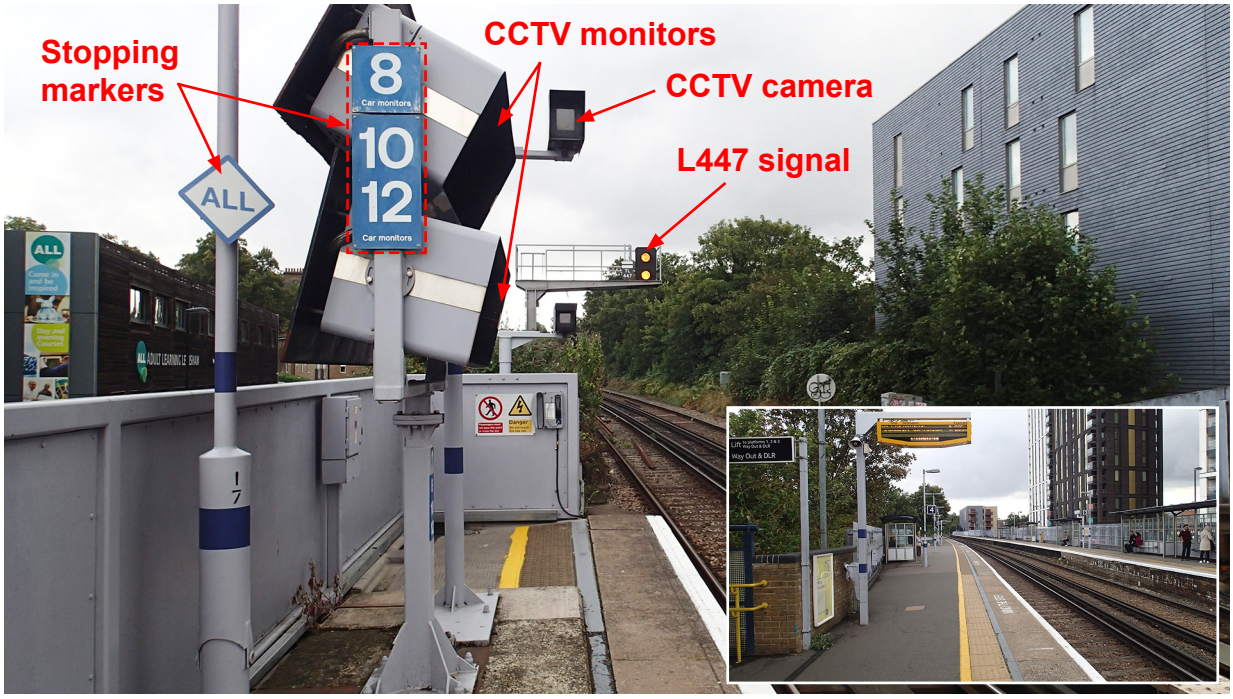

Figure 3: Platform 4 at Lewisham viewed in direction of travel of trains 2M48 and 2M50, showing the stopping markers, CCTV equipment and the general platform curvature

11 Signalling in the area was previously controlled from seven individual panels at London Bridge signal box; panel 5 covers Lewisham station and the immediate area. The controls for all panels were in the process of being transferred to Three Bridges regional operating centre, near Crawley. However, at the time of the incident, panel 5, panel 6 (Courthill Loop and Mid-Kent lines) and panel 7 (Hither Green station and immediate area) at London Bridge remained in operation.

12 All the lines are electrified on the third rail[3] DC traction power system, controlled from the Lewisham electrical control room. There is a designated walking route from Lewisham electrical control room to the London end of platform 4 of Lewisham station.

Organisations involved

13 Network Rail owns, manages and operates the railway infrastructure, including the signalling and traction power system. The lines around Lewisham are part of the Kent Area of its South East Route.

14 Network Rail employed the signalling staff at London Bridge signal box, the electrical control room operators at Lewisham electrical control room, and the mobile operations managers that were deployed to Lewisham station, and other railway locations, to manage the incident.

[3] Also known as the conductor rail.

15 London and South East Railway Ltd (referred to in this report as Southeastern, its trading name) operated and maintained the trains that became stranded. They were running as part of a wider network of passenger services that Southeastern operates in London, Kent and East Sussex. For operating purposes, Southeastern refers to its regular longer distance services as 'mainline' services, and frequently stopping shorter distance services as 'metro' services. Its metro services serve stations closer to London. Southeastern also manages the station at Lewisham, as well as almost all the other stations on its network. Figure 4 shows a map of Southeastern's passenger service network.

16 Southeastern employed the train staff and the staff at Lewisham station.

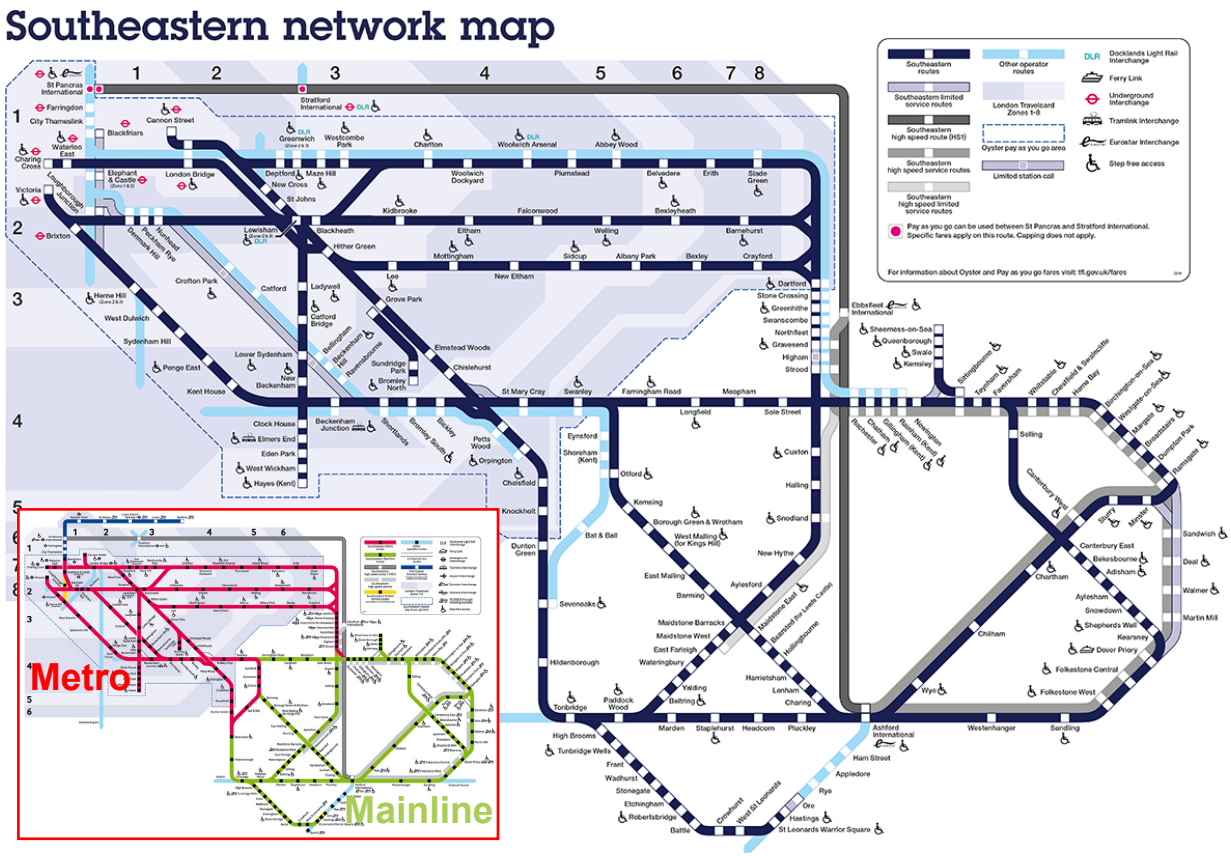

Figure 4: Southeastern passenger service network map. Note: metro and mainline service routes were separately identified on earlier editions – see inset (maps courtesy of London and South East Railway Ltd)

17 Network Rail and Southeastern jointly staff and operate the Kent Integrated Control Centre (KICC) used to oversee and manage train services, infrastructure and incidents in the Kent Area[4]. It is based at Friars Bridge Court in central London.

18 British Transport Police and the London Fire Brigade responded to the emergency, and deployed officers and crew to help manage the incident and the recovery of the railway. Other emergency services and railway industry teams attended and provided support.

[4] Southeastern also uses the KICC to oversee and manage its services that operate over the high speed route from Kent to St Pancras International.

19 Network Rail, Southeastern, British Transport Police and the London Fire Brigade freely co-operated with the investigation.

Trains involved

20 The train stranding incident and its consequences were precipitated by the operation of three trains: 2M48, 2M50 and 2S54. All were formed of electric multiple units.

21 Train 2M48, which was unable to depart from Lewisham station due to conductor rail ice, was 10 coaches long. It was formed of three 'Networker' units (figure 5): one 2-coach class 466 unit (466024) and two 4-coach class 465 units (465164 and 465003). As with other electrical multiple units designed to operate on third rail DC traction infrastructure, Networker units collect traction current via shoegear that runs in contact with the top surface of the conductor rail. The shoegear equipment is fitted on both sides of the outermost bogies of each unit (figure 5 inset).

Figure 5: Typical Southeastern Networker class 465 electric multiple unit. Inset shows the shoegear equipment. (Main image courtesy of London and South East Railway Ltd.)

22 Train 2M50, which was prevented from accessing platform 4 and from which the first passenger egress to track occurred, was also 10 coaches long. It was formed of two 5-coach class 376 'Electrostar' units (376035 and 376002) (figure 6). On-train CCTV showed that the trailing six coaches were crowded and that passengers were standing throughout. Although virtually all the seats were occupied on the leading four coaches, more standing space was available (figure 7).

Figure 6: Typical Southeastern Electrostar class 376 electric multiple unit. (Photo by Hugh Llewelyn on Wikimedia Commons. Used under Creative Commons licence.)

Figure 7: Images showing passenger occupation on leading and trailing units of train 2M50 (images courtesy of London and South East Railway Ltd)

23 Train 2S54, the train that was held behind train 2M50, was the late running 17:06 hrs service from Charing Cross to Orpington. It was 12 coaches long, and was formed of three 4-coach class 465 'Networker' units.

24 There is a single toilet on one vehicle within each class 465 and class 466 unit. Class 376 units have no toilet facilities. None of the units making up the three trains have gangways at their ends. This meant that passengers were unable to move between units within a coupled train.

External circumstances

25 The incident occurred during a period of sustained cold wintry weather. Official weather observations for south London recorded an air temperature that had remained below 0 ºC since the evening of Sunday 25 February, and at times had been as low as -9 ºC.

26 In the hours before train 2M48 started to experience difficulty departing from Lewisham station, local weather stations recorded an air temperature of around -1.5 ºC and a frost point that had been steadily rising to match it[5]. Station CCTV recorded the wintry conditions on Platform 4 and the North Kent lines at this time (figure 8).

Figure 8: CCTV image of platform 4 at 17:20 hrs (image courtesy of London and South East Railway Ltd)

[5] The temperature at which airborne water vapour condenses to form liquid water (dew) when air is cooled by contact with a cold surface is termed the dew point. When the temperature is below the freezing point of water the dew point is referred to as the frost point, as frost is formed rather than dew. A rising dew (or frost) point is indicative of the likelihood of dew (or frost) formation.

Key facts

Background information

Signalling

27 The signal control panels at London Bridge signal box are arranged in front of a large display of the lines that are controlled from the signal box. The shift signalling manager, who was responsible for overseeing the signallers and for maintaining an overview of the signalling operations on the operating floor, worked from a raised desk behind the control panels. Figure 9 is a general view of the signal box operating floor. On the left hand side of the image is the area of the display where lines have been removed because controls had been transferred to Three Bridges regional operating centre[6] (paragraph 11).

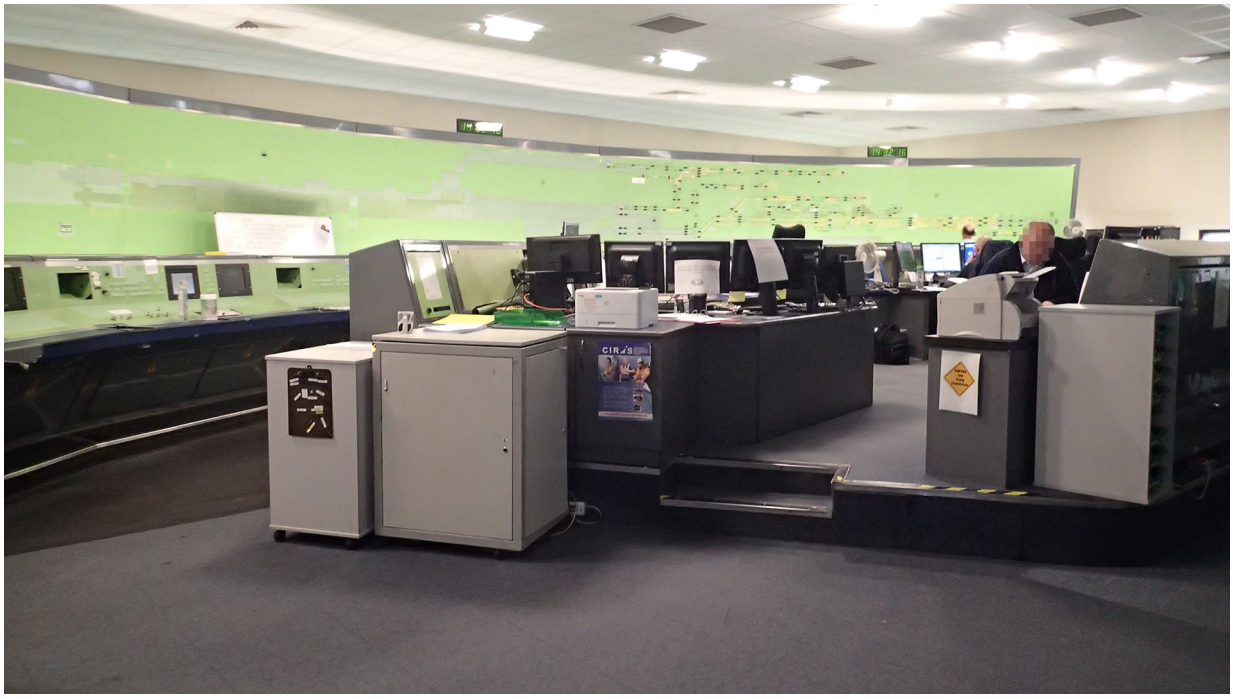

Figure 9: London Bridge signal box operating floor

28 The control panels are of the entrance-exit (NX) type. Each signal is represented by a pushbutton switch. To set a route for an approaching train, the signaller operates (pushes) the switch for the signal at the entrance to the section of the route, followed by the switch for the exit signal[7]. The points along the route then set automatically and, as long as interlocking conditions are met (for instance, the absence of trains, and points set and locked in the correct position), the entrance signal will clear to a proceed aspect. The set route is shown as a series of white lights on the display. The display also shows whether the signal is showing a proceed aspect, the track circuits that are occupied and the reporting numbers of trains. When a track circuit is occupied by a train the lights on the route show as red.

