

Oliver Stewart
RAIB Recommendation Handling Manager



30 January 2023

Mr Andy Lewis
Deputy Chief Inspector of Rail Accidents

Dear Andy,

RAIB Report: Fatal accident at London Underground Waterloo station on 26 May 2020

I write to provide an update¹ on the action taken in respect of recommendations 1 & 2 addressed to ORR in the above report, published on 7 September 2021.

The annex to this letter provides details of actions taken in response to the recommendations and the status decided by ORR. The status of recommendations 1 & 2 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 on 31 January 2023.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Oliver Stewart', written in a cursive style.

Oliver Stewart

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

Recommendation 1

The interface between platform and train (PTI) presents various risks to passengers and, although most are found on all platforms, some platforms present additional or enhanced risk because of specific features such as track curvature creating a significantly higher risk of a person falling below the platform level. The intent of this recommendation is to recognise and assess location-specific risks so they can be properly managed. Reference to RSSB guidance on risk management at the platform-train interface is likely to assist implementation of this recommendation.

London Underground Limited should carry out and document a suitable risk assessment of each tightly curved platform on its network, and any other locations at which passengers are considered to be at particularly high risk due to characteristics of the platform. In each case, this should include consideration of:

- the platform-train gap at all positions along the vehicle body;
- the influence of low, normal and high passenger numbers;
- the train operator's visibility of the PTI during despatch;
- the safety of vulnerable passengers;
- opportunities to expand the use of incident data to improve risk assessments;
- potential engineering measures to prevent access to the gap, to reduce the gap, and/or to detect the presence of people in the gap; and
- non-engineering measures to reduce the likelihood of people falling into the gap and to mitigate the consequences if they do so.

London Underground Limited should develop a timebound programme for the implementation of any additional control measures that are justified

ORR decision

1. London Underground Ltd (LUL) has done detailed risk assessments, engineering assessments and cost benefit analysis for 11 of the 12 stations that have platforms identified as high risk. Infrastructure changes have been proposed at 11 platforms across these stations. The infrastructure proposals have been incorporated into the 2023/24 business plan and the funding for these changes approved. These proposed changes will be made over the next 5 years and will be prioritised from a risk perspective with the most significant stations for numbers of fall down the gap incidents being addressed first. These changes will include a variety of improvements to the infrastructure including the installation of pressure sensors at some platforms.

2. Baker Street is the remaining station with platforms considered to be high risk. Infrastructure changes at Baker Street are being considered as part of a separate project, which is being progressed.

3. ORR has reviewed risk assessments at 8 high risk platforms as part of our inspection programme and found risk assessments had been amended to make them more platform specific.

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

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

Status: Closed.

Previously reported to RAIB

5. On 21 October 2022 ORR reported the following:

At the time of the incident, London Underground Ltd (LUL) did not have a definition of a tightly curved platform or those where passengers are considered to be at a higher risk due to the characteristics of the platform. LUL did not consider its existing classification of Cat A platforms (those which required the assistance of platform staff to despatch the train should the driver's CCTV cameras not be working) to be sufficiently well developed to identify those platforms the recommendation was aimed at.

LUL have since agreed a definition of a tightly curved platform and has assessed the 361 Cat A platforms that may fall into this category, of which there are 21. Incident data for those platforms identified as tightly curved will then be reviewed. Work to identify tightly curved platforms was completed on the 31 August 2022 and the review of incident data at these platforms was completed at the end of September 2022. Following the completion of this, LUL have a clear understanding of the scale of work that will result from this and a timebound plan will be developed. LUL expect that this will be in place by the end of October 2022.

In considering a definition for 'other locations that are higher risk', LUL targeted those platforms with the highest levels of falls between train and platform. At the end of August LU had completed a detailed quantitative risk assessment, engineering assessment and cost benefit analysis of 11 platforms which have highest number of PTI falls between train and platform (56% of all PTI falls on the network). Infrastructure changes have been proposed at some of these stations following these assessments. Baker Street, platform 2, is subject to a separate project so a detailed risk assessment will not be undertaken here at present (further detail included in the evidence provided by LUL).

