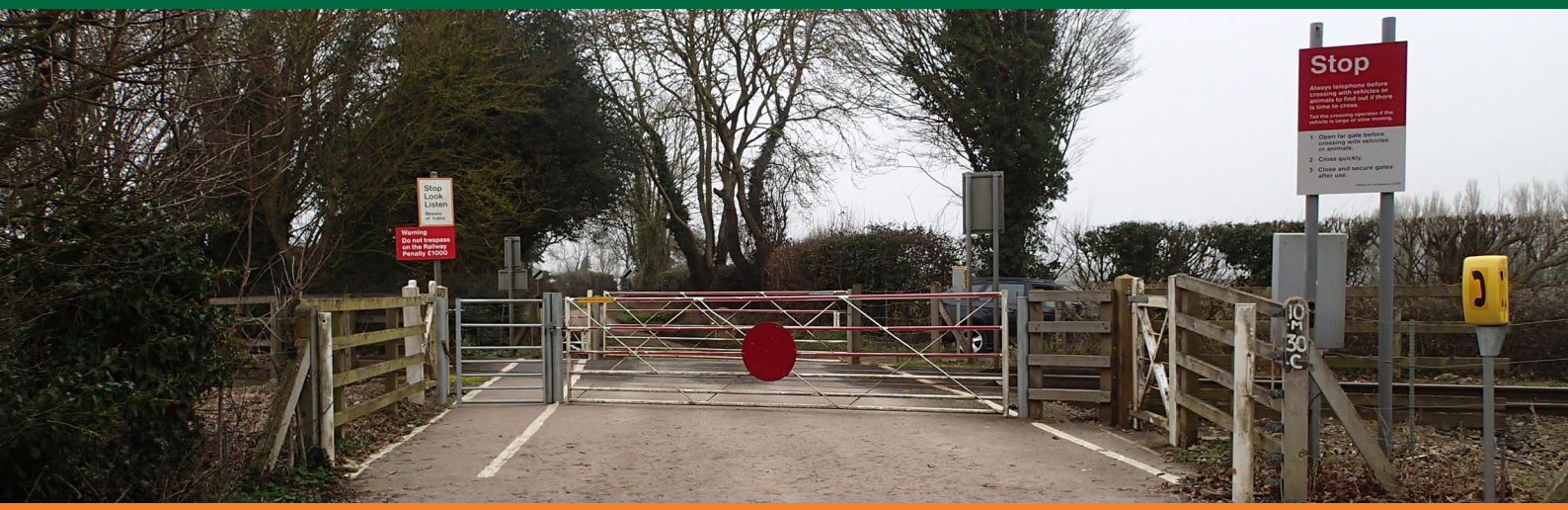
RAIB

Rail Accident Investigation Branch

Rail Accident Report



Near miss at Coltishall Lane User Worked Level Crossing, Norfolk 21 January 2021

Report 03/2022
April 2022

This investigation was carried out in accordance with:

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

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Preface

The purpose of a Rail Accident Investigation Branch (RAIB) investigation is to improve railway safety by preventing future railway accidents or by mitigating their consequences. It is not the purpose of such an investigation to establish blame or liability. Accordingly, it is inappropriate that RAIB reports should be used to assign fault or blame, or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

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

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

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

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

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

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

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

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Near miss at Coltishall Lane User Worked Level Crossing, Norfolk, 21 January 2021

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Summary

At 17:21 hrs on 21 January 2021, a passenger train narrowly avoided a collision with two cars at Coltishall Lane user worked level crossing, near Hoveton, Norfolk. Road traffic over the crossing was higher than usual as a result of drivers seeking a diversionary route for their journeys, following an earlier road traffic accident on a nearby main road.

The safe use of the crossing relied solely on telephones to warn users in road vehicles of approaching trains, and the near miss occurred because the car drivers did not telephone the signaller before using the crossing. The investigation found that this may have been because the car drivers were unfamiliar with the crossing, because the signs at the crossing were ineffective in prompting users on how to cross safely, and because the level crossing gates had already been opened. It is also possible that factors such as the increased level of road traffic may have affected the behaviour of road users and their decision-making.

The investigation also found that Network Rail and its predecessors had not taken measures to close or upgrade this crossing, despite being aware of the risks it posed. This was possibly because Network Rail's processes for assessing and controlling risk at the crossing did not take account of some of the factors present, leading to an incomplete understanding of the risks involved in its operation. Additionally, the status of user worked crossings on public roads was not acknowledged within relevant statutory provisions and industry guidance, and this may have affected how safety at these crossings was managed by infrastructure managers. The Office of Rail and Road had previously taken regulatory action, but this had not resulted in action by Network Rail to address the risk at this crossing by the time the near miss occurred.

RAIB's report makes three recommendations. The first is that Network Rail should assess, and if necessary reduce, the risks of incidents and accidents at vehicular user worked crossings which may see significant use by unfamiliar users, consistent with current industry best practice. The second is that Network Rail, in consultation with the Office of Rail and Road and the Department for Transport, should improve signage at user worked crossings which may share features identified in this investigation. The third is that the Department for Transport, in consultation with the Office of Rail and Road and Network Rail, should evaluate the extent to which recent guidance on the drafting and making of level crossing orders will better enable the implementation of improved safety measures at level crossings.

There is one learning point that reminds those responsible for the management of safety of user worked crossings to adhere to the principles of level crossing risk assessment published by ORR in June 2021.

Introduction

Definitions

1 Metric units are used in this report, except when it is normal railway practice to give speeds and locations in imperial units. Where appropriate the equivalent metric value is also given.

2 The report contains abbreviations which are explained in appendix A. Sources of evidence used in the investigation are listed in appendix B.

The incident

Summary of the incident

3 At 17:21 hrs on 21 January 2021, a passenger train narrowly avoided a collision with two cars at Coltishall Lane user worked level crossing[1] near Hoveton, Norfolk. At the time of the incident, the crossing, which is on a public road, was seeing higher than normal levels of road traffic due to a temporary closure of a nearby main road.

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

4 The cars involved were travelling from east to west over the crossing when the near miss occurred. The first car cleared the crossing around two seconds before the train arrived (figure 2). The second car, following the first, entered the crossing but stopped just short of the railway line, around one second before the train's arrival.

5 The train was travelling at 75 mph (120 km/h) as it approached the crossing. The driver sounded the train's warning horn, and four seconds later applied the emergency brakes in response to seeing the headlights of the first car moving towards, and then over, the level crossing in front of him. The train passed over the crossing at 58 mph (93 km/h) and came to a stand approximately 260 metres beyond the crossing. The train driver subsequently reported the near miss to the signaller. No one was injured and no damage was caused during the incident.

[1] A level crossing where the barriers or gates are operated by the user.

Figure 2: CCTV image from the train around three seconds before its arrival at the crossing showing a car (boxed outline) in the middle of the crossing travelling from left to right

Context

Location

6 Coltishall Lane level crossing is located between Hoveton & Wroxham station (to the south) and Worstead station (to the north) on the Norwich to Cromer line. The crossing allows Tunstead Road (a minor road which becomes Coltishall Lane a short distance east of the crossing) to cross the railway. Tunstead Road is designated as a public highway on both sides of the crossing.

7 The railway line at Coltishall Lane crossing is single track with train movements in both directions, controlled by Trowse Swing Bridge signal box. The maximum permitted speed of passenger trains on this section of the line is 75 mph (120 km/h).

Organisations involved

8 Network Rail is the owner and maintainer of the railway at Coltishall Lane level crossing. It is responsible for the equipment and signage fitted at the crossing, and is the employer of the staff responsible for its operation, inspection, and maintenance.

9 Greater Anglia (Abellio East Anglia Limited) was the operator of the train and is the employer of the train driver involved in the incident.

10 Norfolk County Council is the highways authority for the road approaches to the crossing, and as such has legal duties regarding the maintenance of the road and the highway signage on the approaches to the crossing.

11 Tunstead & Sco Ruston Parish Council is a statutory consultee for local planning applications, including proposed changes to local public highways.

12 All the organisations listed freely co-operated with the investigation.

Train involved

13 The train involved, reporting number 2S23, was the 16:49 hrs Greater Anglia passenger service from Sheringham to Norwich. It was formed of a three-car Class 755 bi-mode multiple unit. RAIB found no evidence that the condition or operation of the train contributed to the incident.

The level crossing

14 Coltishall Lane level crossing is a user worked crossing with telephones (UWC(T)). It has a road gate on each approach (figure 3). It also has pedestrian gates located adjacent to the road gates, which allow access to those on foot. The crossing gates are manually operated by any road users wishing to cross.

