Oliver Stewart
RAIB Recommendation Handling Manager

12 February 2025

Mr Andy Lewis
Deputy Chief Inspector of Rail Accidents

Dear Andy,

RAIB Report: Signal passed at danger and subsequent near miss, Chalfont & Latimer station on 21 June 2020

I write to provide an update[1] on the action taken in respect of recommendations 2 & 3 addressed to ORR in the above report, published on 26 July 2021.

The annex to this letter provides details of actions taken in response to the recommendation and the status decided by ORR. The status of recommendations 2 & 3 is **'Closed'.**

We do not propose to take any further action in respect of the recommendations, unless we become aware that any of the information provided has become inaccurate, in which case I will write to you again.

We will publish this response on the ORR website.

Yours sincerely,

Oliver Stewart

[1] In accordance with Regulation 12(2)(b) of the Railways (Accident Investigation and Reporting) Regulations 2005

Recommendation 2

This recommendation is intended to improve the understanding and management of risk at the interface between the national rail network and London Underground operations.

Chiltern Railways and London Underground Ltd should jointly establish an effective process for the management of safety at the interfaces between their respective operations. This should include further assessment of the risk associated with operation of Chiltern Railways trains on London Underground Ltd's infrastructure and the implementation of any further risk controls deemed necessary.

ORR decision

1. Through a series of seven joint risk workshops, Chiltern Railways and London Underground have developed a joint risk assessment process. On 15 November 2024, TfL confirmed that the revised risk assessment template was now in use. The risk assessment is reviewed on an annual basis and the process is being used by TfL as a template for interfaces with other operators and infrastructure managers.

2. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Chiltern Railways and London Underground have:

- taken the recommendation into consideration; and
- has taken action to close it

Status: Closed.

Previously reported to RAIB

3. On 17 August 2022 ORR reported the following:

The recommendation was addressed to London Underground and Chiltern Railways, although our expectation was London underground would lead the work. LUL, Chiltern, Network Rail and Freightliner are developing An interorganisational risk assessment process, known as a RACI (Responsible, Accountable, Consulted, Informed), that will then feed into each companies' SMS. Changes to each companies' SMS are expected to reflect the changes made to improve the process and collaboration between duty holders. The process will also be documented in the TfL risk standard.

LUL has confirmed that the workshops included discussion with front line operational staff (including Engineering Infrastructure Protection teams) and Trade Union representatives. The number of people able to attend the earlier workshops was limited by COVID restrictions, but LUL plan to invite more people to upcoming workshops. The last risk workshop is scheduled for 11 August. Future joint risk review arrangements will be discussed at that meeting.

The three main risks identified so far by the workshops are trespass, train striking a railway worker and confusion/communication issues between different operators. The group plans to run a Bow-Tie risk model for each risk. The outcome from the risk assessments will also be considered in the LU Quantified Risk Assessment (LUQRA).

Update

4. On 22 February 2024 Chiltern Railways provided the following update:

Please find attachments relevant to 11.7 (Process and associated appendices as evidence of our last review in 2023). This process underpins the ongoing commitment between LUL/CRCL and other stakeholders to continue reviewing the interface risk annually. I hope this is sufficient to close out this recommendation.

5. On 15 November 2024 LUL provided the following update:

Please find attached regarding the recommendation

Recommendation 3

The intent of this recommendation is to reduce the likelihood of a collision with another train due to a driver resetting tripcock equipment and proceeding without authority.

Chiltern Railways and London Underground Ltd (LUL) should jointly review the design of train protection equipment with the objective of reducing the risk associated with resetting of train protection equipment after activation due to a SPAD on LUL infrastructure. The review should consider:

- ways of discouraging the immediate resetting of train protection equipment following its activation (known as ‘reset and go’)
- the need for limiting the speed of train movements after train protection equipment has been activated (similar to SCAT); and
- ways of minimising unnecessary brake activations on non-LUL lines.

The review should take into account any planned upgrades of signalling equipment on LUL lines. Any additional measures found to be justified should be implemented

in accordance with a timebound plan agreed between Chiltern Railways and London Underground Ltd

ORR decision

6. Chiltern Railways and London Underground jointly reviewed different options for train protection equipment and identified a number of possible options. Chiltern concluded that for the existing Class 165 fleet, fitting TPWS was the most appropriate solution, but without DfT funding it was not supported by cost benefit analysis. Chiltern expect to replace the Class 165 fleet within 5 years and DfT want to include the decision on train protection over the Metropolitan Line as part of that process. Until then, tripcocks will be the method of train protection for Chiltern Railways rolling stock running on London Underground's Metropolitan line infrastructure.

7. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Chiltern Railways and London Underground have:

- taken the recommendation into consideration; and
- has taken action to close it.

Status: Closed.

Previously reported to RAIB

8. On 17 August 2022 ORR reported the following:

Protection for trains on the LU Metropolitan Line is being considered as part of the four lines modernisation (4LM) enhancements project between DfT, Network Rail and TfL.

Chiltern Railways and London Underground have identified several possible options for improving train protection for Chiltern trains running on LUL infrastructure. Provision of TPWS is the preferred option and funding is being discussed with DfT. Depending on what the timescale might be for installing TPWS, it may be decided to retain tripcocks and install Speed Control After Trip (SCAT) as an interim measure, with a changeover switch when moving between LUL and NR infrastructure.