With regards to PTI incidents, LUL has targeted the three stations per line with highest number of all PTI incidents and have reviewed the trains and stations-based customer risk assessments (CRAs) at these stations to make them more specific and to ensure that they include:

- Specific PTI measures which are relevant to these stations so the CRAs provide clearer information on the significant contributory factors that might lead to a fall between the train and the platform and the controls in place to manage this risk
- Greater detail on specific areas of higher risk that might be relevant to a PTI incident at these stations / platforms
- Provide further detail on the assessment of the different specific risks that might arise in relation to PTI incidents and greater detail about contributory factors, including customers who are travelling whilst intoxicated, vulnerable customers, etc.
- Further information on the likelihood of a fall down the gap which informed the risk rating in our CRAs
- Greater detail on the clarity of the potential incident severity for each risk.

LUL has considered all PTI risk, not just falls between train and platform.

ORR consider the action plan described by LUL to be credible. We note that some of the remedial engineering work, such as track realignment, is significant and may be difficult to do due to budgetary pressures.

Update

6. On 14 December 2022 provided the following update:

Customer Risk Assessments

The customer risk assessments (CRAs) for the top 3 stations per line (which includes the 12 stations we have identified as most significant for fall down the gap incidents) were reviewed and completed by the end of September 2021. These now include:

- *Greater detail on specific areas of higher risk that might be relevant to a PTI incident at these stations / platforms*
- *Specific PTI measures relevant to the stations we see the highest number of PTI incidents so they provide clearer information in the significant contributory factors that might lead to a fall between the train and the platform*
- *Provide further detail on the assessment of the different specific risks that might arise in relation to PTI incidents and greater detail about contributory factors, including customers who are travelling whilst intoxicated, vulnerable customers etc*
- *Further information on the likelihood of a fall down the gap which informed the risk rating in our CRAs*
- *Provide greater detail on the clarity of the potential incident severity for each risk*
- *Have been restructured to ensure that the order of controls followed the hierarchy of controls, and*

- *Ensure that there is greater consistency between the trains and station CRAs*
- *Consideration was given, as part of these reviews, to any different risks associated with differing customer numbers and areas that PTI incidents are most likely to occur e.g. at cross passages and where gaps are largest.*
- *Our customer risk assessment guidance also requires that as part of the risk assessment process, previous incident data must be considered in order to correctly assess the risk.*

Site visits to the top 12 stations for fall down the gap incidents were also completed in September 2021. Following these a number of recommendations were made including colleague briefings, reviews of signage and public address announcements and at some platforms potential improvements to lighting and white & yellow lines. These improvements have been feasibility assessed and implemented where possible.

We have also introduced standardised line-based processes for station colleagues checking OPO equipment on stations and a consistent method for train operators 'scanning' the OPO as part of their despatch procedures.

*We have held 3 PTI summits to cover the Customer Experience elements of this (customer behaviour, signage, posters, P.A.s etc). They have involved station colleagues from the top 12 stations for fall down the gap incidents, the Safety Health & Environment Team and the Customer Experience Team. The purpose of them was to understand the main customer behaviours that contribute to PTI incidents at these stations and identify actions for influencing these behaviours in a positive way across the whole customer journey to reduce incident potential. Potential suggestions from the summits are in the process of being collated and will be reviewed as a whole. Quick wins, medium and longer term solutions will then be identified and a timebound plan implemented to take these forward. (*Note: this is not part of the RAIB recommendation specifically but part of the wider ongoing PTI work that is being undertaken across LUL).*

Detailed Risk Assessments for top 12 fall down the gap stations

Detailed risk assessments, engineering assessments and cost benefit analysis have been completed for 11 of the 12 stations that have platforms which we have defined as high risk (based on the number of fall down the gap incidents). Infrastructure changes have been proposed at 11 platforms across these stations. The infrastructure proposals have been incorporated into the 2023/24 business plan and the funding for these changes approved. These proposed changes are planned to be made over the next 5 years and will be prioritised from a risk perspective with the most significant stations for numbers of fall down the gap incidents being addressed first.

A detailed risk assessment, engineering assessment and cost benefit analysis has not been undertaken for Baker Street as this is subject to a separate project which is being progressed. This is in the process of being developed to the concept design stage with options currently being evaluated.

We are also doing some further analysis on stations which see higher numbers of PTI incidents than we would expect considering customer numbers. Once this analysis

has been completed we will better understand the scale of the issue and the work which is then required and actions will be built into our network PTI plan.