Figure 3: Coltishall Lane user worked crossing viewed from the east, in daylight with closed gates

15 Because it is not possible for road vehicle users to get sufficient warning of approaching trains by looking along the line, telephones are provided at both sides of the crossing which allow users to contact the signaller at Trowse Swing Bridge signal box and obtain permission to cross. There are also signs on each side of the crossing instructing crossing users with vehicles, or who need to cross with animals, to telephone the signaller to obtain permission before opening the road gates and crossing (see paragraph 47).

16 The signaller can determine the approximate location of trains on the single line between Hoveton & Wroxham and North Walsham by viewing displays showing the states of track circuits[2] and axle counters.[3] These are used to detect the position of trains and used to trigger the opening and closing sequences of automatic crossings elsewhere on the line. When a road user makes a request to the signaller to cross, the user is asked how long they require to do so. The signaller then assesses whether there is sufficient time for the user to cross the railway before a train arrives at the crossing.

People involved

17 The train driver was based in Norwich and had been driving since 1996. His duties that day began at 15:52 hrs. His prompt actions during the incident almost certainly prevented a worse outcome.

18 It was not possible to trace any of the road vehicle drivers involved in the incident.

External circumstances

19 Sunset on 21 January 2021 occurred at 16:20 hrs at Coltishall Lane level crossing and there was no street lighting provided on either of the road approaches. This meant that the incident occurred in darkness. The weather conditions were dry and clear, with good visibility.

20 There had been a road traffic accident earlier on the evening of the incident. This was approximately 2 km (1.25 miles) to the north-west of the crossing, and temporarily increased the number of road vehicles using it. This is discussed in more detail in paragraph 22.

[2] An electrical or electronic device used to detect the absence of a train on a defined section of track using the running rails in an electric circuit.* (All definitions marked with an asterisk have been taken from Ellis's British Railway Engineering Encyclopaedia © Iain Ellis. www.iainellis.com).

[3] A track-mounted device that accurately counts passing axles, generating data which the signalling system uses to determine whether the section is clear or occupied.

The sequence of events

Events preceding the incident

21 The last telephone call received from the crossing before the incident was made by a tractor driver. It was recorded by the signaller at Trowse Swing Bridge signal box as being made at 15:54 hrs on the day of the incident.

22 Around 16:45 hrs there was a serious road traffic accident close to the junction of North Walsham Road (B1150) and The Street, near Sco Ruston (figure 4). This is approximately 2 km (1.25 miles) to the north-west of Coltishall Lane level crossing. At 17:07 hrs the police temporary closed the B1150 road. As no official temporary road diversion was put in place at that time, road vehicles intending to use the B1150 began to use other routes, including Tunstead Road, to continue their journeys.

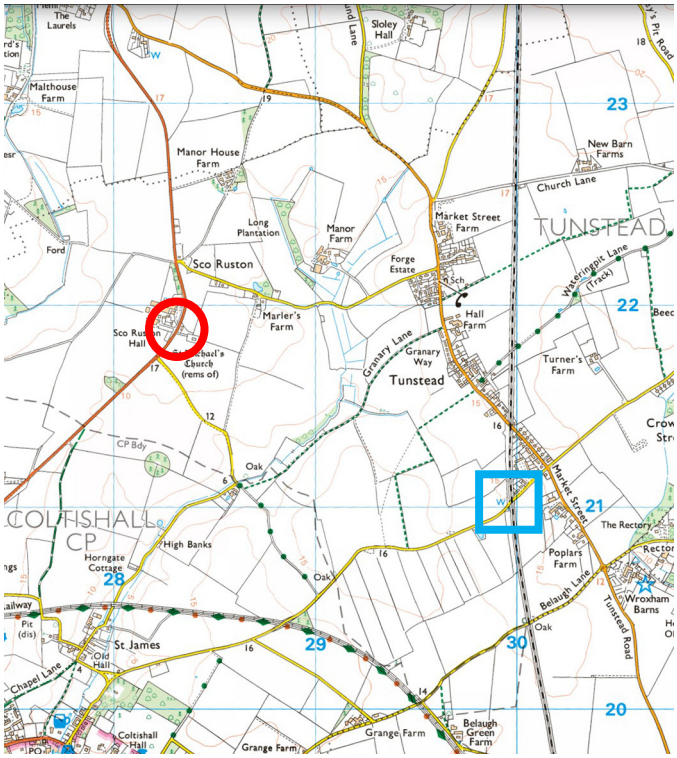

Figure 4: Approximate location of the earlier road accident shown in red circle with Coltishall Lane user worked crossing shown in blue square

23 Train 2S23 left Sheringham at 16:48 hrs, one minute later than scheduled. It made three station stops on its journey towards Norwich. The last station stop before the incident was at North Walsham, approximately 6 miles (9.5 km) to the north of Coltishall Lane level crossing.

24 Data from the on-train data recorder (OTDR) fitted to train 2S23 recorded that the train approached the crossing at the maximum permitted line speed of 75 mph (120 km/h).

Events during the incident

25 At 17:21 hrs, approximately 11 seconds before reaching the crossing, the driver of train 2S23 removed traction power and sounded a series of high and low tone warnings of the train's horn over a period of seven seconds. This was in response to the train driver seeing the headlights of the first car which subsequently crossed, beginning to enter the crossing.

26 Around seven seconds before reaching the crossing, the train driver applied the train's emergency brake. Images from the forward-facing CCTV fitted to train 2S23 show the front of the first car entering the crossing travelling from left to right (as seen from the direction of the train's travel), around five seconds before the train arrived at the crossing.

27 Around three seconds before the train's arrival at the crossing, this car was in the centre of the crossing (figure 2). The train, with its emergency brake applied, was by now travelling at around 65 mph (105 km/h). The car is seen, in the images, to move clear of the crossing around one second later.

28 Around one second before the train reached the crossing, the front of another vehicle, travelling in the same direction as the first, passed beyond the line of the east side gate (figure 5). The images show that the second car's brake lights had illuminated and that it had stopped before reaching the railway line. The train travelled over the crossing at 58 mph (93 km/h).

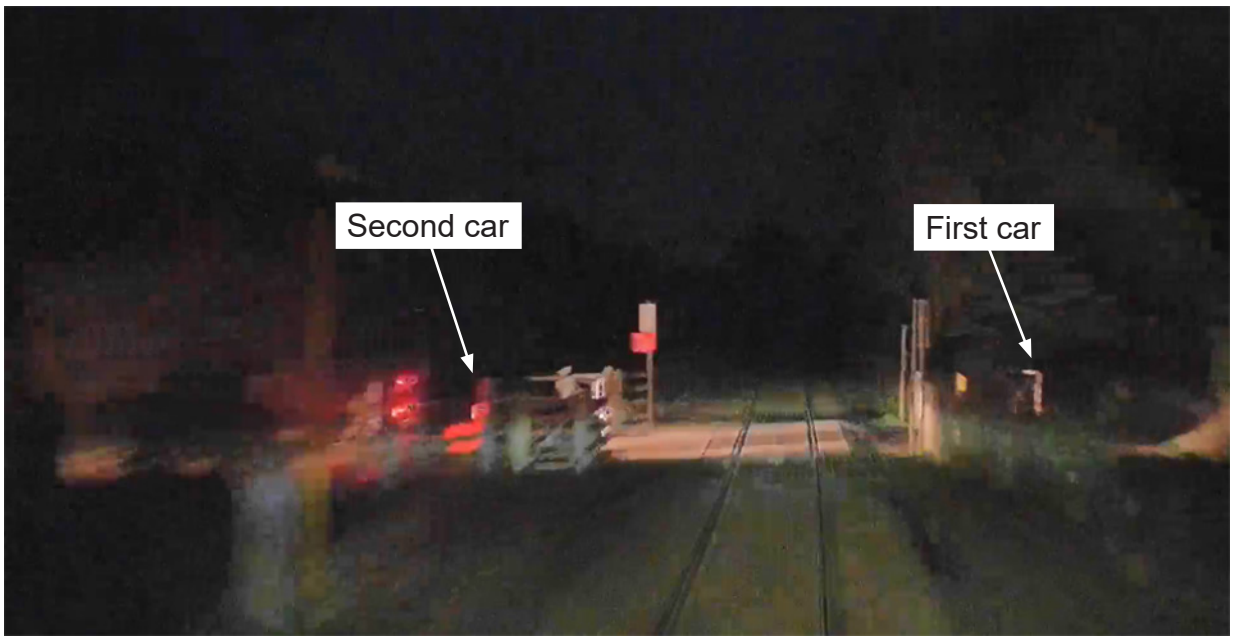

Figure 5: The second car stopping clear of the railway line around one second before the train's arrival

Events following the incident

29 At 17:22 hrs, the train stopped approximately 260 metres beyond the crossing, as a result of the emergency brake application. The train driver contacted the signaller to report the near miss and stated that he was fit to continue duty. The train resumed its journey around three minutes later.