[6] The photograph was taken after the controls for panel 5 had been moved to Three Bridges regional operating centre.

[7] Pulling the push button switch cancels the route.

29 Signallers set routes manually[8] and use a set of documents, collectively known as 'simplifiers', to assist them. The simplifiers present train running information from the working timetable as a sequence of train movements for each panel. Therefore, they are only of use when the train service is running normally. During periods of delay and disruption, signallers needed to rely on judgement and experience. There are instructions applicable to panel 5 entitled 'Special instructions to signallers at London Bridge Panel 5'. There were no written rules or guidance regarding route setting during periods of delay or disruption.

30 None of the signals at Lewisham station are fitted with a subsidiary signal that would enable a signaller to authorise a driver to make a signal-controlled *permissive working* movement past a main signal that is showing a stop aspect (subsidiary signals are sometimes fitted to the signals on the approach to stations to enable trains to reach a platform by entering a signal section that is already occupied by another train).

31 Figure 10 shows the control, communication and information systems available to the signaller on panel 5. In addition to the NX panel, they included:

- the computer display showing the train reporting number of the next train to arrive from the area controlled by Three Bridges regional operating centre (prior to the transfer of the controls for panels 1 to 4, the signaller would have used information from the large signal box display to understand the whereabouts and timing of approaching trains);
- the computer display that shows information from CCF, Network Rail's train running information system;
- telephone equipment, known as the telephone concentrator, to make and receive calls to and from the KICC and other railway locations; and
- the GSM-R radio equipment used to make and receive calls from train drivers.

Figure 10: Panel 5 at London Bridge signal box showing the arrangement of the control, information and communication equipment

[8] The panels have some automatic working features that aid route setting.

32 London Bridge signal box is staffed by two 12-hour shifts: a day shift and a night shift, with shift changes at around 06:45 hrs and 18:45 hrs each day. Around the time of the incident, the shift comprised one signaller for each of the panels 5, 6 and 7, one relief signaller to cover breaks, and the shift signalling manager. The shift signalling manager's responsibilities included communication and liaison with staff in the KICC.

33 Signalling shift managers and signallers at London Bridge signal box reported to a local operations manager, who was responsible for their line management and for ensuring they were competent to undertake their respective roles. The shift signalling manager who was on duty at the time of the incident (referred to as the Shift Signalling Manager (London Bridge)), and the signallers that operated panel 5 (referred to as Signaller 1 and Signaller 2), all had more than 15 years' experience in the signal box. They had all been assessed as competent.

Railway infrastructure and train service control

34 An integrated team of Network Rail and Southeastern control staff in the KICC oversees and manages the operation of the railway infrastructure and train services in the area (paragraph 17). During the working week this team is staffed by three eight-hour shifts: early (07:00 hrs to 15:00 hrs), late (15:00 hrs to 23:00 hrs) and night (23:00 hrs to 07:00 hrs)[9]. Figure 11 is a general view of the operating floor at the KICC.

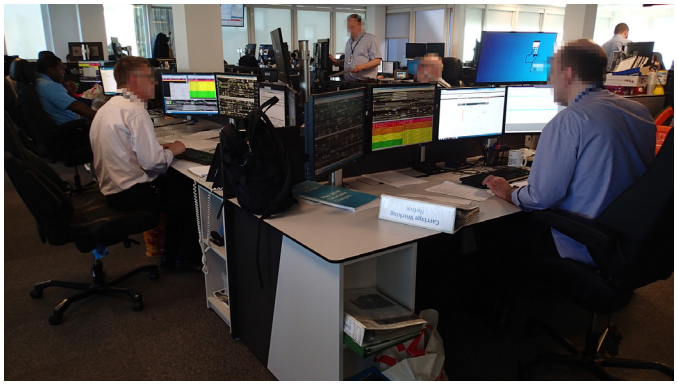

Figure 11: Operating floor at the KICC

35 Network Rail staff, all of whom report to the route control manager on duty, included:

- Incident controllers – responsible for managing train service incidents and, in response, deploying Network Rail resources, such as mobile operations managers and infrastructure maintenance teams. There were two incident controllers on each shift. Those on duty at the time of the incident are referred to as:
  - Incident Controller (South East), covering train services from Charing Cross and Cannon Street; and
  - Incident Controller (Chatham), covering train services from Victoria.
- Support controller – responsible for incidents that do not affect train services, such as a railway fence issue.

[9] There was evidence of informal arrangements to vary these times by mutual staff agreement.

- Train running controller – responsible for regulating the running of train services.
- 'Flight engineer' – responsible for remote monitoring of infrastructure condition and faults.
- Information co-ordinator – responsible for distributing train service information to railway industry parties: for example, using messaging systems and telephone communication.

36 Network Rail's route control managers report to the lead route control manager. The two route control managers who were on duty on the late and night shifts on 2 March and the Incident Controller (South East) (paragraph 71) all had more than 10 years' experience of working in a railway control office.

37 Southeastern staff reported to the passenger experience delivery manager; they included:

- Train service managers – responsible for monitoring and managing Southeastern's train service; for instance liaising with Network Rail's train running controller to recover the service by terminating or diverting trains. There were four train service managers on each shift. Those on duty at the time of the incident are referred to as:
  - Train Service Manager (Metro North), responsible for metro services running out of Charing Cross and Cannon Street stations;
  - Train Service Manager (Mainline), responsible for Southeastern's mainline services running out of Charing Cross and Cannon Street stations;
  - Train Service Manager (Victoria and Metro), responsible for train services running out of Victoria station; and
  - Train Service Manager (High Speed), responsible for train services that use the high speed route from Kent to St Pancras International.
- Resource managers – responsible for monitoring and managing train crew resources. There were four resource managers on each shift.
- Operations communications manager – responsible for messaging and emailing of train service information, and for making remote public address announcements to passengers on trains.
- Information delivery manager – responsible for managing and updating the customer information system in stations.

Other Southeastern staff in the KICC monitored CCTV on the network, for security purposes, and managed the rolling stock fleet.

38 The Train Service Manager (Metro North) (paragraph 65) and the Train Service Manager (Mainline) (paragraph 67) that were on duty on the late shift on 2 March both had more than 9 years' experience of working in the KICC.

39 Network Rail's route control manager and Southeastern's passenger experience delivery manager had adjacent desks on the operating floor. Southeastern's train service managers and Network Rail's incident controllers, train running controller and information co-ordinator, were co-located in a nearby group of eight desks. The desk users had access to:

- a messaging system, known as Tyrell, for sending information to relevant railway locations (such as stations);

- a telephone concentrator, to make and receive calls from signal boxes and other railway locations; and
- CCF, the train running information system.

Figure 12 shows the general arrangement and allocation of the desks; the inset shows a typical arrangement of the communication and information systems available.

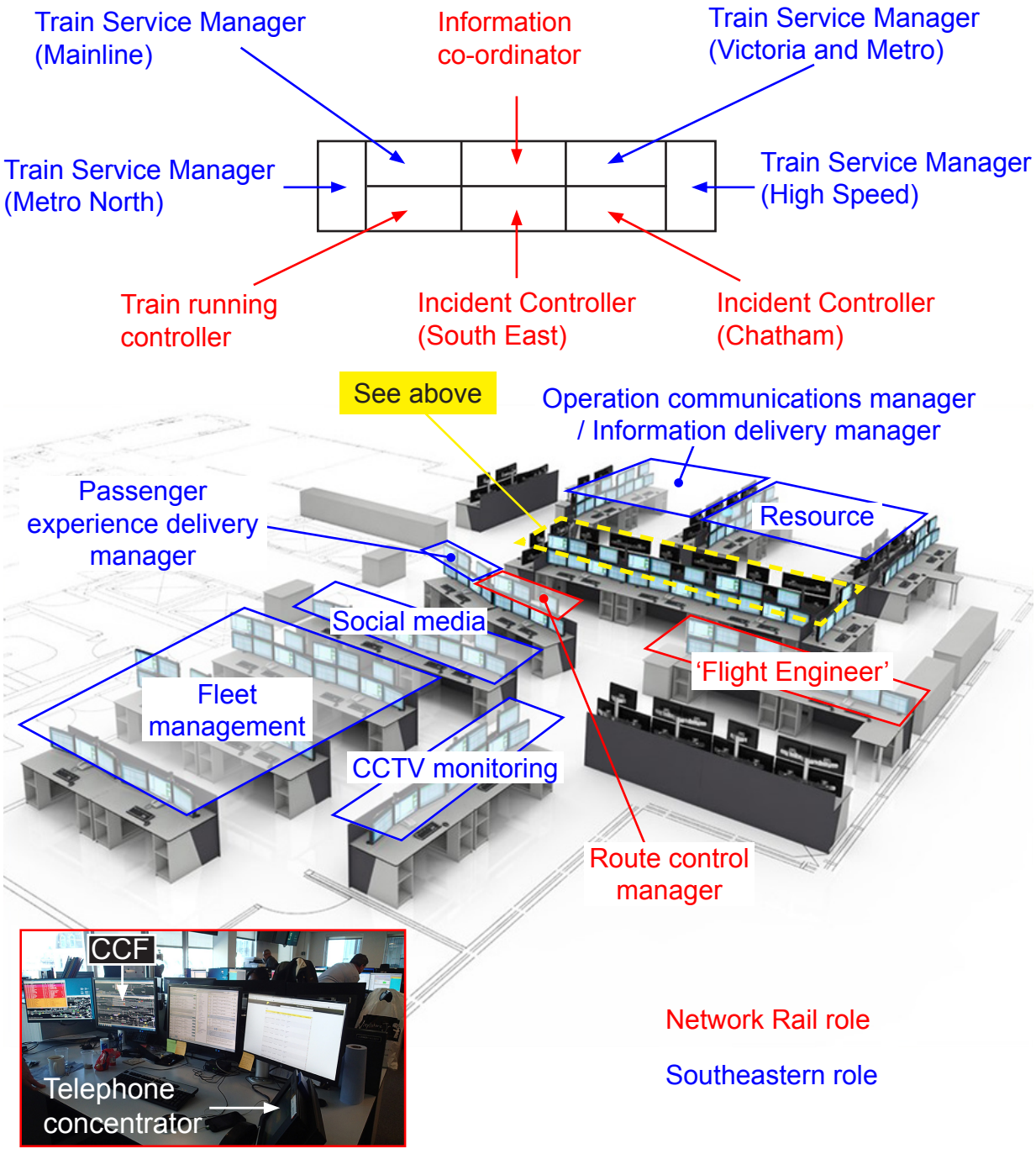

Figure 12: Diagram showing general allocation of desks on the KICC operating floor (main image courtesy of London and South East Railway Ltd)

40 Network Rail standard NR/L3/OPS/045/3.23, 'National operating procedures, train service management' gives instruction to control room staff for managing train services during both normal operation and disruption. While this includes general responsibilities and policies, such as for monitoring and regulating train running, and informing passengers, it does not prescribe detailed individual responsibilities and process arrangements. In the KICC, witnesses described a process by which staff were expected to identify, communicate and manage train service incidents that was generally accepted, although subject to some variation in understanding and practice. This process is illustrated by figure 13 and can be summarised as follows:

- The incident controller should be notified of the incident by the signaller (via the telephone concentrator).
- The incident controller should then determine the relevant course of action and, as appropriate:
  - liaise directly with the relevant train service manager regarding train service matters;
  - mobilise Network Rail resources to site, typically mobile operations managers and infrastructure engineering resources; and
  - use the telephone concentrator to call the electrical control operator, in the event that a traction current isolation is needed.
- The train service manager would:
  - use the telephone concentrator to communicate train routeing decisions to the signal box[10]; and
  - liaise directly with the resource managers, the operations communications manager and the information delivery manager.

Winter preparedness

41 Network Rail document 365 WM – Appendix E3, 'Additional winter preparations 2017 (Kent Area)', describes the special arrangements that were in place for managing the weather-related risks of operating trains in the Kent Area for the 2017-18 winter season. Network Rail also refers to this document as 'Appendix E3'. It was jointly reviewed and agreed with Southeastern.

42 The arrangements included the use of a weather forecast, issued at 03:00 hrs each day by Network Rail's weather forecaster. From this, the on-duty route control manager (or senior Network Rail operations manager) decided whether predicted conditions would be sufficiently extreme to trigger the need for an extreme weather action teleconference (EWAT), involving Network Rail and Southeastern representatives (paragraph 53). The forecasters produced a special 24-hour and five-day outlook of the risk of conductor rail ice formation.

[10] Some accounts suggested that the communication with the signaller would normally be via Network Rail's train running controller.