With respect to the train operators visibility of the PTI, we are already aware of the platforms across the network where there may be issues when platforms are crowded. Where this is the case the OPO has or is in the process of being upgraded. Our programme to upgrade the OPOs for a number of stations across the network also continues. To date 39 platforms have been upgraded and the remaining 56 platforms are going to tender towards the end of 2022 after which contracts will be awarded and design works will start in early 2023. In the interim we have clear rules on the actions to be taken by train operators where this is the case (station colleagues provide assisted despatch) and all train operators are trained and competent to recognise when this is necessary.

Tightly Curved Platforms

The TfL Engineering Team have defined 'tightly curved platforms'. The 12 stations referenced above fall within this definition. In addition to these we have reviewed all of our Category A platforms (which are most likely to be tightly curved) against this definition and identified that there are 20 additional platforms that meet the definition. We have reviewed the incident data at these platforms and this review has identified that there are no issues with high numbers of PTI incidents over the last 4 years. Due to the low incident numbers we consider that a detailed risk assessment, engineering assessment and cost benefit analysis is not necessary for these platforms. Instead, the customer risk assessments for these stations will be reviewed to ensure that they reflect that they are tightly curved and an appropriate level of detail on the specific risks and the mitigation measures in place (as per information on customer risk assessments above that were undertaken for the top 3 PTI stations per line). These reviews have been incorporated into our Network PTI plan to be completed by the end of February 2023.

Timebound Plan

All actions arising from these workstreams are incorporated into the LU Network PTI Plan and have defined timescales and action owners. This is an ongoing plan and remains under periodic review to ensure that it remains relevant and focussed on the high priority PTI issues.

The Infrastructure changes that have been proposed are longer term. These have been incorporated into the TfL Business plan for 2023/24 and the funding for these changes approved. These proposed changes are planned to be made over the next 5 years and will be prioritised from a risk perspective.

Recommendation 2

The intent of this recommendation is to provide those who are responsible for managing risk with reliable risk assessment data that enables them to identify those locations on its network where the risk of harm is highest and to better inform their decisions on the need for additional risk mitigation measures.

London Underground Limited should review and update its quantified system risk model (LUQRA) to ensure that it is consistent with:

- current good practice in the rail industry;
- achieving a better understanding of how risk is distributed across its rail network;
- identifying potentially high-risk locations that warrant more detailed risk assessment;
- providing useful risk information to those with the responsibility for the safety of individual lines and stations;
- understanding the entire risk of harm, including that associated with non-fatal injuries; and
- the systematic evaluation of whether additional safety measures are justified.

In conjunction with any updates to its quantified system risk model, LUL should review and update its safety decision making standard to clarify how the model and other risk assessment processes should be applied in practice

ORR decision

7. LUL has reviewed and updated its quantified system risk model (LUQRA). The LUQRA has been bench marked against other industry risk models used for assessing PTI risk, including the RSSB Strategic Risk Model (SRM) used by the UK mainline.

8. Improvements to LUQRA include considering PTI risk at station level rather than for an entire line. LUL have reviewed 7 of the 19 LUQRA top events, including PTI risk. The LUL safe decision-making standard has been reviewed and will be signed off by the end of January 2023.

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

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

Status: Closed.

Previously reported to RAIB

10. On 21 October 2022 ORR reported the following:

LUL has reviewed and updated the PTI element of the LUQRA, which now includes non-fatal injuries. Review of the other 18 top events in the LUQRA is expected to be completed by 2026.

As part of the review process, LUL has benchmarked the LUQRA against other risk models used for assessing PTI risk in use by other UK railway infrastructure

managers, including the RSSB Strategic Risk Model (SRM) used by the UK mainline.

In conjunction with the updating of the LUQRA, LUL is updating the risk standards Safety Decision Making and the Assessment and Management of Health, Safety & Environment risk. We will provide RAIB with an update once the changes have been formalised.

Update

11. On 14 December 2022 provided the following update:

The review of the LU QRA PTI

The review and update of the LUQRA PTI model was completed in May 2022 (to coincide with the opening of the Elizabeth line).

Benchmarking the LU QRA

A benchmarking study has been completed which identified other risk models in the rail industry and considered any best practise in these models that could be adopted by the LUQRA. TfL benchmarked with RSSB's SRM, HS2's risk model, Crossrail's risk model and the LRSSB risk model. In summary the study has shown that generally the LUQRA PTI model is in line with good practise demonstrated in the industry. However, some improvements for the LUQRA were identified and an action plan has been outlined in the report. The first of these actions are due to be delivered by the end of March 2023.