We have asked Chiltern Railways to explain how the safety mitigation offered by TPWS is factored into the discussions with DfT over funding for fitment to TfL infrastructure over which Chiltern operate. If the discussions have solely been about performance, we have asked for clarity around the factoring in of safety benefits into the modelling, in addition to consideration of the "the capacity and timing benefits" we have told will be assessed.

Update

9. On 25 October 2024, Chiltern Railways provided the following additional information:

In 5 years, the Cl.165 will be almost 40 years old. The assumed life is 35 years, and Chiltern and the Rosco are strongly of the view that the train will be out of service by the end of the decade. Chiltern Railways is actively making the case for the Cl.165 to be retired from this route before that time. Should Angel Trains wish to – and the demand exists – it is possible that the train could be cascaded to another route for a very short period, in which case, the criterion to satisfy Recommendation 3 will not need to be met by any new operator.

Chiltern is working with Network Rail to prepare the business case to replace the Cl.165 and replace it with a battery-electric train. The Strategic Outline Business Case (SOBC) has been approved by the DfT and the Outline Business Case (OBC) has now received funding and we expect to submit that by Spring 2025, with the Final Business Case (FBC) being submitted and hopefully approved by Summer 2025. Experience tells us that any new train will take between 3 and 4 years to deploy into passenger service, thus, we are very confident that the Cl.165 will not be operating on our network within the 5 years envelope.

10. On 18 January 2025, Chiltern Railways provided the following additional information:

1. Train Protection Review

In February 2021 Chiltern & London Underground held a joint workshop to discuss the potential options for train protection for Chiltern operated trains operating over the Metropolitan Line. The Future Train Protection review for CRCL trains on LU Metropolitan Line recommended that the preferred train protection system in order of preference is:

1. *Enhanced TPWS with signal overspeed protection.*
2. *Enhanced TPWS without signal overspeed protection*
3. *Enhanced TPWS with signal overspeed protection and AWS.*
4. *Retain Tripcocks, implement SCAT and a Changeover Switch at boundaries*
5. *Retain Tripcocks, implement SCAT.*

The detailed report is available in Chiltern Engineering Report R394 (Attachment 1).

REPORT R394 - Future Train Protectio

R394 Appendix 1 - Metropolitan Line Tra

In summary, both LU and Chiltern recognise that a TPWS based solution represents the best train protection solution for the existing Chiltern trains operating over the Metropolitan Line but this is not funded at the present time.

2. Reset & Continue Risk for Tripcocks

In April 2021 Chiltern reviewed the risk associated with continuing with tripcock train protection on the Metropolitan Line, in particular the risk of another "reset & go" event without authority as occurred at Chalfont & Latimer and required by Recommendation 3.

This concluded that if LU/DfT/Chiltern agreed for tripcocks to be replaced by TPWS within a 5 year timescale that there was no compelling case to do anything further.

However, if tripcocks are retained in the long term that Chiltern should modify the trains to implement Speed Control After Trip (SCAT) on the fleet with a Train Protection Changeover Switch for use at the boundaries of LU infrastructure. This would implement a 3 minute duration speed restriction of 10mph following a tripcock trip event to bring the Chiltern fleet into compliance with LU standards.
The Changeover Switch would eliminate unnecessary brake activations on non-LU infrastructure by removing the tripcock from operating when on non-LU lines.
This analysis is detailed in Engineering report R386 (Attachment 2).


R386 SCAT ALARP Assessment - Issue 01 | R386 Appendix 1 - TSD-Analysis-Tool-v2 | R386 Appendix 2 - TSD-Analysis-Tool-v2 | R386 Appendix 3 - ALARP Assessment Cl | R386 Appendix 4 - ALARP Assessment Cl

In summary, if tripcocks are retained for the long term, then Chiltern will need to modify the system to reduce the risk of "Reset & Go" events through a Changeover Switch.

3. Current Metropolitan Line Improvements

The 4LM modernisation of the Metropolitan Line re-signals the infrastructure used by Chiltern but does not replace the train protection system. This remains as Tripcocks. LU is fitting Communications Based Train Control (CBTC) to their own fleet, which is a cab-based signalling & train protection system. The re-signalling does offer a number of improvements that will reduce the risk of major incidents such as SPAD alarms at all signals.
The retention of tripcocks perpetuates the speed limits for Chiltern Trains over the Metropolitan Line and the capacity of trains operating over it for the long-term.

4. Potential Metropolitan Line Improvements for Chiltern Services

In 2021 DfT agreed to fund a study to look at the journey time reduction on the Metropolitan Line route by means of replacing tripcocks with TPWS and other track improvements to raise line speeds up to 75mph and train lengths to 9-vehicles.
The resultant study is now published [Chiltern Enhancement Study Phase 1 Metropolitan Main Line, TPREF-20210407, January 2021] (Attachment 3).


Chiltern Enhancement Study P

The key results based on the analysis carried out are as follows:
• Removal of tripcocks will provide significant runtime benefit for non-stopping services on both the up and down lines due to the elimination of tripcock testers. They have no impact on stopping services.
• For stopping services at 75mph with track improvements, a runtime benefit of approximately 75 seconds on both the up and down lines is achievable.
• For non-stopping services at 75mph with track improvements, a runtime benefit of approximately 170 seconds is achievable on the down line and approximately 190 seconds on the up line.
• The runtime difference between 75mph with and without track improvement scenarios are minimal for stopping services. However, for non-stopping services, there is a runtime difference of approximately 17 seconds on the down line and 47 seconds on the up line.
• There is minimal impact on runtime due to the introduction of longer 9-car trains.