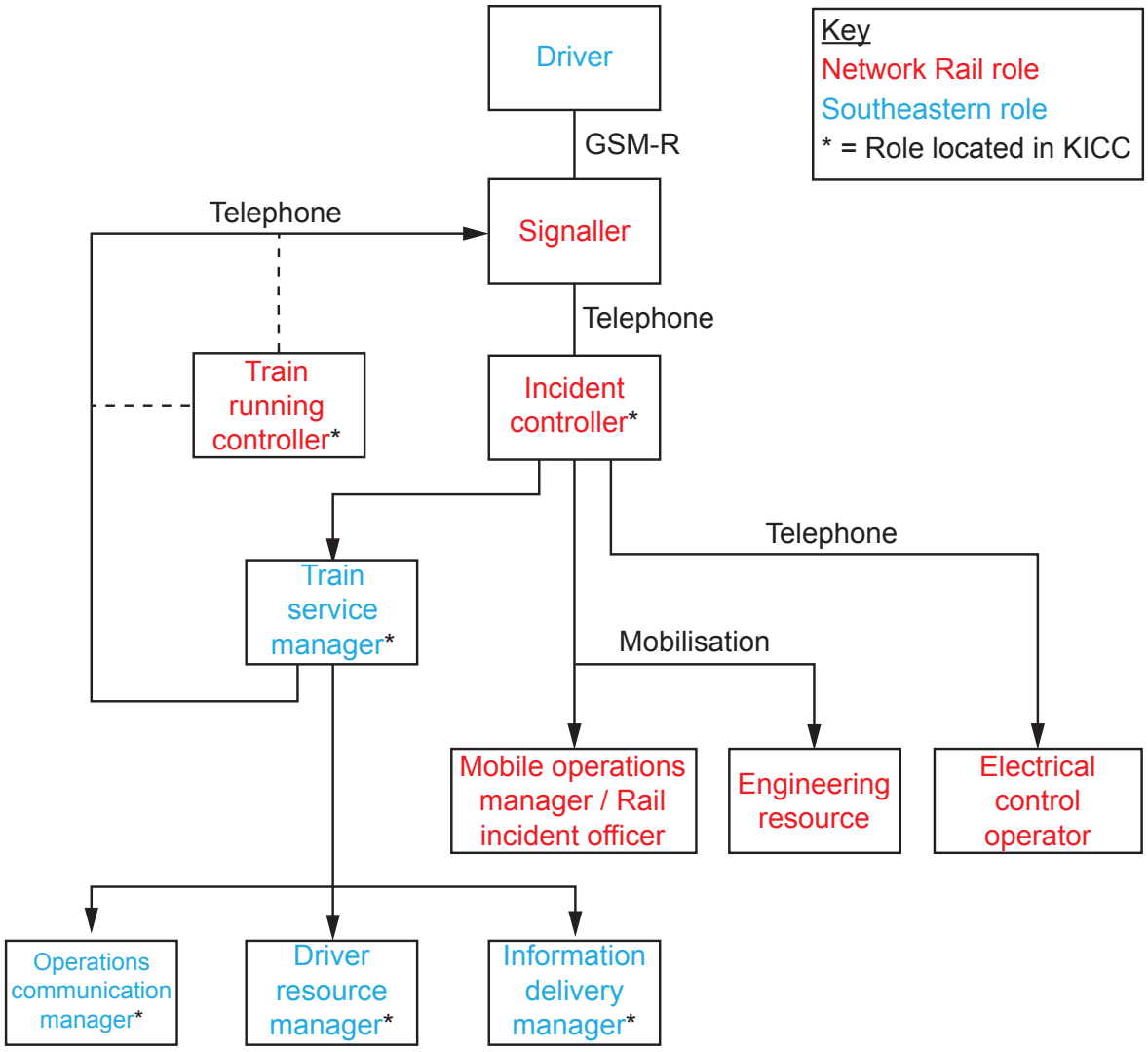

Figure 13: Train service incident management process (as described by witnesses)

43 The EWAT was normally held after the morning peak train service. It was used to review the daily forecast, consider any updates and reported weather observations, and, depending on the likely severity of ice, snow and storm, agree the mitigating actions. Further EWATs may be called during the course of the day to review follow-up actions that are needed until the forecast is issued the next day. Network Rail and Southeastern had an agreed table of measures, referred to as the 'winter matrix', that they used for decision-making.

44 Network Rail had three primary measures it used to manage train service operational resilience when there was a risk of ice:

- Operation of specially-equipped trains to apply an anti-icing fluid on the conductor rail. These trains operated over a set of five pre-planned routes. They ran over two routes in the morning, and three routes in the evening[11]. Southeastern also has a fleet of 20 specially-fitted passenger trains that could be requested to apply anti-icing fluid during normal service.

[11] If trains run over all the pre-planned routes, the majority of the lines in the Kent Area would be treated at least once within a 24 hour period. Some lines would be treated in both the morning and evening.

- Use of conductor rail heating. In 2009 Network Rail started a project to install heating elements to the conductor rail at identified locations on the network. These elements were automatically controlled by local temperature sensors; controls were also provided in the KICC.
- Implementation of a pre-planned contingency timetable known as the key route strategy (KRS). One of the key considerations in the development of the KRS was the impact of ice on the operation of points. With this in mind, the strategy sought to withdraw services on identified routes so that points could be kept in one position at certain junctions (paragraph 55). Southeastern had a complementary set of train and train crew plans for use when the KRS was implemented.

45 Southeastern work instruction SE/WI/OPS/03, 'Managing seasonal risk, identification and control including autumn and winter arrangements', described additional winter weather arrangements. These related to its train operation responsibilities. For instance:

- notifying the Department for Transport when the KRS is implemented;
- briefing drivers on winter driving techniques; and
- the need for rolling stock winterisation checks.

Stranded train management

46 In June 2014, the Association of Train Operating Companies (ATOC)[12] and Network Rail issued joint guidance on how Network Rail and train operating companies should plan and implement arrangements for meeting the needs of passengers when trains become stranded. This document, ATOC NR/GN SP01, 'ATOC/Network Rail guidance note – meeting the needs of passengers when train are stranded', resulted from work following an incident between Dock Junction and Kentish Town in May 2011 (paragraph 170). It sets out information covering:

- Recognising when a train is stranded – the guidance states it is likely that a signaller will be the first to be aware.
- Determining how to respond – the decision whether to evacuate passengers, or if they should stay on the train (this is to be informed by a dynamic risk assessment taking into account factors such as duration, local environment and availability of staff; for resilience purposes, the guidance emphasises the importance of establishing alternative action plans).
- Passenger needs – the requirement to anticipate and understand the needs of passengers in a train stranding situation (information, heating, air conditioning, toilet facilities, etc.) and to focus action plans accordingly.
- Command and control – having relevant structures in place so that stranded train incidents are managed effectively; the guidance also describes the roles and responsibilities of the key staff involved (driver, signaller, incident controller, mobile operations manager etc.) and suggested target times for their respective tasks.

[12] ATOC became part of the Rail Delivery Group in October 2016.

47 ATOC NR/GN SP01 was intended to help Network Rail and train operating companies define procedures that were specific to their own particular circumstances. The procedures developed by Network Rail and Southeastern are:

- Network Rail standard NR/L3/OPS/045/4.15, 'National operating procedures, managing stranded trains and evacuation'; this is also referred to as NOP 4.15; and
- Southeastern work instruction SE/WI/OPS/035, 'Managing the needs of passengers when trains are stranded – incident command, control and communication'.

48 Network Rail issued NOP 4.15 in September 2017 for its railway control offices (such as the KICC) to use. It defines a stranded train as one that is stationary and:

- not expected to be able to continue its journey within 'a reasonable time' (between 10 and 15 minutes is suggested as a guide); or
- is expected to be able continue its journey, but only after an 'unacceptable length of time' (30 minutes is suggested as a guide).

This definition, and the associated time values, are compatible with the guidance in ATOC NR/GN SP01.

49 NOP 4.15 does not define the respective roles of key staff in deciding when a train should be considered to be stranded. However, it refers to the need to use risk assessments to inform incident management decisions and to consider establishing two incident management plans - in effect a main plan and a backup plan (it calls these 'contingency plans': the same term is used in this report). It also highlights the need to co-operate with the train operator and take into account its instructions. A table of evacuation options is provided that includes consideration of permissive working.

50 Southeastern issued SE/WI/OPS/035 in June 2013 with the stated purpose of focusing on the needs of passengers on stranded trains. Its definition for a train being declared stranded is compatible with that defined in NOP 4.15.

51 SE/WI/OPS/035 states that the incident controller (in the KICC) should declare when a train has become stranded. The decision should be based on information provided by the driver, either via the signaller or directly. It also states the need for the KICC to lead the decision on how to respond. Like NOP 4.15, it refers to the need to use a risk assessment form (albeit different) and the importance of having diverse contingency plans in place.

52 SE/WI/OPS/035 additionally gives information on:

- expected timescales - for instance that the KICC should have established if a train is to be declared stranded within 15 minutes of the incident occurring;
- individual staff responsibilities and actions – for instance, for drivers and Southeastern KICC staff;
- evacuation methods and equipment; and
- relevant characteristics of rolling stock – for instance, systems and equipment that are provided, and emergency power availability.

The sequence of events

Events preceding the incident

53 Network Rail received a report of the likelihood of severe winter weather for the week commencing Monday 26 February from its forecast provider and, on the Friday before, started to convene a series of daily EWATs. It used these to review the latest weather condition and forecast information, with representatives from its operation and maintenance functions and train operators, and to agree mitigation measures.

54 In view of the forecast severity of the weather, Network Rail and Southeastern set up *gold command* organisations for the week, staffed by senior company managers, and established a command room in the KICC. British Transport Police deployed an officer to co-locate with KICC staff (referred to as the embedded police officer).

55 As the week progressed, Network Rail asked Southeastern to implement the KRS (paragraph 44), which resulted in the withdrawal of trains from certain routes. The KRS also involved the need for dedicated resources to ensure the operation of points at critical locations (while taking others out of service) and running trains in a minimum formation of two units.

56 At about 03:00 hrs on 2 March, Network Rail's forecaster issued its forecast for the Kent Area over the next 24 hours. It stated that it expected a 'persistent band of snow' to arrive from the south west at around 14:00 hrs. It also predicted a risk of ice formation on the conductor rail; it had predicted the same the day before. At the EWAT convened later in the morning, the forecaster's update advised that, although the 'cold spell' was nearly over, the risk of further snow that afternoon remained, and there was the added possibility of it turning to 'freezing rain' in the south between 16:00 hrs and 20:00 hrs.

57 By the time of the morning EWAT, freezing rain and conductor rail icing issues had already been experienced and Southeastern reported having to deal with a number of stationary trains and service suspensions across the network. Weather issues continued through the morning and into the afternoon. At 14:15 hrs a flipchart was used in the KICC command room to summarise the status of the railway. It recorded that at least eight major lines were blocked due to snow and ice; these included the Dartford Loop lines in north Kent and main lines serving Maidstone and Canterbury. The loss of these lines was in addition to closures due to implementation of the KRS. Witness evidence was that the major strategic objective at this time was reopening as much of the railway as possible so that customers could travel home from London in the afternoon peak. With the exception of a passenger train near Stone Crossing station, which was continuing to have difficulty making progress to Dartford, the majority of the earlier issues with stationary trains had been resolved.

Events during the incident

58 Train 2M48 departed from London Charing Cross at 17:03 hrs. It was 67 minutes late because the extreme weather conditions had delayed the in-bound service from which it was formed. It was routed into platform 4 at Lewisham station, arriving there at 17:25 hrs.

59 At around 17:30 hrs, the Shift Signalling Manager (London Bridge) came on duty at London Bridge signal box, and Signaller 1 signed back on panel 5 after taking a one-hour break (paragraph 33).

60 Station CCTV recorded train 2M48 starting to depart from platform 4 but its progress was exceptionally slow. At 17:32 hrs the driver of train 2M48 made a GSM-R radio call and advised Signaller 1 that he was having traction problems. The signaller asked the driver to 'do your best' and to call back if it was unlikely that the train would get beyond Blackheath, the next station on the Down North Kent line.

61 At 17:34:33 hrs the signalling data logger recorded that Signaller 1 set the route for train 2M50 to cross from the Down Kent Fast line onto the Down Tanners Hill line and proceed to Lewisham Junction. Train 2M50 arrived at the junction at 17:37 hrs and was held at L445 signal on the Down North Kent line waiting to enter platform 4. The 10 coaches of the train occupied the junction and extended onto the Down Lewisham line as far as L253 signal (figures 2 and 14).

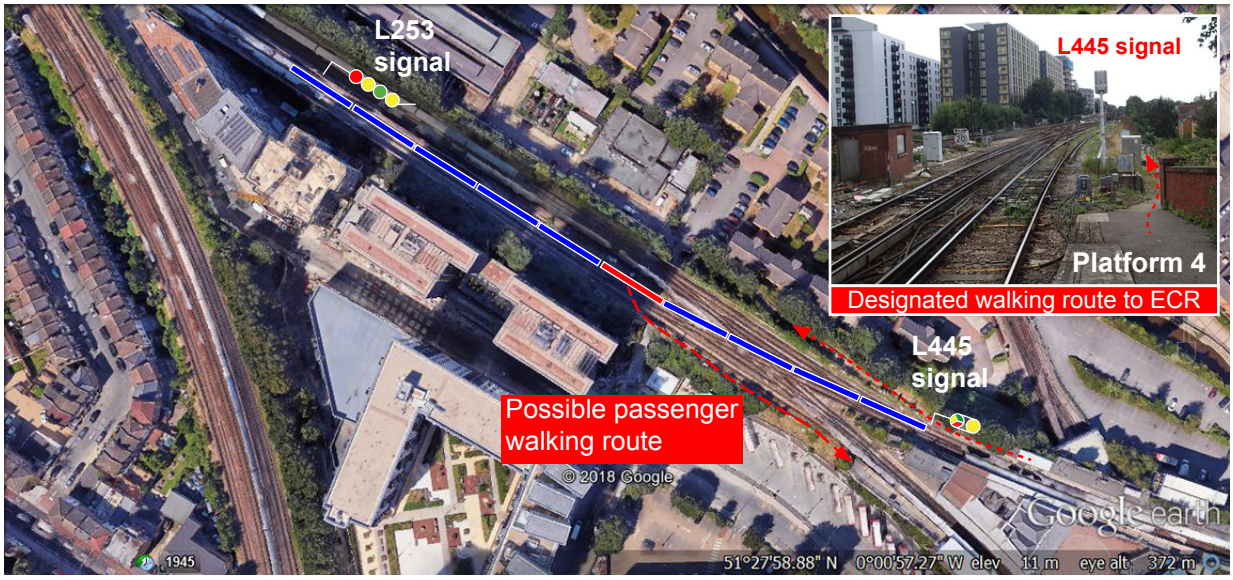

Figure 14: Lewisham Junction showing the position of train 2M50 when held at L445 signal. It also shows the designated walking route to Lewisham electrical control room (paragraph 12), the coach (coloured red) that the first passenger got out of and a possible walking route to platform 1 (paragraph 141)

62 At 17:37:48 hrs Signaller 1 set the route for train 2S54 to follow train 2M50 onto the Down Tanners Hill line. It was brought to a stand and held at L243 signal, with the rear portion of the 12-coach train occupying and blocking Tanners Hill Junction.

63 Train 2M48 continued to make very little progress. By 17:40 hrs, station CCTV recordings showed that it had moved forward just four coach lengths (around 100 metres).

64 At 17:47 hrs the driver of train 2M48 called Signaller 1 to advise of further delay because a passenger communication device[13] had been operated. He said that a member of Southeastern staff (a driver manager), who was travelling on the train and had offered to assist, was going to go back to reset it. The station CCTV showed that around 30 passengers got out of the train, onto platform 4.

65 At around the same time, the Train Service Manager (Metro North) in the KICC called the Shift Signalling Manager (London Bridge) to agree routeing for an empty passenger train elsewhere. During the conversation, the Shift Signalling Manager (London Bridge) mentioned the problems with train 2M48 at Lewisham, but the discussion then returned to the empty train.

66 At 17:50 hrs, the driver of train 2M48 called Signaller 1 back to advise that the passenger communication device had been reset. The driver called back again at 17:53 hrs to inform Signaller 1 that an emergency egress device (paragraph 95) had been operated and that this now needed resetting (the station CCTV recorded that around a further 40 passengers alighted onto platform 4). Signaller 1 asked the driver to move when possible.

67 At 17:55 hrs, the Shift Signalling Manager (London Bridge) called the KICC. This time he spoke to a different member of staff, the Train Service Manager (Mainline). He told the Train Service Manager (Mainline) about the operation of the emergency egress device on train 2M48 and that this was resulting in further delay. The Shift Signalling Manager (London Bridge) explained that other trains were stationary because of the problems with train 2M48, and would remain so until train 2M48 was able to move forward.