Identifying potentially high-risk locations that warrant more detailed risk assessment

We considered this aspect of the recommendation and consider that these issues are more appropriately addressed in our response to Recommendation 1. The work undertaken to address this includes:

- *We have identified the top 12 locations that PTI incidents occur and undertaken detailed risk assessments, engineering assessments and cost benefit analysis.*



Appendix 1 Detailed
Risk Assessments 1 Sl

- *We have identified all 'tightly curved' platforms on the LU Network. In addition to the top 12 stations for PTI incidents a further 20 platforms have been identified as tightly curved. None of these 20 platforms see high numbers of PTI incidents therefore there is no requirement for detailed risk assessments, engineering assessments and cost benefit analysis to be undertaken at these. Instead the CRAs will be reviewed as per recommendation 1 above.*
- *We are in the process of completing some work to identify stations where we see a disproportionately high number of PT incidents compared to customer numbers. We are uncertain about the scale of work that will result from this. Once this has been completed (anticipated mid-December) and we understand the scale of work we will build the associated actions into the Network PTI plan.*

This work has and continues to inform our approach in considering the risks and mitigations which are appropriate for those platforms. The information which has emerged from our review of PTI risk on

our platforms has been shared with those responsible for customer safety on our trains and stations teams.

Understanding the entire risk of harm, including that associated with non-fatal injuries

We have already started to make changes to the LU QRA. Following the 2022.01 release of the LUQRA in May 2022 there are now non-fatal injuries included in 7 of the current 19 LUQRA top events (PTI, Assaults, Flooding, Power failure, Falls on Stairs, Structural Failure and Station Fire).

The remaining LUQRA top events will be reviewed and non-fatal injuries added into the models over the next 5 years. A gap analysis will also be completed to identify non-fatal risks that are not currently covered by the LUQRA top events and then an appropriate QRA will be built to quantify those risks. We expect this work to be completed by 2026 subject to being able to resource with the required expertise.

The systematic evaluation of whether additional safety measures are justified

We have undertaken detailed risk assessments, engineering assessments and cost benefit analysis 11 of the top 12 stations for fall down the gap incidents (Baker Street remains a separate project). Infrastructure changes have been proposed at some of these stations following these assessments where the risks have been assessed as tolerable in line with TfL's Safety Decision Making Standard.

We periodically review PTI performance and investigate significant PTI incidents to ensure that our approach remains risk based. This is done via the line PTI Groups, the Network PTI Working Group and the Network PTI Steering Group.

TfL Safety Decision Making Standard

A concurrent review of the two risk specific standards (Safety Decision Making Standard and the Assessment and Management of Health, Safety & Environment risk) is programmed to take place and for the changes to be submitted to DRACCT at the end of January 2023.

Previously reported to RAIB

Recommendation 1

The interface between platform and train (PTI) presents various risks to passengers and, although most are found on all platforms, some platforms present additional or enhanced risk because of specific features such as track curvature creating a significantly higher risk of a person falling below the platform level. The intent of this recommendation is to recognise and assess location-specific risks so they can be properly managed. Reference to RSSB guidance on risk management at the platform-train interface is likely to assist implementation of this recommendation.

London Underground Limited should carry out and document a suitable risk assessment of each tightly curved platform on its network, and any other locations at which passengers are considered to be at particularly high risk due to characteristics of the platform. In each case, this should include consideration of:

- the platform-train gap at all positions along the vehicle body;
- the influence of low, normal and high passenger numbers;
- the train operator's visibility of the PTI during despatch;
- the safety of vulnerable passengers;
- opportunities to expand the use of incident data to improve risk assessments;
- potential engineering measures to prevent access to the gap, to reduce the gap, and/or to detect the presence of people in the gap; and
- non-engineering measures to reduce the likelihood of people falling into the gap and to mitigate the consequences if they do so.

London Underground Limited should develop a timebound programme for the implementation of any additional control measures that are justified

ORR decision

1. At the time of the incident, London Underground Ltd (LUL) did not have a definition of a tightly curved platform or those where passengers are considered to be at a higher risk due to the characteristics of the platform. LUL did not consider its existing classification of Cat A platforms (those which required the assistance of platform staff to despatch the train should the driver's CCTV cameras not be working) to be sufficiently well developed to identify those platforms the recommendation was aimed at.