The cost of replacing tripcocks on the infrastructure with TPWS has been estimated at a minimum of £10 million. It is likely to be higher than this since these figures are based on Network Rail rates for the recent ATP project. The cost of the necessary track improvements required to achieve the journey time savings are not known.
Chiltern is currently developing a fleet strategy together with the DfT, as the Chiltern fleet will soon be the oldest on the mainline network. The strategy is likely to include replacement of the class 165 fleet with a new fleet within 5 years subject to a business case. The class 165 fleet operates the majority of trains on the Metropolitan Line route. The DfT is not willing to decide on the train protection strategy for Chiltern trains operating over the Metropolitan line independent of the fleet strategy. Therefore, Chiltern is unable to commit to the future train protection arrangements until the fleet strategy is decided.

5. Summary

The work to date shows that:

- *LU and Chiltern have a common view that a TPWS based solution is the best train protection option for Chiltern trains operating over the Metropolitan line with the existing fleet.*
- *If there is no funding for a TPWS based solution, then tripcocks will need to be retained. The retention of tripcocks in the long term would require Chiltern to implement SCAT and a Changeover Switch for use at the boundaries to mitigate "reset & go" without authority risk whilst minimising the impact of undesirable brake applications on non-LU infrastructure.*
- *Changing the train protection system unlocks the ability to make other improvements to the Chiltern service over the Metropolitan Line by enabling high line speeds. There is DfT interest to do this but no funding at present.*
- *Chiltern and DfT are developing a fleet strategy that is likely to replace the class 165 fleet that operates the majority of Metropolitan Line services. The fleet replacement is likely to occur within 5 years.*
- *The DfT want to include the decision on train protection over the Metropolitan Line, as part of the Chiltern fleet strategy.*
- *Chiltern believes it would be disproportionately unreasonable to modify our existing fleet (to install SCAT and a changeover switch) at the present time since a new train fleet is likely to replace the class 165 fleet within 5 years.*

Chiltern Railways believes that we have addressed Recommendation 3 within the limits of the funding constraints and decision making authority placed on us by the DfT. We will be able to finalise our plans with a timebound plan, once the fleet strategy is agreed with the DfT, in particular the replacement of the class 165 fleet.

Previously reported to RAIB

Recommendation 2

This recommendation is intended to improve the understanding and management of risk at the interface between the national rail network and London Underground operations.

Chiltern Railways and London Underground Ltd should jointly establish an effective process for the management of safety at the interfaces between their respective operations. This should include further assessment of the risk associated with operation of Chiltern Railways trains on London Underground Ltd's infrastructure and the implementation of any further risk controls deemed necessary.

ORR decision

1. The recommendation was addressed to London Underground and Chiltern Railways, although our expectation was London underground would lead the work. LUL, Chiltern, Network Rail and Freightliner are developing An interorganisational risk assessment process, known as a RACI (Responsible, Accountable, Consulted, Informed), that will then feed into each companies' SMS. Changes to each companies' SMS are expected to reflect the changes made to improve the process and collaboration between duty holders. The process will also be documented in the TfL risk standard.

2. LUL has confirmed that the workshops included discussion with front line operational staff (including Engineering Infrastructure Protection teams) and Trade Union representatives. The number of people able to attend the earlier workshops was limited by COVID restrictions, but LUL plan to invite more people to upcoming workshops. The last risk workshop is scheduled for 11 August. Future joint risk review arrangements will be discussed at that meeting.

3. The three main risks identified so far by the workshops are trespass, train striking a railway worker and confusion/communication issues between different operators. The group plans to run a Bow-Tie risk model for each risk. The outcome from the risk assessments will also be considered in the LU Quantified Risk Assessment (LUQRA).

4. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, London Underground Ltd and Chiltern Railways have:

- taken the recommendation into consideration; and
- is taking action to implement it

Status: Progressing. **ORR will advise RAIB when further information is available regarding actions being taken to address this recommendation.**

Information in support of ORR decision

5. On 16 November 2021 Chiltern Railways provided the following initial response:

Both parties recognise that there is an opportunity to improve our understanding of key safety interface risks between LU and Chiltern Railways. Whilst we share some of our risk assessments between our organisations, we recognise that there is scope to develop a better collaborative way of identifying, assessing and documenting the key safety interface risks.

To address this, we have scheduled an all day HAZOP/HAZID workshop between Chiltern and LU that will be taking place on 20th January 2022. We have jointly agreed that the purpose of this workshop is to identify hazards/risks related to engineering and operational interfaces. This workshop will be facilitated by the TfL SHE team, with full involvement of Chiltern Railways and LU operational and engineering colleagues. Once we have documented the hazards and risks, we will identify the controls we have in place to manage these risks already, and identify any gaps. Where we have identified any risks where we do not have sufficient control measures in place to manage the risk, the parties will take action to mitigate those risks.

6. On 18 November 2021 London Underground Ltd provided the following initial response:

We recognise that there is an opportunity to improve our understanding of key safety interface risks between LU operations and Chiltern Railways. Whilst we share some of our risk assessments between our organisations, we recognise that there is scope to develop a better collaborative way of identifying, assessing and documenting the key safety interface risks.