30 At 17:24 hrs, a call was made from the crossing to the signal box by a local resident who reported that there had been a ‘very near miss’ with a train and that there had been an accident on the nearby main road. He also stated that four or five cars were queuing at the east side of the crossing waiting to cross and that cars were ‘streaming over the line’ because the gates had been left open.

31 Network Rail subsequently deployed a mobile operations manager (MOM) to the crossing who arrived at 17:56 hrs. He tested and confirmed that both crossing telephones were working, and that all the required signs were in place. He remained there until 18:25 hrs and has stated that no road vehicles used the crossing during this period. The crossing was then attended by an officer from the British Transport Police, and then later by another MOM from 19:40 hrs until 20:30 hrs. The MOM who attended during this later period told the RAIB that there were three or four cars that used the crossing during the time that he was present at the crossing.

32 The first MOM to attend reported that he spoke to a local resident who was present at the time of the incident (believed to the same local resident who made the earlier phone call to the signaller). This person told the MOM that, immediately before the incident, there were about seven cars on the east side of the crossing and about six on the west side, all waiting to cross. The person stated that one of the vehicle drivers opened the gates and that all the cars on the west side crossed the railway, followed by the vehicles on the east side. One of these vehicles crossing from the east side (the first car seen by the train driver) crossed in front of the train while the next vehicle (the second car seen by the train driver) stopped short and reversed (paragraph 28).

33 At around 21:10 hrs, Norfolk County Council Highways was made aware of the closure of the B1150 by the police. The police log records that Norfolk County Council Highways was present at the scene of the road accident by 21:53 hrs to clear debris and assess damage to the trees at the side of the road. There is no evidence that a formal diversion was put in place at any point in the evening.

Analysis

Background information

34 The railway from Norwich to North Walsham was built by the East Norfolk Railway and opened in 1874. A level crossing at Coltishall Lane existed from the opening of the line, and by 1905 it was provided with a resident crossing keeper, who lived in a cottage at the south-west corner of the crossing. In 1964 the crossing keeper was withdrawn by British Railways and telephones for users were provided at the crossing, in line with a Level Crossing Order made under section 66 of the British Transport Commission Act 1957 (see paragraph 104).

35 The majority of user worked crossings on the railway network are on private roads and were originally provided to enable landowners to access their land by crossing the railway. These landowners and their successors, or those who have either acquired rights of access or who have been given permission to use the crossing, are designated by Network Rail as the 'authorised users' of the crossing. Authorised users are given information by the railway about how to use the crossing. They are expected by Network Rail to arrange, as far as possible, to pass this information on to their employees and other people who may have to visit the premises served by the crossing.

36 Since most user worked crossings are on private roads, most members of the public are unfamiliar with them. Furthermore, it will often not be practical for an authorised user of such a crossing on a private road to brief everybody who needs to use it (such as delivery drivers) before they encounter it for the first time. RAIB has previously discussed the potential weaknesses in the authorised user concept in its class investigation into safety at user worked crossings (RAIB report 13/2009) and its report into the accident at Frognal Farm crossing, Kent, in 2017 (see paragraph 115, RAIB report 12/2018).

37 It is obviously not possible to brief those who may use a user worked crossing that is located on a public road. Safe use of such crossings, when fitted with telephones, will therefore rely solely on vehicle users understanding crossing signage, contacting the signaller before crossing, and acting on the information given to them by the signaller.

Identification of the immediate cause

38 The cars entered the crossing as the train approached.

39 CCTV images from train 2S23 show that both cars involved in the incident entered Coltishall Lane crossing as the train approached. The first car crossed the railway in front of the train, while the following car stopped before reaching the railway line.

Identification of causal factors

40 The incident occurred due to a combination of the following causal factors:

a. The car drivers did not telephone the signaller before using the crossing (paragraph 41)

b. The safe use of the crossing relied solely on telephones to warn users in road vehicles of approaching trains (paragraph 59).

Each of these factors is now considered in turn.

The actions of the car drivers

41 The car drivers did not telephone the signaller before using the crossing.

42 The incident occurred at 17:21 hrs, over 30 minutes after the earlier road traffic accident, and at a time of day likely to experience a peak in road traffic. The account given to the Network Rail MOM following the incident from the member of the public indicates that there were a number of users who crossed prior to the incident (paragraphs 30 and 32). The last recorded call from the crossing to the signaller before the near miss was at 15:54 hrs, showing that none of these users telephoned the signaller before using the crossing.

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

a. The car drivers may have been unfamiliar with this crossing and did not understand how to use it correctly (paragraph 44)

b. The signs provided at the crossing did not effectively prompt users how to safely use the crossing (paragraph 47)

c. There was an increase in road traffic at the crossing which, along with other factors, may have affected the behaviour of road users intending to use the crossing (paragraph 53).

Each of these factors is now considered in turn.

Crossing users' understanding

44 The car drivers may have been unfamiliar with this crossing and did not understand how to use it correctly.

45 Since Tunstead Road was being used as a diversionary route in both directions at the time of the incident, it is likely that many of the vehicle drivers using it that evening were unfamiliar with the crossing and may have not understood how to use it correctly. This is supported by a telephone call made to the signaller shortly after the incident at 17:33 hrs, in which the car driver making the call asked the signaller '*What do I do?*'.

46 Although Tunstead Road is a public highway, it is a single-track minor road in a rural location which connects the villages of Tunstead and Coltishall. There is only one residential property on the route between the two villages, which also gives access to farmland either side of the road. Traffic census data shows that the road is lightly used (paragraph 54). Typically, a road vehicle journey between the location of the road traffic accident and arrival at either the east or west side of the crossing would take around five minutes. While some drivers may have been familiar with the road and aware that it could be used as a diversionary route, others were probably directed to it by real-time satellite navigation systems, or by following other road users.

Crossing signage

47 The signs provided at the crossing did not effectively prompt users how to safely use the crossing.

48 There were a number of signs at Coltishall Lane level crossing (figure 3). Although the crossing is situated on a public road, the signs are to the standardised design for a user worked crossing with telephones, as set out in the Private Crossings (Signs and Barriers) Regulations 1996.[4] The main sign providing instructions for road users is known as a diagram 103 sign (figure 6). For road users approaching the crossing from the east, the diagram 103 sign is located on the right-hand side of the crossing and inside the railway boundary, and for traffic coming from the west, the sign is on the left-hand side of the crossing.

Figure 6: Diagram 103 sign on the east side of the crossing

49 The diagram 103 sign is divided into two parts. The upper part comprises white text on a red background, instructing users to stop and telephone the signaller before crossing with vehicles or animals, and to tell the crossing operator if the vehicle is large or slow-moving. The lower part of the sign comprises black text on a white background with a numbered list of instructions for opening and closing the gates.

50 In its report into the October 2017 collision at Frognal Farm User Worked Crossing, RAIB observed that a diagram 103 sign (in that case adapted for use with a power operated gate opener system) '*was not clear, contained conflicting information and did not convey the most important action required to the crossing user*'. Of particular relevance to this investigation were the following findings concerning the base design of the sign:

- The sign does not make it clear to the user that it is not safe to cross the railway without permission from the signaller.

[4] SI 1996 no. 1786.

- The instructions are not concise, and they do not capture the reader's attention. The most important instruction on the sign, to contact the signaller for permission to cross, is not a numbered instruction, and it is therefore easy to overlook. In addition, this instruction is difficult to pick out in the white text on the red background.

51 RAIB observed the diagram 103 sign at Coltishall Lane level crossing in darkness, illuminated by a car's dipped headlights (as these are likely to be used if there are other road users in the vicinity ahead). At ten metres from the crossing gate (figure 7), the diagram 103 sign is lit by the headlights, but is too far away to be legible. At five metres from the gate (figure 8), the positioning of the sign to the right-hand side of the road means it is no longer well illuminated by dipped headlights, nor is it in the car driver's primary field of view (the equivalent sign on the west side of the crossing is situated on the left-hand side of the road, and the instructions on this sign were also not followed by vehicle drivers). It is possible, therefore, that the signs would not attract the attention of some crossing users in road vehicles, especially in darkness, and taking account of the way drivers may behave if there is a queue of traffic behind them (see paragraph 58).