68 The first call from the driver of train 2M50 to Signaller 1 was at 17:59 hrs. The driver could no longer see train 2M48 ahead, because of the curvature of platform 4 (paragraph 10), but he had been watching it earlier and was aware that it was making little progress. Signaller 1 confirmed that train 2M48 needed to move forward (far enough to clear the *overlap* track circuit of L447 signal ahead) before L445 signal could show a proceed aspect. At 18:10 hrs, station staff at Lewisham also called Signaller 1. They advised that train 2M48 was now clear of platform 4 and that it would be safe for train 2M50 to move forward into the station. Signaller 1 again explained that train 2M48 needed to move far enough to clear the overlap track circuit beyond L447 signal before this could happen. There were a number of other calls around this time from drivers of other trains that were stationary. Signaller 1 gave a similar situation update and explanation.

69 A call from the driver of train 2M48 at 18:10 hrs suggested to Signaller 1 that the train was now making progress, albeit very slowly. At 18:11 hrs, the Shift Signalling Manager (London Bridge) called the KICC back. He spoke with the Train Service Manager (Mainline) again, advising him of the slow progress of train 2M48 and the hope of being able to move train 2M50 into the station. After this they discussed options of re-routeing services in order to relieve the disruption that had resulted.

70 At 18:14 hrs, the driver of train 2M48 called Signaller 1 to say that that the driver manager who was on the train (paragraph 64) was happy to help with de-icing. Train 2M48 was still having difficulty making progress.

[13] Although the driver reported that a passenger communication device had been operated it is probable that it was an emergency egress device (paragraph 95).

71 Immediately after this, at 18:15 hrs, the Shift Signalling Manager (London Bridge) decided to call the KICC and request a Network Rail mobile operations manager to help with the de-icing. On this occasion, the Shift Signalling Manager (London Bridge) spoke with the Incident Controller (South East), the incident controller responsible for the affected train (paragraph 35). Witness evidence suggests that this was when the Incident Controller (South East), and Network Rail's KICC staff in general, first became aware of the emerging operational problems at Lewisham. The Shift Signalling Manager (London Bridge) explained the situation and the incident controller started to log reports and actions on Network Rail's incident management and logging tool, the Control Centre Incident Log (CCIL). The first action that the Incident Controller (South East) took was to deploy the mobile operations manager for Lewisham (referred to as the Mobile Operations Manager (Lewisham)), who was in his office at the nearby Lewisham electrical control room (paragraph 12).

72 There is witness evidence that the Mobile Operations Manager (Lewisham) was already aware of the difficulties that train 2M48 was having. He had seen train 2M50 standing at L445 signal from his office, and thinking this unusual, had gone out to speak to the driver. This was around 18:02 hrs; the driver told him he was unable to move because of the train in front. The Mobile Operations Manager (Lewisham) recalled then returning to his office and calling the Incident Controller (South East) to inform him of the situation. This would have been around the same time that the Incident Controller (South East), who was also now aware, wished to deploy him.

73 Tweets to Southeastern's Twitter account indicated that some passengers were now getting increasingly frustrated and uncomfortable. There was an account of a person using a cup as a makeshift toilet facility.

74 At 18:20 hrs, the Shift Signalling Manager (London Bridge) informed the Incident Controller (South East) that train 2M48 had moved forward and reported that the trains should be 'back on the move again'. However, they both agreed that the Mobile Operations Manager (Lewisham) should still attend, if only as a precautionary measure. The signalling data logger showed that the overlap track circuit beyond L477 signal remained occupied at this time and that train 2M48 still needed to move further for L445 signal to show a proceed aspect.

75 In the meantime, Signaller 1 signed off panel 5 and a new signaller (Signaller 2) signed on; Signaller 1 appraised Signaller 2 of the situation. The Shift Signalling Manager (London Bridge) remained on duty. Within two minutes of the handover, the driver of train 2M48 called Signaller 2 to report a fault with the Automatic Warning System (AWS)[14]; the accompanying driver manager was in the process of isolating the system so that train 2M48 could proceed. The Shift Signalling Manager (London Bridge) called and appraised the Incident Controller (South East) of the situation.

[14] The AWS provides audible and visual warnings to drivers when they are approaching signals. Southeastern rolling stock engineers have advised that the fault was likely to be because the train had stopped with bogie-mounted sensing equipment directly above a track-mounted AWS magnet.

76 At 18:31 hrs, the driver of train 2M50 called Signaller 2 with information that the Mobile Operations Manager (Lewisham) intended to get a traction supply isolation (switch off) for 20 minutes so that he could de-ice the conductor rail to assist train 2M48[15]. The Mobile Operations Manager (Lewisham) had updated the driver of train 2M50 when walking past on his way to train 2M48. The driver also advised Signaller 2 that passengers on train 2M50 wanted to use the toilet; the driver was aware there were no toilets on his train and was trying to manage the situation.

77 By this time, the Mobile Operations Manager (Lewisham) had reached train 2M48, met with the driver and, at 18:34 hrs, started to make arrangements with the electrical control operators for a traction supply isolation of the Up and Down North Kent lines (that go through platforms 3 and 4). This involved the electrical control operator then needing to speak with the signallers at London Bridge to confirm the exact position of trains in the area in order to accurately define the required isolation limits.

78 There is witness evidence that the Shift Signalling Manager (London Bridge) and Signaller 2 had now started to discuss plans to authorise emergency permissive working so train 2M50 could pass L445 signal, while it showed a stop aspect, and enter platform 4. However, one of their main concerns was understanding what the Mobile Operations Manager (Lewisham) was planning. At 18:36 hrs, Signaller 2 called the driver of train 2M48 seeking information. The driver advised Signaller 2 that the Mobile Operations Manager (Lewisham) was with him and was seeking a traction current isolation in order to de-ice the rails. Signaller 2 told the driver not to move his train until he called him back.

79 While this was going on, there is evidence of a developing awareness within the KICC of the scale of the incident. Network Rail deployed additional mobile operations managers, including the mobile operations manager based at Herne Hill (referred to as the Mobile Operations Manager (Herne Hill)). At 18:38 hrs, the British Transport Police control room became aware as a result of enquires made by the embedded police officer. Police officers subsequently deployed from Hither Green.

80 At the same time, 18:38 hrs, London-bound train 2K45 departed from Platform 1 (this service had been diverted via the Up Lewisham and Up Tanners Hill lines to avoid the blockage at Lewisham Junction).

81 At 18:40 hrs, the Signalling Shift Manager (London Bridge) spoke with the Incident Controller (South East) to explain the proposal to authorise emergency permissive working for train 2M50. The conversation was interrupted at 18:41 hrs by the alarm from a GSM-R railway emergency call made by the driver of train 2M50. He was reporting that a passenger had used an emergency egress device to open a door and get out of the train. The train computer recorded that the door that had been opened was on the right-hand side of the fifth coach of the leading unit. Train 2K45 had passed by this door two minutes earlier. The conductor rails in the area were live.

[15] By spraying de-icing fluid.

82 Signaller 2 answered the railway emergency call from the driver of train 2M50 and promptly called the electrical control operator to request a traction current isolation. The data logger in the electrical control room recorded that the current was switched off in the immediate vicinity of train 2M50 at 18:44:31 hrs. Three minutes after the emergency call, the Shift Signalling Manager (London Bridge) called the driver of train 2M50 back to confirm that the current was being isolated. This was while Signaller 2 remained talking with the electrical control operator. The driver of train 2M50 stated that passengers were getting out of the train. It is possible that other passengers got out of the open door on the fifth coach when the track was still electrically live. At 18:44:57 hrs, the train computer recorded that passengers had also opened doors on the trailing unit of train 2M50. However, by this time the power had been switched off. Shortly afterwards, the driver placed a *short circuiting bar* on the track.

Events following the incident

83 At 18:45 hrs, the driver of train 2S54, which was blocking Tanners Hill Junction, made an emergency call to London Bridge signal box (another signaller answered) to report that two passengers had got out of that train[16] and gone onto the track. Although the traction current was now isolated on the line that train 2S54 was on (Down Tanners Hill), the current on the adjacent Up Kent Fast and Down Kent Fast lines was not switched off until 18:49:29 hrs. The passengers that got out of train 2S54 made their way to St Johns station, and crossed over the Up Kent Fast and Down Kent Fast lines when they were probably still live. At 18:45 hrs, the Shift Signalling Manager (London Bridge) called and informed the Incident Controller (South East) of the detrainment; he later updated Network Rail's route control manager, additionally explaining that train 2S54 was stopping trains running in the wider area.

84 Shortly after this, the route control manager called the Mobile Operations Manager (Lewisham). He told him that passengers were detraining from train 2M50[17] and that he needed to leave train 2M48 and attend. While walking back to platform 4, the Mobile Operations Manager (Lewisham) met three passengers who had decided to get out of train 2M48. He escorted them off the track.

85 The British Transport Police incident log records its first officers arriving at Lewisham station at 18:52 hrs. They were initially unable to find a mobile operations manager and establish whether or not the traction supply was off. Because they had seen people walking around on the railway (this would have been in the vicinity of train 2M50), they informed their control room that they needed to go onto the track. They later reported that people were walking (along the track) towards St Johns station. More police officers arrived later.

[16] The driver later advised that three passengers had got out.

[17] There is witness evidence that the Mobile Operations Manager (Lewisham) was already aware of the passenger detrainment because he had overheard the railway emergency call from train 2M50 when speaking with the driver in the cab of train 2M48 (paragraph 78).

86 The Mobile Operations Manager (Herne Hill) arrived at Lewisham at around 19:00 hrs and was met by police officers on platform 4. At this point he had not been fully appraised of the status of the railway and told the officers to treat the conductor rail as being live. London Fire Brigade was advised of the situation by British Transport Police, and started to arrive at 19:27 hrs. By 19:53 hrs, British Transport Police and London Fire Brigade had *silver command* (tactical) officers on site.

87 The Mobile Operations Manager (Lewisham) acted as the appointed Rail Incident Officer. The Mobile Operations Manager (Herne Hill) understood that he was there to assist, but was at first unable to contact the Mobile Operations Manager (Lewisham) by mobile telephone[18]. Eventually the two mobile operations managers met up on platform 4. It was agreed that the Mobile Operations Manager (Herne Hill) (who was now aware that traction supply was switched off) should attend train 2M50. It was reported that at least 30 passengers had got off train 2M50 by this time.

88 The driver of train 2M50 told the Mobile Operations Manager (Herne Hill) that the passengers were becoming increasingly restless and that passenger communication and emergency egress devices on the train needed to be reset. The Mobile Operations Manager (Herne Hill) used the public address system to announce that staff needed to walk through the train to reset the devices. However, the response of the passengers led the Mobile Operations Manager (Herne Hill) to decide this would be too difficult. Therefore, he called the Mobile Operations Manager (Lewisham) to advise him that he wanted to start detraining passengers via the left-side doors of the leading vehicle. He reported later walking through the train and finding multiple doors had been opened and that passengers had got off on both sides and were walking on the track. Some were making their way to St Johns station rather than to Lewisham.

89 The British Transport Police incident log records the police and fire silver command officers met with the Mobile Operations Manager (Lewisham) at 19:56 hrs. The Mobile Operations Manager (Lewisham) confirmed that the traction supply was off and the three parties started to discuss a tactical plan. There was joint agreement that it was no longer possible to try to keep passengers on board train 2M50 and that evacuation was the safest option. Fire crews provided lighting and helped the passengers to get off the train and make their way onto the station platform. Additional resources were sought from the Metropolitan Police to help with the evacuation and manage public order.

90 At around 20:00 hrs, the Mobile Operations Manager (Lewisham) recorded that he asked that additional resources (from London Underground and a Network Rail track maintenance team) go to train 2M48 to continue with de-icing and discourage further passenger detrainment. Around ten minutes later, he asked the Mobile Operations Manager (Herne Hill) to go to St Johns to meet British Transport Police officers and help manage the passenger detrainment that had been reported there (paragraph 83). Other Network Rail teams were deployed to other detrainment locations.

[18] The standard means of communication used by mobile operations managers.

91 The Mobile Operations Manager (Lewisham) reported that, by 21:10 hrs, all passengers were off train 2M50 and passengers on train 2M48 had been asked not to use emergency egress devices. The Mobile Operations Manager (Herne Hill) had earlier reported to him that the track was clear at St Johns but more passengers were now trying to get off train 2S54.

92 Around 21:20 hrs, the police and fire silver command officers and the Mobile Operations Manager (Lewisham) all agreed that the traction supply should be restored. Shortly afterwards, London Fire Brigade's monitoring officer[19] challenged this. He wanted assurances that, as far as practicable, all passengers were accounted for and suggested the use of a thermal imaging camera to check the surrounding vicinity. London Fire Brigade explained that this is normal practice and is done to ensure that all reasonable steps are taken to account for the risk of loss of life. However, there was general concern that delaying traction current restoration was likely to result in additional passenger detrainment that would further delay service restoration. After further consideration of the risks, and reassurance from the route control manager, permission was granted to turn the traction supply back on.

93 The traction supply was restored at 21:36 hrs. While there were technical problems getting some of the trains re-started, and further de-icing work was needed to enable train 2M48 to reach Blackheath station, the majority of the trains were moving again by 22:10 hrs (figure 2).

[19] London Fire Brigade procedures allow for a monitoring officer who is a rank above the most senior fire officer attending a scene, in this case silver command (tactical) officer, to discuss tactical options to ensure all statutory duties have been delivered.

Analysis

Identification of the immediate cause

94 **Passengers on train 2M50 became so uncomfortable they were prepared to face the risk of detraining onto the track against advice and in spite of the information provided by the train operator.**

95 Emergency egress devices are a standard requirement on passenger trains operating on Network Rail. They are provided at each set of external powered doors so that, in an emergency and irrespective of the state of vehicle power, passengers can open the doors[20]. The devices are fitted in a panel above the doorway in the passenger vestibules of class 376 units. Separate passenger communication devices are provided in the vestibule so that passengers can speak with the driver (figure 15).

96 On-train CCTV recordings confirmed that the passenger that first got off train 2M50 decided to use an emergency egress device on the right-hand side of the fifth coach (paragraph 81). This was contrary to instructions on passenger safety information notices that Southeastern had fitted to the inside of the passenger doors, and to signs located immediately above each emergency egress device (figure 15). The initial detrainment of passengers was also in spite of announcements made by the driver (paragraph 143).

Figure 15: Passenger vestibule on class 376 unit (images courtesy of London and South East Railway Ltd)

[20] Current requirements for emergency egress devices are specified in Railway Group standard GM/RT 2473, 'Power operated external doors on passenger carrying rail vehicles'. They state that doors can only be opened if the vehicle speed is less than 5 km/h.

97 The passenger decided to open the doors around 10 minutes after a passenger on another coach had used a passenger communication device to tell the driver of their need to use the toilet (paragraph 76). The passenger that got off train 2M50 did so less than two minutes after train 2K45 travelled past on the adjacent line. The conductor rail was electrically live and remained so for around three minutes. Other passengers got off this and other stationary trains while the electrical control operator was in the process of isolating the traction current. It is probable that some of these passengers went onto the track while the conductor rail was electrically live.