To address this, we will

1. establish an effective process for the management of safety at the interfaces between Chiltern Railways and LU We will hold a joint LU-Chiltern Railways hazard identification workshop on 20 January 2022. We have agreed with Chiltern Railways that the purpose of this workshop is to identify hazards/risk related to engineering interfaces and operational interfaces. This workshop will be facilitated by the TfL Safety, Health & Environment (SHE) team, with full involvement of Chiltern Railways and LU operational and engineering colleagues. Once we have documented the hazards and risks, we will identify the controls we have in place to manage these risks already and identify any gaps. Where we have identified any risks where we do not have control measures in place to manage the risk, we will work closely with Chiltern Railways and take action to mitigate those risks. After we carry out the workshop, we will write to inform you of our plan on next steps.

2. identify and manage safety risk where other operators use our infrastructure (and vice versa) Following the incident in June 2020, and prior to the RAIB report, the TfL Risk & Assurance team carried out a review of operational interfaces to ensure that we understood the safety risks associated with other operators using our infrastructure, and vice versa. This review was commissioned by the Managing Director, LU and TfL Engineering and led by the TfL Chief Engineer and Head of SHE London Underground.

This review considered LU's approach where LU operates on Network Rail (NR) infrastructure and where other train operating companies and freight operating companies operate on LU infrastructure. The review also includes consideration of safety risks associated at boundaries between infrastructure managers, as well as shared sites. The review found that there were opportunities to improve LU's visibility of safety risks at interfaces with third parties, and with the assurance regime associated with these key safety interface risks. The review recognised that such assurance would need to be two way, proportionate to risk, focussed on control compatibility and not overstep the statutory obligations of each organisation.

We (LU) have taken a number of actions based on that review and the learnings from the LU-Chiltern Railways hazard identification workshop mentioned above will be incorporated into our network approach to identifying, assessing, documenting and managing safety risks at interfaces with third parties. We are happy to share more detail with you.

We recognise that there is already good practice available in other parts of the UK transport sector and, following the review mentioned above, we are discussing how we learn from those assurance processes and, where possible, aligns our approach with that taken by Network Rail and other operating companies. We are in discussion with the RSSB and will meet them on 26 November 2021 to discuss this further.

7. On 6 April 2022 LUL provided the following update:

You asked about the actions which have emerged from our review of risks associated with LU operating on Network Rail infrastructure and where other TOCs and FOCs operating on LUL infrastructure. You also asked about the actions that came out of that review and will be discussed at the hazard identification workshop on 20 January 2022.

The first LU-Chiltern risk review was held on 20 January 2022. This was attended by the TfL Engineering and Safety, Health & Environment team as well as the LU operations team. We also had representatives from Chiltern Railways, Network Rail and Freightliner. We agreed that the risk assessment will be based on a route basis, specifically:

- *West Hampstead to Harrow-on-the Hill*
- *Harrow-on-the Hill to Rickmansworth*
- *Rickmansworth to Chalfont & Latimer*
- *Chalfont & Latimer to Mantleswood (NR boundary)*

A Responsible, Accountable, Consulted, Informed (RACI) document has been drafted for this piece of work. This RACI will cover TfL, Chiltern Railways, Network Rail and Freightliner. The final RACI document will be included in the relevant risk assessments.

We are carrying out a series of workshops which will involve HAZID/HAZOP risk reviews. The first workshop was on 22 February where the CRL and LU teams set

the baseline and commitment for the workshop and it included introductions, rules, overview of the incident and expectations as to the complexity of the task and the associated timescale needed to produce a quality risk assessment. This led onto discussing and agreeing to the Terms of Reference, reviewing the RACI and providing a risk matrix that would enable the group to assess the risk rating. Three groups were established which helped us understand each of the hazardous events and risk causes. We identified a first list of hazards to be generated. Controls were discussed for LU, Chiltern Railways, Network Rail and Freightliner and a risk rating was applied to each risk.

The session also generated a number of queries and actions e.g. ensuring that there is clarity about technical wording across different organisations.

We held another HAZID/HAZOP risk review workshop on 10 March and have a final workshop scheduled for 12 May. We are happy to share the results of these workshops with you once they have concluded.

We are in the process of ensuring that risks to the safe operation of the LU train service are included in our risk assessment and management framework. We will include this information in our risk assessments in TfL's risk assessment database (SHEERA) and in the LU QRA and we are updating our risk assessment training to ensure that those who have responsibilities for assessing these risks have the competence to do so.

Where risks have been rated as 'high' in the workshops mentioned above, we will produce separate Bow-Tie risk models for these risks. This will allow us to further investigate the risks. The output from the Bow-Tie risk models will be included in the LUQRA Third Party model.

We will continue to update you on progress of this work. The final HAZID/HAZOP risk review workshop will be held in May. We will write to you in June to update you on the conclusions of the workshops.

We aim that the revised risk assessment will be available by the end of August 2022. We will schedule reviews in line with sharing of assurance activities (the details of which are to be agreed), updating in line with 4LM changes, rolling stock changes, PTI risk assessments, etc., so that we maintain suitable and sufficient risk assessments and appropriate discussions with third parties about risk into the future.

Recommendation 2: discussions with RSSB *You also asked about the outcome of our meeting with the RSSB.*

We met the RSSB on 26 November to discuss best practice in managing interface risks. Both parties agreed it would be beneficial to hold further meetings to discuss opportunities for collaborative working on matters of interest including, but not limited to, NR/TOC/LU assurance.

The follow up meeting was held on 21 February 2022 and was focused on giving and receiving safety assurance, to/ from other duty holders. Key areas of discussion included technical assurance, operational assurance and risk assessment. Further, TfL and RSSB held a joint workshop to identify what hazard information needs to be shared with other duty-holders for each asset class, and what form that might take on 10 March. Discussions continue.