Figure 7: The view of the east side of the crossing from 10 metres away in darkness with gates closed. (The white sign on the gate has been added since the date of the incident)

52 Subsequent queuing vehicle drivers may have paid less attention to the signs at the crossing, possibly assuming that the driver of the vehicle at the front of both queues had received permission to cross, or that as the vehicle in front had crossed safely, that it was also safe for them to do so. This behaviour was possibly influenced by the general increase in traffic using the crossing (see paragraph 56).

Figure 8: The view of the east side of the crossing from 5 metres away in darkness with gates closed. (The white sign on the gate has been added since the date of the incident)

Increase in road traffic levels

53 There was an increase in road traffic at the crossing, which, along with other factors, may have affected the behaviour of road users intending to use the crossing. This is a possible factor.

54 Network Rail's level crossing risk assessment for Coltishall Lane level crossing, which was current at the time of this incident, included a usage census conducted in February 2019. This stated that there was a daily average of eight road vehicles using the crossing and that this level of usage applied to the whole year. It recorded that the crossing had neither a high number of 'irregular' (unfamiliar) users, nor a high number of users during the night or at dusk. A more recent census conducted in November 2020 as part of the cyclical risk assessment due to begin in 2021, stated the average daily usage to be four road vehicles.[5]

[5] Network Rail's process for level crossing risk assessment is cyclical based on the risk profile of the crossing. Coltishall Lane level crossing was being assessed on a medium risk cycle involving an inspection every 147 days and a risk assessment every 15 months. Should there be either a near miss event or three reported incidents within a 12-month period, then an immediate reassessment should be undertaken.

55 RAIB requested that Network Rail provide a sample of the number of telephone call requests received by the signaller from road users at the crossing over an 18-month period from July 2019. This showed that the average number of calls made from the crossing ranged between four and twenty per day. RAIB noted that the highest number of calls were over the summer months, probably due to an increase in farm traffic accessing adjacent land. Although Network Rail's risk assessment figures do not reflect this seasonal increase, the sample of telephone call requests suggests that the figures of average daily use derived by Network Rail from the censuses undertaken were reasonably representative of actual levels, outside of these seasonal peaks.

56 The account from the member of public given to the MOM (paragraph 32) indicates the high number of users present before the incident. The number is many more than the daily usage recorded in the last census before the incident, and demonstrates that higher levels of road traffic were using the crossing than would normally be expected. It also provides evidence that, in some circumstances, multiple vehicles may wish to use the crossing at the same time.

57 The account also shows that these vehicles, other than those at the front of the queues, approached the crossing with the gates already opened. Finding a crossing gate open may affect the behaviour of users at a crossing. An open gate can create an impression that the crossing is safe to use, particularly among users unfamiliar with the crossing and its correct operation. Observing that the gates were being opened by other users, which is likely to have been the case for some of the drivers, could also give this impression. Additionally, encountering an open gate could make it less likely that car drivers will stop, read the instructions on the sign and contact the signaller, particularly if a vehicle has already crossed ahead of them.

58 The higher volume of road traffic will of itself increase the risk of such an incident at the crossing. Additional factors such as users 'tailing' each other over an already opened crossing, assuming that it is safe to cross, or not wishing to stop and further delay themselves or those behind them, are also more likely as the density of users increases.

The safe use of the crossing

59 The safe use of the crossing relied solely on telephones to warn users in road vehicles of approaching trains.

60 The safe use of Coltishall Lane level crossing relies upon road users contacting the signaller before crossing. This is necessary because the sighting distance available to users to see approaching trains provides insufficient time for them to take a decision to cross safely. As previous paragraphs have explained, there are several reasons why users may not have called the signaller before using the crossing on 21 January 2021. This meant that the reliance on telephone calls to protect both users and the train became ineffective both before, and during, the incident.

61 Network Rail had recorded 21 safety incidents at Coltishall Lane crossing over the previous 15 years. These included reports of users not requesting to cross (nine instances), users not calling back after crossing when requested by the signaller (five instances), train drivers reporting pedestrians crossing in front of them (five instances) and poor communication with non-English speaking car drivers (two instances). In some of these cases, the driver of the next train approaching the crossing was cautioned to drive slowly and check that the gates had been closed by users. There was also an incident recorded following another earlier local road closure in December 2020, when a caller reported that the gates had been left open at the crossing, as well as an incident after January 2021 in which a narrowly avoided collision with a train resulted from the non-use of telephones. Given that reports of crossing users not using the telephone would generally only be made in a limited set of circumstances (for example, where a train is present, or where the incorrect usage is reported by a member of railway staff or a third party nearby), the numbers given for non-use of telephones are likely to be an under-representation of the actual number of occasions on which this occurred.

62 This suggests that road users do not always understand how to use the level crossing correctly, and demonstrates that the reliance on telephone calls alone to protect the crossing and those using it has, on numerous occasions, been ineffective. Although there is no indication that it was a factor in this incident, RAIB also notes that the use of telephone calls as a method of protection may not be suitable for crossing users who are deaf, or who suffer from hearing loss.

Identification of underlying factors

The railway's previous attempts to upgrade or close the crossing

63 Network Rail and its predecessors had not closed or upgraded this crossing, despite being aware of the risks associated with it.

64 On 15 November 2000 there was a fatal collision between a train and a car at the crossing. One passenger in the car was seriously injured, and another later died due to injuries sustained in the accident.

65 Records show that, following this accident, Railtrack, the infrastructure manager then responsible for the crossing, considered undertaking a census of usage in January 2001. This was because Railtrack believed that the safety authority at the time, Her Majesty's Railway Inspectorate,[6] would require Railtrack to upgrade the crossing to an automatic half barrier level crossing[7] (AHB). Correspondence from this time mentions the 'Blue Book', a reference to the 1981 Department of Transport guidance on level crossing protection[8] (see paragraph 105). This stated that user worked level crossings which have a significant number of 'public' users should not have road traffic exceeding about 20 vehicles daily, and that the traffic must be 'essentially local in character'. Although the Blue Book guidance had by this time been superseded by the 1996 publication of Railway Safety Principles and Guidance (RSPG)[9] (see paragraph 108), this latter document gave no guidance on protection measures for user worked crossings on public roads.

66 Railtrack also considered the purchase of land adjacent to the crossing to create a new route from the west side of the crossing to meet an existing road towards the north. This would have led to either downgrading the road on the east side to a private road, with access limited to those needing to reach adjacent land, or a complete closure of the road crossing. Correspondence from this time mentions that Railtrack thought that this would be preferable to upgrading the crossing to an AHB type of level crossing.

67 The Coroner's letter sent to Railtrack in March 2001 following the inquest into the November 2000 fatal accident found that, although the signaller had given permission to cross, the user took longer than expected due to difficulties with the latch on one of the gates. The letter noted that the decision to cross was 'wholly dependent upon a conversation between the signaller and that driver'. As there had been another vehicle present wishing to cross when the accident took place, the Coroner put a further question to Railtrack to consider the issue of whether occupants of queuing vehicles could assume that it is safe to cross behind the one in front.

68 In June 2001, following the conclusion of a formal investigation by Railtrack, there was a further request for a census of crossing use as the options of an upgrade to the crossing, or its closure, were both being considered. RAIB has found no evidence of that census being carried out or what factors were looked into as part of this consideration, which was due to be completed by April 2002. It is not known what decision was taken at the end of the process, and there is no evidence that any changes were subsequently made to the crossing at that time.

[6] Her Majesty's Railway Inspectorate (HMRI) was part of the Health and Safety Executive (HSE). The Office of Rail and Road has regulated safety on the British rail and tram networks since HMRI was transferred to ORR in 2006.

[7] An automatic level crossing fitted with half barriers and traffic lights on the highway and a telephone to the relevant signal box or signalling control centre.*

[8] 'Railway Construction and Operation Requirements – Level Crossings'. Department of Transport, 1981.

[9] 'Railway Safety Principles and Guidance, section 2E: Guidance on level crossings' (RSPG Section 2E).

69 In June 2003 the Network Rail regular risk assessment recorded that the local management team thought safety at the crossing could be improved by either closing it or fitting it with miniature stop lights[10] (also known as miniature warning lights). It also stated that providing miniature stop lights was not an acceptable upgrade, because the crossing was on a public road. The risk assessment further stated that upgrading the crossing to an AHB crossing would be acceptable to HMRI and was in line with its guidance.

70 This reference, to miniature stop lights not being acceptable as an upgrade on public roads, appears to be a reference to the fact that they are authorised for use by the Private Crossings (Signs and Barriers) Regulations 1996, which do not apply to public roads. Although this would prevent them from being fitted to crossings on public roads under these regulations, they could be fitted if otherwise specifically authorised, for example, by a revised level crossing order (see paragraphs 102 and 110).