Identification of causal factors

98 The self-detrainment of passengers resulted from a combination of the following causal factors:

a. passengers were trapped on train 2M50 for a prolonged period in circumstances that became increasingly uncomfortable (paragraph 99); and

b. some passengers' desire to get out of train 2M50 ultimately outweighed the efforts by Southeastern to encourage them to stay on board (paragraph 139).

Prolonged train occupation

99 **Passengers were trapped on train 2M50 for a prolonged period in circumstances that became increasingly uncomfortable.**

100 Train 2M50 was held at L445 signal for 63 minutes before the first passenger detrained. During this time many passengers were standing in crowded conditions and were unable to judge how long they would remain trapped on board the train. In such circumstances it is understandable that some passengers became uncomfortable, frustrated or agitated.

101 While other individual motivations are possible, evidence of the needs and discomfort of other passengers (paragraphs 73 and 76) suggest that the need to use the toilet was amongst the probable reasons for the first passengers deciding to get out of train 2M50.

102 A lack of toilet provision is not unusual on trains like 2M50 that operate on metro services. Such services usually operate over relatively short-distance routes and stop frequently (paragraph 15). The ATOC document entitled 'Key train requirements, issue 4', dated June 2016, states:

> 'While the provision of toilets on trains is now very much the accepted norm, it should not be assumed that this is appropriate to all types of train operating on all types of duty cycle. As an example, passenger carrying capacity on metro is frequently a critical factor in train design and the installation of toilets inevitably occupies a significant amount of space. It is therefore common practice worldwide not to provide toilets where this type of train is operating intensive services with frequent stops into and across large conurbations.'

103 Class 376 units, from which train 2M50 was formed, were not provided with toilet facilities (paragraph 24). This information is published on the accessibility pages of the National Rail Enquiries website[21] and was known to the driver of train 2M50 (paragraph 76). Southeastern only uses class 376 units on its metro services. However, it does not have arrangements in place to mitigate the weather-related and train stranding risks associated with the lack of toilet provision. Southeastern work instruction SE/WI/OPS/035 (paragraphs 50 to 52) refers to the need for train crews to consider the availability of toilets when they are already provided, stating 'if necessary manually over-riding automatic systems to allow for their continued use'. While the provision of emergency toilet facilities is suggested in the ATOC guidance note ATOC NR/GN SP01 (paragraph 46), SE/WI/OPS/035 makes no mention of the company providing such facilities for use in the event that a train is stranded.

Reasons for train 2M50 becoming stranded

104 The factors that led to train 2M50 being held at L445 signal for 63 minutes were a combination of the following:

- L445 signal was unable to show a proceed aspect because ice had accumulated on the conductor rail preventing train 2M48 from being able to make sufficient progress to clear the overlap of the next signal (paragraph 105).
- signalling staff at London bridge signal box did not implement emergency permissive working to enable train 2M50 to pass L445 signal while it was showing a stop aspect (paragraph 117).
- train 2M50 was not held at a signal that would have allowed it to be subsequently diverted onto an alternative line (paragraph 133).

Conductor rail icing

105 **L445 signal was unable to show a proceed aspect because ice had accumulated on the conductor rail preventing train 2M48 from being able to make sufficient progress to clear the overlap of the next signal.**

106 The class 465 and 466 units that formed train 2M48 rely on electrical contact between the top surface of the conductor rail and the train shoegear (paragraph 21). Since ice is generally a poor conductor of electricity, its accumulation on the conductor rail can result in an insulating layer that can lead to trains having difficulty drawing traction current. Figure 16 illustrates typical ice and frost formation on a conductor rail.

107 The weather conditions in the Lewisham area prior to train 2M48 departing from platform 4 were consistent with the formation of ice and frost on the surface of the conductor rail. The factors that led to the ice formation were:

- the frost point of the air rising to the surface temperature of the conductor rail; and
- rain freezing on the surface of the conductor rail.

[21] www.nationalrail.co.uk.

Figure 16: Typical ice and frost formation on the surface of a conductor rail (image courtesy of Network Rail)

108 The ice was allowed to form and remain on the conductor rail at Lewisham station because:

- arrangements to treat the conductor rail were not effective (paragraphs 109 to 113); and
- no train had recently passed over the line (paragraphs 114 to 115).

109 Network Rail has two ways of treating the conductor rail to manage the risks of ice accumulation: conductor rail heating and the application of an anti-ice fluid (paragraph 44).

110 Network Rail's conductor rail heating system uses electrical elements to melt ice and prevent it forming; the elements are surface-mounted on the web of the conductor rail. The heating system is powered by the DC traction power system and uses technology that is similar to systems that are used to heat points. It is designed to be installed at places where trains need to accelerate, such as stations and signals. Network Rail had installed conductor rail heating at a number of locations in its Kent Area, but these were mainly in central and south Kent (figure 17). Nearly all were outside London. No conductor rail heating was provided on the Down North Kent line at Lewisham station or at a number of other service-critical locations within London. Network Rail could provide no formal record of the criteria it used to decide on locations for the installed conductor rail heating. However, its engineers felt that they had probably been chosen on the basis that they were places where problems had been previously experienced. It is also likely that the high frequency of train services in urban areas would have been seen as reducing ice accumulation, because frequent trains would scrape ice from the conductor rail surface before it became thick enough to cause a problem.

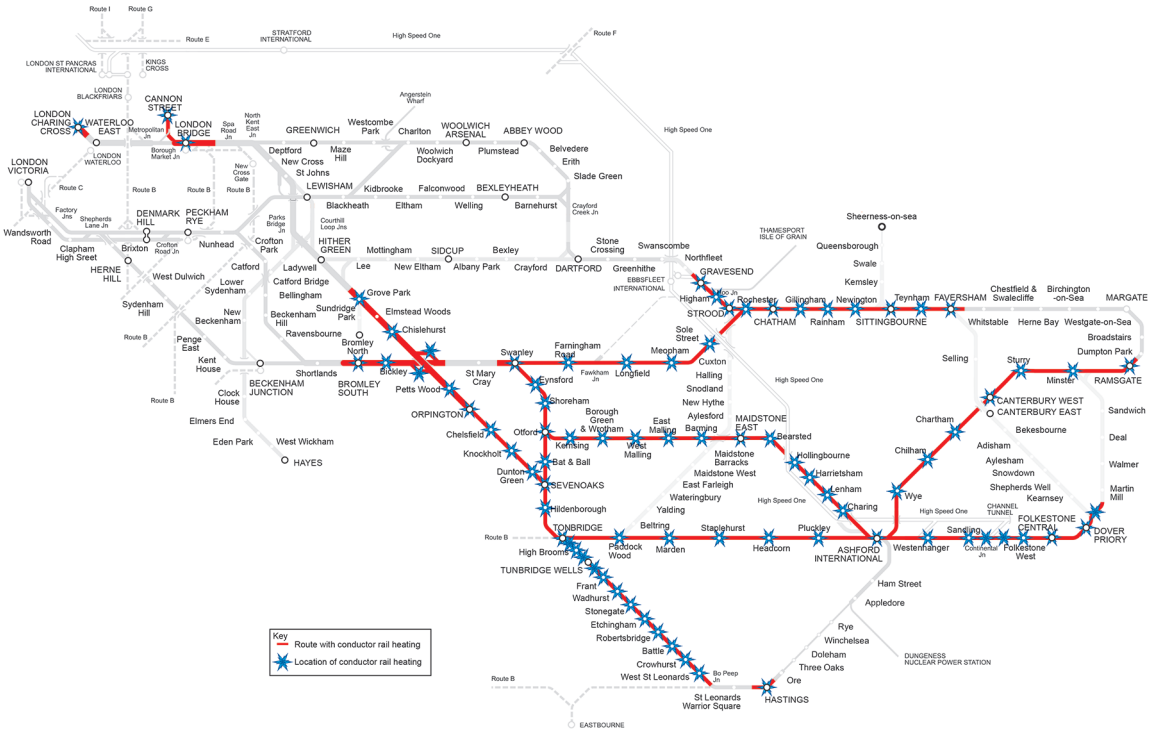

Figure 17: Map showing the location of conductor rail heating in the Kent Area (map courtesy of Network Rail)

111 On 2 March 2018, Network Rail advised that traction problems had been experienced at locations where conductor rail heating was installed. This suggests that the ice accumulation at Lewisham may have been particularly severe on that day. Although standard conductor rail heating may not have overcome all the traction difficulties encountered by train 2M48, its provision on the Down North Kent line in platform 4 is likely to have been beneficial in the circumstances.

112 In the absence of conductor rail heating, Network Rail relied on applying anti-icing fluid. The anti-icing fluid that Network Rail uses works by forming a surface coating that prevents ice adhering to the conductor rail surface. This makes it easier for shoegear to remove it[22]. The fluid also helps prevent ice forming by lowering the freezing point.

113 The last application of anti-icing fluid on the Down North Kent line at Lewisham station was by one of Network Rail's pre-planned special trains (paragraph 44). The train passed through the station at 22:34 hrs on 1 March 2018, around 19 hours before the arrival of train 2M48. Network Rail report that anti-icing fluid has been assessed as providing a minimum of 12 hours protection[23]. On this basis, it would have been expected to have remained effective for service trains operating during the early morning of 2 March, but not necessarily in the late afternoon when the driver of train 2M48 attempted to depart from Lewisham station.

[22] One of the trains that Network Rail uses to apply the fluid has special serrated shoegear that is designed to scrape ice from the conductor rail.

[23] At -5ºC in conditions where frost will actively form.

114 It is evident that there is a general reliance on the benefits of service trains keeping the conductor rail clear of ice (paragraphs 110 and 112). During normal timetable operation, three train services per half hour were scheduled to depart from platform 4 at Lewisham and run over the Down North Kent line:

- Charing Cross to Dartford, via Bexleyheath
- Charing Cross to Dartford, via Woolwich
- Victoria to Gravesend, via Bexleyheath

115 However, the implementation of the KRS timetable (paragraph 55) resulted in the last two of these train services not running. In addition, train 2M48 was 67 minutes late departing from Charing Cross due to weather-related problems encountered by the in-bound train service (paragraph 58). The net effect was that when the driver of train 2M48 tried to depart, instead of six trains having passed through platform 4 in the previous hour, no train had run over the line for around 90 minutes. The RAIB found no evidence that there had been supplementary treatment of the conductor rail, for instance by a mobile operations manager, in the meantime or in the hours before.

116 The Mobile Operations Manager (Lewisham), who had been deployed to de-ice the points at Lewisham Junction at about 16:00 hrs, had gone back to his office at the Lewisham electrical control room. Platform 4 is directly accessible via a designated walking route (paragraph 12 and figure 14). Therefore, if the Mobile Operations Manager (Lewisham) had been asked when train 2M48 first started to have difficulty, it would have been relatively straightforward for him to have returned to Lewisham station to treat the conductor rail as well. Unfortunately, the Incident Controller (South East), who subsequently deployed him, was not made aware of the difficulty that train 2M48 was having for 38 minutes (paragraph 128).

Emergency permissive working

117 **Signalling staff at London Bridge signal box did not implement emergency permissive working to enable train 2M50 to pass L445 signal while it was showing a stop aspect.**

118 Regulation 3.4 of Module TS2[24] of the Rule Book, 'Track circuit block regulations', permits signallers to use permissive working in an emergency to allow a train, which is carrying passengers, to enter a signal section that is occupied by another train so that it can reach a station platform. This regulation, referred to as 'emergency permissive working', requires the signaller to seek prior authorisation from a 'signal box supervisor' (in this case, the shift signalling manager that was on duty) or 'Operations Control' (in this case the KICC). A number of other prerequisites are defined, such as ensuring there is enough room at the platform to safely deal with the train. Regulation 3.4 came into force in December 2012. The full text is reproduced in Appendix C.

[24] Issue 4 was in force at the time of the incident.

119 Signallers at London Bridge signalling box could have used regulation 3.4 to give the driver of train 2M50 authority to pass L445 signal as soon as they realised that train 2M48 was not going to be able to make timely progress and there was assurance that there was sufficient space in platform 4. This would have allowed:

- train 2M50 to reach platform 4, where passengers could have safely detrained;
- train 2S54 to continue on its journey to Orpington, via platform 2 and the Down Mid-Kent line; thereby
- unblocking Tanners Hill junction and allowing the other trains that were stationary to continue their journeys.

120 No-one on the operating floor at London Bridge signal box gave authority for the driver of train 2M50 to pass L445 signal while it showed a stop aspect because:

- signalling staff took over 62 minutes to decide to use regulation 3.4 (paragraphs 121 to 126); and
- staff in the KICC did not propose that regulation 3.4 should be used (paragraphs 127 to 132).

121 The signallers on duty on panel 5 at London Bridge signal box received a number of calls from the drivers at Lewisham concerning the exceptionally slow progress of train 2M48 (paragraphs 60, 64, 66, 68 and 75). The signallers would also have had an indication of the lack of progress of train 2M48 from the status of individual track circuits on the signal box display (paragraph 28).

122 However, there is evidence that both the on-duty signallers and the Shift Signalling Manager (London Bridge) believed that train 2M48 would eventually clear the overlap for L447 signal. Initially, a decision not to apply regulation 3.4 (to allow train 2M50 to pass the stop signal) would have made sense to them (optimism bias). This belief was based on the following knowledge and information:

- They knew that train 2M48 did not need to move far to clear the overlap for L447 signal, and that earlier trains had departed successfully.
- Despite the lack of significant movement, the driver's updates tended to indicate that the train was moving, albeit slowly, or that earlier reported problems had been resolved - for instance after 21 minutes (17:50 hrs, paragraph 66) and after 41 minutes (18:10 hrs, paragraph 69).
- The driver had not declared that train 2M48 had failed.
- The Mobile Operations Manager (Lewisham) was later on site to de-ice the conductor rail and remedy the difficulty (paragraph 76).

123 It is also possible that a lack of suitable information reminding signalling staff at London Bridge signal box of the accumulated delay of train 2M48, and the effect this was having on other trains in the area, led to the urgency of the situation being overlooked.

124 With signalling controls being transferred to Three Bridges regional operating centre, there was evidence that the progressive loss of the information from the large signal box display (paragraph 27) had led to signallers relying more on CCF when regulating trains and gaining an overview of train running in the area. On CCF, the amount by which a train is delayed is represented using a colour code. However, because train 2M48 was more than 20 minutes late when it departed Charing Cross (paragraph 58) it was already given the maximum delay colour of pink. Figure 18 shows the CCF screen image for the Lewisham area at 17:55 hrs; by this time trains 2M48, 2M50 and 2S54 were all displayed as pink. No other graphical presentation of train delay information was provided.