This collegiate approach reflects TfL's commitment to address the issues raised in the investigation report by engaging different stakeholders across the industry. It also aligns with the RSSB strategy 'Leading Health and Safety on Britain's Railways', which promotes collaborative working between stakeholders in order to reduce health and safety risks.

8. On 10 May 2022 LUL provided the following further update in response to questions ORR posed to them:

- **Recommendation 2 states that Chiltern Railways and London Underground Ltd should jointly establish an effective process for the management of safety at the interfaces between their respective operations. Your update refers to the RACI; will this be the documented process?**

  LUL response: *The collective RACI will form a part of the documented process within TfL's Risk Standard. Chiltern, Network Rail and Freightliner will document the relevant elements of the RACI as part of their SHE Management Systems.*

- **Once the risk assessment workshops have been completed, how will this feed into process?**

  LUL response: *The completion of the workshops will firstly enable the interorganisational Risk Assessment process to be updated within the TfL Risk Standard (and relevant elements of the process in the Chiltern, Network Rail and Freightliner risk assessments). This will reflect the changes made to improve the process and collaboration. Secondly, by having a workable template for TfL to work with other third Parties, our next step is to develop a programme to review and set up workshops with the other stakeholders where we have combined or overlap of risks.*

- **Can you confirm if the HAZID/HAZOP workshops included staff reps and those in operational roles that the risks being assessed are relevant to?**

  LUL response: *I can confirm that the workshops held so far have had both operational and TU engagement. Due to the restriction on numbers (as this work started while there were still some COVID restrictions in place) only a small number of TU Health & Safety Representatives were part of the earlier workshops. Invitations to further sessions will be extended out to more groups such as TUs, our Engineering Infrastructure Protection teams and others as appropriate.*

9. On 19 July 2022 LUL provided the following update:

As noted in my last response (10 May 2022), we have organised a series of workshops which will enable us and our key partners (Chiltern, Network Rail and Freightliner) to develop a clear inter-organisational Risk Assessment process. This process will be documented in the TfL Risk Standard.

You asked for an update on the workshops. I can confirm that the risk workshops are continuing. We were due to hold the last workshop last week. However, the key facilitator was unwell. This session has now been re-scheduled for 11 August.

The group has completed the risk assessment for the following routes:

Route 1 - West Hampstead to Harrow-on-the Hill (NR/LU)
Route 2 - Harrow-on-the Hill to Rickmansworth
Route 3 - Rickmansworth to Chalfont & Latimer

The group is currently working on Route 4 – Metropolitan line between Chalfont & Latimer and Pipers Wood (the LU/NR boundary). Following that, we will start the Central Line risk assessment to reflect the Chiltern Trains interface on the line. This is additional to the work that we agreed at the start of the workshops, but we considered it important that we include this in this review.

So far, the workshops have identified three main risks:

- *Trespass*
- *Train striking a railway worker*
- *Confusion / communication issues between different operators*

The group plans to undertake a deep dive analysis (using a Bow-Tie risk models) for these risks to better understand these risks.

We have also ensured the outcomes from the risk assessments are considered in the LU Quantified Risk Assessment. This will ensure that the risks are fully controlled and quantified.

The frequency of the risk review will be discussed at the August Meeting. This will ensure that changes to risk are considered between the various parties and documented and managed appropriately. We will also start to consider our programme to review and set up workshops with the other stakeholders where we have combined or overlap of risks.

Recommendation 3

The intent of this recommendation is to reduce the likelihood of a collision with another train due to a driver resetting tripcock equipment and proceeding without authority.

Chiltern Railways and London Underground Ltd (LUL) should jointly review the design of train protection equipment with the objective of reducing the risk associated with resetting of train protection equipment after activation due to a SPAD on LUL infrastructure. The review should consider:

- ways of discouraging the immediate resetting of train protection equipment following its activation (known as ‘reset and go’)
- the need for limiting the speed of train movements after train protection equipment has been activated (similar to SCAT); and
- ways of minimising unnecessary brake activations on non-LUL lines.

The review should take into account any planned upgrades of signalling equipment on LUL lines. Any additional measures found to be justified should be implemented in accordance with a timebound plan agreed between Chiltern Railways and London Underground Ltd

ORR decision

10. Protection for trains on the LU Metropolitan Line is being considered as part of the four lines modernisation (4LM) enhancements project between DfT, Network Rail and TfL.

11. Chiltern Railways and London Underground have identified several possible options for improving train protection for Chiltern trains running on LUL infrastructure. Provision of TPWS is the preferred option and funding is being discussed with DfT. Depending on what the timescale might be for installing TPWS, it may be decided to retain tripcocks and install SCAT as an interim measure, with a changeover switch when moving between LUL and NR infrastructure.

12. We have asked Chiltern Railways to explain how the safety mitigation offered by TPWS is factored into the discussions with DfT over funding for fitment to TfL infrastructure over which Chiltern operate. If the discussions have solely been about performance, we have asked for clarity around the factoring in of safety benefits into the modelling, in addition to consideration of the “the capacity and timing benefits” we have told will be assessed.

13. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Chiltern Railways and London Underground have:

- taken the recommendation into consideration; and
- are taking action to implement it

Status: Progressing. **ORR will advise RAIB when further information is available regarding actions being taken to address this recommendation.**

Information in support of ORR decision

14. On 16 November 2021 Chiltern Railways provided the following initial response:

In February 2021, Chiltern Railways convened a workshop with London Underground to explore train protection of Chiltern’s fleet operating over the LU infrastructure. This was, in part, arranged as a result of both parties recognising the limitations and differences of the protection system for Chiltern trains on the LU network compared to the national network and linked to the limited scope of the 4LM

project in this field, but also in response to the RAIB's recommendation following the Chalfont incident.

The output of that workshop is attached here (see the two R394 documents) and offered up a number of potential options:

1) *Do Nothing (Retain Tripcocks);*
2) *Do Nothing (Retain Tripcocks + Introduce SCAT);*
3) *Do Nothing (Retain Tripcocks + Introduce SCAT + Changeover Switch);*
4a) *Enhanced TPWS (with overspeed protection on each signal);*
4b) *Enhanced TPWS (without overspeed protection on each signal);*
5) *Enhanced TPWS (with overspeed protection on each signal) + AWS;*
6) *Radio Based Limited Supervision (Under development);*
7) *CBTC with Changeover at boundary on Chiltern Fleet;*
8) *ETCS with STM for CBTC.*

Each of the options was considered against a number of criteria including, but not limited to: expected life of system; estimated capital and operational cost; benefits – speed increase and/or capacity improvement; training requirements – for Drivers, Signallers & Maintainers; estimated time to implement; legislation and approvals. At this stage, costs associated with each option were only loosely estimated.

The workshop concluded that the following options would be progressed, in the order of preference shown below:

1. *Option 4a - Enhanced TPWS with signal overspeed protection;*
2. *Option 4b - Enhanced TPWS without signal overspeed protection;*
3. *Option 5 - Enhanced TPWS with signal overspeed protection and AWS;*
4. *Option 3 Retain Tripcocks, implement SCAT and a Changeover Switch at boundaries;*
5. *Option 2 Retain Tripcocks, implement SCAT.*

Following the workshop, a series of meetings with Chiltern Railways, Network Rail, Department for Transport and London Underground were organised to consider the output from the workshop. The stakeholders agreed, as with the report outlined above, that provision of TPWS was the preferred option. It was also agreed that it

was not feasible to incorporate provision of TPWS into the 4LM CBTC scope because the 4LM physical design is complete and installation has commenced.

However, the provision of TPWS in any form is reliant on DfT funding. Chiltern has been in discussion with the DfT to establish how funding opportunities could be determined, and as a result, a further piece of modelling has been commissioned, through DfT funding, to assess the capacity and timing benefits that could be attained if TPWS were to replace trainstops. The timeline for this workstream is attached and shows a scheduled completion date of May 2022.

In the interim, a number of controls have been put in place to manage this risk:

- *A Met line Train Regulation Policy review between LU and Chiltern Railways was completed in April 2021 (see attachment); this review was undertaken to agree the requirements of managing the train regulation safely at key locations during train service delays. The reviewed policy has been briefed out to relevant stakeholders at LU and CRCL.*

- *In April 2021 Chiltern and LU participated in a table top emergency exercise to rehearse our joint response to major operational event. Numerous issues were highlighted for further follow up and resolution; these are being tracked through our joint periodic meeting.*

- *Post incident welfare management: LU and CRCL have reviewed post incident management regarding operational/welfare processes for the staff involved; LU agreed to align their understanding with CRCL requirements regarding the monitoring of the staff involved and associated actions post incident. The relevant stakeholders have been briefed (see attachment).*

- *Chiltern Railways drivers were re-briefed regarding the need to seek authority to proceed from the signaller or line controller following activation of the tripcock; initially through traincrew notice after the immediate aftermath of the incident, followed by a strengthened instructions in the reviewed Chiltern Railways LU Instructions document and Train Driver Standards & Guidance Issue 2 document. Furthermore, the incident at JT6 was included in the recent driver safety briefing (including the FFCCTV footage from the incident itself).*

- *Tripcock reset warning labels are now provided on all Chiltern DMU fleet to remind train drivers of the appropriate instructions in the event of a tripcock activation/operation.*

- *The LU Rule Book team is currently reviewing, with LU operational staff, whether updates could be made to the LU Rule Books to make the actions required by a driver following a Tripcock Activation clearer, <u>irrespective</u> of how the Tripcock Activation was initiated (this will remove the ambiguity regarding trips caused by high ballasts, animals etc). Should any changes be made, these will be communicated with relevant LU operational staff and Chiltern Railways drivers.*

Should DfT fund enhanced TPWS, we will manage the risk, using the operational controls set out above, until the enhanced TPWS is in place for all Chiltern Railways rolling stock operating on LU infrastructure. If a decision is made by DfT not to fund enhanced TPWS, we would continue to manage this risk as set out above and explore the feasibility of option 2 and 3 outlined above (ie the retention of tripcock but implement SCAT). Those enhanced mitigation actions will become standard operating procedures and arrangements for Chiltern Railways and LU.

15. On 1 February 2022 Chiltern Railways provided the following update:
The joint project with DFT, NR and TFL to look at enhancements (modelling the potential operation of faster, longer trains on the new 4LM LUL infrastructure with tripcocks removed and replaced with TPWS or alternative) is running approximately 2 months behind schedule.

As per the attached schedule the review of the report for phase 1 (modelling in base infrastructure) was due to be undertaken by the end of November '21. It is now expected that this will be received in early February 2022 following which Chiltern will have a session with TFL to review the output.