71 Of the 21 safety incidents recorded at Coltishall Lane in the 15 years before the accident (paragraph 61), 13 were reports of safety incidents at the crossing between 2006 and 2010, including six reported near misses with road vehicles. A further near miss at the crossing in Spring 2011 led to the then train operator expressing concern over its safety. Network Rail reported that it had undertaken a cost-benefit analysis which showed that it was justifiably beneficial to the safety of users to add miniature stop lights to the crossing. However, Network Rail's local level crossing management team had been told by its national standards team that miniature stop lights were not 'ideal' at this crossing as it was on a public road. The local management team therefore considered the options of upgrading to a CCTV or a manually controlled barrier type crossing, but these options had not yet been assessed as part of any cost-benefit study. The risk assessment document also stated that Network Rail would make more efforts to manage 'misuse' at this crossing. No change to the crossing itself resulted from any of these considerations.

72 In February 2012, Network Rail began pursuing the option of a closure of the crossing or downgrading the road. This option again proposed a new route from the west side of the crossing to join to an existing road to its north, enabling the road vehicle part of Coltishall Lane crossing to be closed, or the road downgraded and the crossing's use limited to permitted users (such as those with legal rights of access or with permission to use the crossing, and who would then be designated as authorised users). The highway would have had its public road status removed, and the footpath crossing kept as a pedestrian right of way. In June 2013, Network Rail submitted the proposal for consultation to the Highways and Transport department at Norfolk County Council, and the local Sco Ruston and Tunstead Parish Council.

73 Responses to the consultation received in June 2014 stated that neither council agreed to support the proposal. Response objections included the restriction of access to farm vehicles, the loss of regular use of the crossing in peak times to access local schools, and its use by residents, visitors and emergency services, often directed by satellite navigation systems. This meant that Network Rail did not further pursue a closure or diversion of the crossing.

[10] Miniature stop lights consist of red and green lights. The green light normally shows to road users, but an approaching train automatically changes the lights to red.

74 In July 2016, the local level crossing management team proposed that the crossing be upgraded to either an AHB, or a manually controlled barrier crossing with obstacle detection. This proposal was agreed with the relevant route asset manager at Network Rail, who was the budget holder for this upgrade, and it was scheduled to be completed within Network Rail's control period 6 (CP6) running from 2019 to 2024. This proposal was superseded following actions taken in response to an improvement notice served by ORR in 2017 (see paragraph 87).

75 In February 2017, the regular risk assessment again recorded that a user worked crossing with a telephone was not appropriate for a public road. The local level crossing management team documented, via a level crossing works request, that it should be upgraded to an AHB crossing, which would then make it compliant with the ORR's guidance in Railway Safety Publication 7 'Level Crossings: A guide for managers, designers and operators' which was current at that time (see paragraph 109).

76 The local level crossing management team told RAIB that the request to upgrade the crossing to an AHB was not pursued because there was a perception in Network Rail that ORR was no longer permitting new AHBs to be fitted in the Anglia route. This perception appears to have resulted from a misunderstanding of ORR's acknowledgement of the increased risk associated with AHBs in certain locations. ORR has told RAIB that its attitude towards new AHB installations may not have been fully understood by industry, and that there was a misconception that new AHBs were no longer permitted to be fitted at any location.

77 Following a review in November 2017, the risk assessment document at that time stated that the options for improvements at this crossing were:

a. Upgrading the crossing to an AHB type. It was stated that this would bring the crossing up to standard and was the minimum requirement for a crossing on a public road. It further stated that this gave the benefit of reducing calls to the signaller for requests to cross (as do options b and c below). By this time, reducing the workload of signallers was the subject of an improvement notice by ORR (see paragraph 87)

b. Crossing closure by the provision of a diversionary road similar to that considered previously in 2012, as well as the option of providing a bridge to replace the user worked crossing at Belaugh Lane user worked crossing (600 metres to the south of Coltishall Lane crossing) with an extended alternative route connecting the two closed roads to the west

c. Upgrading the crossing to a CCTV type

d. Moving the east side gate closer to the railway to reduce the distance between the gates, and hence the time, that users require to cross between them.

78 The document also included a cost-benefit analysis for each individual safety improvement. The route level crossing team and route asset manager concluded that they should seek to implement a road closure with a diversion and, should closure not be possible, undertake the installation of miniature stop lights. It further stated that ORR should be consulted before the installation of the miniature stop lights.

79 Two physical changes were made to the crossing in 2017. The first, in March 2017, was the addition of a sign fitted to each gate near the latch (figure 9). The second, completed by November 2017, was moving the east-side gate three metres closer to the railway line as proposed in the risk assessment (see paragraph 77d).

Figure 9: The additional sign added to the road gates close to the latch

80 In February 2019, Network Rail began the last risk assessment review cycle before the incident. As part of this, a review was made of the reported incidents in the previous period. It was noted that there were two instances of road users not requesting permission to cross, and some occasions when the user did not call the signaller back as requested. The assessor again recorded that because the crossing was on a public road, the use of the telephones was not deemed acceptable as a risk control and, because overall use was not monitored, the proportion of users using telephones could not be established.

81 In April 2019 three possible options for improvement were evaluated following this assessment. These were: upgrading the crossing to a manually controlled barrier crossing with CCTV or obstacle detection; adding miniature stop lights; and closure by adding a diversionary road. The safety benefit of a manually controlled barrier crossing with the additional equipment was analysed as being disproportionate to the cost and was rejected. It was accepted that the creation of a diversionary road to enable the crossing to be closed should again be pursued.

82 The local level crossing management team believed that there would be a safety improvement by fitting miniature stop lights at the crossing, considering that designs with improved conspicuity compared to the earlier type had been developed and fitted elsewhere. This was not accepted by the central team that signed off crossing designs in Network Rail, following a similar application to modify another crossing. The response from this team was that the road approaches would require to have their public highway status removed before miniature stop lights could be fitted.

83 The three options (paragraph 81) were accepted for a review to be undertaken in Network Rail's control period 8 (CP8) between 2029 and 2034. It also noted that the option of converting the crossing to an AHB was no longer being considered due to the perception that it would not be accepted by ORR as a safety improvement (paragraph 76).

84 In November 2020, a risk assessment was undertaken in preparation for the next regular risk review cycle. This recorded that users 'sometimes' ask the signaller for permission to cross. It was also again stated that telephones were not suitable as mitigation, given that the crossing was on a public road.

85 In summary, Network Rail and its predecessor, Railtrack, had considered the options to address the risks present at Coltishall Lane level crossing for a period of nearly 20 years, before the near miss occurring in January 2021. Despite repeated assessments concluding that the arrangements were unsatisfactory, no action to change the crossing resulted. This was because:

- Proposals to upgrade protection at the crossing to include miniature stop lights were not progressed on the basis that there was a perception that such lights are not permitted on user worked crossings on public roads
- Proposals to upgrade the crossing with an AHB installation were not pursued earlier due to a perception that it was not a suitable upgrade because of ORR's anticipated resistance
- Proposals to close or downgrade the crossing were objected to by the relevant councils and not pursued further by Network Rail
- Proposals to upgrade the crossing to a more protected type were not seen as providing sufficient safety benefit to justify the cost or were otherwise not progressed by Network Rail.

ORR regulatory action

86 Previous regulatory action taken by ORR had not yet resulted in action being taken by Network Rail to address the risk at this crossing.

87 In March 2017, ORR issued an improvement notice to the Anglia route.[11] This was in response to near misses that had occurred at user worked crossings with telephones. It required Network Rail to identify signal boxes where the duties of the signaller included receiving a substantial number of calls from crossing users, and to identify all user worked crossings with telephones where the signaller had an imprecise knowledge of the location of the train when a request to cross was made. Once identified, it required Network Rail to assess the effects of these calls on the workloads of signallers, and then to identify control measures to reduce the risk.

88 For those user worked crossings so identified, the improvement notice required Network Rail to consider the options to address the risks. This included consideration of crossing closure, installing automatic warning devices to warn users of approaching trains, and improving the information given to signallers on the location of approaching trains. As a result of this process, Network Rail proposed safety improvements to level crossings across the route. This included consideration of either closure or upgrading both Coltishall Lane and Belaugh Lane user worked crossings.

89 In January 2018, ORR issued a second local improvement notice[12] requiring Network Rail to implement the changes and improvements it had identified following the March 2017 improvement notice. This second improvement notice required the changes and improvements to be implemented by the end of March 2021.