125 Signallers on duty at panel 5 work in accordance with the Rule Book and the 'Special instructions to signallers at London Bridge Panel 5'. Neither of these documents define criteria for determining when a train should be considered unable to move or make adequate progress, nor the timeliness of the response or the action to be taken.

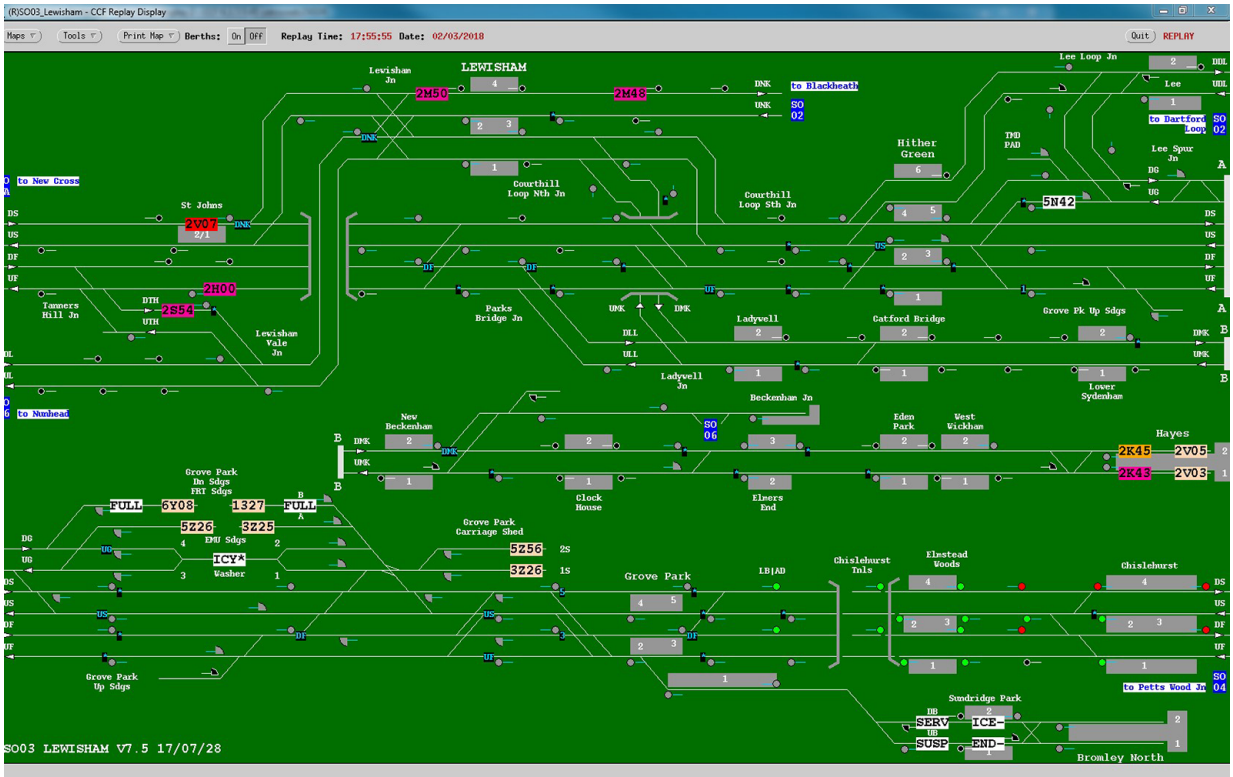

Figure 18: CCF screen image for Lewisham at 17:55 hrs on 2 March 2018. Note: this image was acquired using the playback facility in CCF (image courtesy of Network Rail)

126 The RAIB also found evidence of a reluctance to apply regulation 3.4 initially, a lack of confidence in its use, and that emergency permissive working is seldom used or practised at London Bridge. Other possible reasons for the delay in deciding to apply regulation 3.4 include:

- Clarity regarding the authority that the signalling staff required. At 18:41 hrs the Shift Signalling Manager (London Bridge) called the Incident Controller (South East) to advise him of the proposal to use emergency permissive working. It is possible that the intention of the call was to seek authority from the KICC (paragraph 118). However, since the call was interrupted by the alarm from the railway emergency call (paragraph 81) this is not certain. Whatever the intention, regulation 3.4 is clear in that the Shift Signalling Manager (London Bridge) was permitted to authorise emergency permissive working himself, without reference to the KICC (Appendix C).
- Concern regarding the precise whereabouts of train 2M48, and the risk it posed. Signaller 2 was particularly concerned about what Mobile Operations Manager (Lewisham) was planning to do on site, and if there would be a conflict with train 2M48 (paragraph 78).

127 Network Rail expects its incident controllers in the KICC to be central to the decision-making process during incident management (paragraph 40). If the Incident Controller (South East)[25] had become aware of the developing seriousness of the incident at Lewisham sufficiently early, he would have had the opportunity to consider and start developing contingency plans to manage it. It is possible that the use of emergency permissive working might have been identified and promoted as part of this (paragraph 49). However:

- information from early telephone communication between the KICC and Signalling Shift Manager (London Bridge) concerning the incident was not fed to the Incident Controller (South East) (paragraphs 128 to 130); and
- the significance of the incident was not independently identified by staff and information systems in the KICC (paragraphs 131 to 132).

128 Incident controllers rely on telephone communication to become aware of train running incidents. There were a number of calls between the Shift Signalling Manager (London Bridge) and the KICC concerning, or mentioning, the difficulty that train 2M48 was having. However, the first three of these involved neither the Incident Controller (South East) nor any other member of Network Rail staff; all three were an indication that train 2M50 was stationary:

- after 9 minutes, the Shift Signalling Manager (London Bridge) mentioned that train 2M48 was having difficulty leaving Lewisham in a call with Southeastern's Train Service Manager (Metro North) (paragraph 65);
- after 18 minutes, the Shift Signalling Manager (London Bridge) spoke with Southeastern's Train Service Manager (Mainline) to report further delay to train 2M48 because a passenger communication device had been operated (paragraph 67); and

[25] Covering train services from Charing Cross and Canon Street (paragraph 35).

- after 33 minutes, the Shift Signalling Manager (London Bridge) spoke with Southeastern's Train Service Manager (Mainline) again, this time to provide an update that train 2M48 was making progress but slowly (paragraph 69).

The Incident Controller (South East) was not made aware of the incident until train 2M50 had been at L445 signal for 38 minutes (paragraph 71).

129 There are a number of possible reasons why the Incident Controller (South East) did not get to know that a serious train service incident was unfolding until 18:15 hrs:

- Special instructions (paragraph 29) did not specify who the signalling staff should communicate with in the KICC in the event of such an incident. In this case an early dialogue was established with Southeastern's train service managers rather than Network Rail's incident controller.
- The calls between the Shift Signalling Manager (London Bridge) and the train service managers used informal communication protocols. Steps were not taken to confirm the identities and roles of the respective callers, and that the roles were relevant to the message being communicated.
- There were no formal processes or arrangements for passing and sharing critical information within the KICC to ensure that the relevant responsible role (in this case the Incident Controller (South East)) was made aware.
- The two Southeastern train service managers involved have adjacent desks in the KICC; they support each other during busy periods and there is a common 'hot line' telephone number that they share[26]. Therefore, it was not unusual for the Train Service Manager (Mainline) to handle a call relating to a train (such as 2M48) that the Train Service Manager (Metro North) was responsible for. Although within the same cluster of desks, the Incident Controller (South East) is more distant and, unless they were to speak over the top of the desks, both the train service managers would have had to walk round to inform him (figure 12).

130 None of the calls were recognised as significant enough for any other person in the KICC to declare either train 2M50 or 2M48 as being stranded. The RAIB has identified this as an underlying factor (paragraph 161).

131 Independent identification of the emerging severity of the incident at Lewisham would have required the Incident Controller (South East), or someone else within the KICC, to have been proactively searching the information systems available. However, CCF, the main train running information system available in the KICC, was already displaying the maximum delay colour code for trains 2M48 and 2M50 (paragraph 124). It is also unlikely that KICC staff would have had the capacity to continually monitor CCF information given their high workload on 2 March 2018.

132 CCF information is displayed as a series of individual screens, each covering an individual area, such as that around Lewisham (figure 18). KICC staff need to page through a number of screens to gain an overview of all the train services they are responsible for. There is no large graphical display of the overall status of train running in the Kent Area. Furthermore, KICC staff need to contact individual signal boxes to obtain detailed information, such as the precise location of trains and track circuit occupation.

[26] Southeastern staff do not answer calls made to Network Rail telephone lines.

Route setting

133 **Train 2M50 was not held at a signal that would have allowed it to be subsequently diverted onto an alternative line.**

134 Figure 19 shows a diagram of the signalling arrangements at Lewisham station.

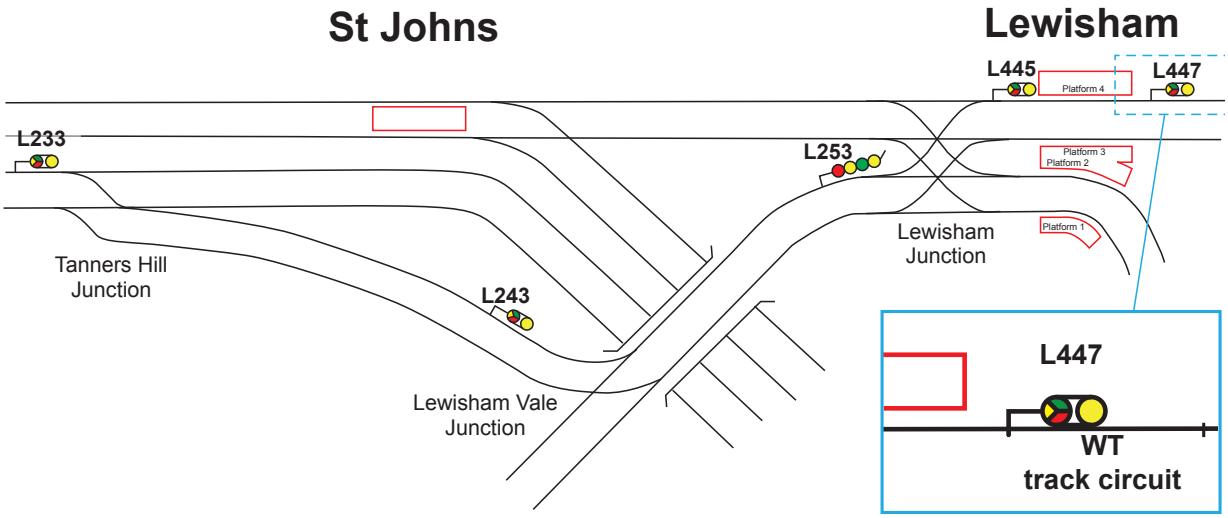

Figure 19: Signalling layout at Lewisham station

135 In what would have been routine, Signaller 1 routed train 2M50 so that it closely followed train 2M48 into Lewisham by manually setting a route as far as L253 signal. L253 signal has an automatic working facility that signallers use to aid route setting into platform 4 (footnote 8). There is evidence that this facility was selected[27]. This meant that the signalling system automatically extended the set route so that trains could reach platform 4 without the signaller needing to take further intervention. To have prevented the train being able to pass L253 signal the signaller would have needed to de-select the automatic working facility. The signalling data logs showed Signaller 1 set the route for train 2M50 around four minutes after train 2M48 had started to depart and two minutes after he had received a call from the driver of train 2M48 that he was having traction difficulties (paragraph 61). Shortly afterwards the signaller set the route for train 2S54 to approach L243 signal, following train 2M50 onto the Down Tanners Hill line (paragraph 62).

136 If the route for train 2M50 had been set so that it could not proceed beyond L253 signal, it would not have occupied Lewisham Junction, and would not have blocked the Down Mid-Kent and both North Kent lines. It would also have been possible to later re-route it, for instance into platform 2, where the passengers could have safely detrained and the service terminated.

137 The signaller would have understood the behaviour of the interlocking arrangements at Lewisham. These ensure that:

- L253 signal cannot show a proceed aspect until a train in platform 4 has occupied the overlap track circuit for L447 signal (track circuit WT), indicating that it has started to leave the station.

[27] Controls for selecting the automatic working facility are provided on the signaller's NX panel.

- L445 signal cannot show a proceed aspect until the train leaving platform 4 has then cleared track circuit WT, indicating that it has left the station.

As a result, the signaller's experience was that the signalling system rarely permitted trains to be held at L445 signal. Train 2M50 was held at L445 signal in this particular case because train 2M48 had made sufficient progress to occupy WT track circuit, but had then been unable to progress sufficiently to clear it.

138 The signallers are expected to apply individual judgement and experience to setting routes when train services are not running normally, and are not provided with guidance or instructions on how to route trains during periods of disruption (paragraph 29). It would be common practice for signallers to set a route so trains could approach L445 signal when a train is still occupying platform 4. The short timeframe within which the signaller manually set the route for train 2M50, and not taking the opportunity to de-select the automatic working facility, suggests a decision based on habitual operating practice, rather than full consideration of the possible consequences. The decision was probably influenced by the routine requirement to minimise train headway at such a service-critical signalling location, and the signaller's knowledge of the interlocking arrangements.

Passenger motivation

139 **Some passengers' desire to get out of train 2M50 ultimately outweighed the efforts by Southeastern to encourage them to stay on board.**

140 The following conditions probably influenced the decision of passengers to leave train 2M50, as some became impatient and the environment on the train became more difficult to endure over time (paragraph 99):

- the train was held at a signal close to Lewisham station and some passengers felt that there was a relatively safe and easy walking route to the station (paragraph 141);
- the information that was available to be given to passengers by the driver was limited (paragraphs 142 to 144);
- there were few rail industry staff available to assist with the management of passengers and reinforce the instructions that Southeastern was attempting to relay (paragraphs 145 to 147); and
- social media conversations suggested a shared predicament that was not being effectively managed (paragraphs 148 to 150).

Station proximity

141 Figure 14 shows the approximate position of train 2M50 when it was held at L445 signal and the location of the coach (coloured red) that the first passenger exited from. While the route that the first passenger took is not known, the lights of Lewisham station would have been visible from the door, and the London end of platform 1 was not far away. It was a walk of less than 80 metres. The front of the train was only around 10 metres from platform 4. Other passengers that got off train 2M50 also walked in the direction of St Johns station (paragraph 85).

Passenger information

142 ATOC guidance note NR/GN SP01 emphasises the initial provision of information as the 'biggest single need' for passengers stranded on trains. Southeastern's work instruction for managing stranded trains, SE/WI/OPS/035, recognises this and requires that its train crews endeavour to make regular 'manual announcements' within two minutes of an unscheduled stop, and then at least every five minutes.