The plan is, that once complete, business case options for replacing tripcocks with the DFT can be considered. This will need to include all aspects of safety, lifespan of the tripcock system and the customer benefits of extra capacity and faster trains.

With regards to your query about the differing options and associated risk mitigations, as outlined above, the work we are doing with LU is currently focussed on capacity and performance benefits of line speed increase. This would be enabled by a change to the train protection arrangements. The work in report R394 broadly considered the risk reduction benefits from the various options (see Appendices attached). However we were not able to quantify these because there is no risk model that shows the risk reduction for each option on LU infrastructure that we are aware of.

However we have done some work on the risk benefits of SCAT and a changeover switch <u>in conjunction with LU</u>. This actually used TPWS data from 10 years ago following the debate on "Reset & Continue" to estimate the benefit of SCAT. The report (R386) is attached and shows that the benefit of SCAT with a changeover switch depends on the expected remaining life of tripcocks. If Chiltern/DfT/LU can agree that there is a case to adopt TPWS within the next 5-10 years, then there is no case for SCAT. If we have to live with tripcocks for a period over say 10 years, then we will need to seek funding to install SCAT with a changeover switch since this then has a risk reduction case.

16. On 18 November 2021 London Underground Ltd provided the following initial response:

The joint review has been completed.

Earlier this year (February 2021), Chiltern Railways held a workshop with LU to consider the train protection arrangements relating to Chiltern Railways operating over LU infrastructure. The output of that workshop was a report which provides

options for train protection systems (Appendix 1). The report sets out the options which should be further considered, in order of preference:

1. *Option 4a - Enhanced TPWS with signal overspeed protection,*
2. *Option 4b - Enhanced TPWS without signal overspeed protection,*
3. *Option 5 - Enhanced TPWS with signal overspeed protection and AWS,*
4. *Option 3 Retain tripcocks, implement SCAT and a Changeover Switch at boundaries, and*
5. *Option 2 Retain tripcocks, implement SCAT.*

The review took 4LM re-signalling plans into account. We will consider how this risk is managed when the new signalling system is introduced on this section of the Metropolitan line and ensure that the risk associated with resetting of train protection equipment after activation due to a SPAD on LUL infrastructure is managed effectively.

The decision on next steps will be made by Chiltern Railways and the Department for Transport. Following the workshop, a series of meetings were organised with Chiltern Railways, Network Rail, Department for Transport and LU to consider the output from the workshop, amongst other things. It was agreed that provision of TPWS was the preferred option (concurring with the report). It was also agreed that it was not feasible to incorporate provision of TPWS into the LU 4LM CBTC scope because the 4LM physical design is complete and installation has commenced. The decision on funding for enhanced TPWS will be made by the Department for Transport (DfT). Chiltern Railways is discussing this with the DfT.

While the decision making and next steps in implementation rest with Chiltern and the Department for Transport, LU agreed to undertake an assessment of the performance impact of CBTC on Chiltern Trains. The assessment is underway and once complete will allow further meaningful discussions with Department for Transport regarding funding for provision of TPWS. We plan to complete the LU assessment by May 2022.

Until the point at which DfT can fund enhanced TPWS, Chiltern Railways will manage the risk, using the operational controls set out below, until the enhanced TPWS is in place for all Chiltern Railways rolling stock operating on LU infrastructure. If a decision is made by DfT not to fund enhanced TPWS, Chiltern Railways would continue to manage this risk as set out above. In that scenario, those enhanced mitigation actions will become standard operating procedures and arrangements for Chiltern Railways and LU. LU will consider what assurances will be appropriate to ensuring that this safety risk is being managed effectively, with input from Chiltern Railways.

In the interim, a number of controls have been put in place to manage this risk. Some are owned entirely by Chiltern Railways, some are jointly delivered and others rely on LU input.

Joint Chiltern Railways-LU actions:

- *LU and Chiltern Railways completed a Metropolitan line Train Regulation*

Policy review between LU and Chiltern Railways in April 2021. This review was undertaken to agree the requirements of managing the train regulation safely at key locations during train service delays. The reviewed policy has been briefed out to relevant stakeholders at LU and Chiltern Railways.

- *In April 2021, Chiltern Railways and LU participated in a tabletop emergency exercise to rehearse our joint response to major operational event. This identified a number of issues for further follow up and resolution. These are being actioned and tracked through the joint LU Metropolitan line-Chiltern Railways monthly meeting.*
- *LU and Chiltern Railways have reviewed post incident management regarding operational/welfare processes for the staff involved in the incident. We are aligning requirements regarding the monitoring of the staff involved and associated actions post incident.*

Chiltern Railways led actions:

- *Chiltern Railways drivers were re-briefed regarding the need to seek authority to proceed from the signaller or line controller following activation of the tripcock, This was done initially through traincrew notice after the incident and followed by a strengthened instructions in the reviewed Chiltern Railways LU Instructions document and Train Driver Standards & Guidance Issue 2 document. The incident at JT6 was included in the recent driver safety briefing (including the CCTV footage from the incident itself).*
- *Tripcock reset warning labels are now provided on Chiltern fleet to remind train drivers of the appropriate instructions in the event of a tripcock activation/operation.*

LU-led actions:

- *The LU Rule Book team is currently reviewing, with LU operational staff, whether updates could be made to the LU Rule Books to make the actions required by a driver following a tripcock activation clearer, irrespective of how the tripcock activation was initiated (this will remove the ambiguity regarding trips caused by high ballasts, animals, etc.). Should any changes be made, these will be communicated with relevant LU operational staff and Chiltern Railways drivers.*

The RAIB report also recommended that LU should consider if there is a risk of a collision with another train due to a driver resetting tripcock equipment and proceeding without authority on other LU lines. Our Engineering team has confirmed that this risk is unlikely to be realised on other rolling stock. This is explained further in the following paragraphs.