[11] I/DTHM/30/03/2017. See https://www.orr.gov.uk/monitoring-regulation/rail/promoting-health-safety/investigation-enforcement-powers/our-enforcement-action-date/improvement-notices/2017.

[12] I/DTHM/23012018. See https://www.orr.gov.uk/monitoring-regulation/rail/promoting-health-safety/investigation-enforcement-powers/our-enforcement-action-date/improvement-notices/2018.

90 ORR was regularly updated on the progress of this second improvement notice. In July 2020 Network Rail explained that a downgrade to Coltishall Lane level crossing to remove its public status could not be delivered within the notice period. However, recognising that the crossing was used by the public and given the volume of traffic using it, Network Rail was developing the option of upgrading the crossing to an AHB. Network Rail stated to ORR that it was highly unlikely that even this change would be completed by the end date specified in the improvement notice.

91 A further update was given in October 2020, stating that the crossing would be upgraded with automatic barrier equipment. It explained that plans had been put in place and a programme was being developed which involved possible purchase of land, the provision of a power supply and a new level crossing order.[13]

92 Although many of the identified improvements relating to other user worked crossings covered by the improvement notice had been completed by March 2021, no changes were made to Coltishall Lane level crossing before the incident occurred. The principal reason for this was that both Coltishall Lane and Belaugh Lane crossings were on public roads, whereas the crossings that were upgraded were on private roads and so had miniature stop lights fitted in accordance with the relevant regulations (see paragraph 108). The planned date stated for the completion of the upgrades to both crossings was given by Network Rail as September 2023 (see paragraph 130).

Assessment and control of risk at user worked crossings on public roads

93 Network Rail's processes for assessing and controlling risk at Coltishall Lane user worked crossing did not account for some of the factors present at the crossing. This is a possible underlying factor.

94 Network Rail's process for level crossing risk assessment at the time of the accident included periodic site visits to each level crossing to collect data relating to its condition, environment and frequency of use.

95 The data collected is entered into Network Rail's all level crossings risk model (ALCRM) which numerically generates a comparative risk for each level crossing, known as the risk score. This score is made up of a letter (A (high) to M (low)) representing the individual risk to the 'most exposed' crossing user, and a number (1 (high) to 13 (low)) representing the collective risk. The collective risk is an estimate of the total risk to all crossing users and the occupants of trains.

96 Regular reviews, known as optioneering, take place which consider different risk control options to improve a crossing's safety. These consider both the risk score, a cost-benefit analysis of possible changes that could be made to the crossing, and a qualitative assessment. This can include expert judgement, to identify and recommend possible level crossing improvements. The process is completed by producing a narrative risk assessment for each crossing which describes the identified risks and their management, together with supporting information and the risk control options selected.

[13] https://www.orr.gov.uk/guidance-compliance/rail/health-safety/level-crossings/orders.

97 The ALCRM risk score for Coltishall Lane crossing at the time of the incident was B5. This is a relatively high score, particularly for road users, and, while other user worked crossings with telephones within the East Anglia route have the same risk score, the majority of these are not on public roads. Any differences in the risk scores between different user worked crossings are primarily driven by the differences in their use, either from the average number of crossing users, or the frequency of trains.

98 However, although the narrative assessment stated that Coltishall Lane crossing was on a public road, the ALCRM model does not allow differentiation between a user worked crossing on a public road and one on a private road. This means that any additional risks created by a crossing being on a public road, such as the greater chance of it being used by unfamiliar users or diverted road traffic (paragraphs 44 and 53), are not highlighted by the risk score. There was also no evidence that multiple users wanting to cross at the same time was accounted for, even though this had previously been raised as a risk by the Coroner in 2001 (paragraph 67).

99 Neither the numerical analysis nor the narrative risk assessment accounted for the absence of any authorised users at this crossing. In its report into the collision at Frognal Farm, RAIB found that the system by which authorised users are responsible for briefing visitors about the safe way to use private user worked crossings is not reasonable in present day circumstances. However, the concept of authorised users is still cited within Network Rail's risk assessment process as a control measure, with level crossing managers meeting regularly with authorised users to keep them informed as to any changes that may affect the safety of the crossing, and to record any changes in use. It is of note that the absence of this as a control measure, however effective it may or may not be, in reality only applies to user worked crossings on private roads, and the risk assessments should have accounted for this.

100 RSSB has stated to RAIB that, as part of project T936 'Enhancing the accuracy and functionality of the ALCRM (2011-2017)', it looked at whether the ALCRM should include differences for user worked crossings situated on public and private crossings. RSSB concluded that, while the available data suggested that user worked crossings on public roads were over-represented in reported accidents, there was no evidence for considering them to be higher risk than user worked crossings on private roads. However, RSSB stated that this conclusion was reached on the absence of evidence rather than conclusive evidence either one way or another and therefore did not rule out that a difference exists, or that there should be a change in assessment process. RSSB's recommendation suggested that additional data be gathered that may support a conclusion, although there is no evidence that this recommendation was ever implemented by the rail industry.

Law and industry guidance

101 The status of user worked crossings on public roads was not acknowledged within relevant statutory provisions and industry guidance. This is a probable underlying factor.

102 Coltishall Lane level crossing is subject to a level crossing order. Level crossing orders are made for level crossings on public vehicular roads (or private roads to which the public has access in England and Wales) and define what protective equipment, signs and road markings must be present at the crossing to protect both those using the railway and the highway. Level crossing orders place duties on both the crossing operator (that is to say, the infrastructure manager) and the local highway authority and are now made through provisions in the Level Crossings Act 1983. The order-making process is managed by ORR on behalf of the Secretary of State for Transport.

103 The great majority of user worked crossings on the mainline railway in Great Britain are situated on roads which are either private on both sides of the railway, or private on one side. However, Network Rail nationally has 56 user worked crossings located on roads which are designated as public highways on both sides of the railway.

104 User worked crossings on public roads were first introduced by British Rail in the 1960s, with the first level crossing order authorising Coltishall Lane as a user worked crossing in 1964. This order laid out the requirements for the crossing, including the requirement for telephones to be fitted. The order was reissued in 2000 to incorporate a minor revision concerning gate clearance above the road surface.

105 In 1981, government requirements for the protection and construction of user worked crossings on public roads were issued in the Department of Transport's 1981 'Railway Construction and Operation Requirements: Level Crossings' (paragraph 65), which stated at section 9.2.1 that, for user-worked gates and lifting barriers at public level crossings '*Road traffic shall not exceed about 20 vehicles per day and must be essentially local in character*'. The document also stated that that miniature stop lights were not suitable for use at public vehicular level crossings.

106 This latter requirement resulted from a 1978 report by the Department of Transport and the British Railways Board (BRB),[14] which stated that there were then 45 user worked crossings on public roads fitted with miniature stop lights, and that that there had been objections to the use of such lights on public roads and a tendency for them to be used incorrectly and for gates to be left open. The report states that BRB had decided not to continue with further installations of these crossings on public roads.

[14] https://www.railwaysarchive.co.uk/documents/DoT_LCProtection1978.pdf.

107 In 1979 an accident occurred on a public road at Naas user worked level crossing in Gloucestershire in which three people were killed, and five injured, after a passenger train collided with a refuse lorry on the crossing. The crossing was fitted with manually pumped hydraulic barriers and an earlier version of miniature stop lights, the red light of which was described in the accident report as 'having an optical performance similar to the brake lights on…motor-cars'.[15] The investigation found that the lights had been functioning correctly during the accident and endorsed the recommendation of the 1978 report that miniature stop lights not be used on public roads. The report also recommended that certain existing crossings on public roads fitted with such lights be upgraded to a type of crossing considered to offer greater protection to users.

108 In 1996, HMRI published Railway Safety Principles and Guidance (RSPG) part 2, section E 'Level Crossings'.[16] Although not retrospective, this guidance now stated that user worked crossings should only be used on private roads. It also maintained the previous requirement that miniature stop lights should only be fitted at private crossings. It gave no recognition of, or guidance on, the protection measures which should be used at user worked crossings located on public highways.

109 In 2011, RSPG part 2 section E was superseded by the ORR's Railway Safety Publication 7 (paragraph 75), the guidance in force at the time of the incident. Like its predecessor, this guidance also stated that user worked crossings should only be used on private roads and that miniature stop lights should only be fitted at private crossings. This meant that there was a period between 1996 and 2021 when no guidance was available to infrastructure managers about how safety at these crossings was to be managed. This almost certainly affected how safety at the crossing was managed by successive infrastructure managers, particularly given that British Rail and Railtrack historically relied on using compliance with standards and guidance, rather than risk assessment of individual crossings, to control risk.