143 While train 2M50 was not formally declared to be stranded, the driver reported that he made regular announcements using the on-train public address system[28]. These included a statement regarding current status and reminders of the need to stay on the train. However, his information sources were limited:

- He could initially see the progress of train 2M48 ahead. However, although it was only making slow progress, it would not have been long before train 2M48 disappeared out of view. This is because platform 4 is curved and the train had started to depart from stopping markers at the far end (paragraph 10).
- He made three GSM-R calls to the signallers on duty at panel 5, and Signaller 2 made a general broadcast updating drivers in the area. However, the calls that the driver received from the signallers did not provide any specific new information for a period of nearly half an hour.
- He spoke face-to-face with the Mobile Operations Manager (Lewisham) who informed him of the work to de-ice the conductor rail for train 2M48 (paragraph 76).

144 In summary, the only information that the driver could give to passengers was that he was waiting for train 2M48 to move. The lack of an identified contingency plan (paragraph 161) limited the information available for him to reassure the passengers that the situation was being resolved.

Availability of rail staff

145 The driver of train 2M50 needed to remain in the cab so that he could use the on-train public address system and communicate with the signaller (and other critical railway staff) using the GSM-R equipment. This meant there were no rail staff on the train to speak with passengers and reinforce safety messages.

146 Southeastern advised that it had a team of station staff at Lewisham. However, they were not qualified or trained to go on the track and so were unable to reach train 2M50 and assist with the management of passengers.

147 The Mobile Operations Manager (Lewisham) was the only member of Network Rail staff who had arrived before the first passenger detrained. However, he had not been deployed until nearly 40 minutes after train 2M50 had come to a stand, and was tasked with de-icing the conductor rail for train 2M48 (paragraph 71).

Social media

148 Before the first passenger left train 2M50, a number of passengers tweeted messages to Southeastern's Twitter account expressing discomfort and frustration (paragraph 73). Figure 20 shows some examples.

[28] The operations communications manager (paragraph 37) additionally made remote announcements to passengers on train 2M50 using the GSM-R equipment in the KICC. However, this was after emergency services had arrived and, therefore, after the first passengers had got off.

Figure 20: Typical tweets to Southeastern's Twitter account prior to 18:41 hrs

149 It would not necessarily be possible for passengers to know that an individual message related to the train they were on. However, the information being exchanged would probably have promoted a shared feeling of dissatisfaction and possibly thoughts of getting off the train. These, and other tweets sent over the course of the evening, may also have influenced others to leave stationary trains in the area.

150 Southeastern monitors and responds to messages sent to its Twitter account from a desk in the KICC (figure 12), and had guidelines in place for managing its presence on social media. The guidelines include a section on tweeting during train service disruption, but they neither consider the effects of social media communication on the safety behaviour of passengers nor the best way of using social media to influence such behaviour. The lack of such guidance was probably not relevant in the circumstances because no contingency plan had been identified on which to brief the passengers (paragraph 144).

Identification of underlying factors

Winter season preparations

151 **Network Rail and Southeastern's implementation of extreme weather management strategies for train service operation in the Kent Area during the 2017-18 winter season did not effectively manage the conductor rail ice accumulation risk on 2 March 2018.**

152 The forecast of cold winter weather that started on Sunday 25 February 2018 resulted in regular EWATs and in Network Rail and Southeastern setting up gold command organisations for the week (paragraphs 53 and 54). These command and control arrangements resulted in the implementation of a set of pre-defined strategies for managing the risk of conductor rail ice accumulation that were described in their respective winter season preparation procedures. These strategies did not together prevent trains from experiencing serious traction current collection difficulties and the consequential effects.

153 In summary, the implementation of the KRS timetable reduced the number of trains operating over certain routes and the inherent ice clearance benefit they provided (paragraph 115). This increased the risk of ice accumulation, particularly on those lines:

- without conductor rail heating (paragraph 110); or
- which had not recently been treated with anti-ice fluid (paragraph 113).

154 There was also no pre-defined strategy:

- to avoid trains being brought to a stand where they occupied a critical junction or were very close to a station (paragraphs 136, 141 and 155); and
- for the provision of emergency toilet facilities on trains (paragraph 103).

Routeing of trains during service disruption

155 **Network Rail provided no guidance to its signallers on the actions they should take when routeing trains during periods of service disruption.**

156 The signalling staff at London Bridge signal box were given no guidance on how to route trains to maximise operational resilience during service disruption. Such guidance would have helped avoid the rapid escalation of the consequences of the traction difficulties experienced by train 2M48.

157 The signaller on duty at panel 5 was required to rely on experience and judgement when he set the route for train 2M50. This resulted in him not de-selecting the automatic working facility (paragraph 135), and deciding to adopt the routine procedure of setting a route as far as L445 signal.

158 Given his experience of the signalling system at Lewisham, and that routeing trains like this minimises the train headway, he probably considered that the routeing decision was reasonable (paragraph 138). However, L445 signal is only 10 metres from the end of platform 4 and is at the exit of Lewisham Junction. Therefore, the decision risked the possibility that train 2M50 would not be able to reach the platform and would continue to block Lewisham Junction if a train in front had difficulty departing from the station.

159 Given the very large number of passengers and the high frequency of trains on a metro-type railway operation, such as at Lewisham, it is vital that precautionary actions are taken as soon as it is suspected that trains may encounter difficulties. In these situations the standard response should be to prevent following trains from closing up or blocking other routes. The next response should always be to notify someone who is competent and empowered to start thinking through the steps that are needed to prevent the situation from deteriorating any further.

160 In particular, the RAIB understands that London Underground Ltd normal practice in the event of a train stopping out of course is to hold trains in platforms until more is known of the circumstances. Although it is recognised that there are some important differences between London Underground and Network Rail operations, the RAIB believes that there would be real benefit from considering whether, and how, similar principles can be applied to high density metro-type railway operation on Network Rail's infrastructure.

Management of stranded trains

161 **The rules and processes used by Network Rail and Southeastern did not lead to train 2M50 or train 2M48 being declared as stranded trains. This meant that contingency plans to control the risk of unmanaged passenger detrainment were not established and implemented in a timely fashion.**

162 Network Rail and Southeastern operating procedures make clear the requirement for the KICC[29] to develop contingency plans when responding to stranded train incidents (paragraphs 49 and 51). The timely consideration of these procedures, and the development and implementation of suitable contingency plans, had the potential to address issues concerning a number of factors associated with this incident. For instance:

- proposing the use of emergency permissive working (paragraph 127);
- the provision of information to train passengers that assured them that the incident was being resolved (paragraph 144); and
- the earlier deployment of mobile operations managers, or other railway resources, to assist drivers (paragraph 147).

Such plans would also have provided the basis for notification and engagement with emergency service control rooms, which would have enabled them to be better prepared as events developed.

163 Ultimately no contingency plans were developed because none of the stationary trains were declared as being stranded. The following reasons are possible:

- the roles and responsibilities of key staff (for instance the driver, signaller and incident controller) with regards to recognition, identification and declaration of a train stranding incident are not defined in the procedures that the signallers worked to;
- while Southeastern's work instruction SE/WI/OPS/035 refers to the role of the incident controller in declaring a train stranding incident, it does not define what is expected of its drivers in providing supporting information; and

[29] Network Rail's procedure NOP 4.15 applies nationally and refers to the duties of 'Route Operations Control'.

- the criteria used by Network Rail and Southeastern for when a train should be declared to be stranded allowed for judgement by those involved (paragraphs 48 and 50); therefore, it is significant that the signalling staff on duty at London Bridge maintained the joint mind-set that the train was about to make adequate progress and clear the overlap for L447 signal (paragraph 122).

Factors affecting the severity of consequences

The stranding of other trains

164 **Many of the factors that led to the self-detrainment of passengers from train 2M50 also resulted in passengers getting out from other trains and going onto the track because they were also trapped for prolonged periods of time. This exacerbated the disruption of train services.**

165 Although the RAIB's investigation has focussed on the hazardous occurrence of passengers detraining from train 2M50 onto lines with electrically live conductor rails, the consequences of the incident at Lewisham station were much wider. A queue of stationary trains formed that nearly extended as far back as London Bridge station. This inevitably resulted in the need to re-route passenger services and caused major travel disruption across Network Rail's South East Route.

166 A total of ten trains became stranded as a direct result of the problems encountered by train 2M48 at Lewisham (paragraph 4). The majority were unable to move for around four and a half hours, and records indicate that passengers got out and went on to the track from at least five of them (figure 2). Although conductor rails were only electrically live when the first passengers on trains 2M50 and 2S54 got out, the detrainment of a large number of passengers onto the track is, in general, potentially unsafe, particularly in wintry conditions. Passengers climbed down from open train doors in the dark, many unaided and some carrying their possessions, onto terrain that was covered with snow which hid inherent slip, trip and fall hazards. Therefore, it is fortunate that there were no instances of serious injury.

167 Some of the measures that could have minimised the risk of passengers self-detraining from train 2M50 at Lewisham would also have greatly reduced the impact on other trains in the area. Examples include:

- improved management of the risk of ice accumulation (paragraphs 105 to 116);
- implementation of a precautionary route setting strategy to prevent the unnecessary blocking of Lewisham and Tanners Hill junctions by trains until the departure of train 2M48 had been confirmed (paragraphs 133 to 138); and
- improved on-board facilities (paragraphs 99 to 103).

168 Although the management of the wider incident and the subsequent recovery of the railway is outside the scope of the RAIB's investigation, it has been the subject of examination as part of the joint industry investigation (paragraph 187).

Observations

169 Although it was not causal to this incident, because it did not ultimately lead to the first unsafe passenger detrainment, the RAIB observes that while one toilet was provided on each of the units forming trains 2M48 and 2S54, at least two of these toilets had been locked out of use[30]. Because no gangways are provided at the ends of the units, some passengers on these trains would have had no access to toilet facilities (paragraph 24). None of Southeastern's trains carried emergency toilet facilities. The poor condition and unserviceability of the toilets on trains 2M48 and 2S54 may have led to the uncontrolled and unsafe detrainment of other passengers on 2 March 2018, which exacerbated the disruption of train services.

Previous occurrences of a similar character

170 The RAIB has investigated previous incidents involving the unsafe egress of passengers from trains. These include:

- The incident between Dock Junction and Kentish Town, 26 May 2011 (RAIB report 07/2012[31]). An electric multiple unit, running on an overhead AC electrified line, lost traction power and became stranded because foliage in the train pantograph had resulted in circuit breakers automatically opening. The air-conditioning and toilets on the train stopped working at an early stage, and an assisting train did not couple to the failed train for nearly two hours. There were further problems as the driver tried to confirm the status of doors that had been opened to improve ventilation and passenger alarms that had been operated. Eventually, the driver overrode a safety system and started to move the train to test that the two trains were properly coupled. Some passengers were alighting of their own accord at the time. When the coupled train was moved to Kentish Town station at least two doors were open.
- The incident at Peckham Rye station, 7 November 2017 (RAIB report 16/2018). An electric multiple unit, running on a third rail DC electrified line, came to a stand 30 metres short of the station platform as result of a brake fault. Following conversations on the GSM-R radio with various members of railway control staff, train technicians and the signaller, the driver was led to arrange the evacuation of train passengers via the leading cab door with the assistance of a member of station staff. This involved passengers climbing down steps to ground level very close to the conductor rail, which was electrically live. Around 80 passengers had alighted by this route before an operations manager realised what was happening and stopped the evacuation.

171 In both of these incidents, the implementation of contingency plans to evacuate or assist the incident train led to passengers being put at risk. In the train stranding incident at Lewisham, passengers alighted of their own accord before the significance of the situation was appreciated, and a contingency plan had been developed and implemented (paragraph 163).

[30] One of these was re-instated during the incident. However others became progressively unusable.

[31] RAIB reports are available at www.raib.gov.uk.

172 The extreme cold weather over the days prior to 2 March 2018 widely affected operations on the national network. On 1 March, the impact included major passenger train delays resulting from frozen points in the Bristol area and the need to rescue passengers from a train that had become stranded in snow near Haltwhistle, Northumberland. Third rail DC electrified lines were particularly badly affected. As well as nearly 20 other recorded incidents involving conductor rail icing issues in the Kent Area on 2 March (paragraph 57), there had been major difficulties in the New Forest, Bournemouth and Poole areas the night before. One incident involved two trains near New Milton station that were stranded overnight with the passengers not being rescued until around 08:30 hrs the next day. This incident was widely reported. While the RAIB is not aware of reports of passengers unsafely getting out of these trains, knowledge of these recent events may have influenced the decisions of passengers trapped on the trains near Lewisham.

173 Extreme cold weather has resulted in train stranding incidents in previous winters. These include three incidents that occurred in the Channel Tunnel between December 2009 and February 2010, an incident in March 2010 when over 100 passengers had to be rescued from a train that had been stranded overnight in snow north of Aviemore, and a Southeastern train service near Orpington in November 2010 where passengers again needed to stay on board overnight.

Summary of conclusions

Immediate cause

174 Passengers on train 2M50 became so uncomfortable they were prepared to face the risk of detraining onto the track against advice and in spite of the information provided by the train operator (paragraph 94).

Causal factors

175 The causal factors were:

a. Passengers were trapped on train 2M50 for a prolonged period in circumstances that became increasingly uncomfortable (paragraph 99, **Recommendation 5**).

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

   i. L445 signal was unable to show a proceed aspect because ice had accumulated on the conductor rail preventing train 2M48 from being able to make sufficient progress to clear the overlap of the next signal (paragraph 105, **Recommendation 1**).

   ii. Signalling staff at London Bridge signal box did not implement emergency permissive working to enable train 2M50 to pass L445 signal while it was showing a stop aspect (paragraph 117, **Recommendations 2 and 3**, **Learning points 1 and 2**).

   iii. Train 2M50 was not held at a signal that would have allowed it to be subsequenty diverted onto an alternative line (paragraph 133, **Recommendation 1**).

b. Some passengers' desire to get out of train 2M50 ultimately outweighed efforts by Southeastern to encourage them to stay on board (paragraph 139, **Recommendation 4**).

Underlying factors

176 The underlying factors were:

a. Network Rail and Southeastern's implementation of extreme weather management strategies for train service operation in the Kent Area during the 2017-18 winter season did not effectively manage the conductor rail ice accumulation risk on 2 March 2018 (paragraph 151, **Recommendation 1**).

b. Network Rail provided no guidance to its signallers on the actions they should take when routeing trains during periods of service disruption (paragraph 155, **Recommendation 1**).

c. The rules and processes used by Network Rail and Southeastern did not lead to train 2M50 or train 2M48 being declared as stranded trains. This meant that contingency plans to control the risk of unmanaged passenger detrainment were not established and implemented in a timely fashion (paragraph 161, **Recommendation 2**).

Factors affecting the severity of consequences

177 Many of the factors that led to the self-detrainment of passengers from train 2M50 also resulted in passengers getting out of other trains and going onto the track because they were also trapped for prolonged periods of time. This exacerbated the disruption of train services (paragraph 164, **Recommendations 1 and 5**).

Additional observations

178 Although not linked to the incident on 2 March 2018, the RAIB observes that:

a. The poor condition and unserviceability of toilets that were provided on trains 2M48 and 2S54 may have led to the uncontrolled and unsafe detrainment of other passengers on 2 March 2018.This exacerbated the disruption of train services (paragraph 169, **Recommendation 5**).