All our passenger stock operate under tripcock protection and are fitted with Speed Control After Tripping control. It is not possible to override or circumvent this without significant technical knowledge and access to equipment only accessible to technical staff.

We operate with other passenger rolling stock on the Bakerloo Line (Queens Park to Harrow & Wealdstone), Richmond Branch of the District Line (Gunnersbury to

Richmond) and Wimbledon Branch of the District Line (East Putney to Wimbledon). Each of these lines have TPWS fitted. Most recently the Richmond branch was fitted which was funded by Arriva Rail. The areas with TPWS are maintained by Network Rail.

We have a range of controls in place to manage this risk on engineering trains operating on our network:

- *Battery Locomotives, Plasser Tamping Machines and the Track Recording Vehicle do not have Speed Control After Tripping control. However, they are normally operated by two people which means that the risk of a train operator resetting tripcock equipment and proceeding without authority is less than in a vehicle operated by a single operator. Where we plan to replace the battery locomotive trains or tampers, we will consider options for further managing this risk.*
- *Rail Adhesion trains: the Railhead Treatment Train and D-stock Rail Adhesion Trains operating on the Metropolitan line have Speed Control After Tripping control*
  The Central line Sandite trains don't have Speed Control After Tripping control, but, as with the battery locomotives, tamping machine and Track Recording Vehicle, they are operated by two people.
- *Rail reprofiling machines: none of the third-party rail grinding machines have Speed Control After Tripping. These all have an operator and LU pilot when operating as signalled trains (which is only on tripcock sections of the network,) since the provider doesn't have route knowledge.*
- *Other Operators using LU Infrastructure: South Western Railway trains do not have Speed Control After Tripping. They operate with TPWS signalling protection. We will discuss the recommendations from the RAIB report and this specific risk with them to ensure that we are managing this risk effectively*

As noted above, our operational review of interfaces to ensure that we understood the safety risks associated with other operators using our infrastructure (and vice versa) has identified areas where we could improve how we manage safety risk. We are addressing the issues identified and monitoring deliver of those actions at the London Underground Executive meetings.

If you wish to discuss our approach to managing this risk on other lines in further detail, I would be happy to make arrangements for you to meet our relevant experts.

17. On 6 April 2022 LUL provided the following update:

You asked for confirmation that the LUL/CRL assessment of train protection arrangements will be completed by May 2022.

The performance assessment currently being undertaken in three phases consists of: -

- *Phase 1 of the study considers the likely runtime improvements associated with the speed uplifts (above 60 mph).*

• Phase 2 considers the impact of the changes on capacity, and the consequent timetable planning rules for passenger trains (Metropolitan and Chiltern).

• Phase 3 considers the use of Rail Head Treatment Trains, and the planning rules relevant to their use.

The performance assessment was due for completion in May 2022 but due to delays in starting these works, it is now due for completion in September 2022. TfL RESTRICTED

The outcome of the assessment will allow the DfT / LU to choose which train protection solution to provide noting that a TPWS solution would require funding from the DfT.

The assessment of train protection systems where risk was considered was undertaken as part of a workshop with Chiltern Railways Limited (CRL). The assessment took place in February 2021 with the report detailing the outcome published in March 2021. This report was provided to you in November 2021.

The results of the assessment of train protection systems were, in order of preference (but not considering funding): -

Option 4a - Enhanced TPWS with signal overspeed protection.

Option 4b - Enhanced TPWS without signal overspeed protection

Option 5 - Enhanced TPWS with signal overspeed protection and AWS.

Option 3 - Retain Tripcocks, implement SCAT and a Changeover Switch at boundaries

Option 2 - Retain Tripcocks, implement SCAT.

The outcome of the performance analysis will determine whether the TPWS can be funded by the DfT.

You also asked for clarification on the level of risk mitigation provided by each of the options and how we prioritised these options.

The assessment of train protection systems workshop in February 2021 did not look at prioritising the options in terms of risk reduction alone but an element of the review considered the likelihood of a "Repeat of Chalfont & Latimer SPAD". Had risk reduction alone been the driving factor an option providing Automatic Train Operation, (i.e., fit CRL fleet with CBTC) would have been chosen but those options were discounted based on grossly disproportionate costs to CRL and the age of the rolling stock.

18. On 19 July 2022 LUL provided the following update:

You asked how the safety mitigation offered by TPWS is factored into the discussions with DfT over funding.

As noted in my letter to you in November 2021, the decision on next steps in relation to safety mitigation will be made by Chiltern Railways and the Department for Transport. LU agreed to undertake an assessment of the performance improvements attainable by higher speed running for Chiltern Trains over the

Metropolitan main line. The assessment is underway and once complete will allow further meaningful discussions between Chiltern Railways and the Department for Transport regarding funding for provision of TPWS. We plan to complete the LU assessment by November 2022.

The decision making and next steps in implementation rest with Chiltern Railways and the Department for Transport. They will be able to share with you how the safety mitigation offered by TPWS is factored into the discussions with DfT over funding for fitment to TfL infrastructure over which Chiltern operate.