110 In addition to the relevant guidance, user worked crossings on public roads also lie outside of the provisions of the Private Crossings (Signs and Barriers) Regulations 1996 (paragraph 70), which permit Network Rail to fit miniature stop lights to user worked crossings on private roads only. Network Rail is not legally allowed to fit such lights to user worked crossings on public roads without first obtaining authorisation for their use on a public road, either by reference to them in a level crossing order or by another authorisation route. Evidence provided to RAIB by Network Rail shows that 22 of the 56 user worked crossings on public roads are fitted with miniature stop lights, although it was unclear how many of these miniature stop lights fitments were authorised, either through a level crossing order or by other means of authorisation.

[15] https://www.railwaysarchive.co.uk/documents/MoT_Naas1979.pdf.

[16] 'Railway Safety Principles and Guidance, section 2E: Guidance on level crossings' (RSPG Section 2E).

Law Commission recommendations

111 In 2013, the Law Commission and The Scottish Law Commission published recommendations on necessary reforms to law relating to level crossings in Great Britain. The Law Commissions concluded that '*the legislation governing level crossings is complex and antiquated*' and identified the need for modernisation. The Law Commissions pointed out that the procedure for making changes to the protective measures at level crossings, is '*cumbersome and expensive*'. They also found the current procedures for the closure of level crossings to be '*complicated and time consuming*'.

112 The recommendations of the Law Commissions included the replacement of current level crossing law with a regime based entirely on the Health and Safety at Work Act, supported by regulations under section 15 of that Act, and approved codes of practice and guidance. It is the view of RAIB that such a regime, if properly implemented, could be less complicated and prescriptive, so making it easier for infrastructure managers to propose additional protective measures at level crossings based on a risk-based justification.

113 In May 2018 the Minister of State at the Department for Transport responded to the Law Commission explaining that he had concluded that the best way of achieving reform is through administrative changes to the level crossing management processes rather than through legislative reform. He stated that Network Rail had made changes to the way it was managing risk at level crossings and that ORR was looking in parallel at the extent to which the Level Crossing Order process could be operated more efficiently and more in line with a risk-based approach to health and safety regulation.

Previous occurrences of a similar character

114 In 2009 RAIB undertook a class investigation into a series of accidents and incidents which occurred at user worked crossings between June 2006 and December 2008. RAIB's report (RAIB report 13/2009) made a number of safety recommendations relating to topics including improved protection at crossings where adequate sighting is not achievable, the closure of crossings not adequately protected and a review of the requirements for signs at crossings (see paragraph 120).

115 On 23 October 2017, a passenger train collided with a parcel delivery van at Frognal Farm user worked level crossing, near Teynham in Kent, at 89 mph (143 km/h). The van driver suffered serious injuries as a result of the accident, which also caused severe damage to the train and the van. RAIB's report (RAIB report 12/2018) made recommendations relating to the improvement of signage at private crossings and the concept of authorised users (see paragraph 126).

Summary of conclusions

Immediate cause

116 The cars entered the crossing as the train approached (paragraph 38).

Causal factors

117 The causal factors were:

a. The car drivers did not telephone the signaller before using the crossing (paragraph 41). This causal factor arose due to a combination of the following:

   i. The car drivers may have been unfamiliar with this crossing and did not understand how to use it correctly (paragraph 44, **Recommendation 1**).

   ii. The signs provided at the crossing did not effectively prompt users how to safely use the crossing (paragraph 47, **Recommendation 2**).

   iii. There was an increase in road traffic at the crossing which, along with other factors, may have affected the behaviour of road users intending to use the crossing. This is a possible factor (paragraph 53, **Recommendation 1**).

b. The safe use of the crossing relied solely on telephones to warn users in road vehicles of approaching trains (paragraph 59, **Recommendation 1**).

Underlying factors

118 Underlying factors were:

a. Network Rail and its predecessors had not closed or upgraded this crossing, despite being aware of the risks associated with it (paragraph 63, **Recommendation 1**).

b. Previous regulatory action taken by ORR had not yet resulted in action being taken by Network Rail to address the risk at this crossing (paragraph 85, **no Recommendation**).

c. Network Rail's processes for assessing and controlling risk at Coltishall Lane user worked crossing did not account for some of the factors present at the crossing. This is a possible underlying factor (paragraph 93, **Recommendation 1**).

d. The status of user worked crossings on public roads was not acknowledged within relevant statutory provisions and industry guidance. This is a probable underlying factor (paragraph 101, **Recommendation 3**).

Previous RAIB recommendations relevant to this investigation that are currently being implemented

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

RAIB investigation into safety at user worked crossings, RAIB report 13/2009, Recommendation 8

120 This recommendation reads as follows:

> *The Department for Transport, in consultation with the Office of Rail Regulation,*[17] *should review the requirements for signs prescribed by law for use at private crossings, and revise them as necessary, taking into account the need to convey information and instructions clearly and unambiguously to diverse users.*

121 In its report into the collision at Frognal Farm user worked crossing (paragraphs 115 and 126), RAIB stated that the implementation of this recommendation could have resulted in the provision of signage which alerted unfamiliar users to the correct way to use the crossing, potentially addressing one of the causal factors of that accident.

122 In response to this recommendation, the Department for Transport has informed RAIB that it has worked with Network Rail and ORR since 2016 to develop new signs based on RSSB's research project T983 'Research into signs at private level crossings' and has subsequently created a new suite of signs to replace the older 1996 signs. These signs have undergone human factors trials to understand how unfamiliar users would potentially react to them in a realistic setting. The proposed signage has also been tested at two existing user worked crossings. Network Rail reported that users at these locations have indicated that the new signs are easier to understand than the older versions.

123 The proposed set of new prescribed signs is intended to be comprehensive enough to cover the vast majority of user worked crossings currently on the rail network or expected to be in use in the future. However, it will not be possible to cater for all circumstances within a single set of regulations, given the diverse nature of the UK rail network and the uniqueness of individual user worked crossings, so there will be exceptional cases where a non-prescribed sign is needed. These non-standard signs would, as now, still require individual authorisation by the relevant authority (see paragraph 129).

124 On 6 April 2022 the Department for Transport began a consultation on a proposal to make changes to signage at private level crossings. The proposed changes would revoke the existing Private Crossings (Signs and Barriers) Regulations 1996 and introduce new regulations which would replace the existing signs authorised for user worked crossings on private roads with the proposed set of new prescribed signs. The proposed changes set a target for these new signs to be installed at all private level crossings by 2029. They would not carry forward the concept of the authorised user into legislation, which the department states is 'an outdated term without a proper legal basis'.

[17] Renamed the Office of Rail and Road on 1 April 2015.

125 It is proposed that these new regulations will apply to all railway infrastructure managers in Great Britain. The proposed set of new prescribed signs will not, however, be permitted at user worked crossings on public roads without the appropriate authorisation (see paragraph 129), because these crossings will remain outside of the scope of the new regulations.

Accident at Frognal Farm user worked crossing, RAIB report 12/2018, Recommendation 1

126 This recommendation read as follows:

> *The intent of this recommendation is to enable crossing users who may be unfamiliar with user worked crossings to safely operate and traverse such crossings, in view of the increasing number of reasons that people may need to use user worked crossings without necessarily having been briefed on their use.*
>
> *Network Rail, with Office of Rail and Road and Department for Transport support, should review and revise the information offered to users of private level crossings, including consideration of signage wording and diagrams, the conspicuity and placement of signage, and the actions that the user needs to take, including operation of the gates or barriers, and communication with the signaller. The review should also consider, alongside the presentation of information, practicality and feasibility of the current arrangements by which authorised users are expected to brief and inform other potential users of the crossing, in view of the increased dependence of occupiers on delivered goods and services from a plethora of sources, and other factors which may increase the number of crossing users.*

127 In August 2019, ORR informed RAIB that it was working with Network Rail to take suitable actions to address this recommendation, although an accurate plan for full implementation had not yet been formulated.

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

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

128 ORR has informed RAIB that it plans to issue new guidance on the level crossing order process and to issue new level crossing order templates. The new guidance and templates are intended to simplify the order process as far as possible, while meeting the relevant legal requirements, and to be more accommodating of changes, particularly innovations in technology. This will reflect the principles-based approach set out in its new guidance on safety at level crossings (see paragraph 137) and to address some of the recommendations in the 2013 Law Commission and Scottish Law Commission report on level crossings (paragraph 111).