Previous RAIB recommendations relevant to this investigation

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

Incident between Dock Junction and Kentish Town, 26 May 2011, RAIB report 07/2012, Recommendation 1

180 **The RAIB considers that more effective implementation of elements of Recommendation 1 in report 07/2012 could have helped address factors identified in this investigation.**

181 This relevant parts of the recommendation are:

Recommendation 1

Train operating companies and Network Rail routes over which they operate, should review existing protocols, or jointly develop a new protocol, for stranded trains in accordance with the contents of ATOC / Network Rail Good Practice Guide GPD SP01 'Meeting the needs of passengers when trains are stranded'. The protocols should also consider:

…

- *the different arrangements in place for the interface between Network Rail and train operators' control functions;*

…

- *the need to provide on site support to the traincrew of such trains in managing passengers' needs;*

…

- *the need to recognise when minor operational occurrences have the potential to develop into major incidents unless decisions are taken in a timely and decisive manner;*

…

182 The ATOC/Network Rail Good Practice Guide GPD SP01 is now published as ATOC NR/GN SP01 (paragraph 46). More detailed consideration, and a fuller implementation of the guidance defined in this document, together with the three additional considerations identified in paragraph 181, might have removed the need for the following recommendations made in this report:

- Recommendation 2, in that in responding in a timely manner to the emerging incident at Lewisham decisive action could have been taken to implement a contingency plan that would have been effective in managing the risk of passengers detraining from train 2M50 of their own accord.
- Recommendation 3, in that the effectiveness of communication and information sharing arrangements between Network Rail's signalling staff, Network Rail's control centre staff and Southeastern's control centre staff could have been reviewed and improved.
- Recommendation 4, in that Southeastern could have identified the need to train more of its staff to assist its train crews during incidents.

- Recommendation 5, in that ATOC NR/GN SP01 refers to considering providing emergency toilet facilities.

183 In May 2013, ORR reported that it considered the recommendation had been implemented, but that it would continue to monitor the application of the stranded train protocols. Inspections of Network Rail's response to stranded trains in 2013-14 found deficiencies in its operational arrangements. These have resulted in Network Rail amending its NOP documents.

Incident at Peckham Rye station, 7 November 2017, RAIB report 16/2018, Recommendations 1 and 2

184 **RAIB report 16/2018 was published on 9 October 2018. The RAIB considers that the effective implementation of Recommendation 1, and elements of Recommendation 2, in report 16/2018 will complement the safety learning identified in this investigation.**

185 Recommendation 1 and the relevant elements of Recommendation 2 are:

Recommendation 1

Arriva Rail London should review and improve, as necessary, its training, procedures, control room environment and equipment to enable controllers and train drivers to deal effectively with out-of-course scenarios involving stranded trains. This should include consideration of the use of simulators, whether full task or part task, and table-top exercises.

This recommendation may also be applicable to other train operators.

Recommendation 2

Network Rail (South East route), in consultation with train operating companies as appropriate, should review the adequacy of its existing arrangements for implementing national policy and guidance for the safe evacuation of passengers from stranded trains. As a minimum the review should cover how all parties ensure that:

- *all parties quickly gain a common understanding and shared situational awareness of the circumstances;*

…

- *staff on the ground, such as train crew, are provided with appropriate support in circumstances which are difficult and / or unfamiliar;*

…

All necessary changes or additions to existing management arrangements identified from the review should then be suitably documented, validated, implemented, and briefed.

186 While the incident at Peckham Rye station concerned an unsafely managed train evacuation, the above safety learning will help address issues identified in this investigation. For instance:

- Incident simulation and practice will help reinforce effective information sharing and communication skills within the KICC and between KICC staff and signallers.

- Arrangements to improve situational awareness will aid the timely identification of critical incidents, such as when a train is to be declared as stranded.
- Improved support arrangements for train crew will aid their ability to manage, inform and reassure passengers during railway incidents.

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

187 Network Rail and Southeastern reported that they have identified and implemented a number of actions relevant to the findings of this report. These were generally as a result of a joint industry investigation[32].

188 Network Rail and Southeastern have implemented improvements to their winter seasonal preparedness arrangements, including:

- changes to weather forecasting arrangements to give a warning when the risk of conductor rail ice accumulation is likely to be particularly severe, with the aim of enabling earlier decision making and information sharing; and
- changes to the KRS; for example, more frequent train services (to help clear conductor rail ice) and the withdrawal of trains without toilets.

189 Network Rail is investigating options to improve its winter seasonal preparedness, including:

- improved anti-icing fluids and de-icing application methods; and
- a review of conductor rail heating locations and effectiveness.

190 Network Rail and Southeastern have developed a set of instructions for drivers and signallers that are designed to specifically deal with a train that cannot make adequate progress because of conductor rail ice accumulation. These centre on the driver using the GSM-R radio to make an urgent call to the signaller, and declaring that 'this is an ice call'. Southeastern has briefed its drivers to make this call within two minutes of first experiencing traction difficulty. Network Rail has reported that it has briefed its operations staff on the steps to take, for example:

- Signallers are to inform other drivers in the area, adjacent signal boxes (so that other trains can be diverted or held at stations, and other drivers informed), and the control centre. They are then required to assess and implement options for moving trains into station platforms. This includes consideration of emergency permissive working.
- The control centre staff member taking the call is to immediately deploy mobile operations managers and inform the route control manager. The route control manager is then to initiate a sequence of actions within the control centre.

191 Network Rail and Southeastern have developed documentation defining the various roles, responsibilities and interfaces within the KICC. This is in the process of being revised so that information sharing responsibilities are emphasised. Network Rail has also produced a reference guide to Network Rail and train operating company responsibilities for managing stranded train incidents that is to be applied in conjunction with this and NOP 4.15 (paragraph 47). It refers to this guide as the 'pitstop plan – stranded train actions'.

[32] The industry investigation report is available at: https://newsroom.southeasternrailway.co.uk/news/southeastern-and-network-rail-announce-action-plan-following-independent-report-into-lewisham-train-disruption.

192 Southeastern is undertaking a feasibility study with a view to training more of its staff to be able to respond to train incidents. It is referring to these as 'incident responders'. Southeastern has advised that a training course has been developed, and that it is hoping to decide on the feasibility of the proposal in early 2019.

193 Southeastern has identified enhancements to the emergency facilities it provides for its trains in the winter. These include 'grab bags' containing protein and cereal bars, glow sticks and foil blankets located at key stations which Southeastern and Network Rail staff can take to stranded trains, along with the existing stockpiled water. It also reported that it is working with Norwegian State Railways on the design of a portable emergency toilet that can be stored at stations.

194 Network Rail is also investigating opportunities that may have improved incident management and recovery, including:

- trialling the use of Airwave radios, which are used by the emergency services, to improve the situation awareness of those attending rail incidents and enable its mobile operations managers to communicate directly with police and other agencies; and
- additional incident management training and use of inter-agency table-top exercises.

195 RSSB has two research projects underway concerning the management of train service disruption:

- Project T1135, 'Developing a framework and implementation activities to empower staff to make decisions during service disruption' - this concerns the development of a tool to improve the effectiveness of operational decision making.
- Project T1154, 'Enabling better planning and resource management during disruption' - this concerns the development of a tool to provide good practice in the development of contingency plans.

Background to the RAIB's recommendations

196 Passengers got off train 2M50 of their own accord because they had been held on the stationary train for a long time and the conditions were becoming uncomfortable. Even though train 2M50 was unable to move, and train 2M48 was unable to make adequate progress, neither the drivers, the signallers or control centre staff declared them as stranded trains. As a result no contingency plans were developed and implemented. Information from these plans could have been briefed to passengers to provide comfort that resolution was imminent. The recommendations focus on actions that will minimise the risk of trains becoming stranded in such circumstances, and the need for operations staff to instigate actions to manage the consequences of a stranded train in a timely manner.

197 This incident highlights that there are situations when front-line staff need to make quick decisions under pressure. In these circumstances they require structured and unambiguous instructions. Such rule-based decision making is fundamental to safe rail operation and is familiar to signallers, drivers and other operational staff. Recommendation 2 requires a review of the criteria followed by drivers and signallers when deciding whether to declare a train stranded. It is intended that this will lead to revisions to the criteria to ensure deterministic and timely behaviour. Other RAIB investigations of stranded train incidents, such as the incident at Peckham Rye station on 7 November 2017 (paragraph 170), have identified recommendations concerning the better management of industry-controlled passenger evacuation.

Recommendations and learning points

Recommendations

198 The following recommendations are made[33]:

1 *The intent of this recommendation is to identify practical opportunities to improve train service resilience when conductor rail ice risk is forecast.*

Network Rail (South East route) and Southeastern, should undertake a holistic review of their seasonal preparedness arrangements for winter taking into account the actions already taken or in progress as result of this incident. This should have the objective of maximising operational resilience and minimising the risk of train stranding incidents that could lead to unsafe passenger detrainment. In so doing it should consider the effectiveness of existing and proposed mitigation measures (for instance conductor rail heating and the running of de-icing trains), and the criteria for their use, taking into account the criticality of locations to operational performance. The review should also include consideration of operational strategies, such as the key route strategy, and encompass train routeing strategies designed to enhance operational resilience during winter weather and avoid the unnecessary blocking of key junctions. Strategies and practices used by other metro-type railway operators should be considered. Network Rail and Southeastern should jointly implement changes that are identified as beneficial (paragraphs 175a.i, 175a.iii, 176a, 176b and 177).

This recommendation may also be applicable to other train operating companies and Network Rail routes.

[33] 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 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 to ensure that signallers and drivers respond in a timely manner to events that have the potential to result in a train being stranded or held at a signal for an extended period of time.*

Network Rail (South East route) and Southeastern should work in conjunction with RSSB to provide suitable instructions and guidance to operations staff to help them determine when a train should be considered as stranded (as a result of it being unable to move, or make adequate progress), the timeframe within which this needs to be declared and the actions that then need to be taken. They should develop and publish suitable instructions, and where appropriate update the Rule Book (paragraphs 175a.ii and 176c).

This recommendation may also be applicable to other train operating companies and Network Rail routes.

3 *The intent of this recommendation is to ensure that information that is critical to the operation of the railway is communicated to the correct role within the KICC in an accurate and timely manner, as highlighted by the reasons for miscommunication identified in paragraph 129.*

Network Rail (South East route) and Southeastern should continue their joint review of the processes for decision making, communications and the handling of information with and within the KICC. They should make enhancements so that:

- the functional responsibilities of the individual roles within the KICC, and the information important to them, are defined and make arrangements to ensure that staff clearly understand;
- the appropriate lines of communication between signalling staff and KICC staff are defined, and incorporated in the method of working, and make arrangements to ensure that staff clearly understand; and
- within the KICC, information critical to the operation of the railway is made visible to, or communicated to, the relevant responsible role in a timely manner (paragraph 175a.ii).

This recommendation may also be applicable to other railway control centres.

4 *The intent of this recommendation is to improve the availability of Southeastern staff that are competent to support train crews in the event of a railway incident at locations other than in station platforms. This complements recommendation 2 in RAIB report 16/2018 that was placed on Network Rail (South East route) to enable provision of appropriate support to staff on the ground, such as train crew.*

Southeastern, in consultation with Network Rail (South East route), should review its arrangements and resources for assisting train crews in managing, informing and reassuring passengers on trains that are stopped at locations remote from station platforms. It should make any changes that are necessary to provide sufficient numbers of suitably trained staff who are competent to access the track and support the managed evacuation of trains. It should also clarify when and how these staff will be deployed (paragraph 175b).

This recommendation may also be applicable to other train operators.

5 *The intent of this recommendation is to ensure that the essential needs of train passengers are reasonably met in the event that they need to stay on board for an extended time as result of a foreseeable extreme weather event.*

Southeastern, in consultation with Network Rail (South East route) as appropriate, should continue its review of the adequacy of the systems and facilities on each type of train it operates as they relate to alleviating the risk that passengers decide to detrain from trains that have been stranded for extended periods of time. This should include consideration of toilet use, heating, ventilation, passenger information, food and drink, and take into account the practice of other metro-type railway operators. It should then review its seasonal preparedness and make arrangements to provide any additional facilities, provisions and information that passengers need in an emergency resulting from an extreme weather event (paragraphs 175a, 177 and 178a).

This recommendation may also be applicable to other train operators.

Learning points

199 The RAIB has identified the following key learning points[34]:

1 This investigation demonstrates the importance of timely application of emergency signalling rules (such as regulation 3.4 in the track circuit block regulations concerning emergency permissive working) and of signallers being familiar and confident in their use. This should include training to ensure familiarity with all elements of the Rule Book, and opportunities to apply such regulations where infrequent application may otherwise create barriers to invoking them (paragraph 126).

2 This investigation demonstrates the importance of signallers and staff in railway control centres using appropriate protocols when using voice communications. These include the need for callers to confirm that they are speaking to the relevant responsible individual (paragraph 129).

[34] '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.

Appendices

Appendix A - Glossary of abbreviations and acronyms

AC	Alternating current
ATOC	Association of Train Operating Companies
AWS	Automatic warning system
CCF	Network Rail's train running information system, used by control centre staff and others, which provides a visual schematic display of train position, both real-time and historic, and presents information on train running.
CCIL	Control centre incident log
CCTV	Closed circuit television
DC	Direct current
EWAT	Extreme weather action teleconference
GSM-R	Global system for mobile telecommunications – railways
KICC	Kent Integrated Control Centre
KRS	Key route strategy
NOP	National operating procedure

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.

Gold command	The standard management framework employed at complex or major incidents, mandated by the Civil Contingencies Act (2004). Gold is strategic.*
Overlap	The distance beyond a signal that is proved clear prior to the signal on the approach to it being cleared.*
Permissive working	An exception to the failsafe design of signalling, where one train can be permitted to enter a section already occupied by another train.*
Short circuiting bar	An electrically conductive metal bar that is placed by hand between the running rail and conductor rail using an insulated handle. It will either cause the electrical supply to be automatically disconnected or it will reduce the electrical potential locally to a safe level.
Silver command	The standard management framework employed at complex or major incidents, mandated by the Civil Contingencies Act (2004). Silver is tactical.*

Appendix C - Rule Book Module TS2 ‘Track circuit block regulations’ (extract)

Taken from: Railway Group Standard GE/RT8000/TS2, Issue 4

3.4 Emergency permissive working

In an emergency, you can allow a train conveying passengers to enter an occupied signal section to reach a station platform, as long as you have been authorised to do so by the signal box supervisor or Operations Control.

You must make sure that there is enough room to safely deal with the train at the platform.

Before you allow a train to proceed, you must tell the driver what has happened, and instruct the driver to pass the signal at danger.

You must also tell the driver that when the train has arrived at the station platform, no further movement is to be made without the authority of the signaller.

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