129 The draft of the new guidance on the level crossing order process states that, if an infrastructure manager identifies that a non-prescribed variant of a traffic sign or road marking already authorised within the Traffic Signs Regulations and General Directions is required, then they will need to request authorisation to use this from the relevant authority (such as the Department for Transport, National Highways, Transport Scotland or Welsh Government). An exception to this is where an infrastructure manager wishes to use signs from the Private Crossings (Signs and Barriers) Regulations 1996 other than at a private crossing (for example on a user worked crossing located on a public road). In such a case ORR will make the authorisation instead, as this task is delegated to it by the Department for Transport. Any new or novel traffic sign or road marking not covered by the Traffic Signs Regulations and General Directions or the Private Crossings (Signs and Barriers) Regulations 1996 (or any regulations that supersede these) can only be used after an application to the Department for Transport.

Other reported actions

130 A new assessment of the possible options for improving safety at both Coltishall Lane and Belaugh Lane user worked crossings was completed by the local level crossing management team in February 2021, following this incident. This considered options including closure, replacement by bridges, and alternative, more protected, crossing types. The fitting of miniature stop lights was noted as being prohibited in this review as both crossings are on public roads, although the review notes that they will be considered by ORR should Network Rail produce a policy for their use. The review concluded that the preferred option was fitting AHBs at both crossings. The review also decided to install CCTV to allow prosecution of anyone misusing the crossing in the future.

131 The review also stated that in the interim, the local level crossing team would liaise with the local highways authority to inform Network Rail of any local road closures, to help limit the use of the crossings by those unfamiliar with them. Additionally, should signallers receive an increase in requests to use the crossings, a mobile operations manager will be sent to the crossings to assess and manage the increase in road traffic use.

132 On 25 March 2021, Network Rail Anglia route wrote a letter to ORR detailing its progress in implementing the actions following the second improvement notice (paragraph 89). For both these crossings, the letter stated that the route had considered fitting overlay miniature stop lights,[18] the consideration of which had been supported by ORR. It stated that it had withdrawn this proposal pending ongoing considerations by Network Rail's Technical Authority on a policy document supporting the fitting of miniature stop lights on public roads. The route also had concerns that it would be unable to brief users in the way it did for user worked crossings on private roads.

133 The letter further stated that downgrading the crossing by removing road access to the public was not a practical option within the timescales required. A risk assessment review had shown that the most appropriate option was fitting the crossing with AHBs. This had been planned to be completed by the end of September 2023 as it required the possible compulsory purchase of land adjacent to the crossing and overcoming work capacity issues in providing timely upgrades. The letter also stated that CCTV cameras had been installed to monitor use and user behaviour. Network Rail informed RAIB in October 2021 that these cameras were not yet capable of being remotely monitored.

134 Before this incident, Network Rail had begun a review of providing miniature stop lights at user worked crossings on public roads as a cost-effective safety improvement. This review considered industry changes and developments since the 1978 British Railways Board report (paragraph 106). This included the emerging introduction of new signage (paragraph 122), the current system of management using dedicated level crossing teams and the development of new, larger warning lights, together with the options of having audible warnings and power operated gates. This initiative was supported by ORR.

135 On 3 March 2021, Network Rail conducted a hazard identification and assessment process (HAZID) to identify the factors which needed to be considered. The output of this review was to develop a set of policy statements to define the conditions and requirements under which miniature stop light protection at a user worked crossing on a public road may be safely provided.

136 On 25 March 2022, ORR wrote to Network Rail in response to this review. ORR stated in this response that, although many factors have altered since the use of miniature stop lights on public vehicular roads was discouraged, there had not been sufficient changes to support a blanket rule about their introduction. ORR states that the options for any site must be considered based on a risk assessment, with miniature stop lights being available as a potential risk control measure, where they are the reasonably practicable option. ORR also stated that it expected miniature stop lights to be considered at public vehicular user worked crossings only where they would replace the need for vehicle users to telephone the signaller to obtain permission to cross.

[18] Overlay miniature stop lights are independent of the signalling system and, unlike previous types, do not receive commands to change state from the existing signalling system, but have their own means of detecting the absence and presence of trains.

137 In June 2021, ORR updated its guidance on safety at level crossings, 'Principles for managing level crossing safety'.[19] This new guidance marked a change from Railway Safety Publication 7 (paragraph 109) in that it no longer describes particular layouts and methods of operation but rather takes a risk-based approach and sets out principles and factors which should be considered in a level crossing risk assessment. It emphasises that risk should be reduced through the design of a level crossing or through an alternative way of crossing the railway where this is reasonably practicable, and the importance of considering how level crossings are used.

[19] https://www.orr.gov.uk/sites/default/files/2021-06/principles-for-managing-level-crossing-safety-june-2021_0.pdf.

Recommendations and learning point

Recommendations

138 The following recommendations are made:[20]

1 *The intent of this recommendation is that Network Rail reduces the risk of accidents at vehicular user worked crossings which may see significant use by road vehicle users who are unfamiliar with the crossing.*

Network Rail should assess the risk at vehicular user worked crossings on public roads and on private through roads, which may see significant usage by road vehicle users unfamiliar with the crossing, or where several road vehicle users may intend to use the crossing simultaneously. This assessment should be conducted in line with current industry good practice and should consider factors not captured by its current risk assessment processes. Network Rail should develop a programme to implement the closure, replacement and safety improvement of such crossings based on the results of these assessments.

As part of this process, Network Rail should consider what actions should be adopted to control the risks identified during the period in which longer term actions are being implemented (paragraphs 117a.i and iii, 117b and 118a and c).

2 *The intent of this recommendation is that Network Rail, the Office of Rail and Road and the Department for Transport improve signage at vehicular user worked crossings which may share features identified in this investigation.*

Network Rail, the Office of Rail and Road and the Department for Transport, as part of the current initiatives on improving signage at vehicular user worked crossings on private roads, should consider the suitability of these signs for vehicular user worked crossings on public roads, or on crossings that share features similar to those identified in this investigation, taking into account the findings of Recommendation 1 (paragraph 117a,ii).

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[20] 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, Recommendations 1 and 2 are addressed to the Office of Rail and Road, and Recommendation 3 to the Department for Transport, to enable them to carry out their duties under regulation 12(2) to:

(a) ensure that recommendations are duly considered and where appropriate acted upon; and

(b) report back to RAIB details of any implementation measures, or the reasons why no implementation measures are being taken.

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

3 *The intent of this recommendation is to evaluate the extent to which recent guidance on the drafting and making of level crossing orders will better enable the implementation of improved safety measures (such as the adoption of non-prescribed signage) by level crossing operators, and to identify the scope for any further improvement.*

The Department for Transport, in consultation with the Office of Rail and Road and Network Rail, should review the current mechanisms for improving safety measures at level crossings. This should evaluate the extent to which new ORR guidance on the application of the level crossing order process (and new level crossing order templates) will facilitate the effective management of risk by level crossing operators and consider if there is a need for further changes to the process. The findings of the review should be used to inform future policy relating to level crossing safety (paragraph 118d).

Learning point

139 RAIB has identified the following important learning point:[21]

1 This investigation highlights the importance of those responsible for the management of safety of user worked crossings following the principles of level crossing risk assessment published by ORR in June 2021.[22] In doing so, consideration should be given to non-routine, but foreseeable events, that may affect the behaviour of users and safe use of crossings.

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

[22] 'Principles for managing level crossing safety'. https://www.orr.gov.uk/sites/default/files/2021-06/principles-for-managing-level-crossing-safety-june-2021_0.pdf

Appendices

Appendix A - Glossary of abbreviations and acronyms

AHB	Automatic half-barrier level crossing
ALCRM	All Level Crossings Risk Model
BRB	British Railways Board
CCTV	Closed-circuit television
HMRI	Her Majesty's Railway Inspectorate
MOM	Mobile operations manager
NCC	Norfolk County Council
MSL	Miniature stop lights
ORR	Office of Rail and Road
OMSL	Overlay miniature stop lights
RAIB	Rail Accident Investigation Branch
RSPG	Railway Safety Principles and Guidance
RSSB	Rail Safety and Standards Board
UWC	User worked crossing
UWC(T)	User worked crossing (with telephones)

Appendix B - Investigation details

RAIB used the following sources of evidence in this investigation:

- information provided by witnesses
- information taken from the train's on-train data recorder (OTDR)
- closed-circuit television (CCTV) recordings taken from the train
- the train driver's report
- signal box voice recordings
- site observations, photographs and measurements
- Network Rail level crossing records
- reports from the local police
- correspondence from Norfolk County Council
- industry standards and guidance
- a review of previous RAIB investigations that had relevance to this incident.

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