2. LUL have since agreed a definition of a tightly curved platform and has assessed the 361 Cat A platforms that may fall into this category, of which there are 21. Incident data for those platforms identified as tightly curved will then be reviewed. Work to identify tightly curved platforms was completed on the 31 August 2022 and the review of incident data at these platforms was completed at the end of

September 2022. Following the completion of this, LUL have a clear understanding of the scale of work that will result from this and a timebound plan will be developed. LUL expect that this will be in place by the end of October 2022.

3. In considering a definition for 'other locations that are higher risk', LUL targeted those platforms with the highest levels of falls between train and platform. At the end of August LU had completed a detailed quantitative risk assessment, engineering assessment and cost benefit analysis of 11 platforms which have highest number of PTI falls between train and platform (56% of all PTI falls on the network). Infrastructure changes have been proposed at some of these stations following these assessments. Baker Street, platform 2, is subject to a separate project so a detailed risk assessment will not be undertaken here at present (further detail included in the evidence provided by LUL).

4. With regards to PTI incidents, LUL has targeted the three stations per line with highest number of all PTI incidents and have reviewed the trains and stations-based customer risk assessments (CRAs) at these stations to make them more specific and to ensure that they include:

- Specific PTI measures which are relevant to these stations so the CRAs provide clearer information on the significant contributory factors that might lead to a fall between the train and the platform and the controls in place to manage this risk
- Greater detail on specific areas of higher risk that might be relevant to a PTI incident at these stations / platforms
- Provide further detail on the assessment of the different specific risks that might arise in relation to PTI incidents and greater detail about contributory factors, including customers who are travelling whilst intoxicated, vulnerable customers, etc.
- Further information on the likelihood of a fall down the gap which informed the risk rating in our CRAs
- Greater detail on the clarity of the potential incident severity for each risk.

5. LUL has considered all PTI risk, not just falls between train and platform.

6. ORR consider the action plan described by LUL to be credible. We note that some of the remedial engineering work, such as track realignment, is significant and may be difficult to do due to budgetary pressures.

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

- 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

8. On 18 November 2021 LUL provided the following initial response:

We recognise that the interface between platform and train (PTI) presents risks to our customers. We also recognise that the risk of a customer falling between the train and the platform varies between stations due to the infrastructure at the station.

We wrote to you in April and July 2021 to update you on the actions we had taken in response to this incident. We have shared our PTI risk assessment review (Appendix 1) and associated plan (Appendix 2) with you and, as always, noted that we would welcome the ORR's view on our conclusions. We shared our proposed approach on the recommendation in the RAIB report with Kerry Williams on 10 November.



Appendix 1 Waterloo
FIR Recommendation



Appendix 2 PTI
Implementation Plan

In addressing the specific elements of the RAIB's recommendations, we have started to address some of the issues already (following our internal investigation) and are ensuring that we address all the specific issues identified in the RAIB report. This includes:

- *Risk Assessments for tightly curved platforms: the RAIB report made a recommendation in relation to tightly curved platforms, but did not define "tightly curved platforms". Our Engineering team are currently reviewing our curved platform categorisation and will create a definition of 'tightly curved platforms' and we plan to finalise this definition by 17 December 2021.*
- *Other locations which may be higher risk: we have shared with you our approach to assessing the risks to our customers at higher risk platforms. We have defined higher risk as the 12 platforms where the greatest number of fall down the gap incidents occur. Over half (56%) of all fall down the gap incidents on LU infrastructure happen on these 12 platforms. We are also considering in this review the PTI risks at the three stations on each line which have the greatest number of PTI incidents.*

For platforms which we have already categorised as higher risk, and for others once we have defined tightly curved platforms and identified those platforms which meet this criteria, we will implement the actions identified in our PTI risk assessment review.

We are in the process of updating all relevant risk assessments to ensure that they consider:

- *the platform-train gap at all positions along the vehicle body,*
- *the influence of low, normal and high passenger numbers,*
- *the train operator's visibility of the PTI during despatch,*
- *the safety of vulnerable passengers,*
- *opportunities to expand the use of incident data to improve risk assessments,*

- *potential engineering measures to prevent access to the gap, to reduce the gap, and/or to detect the presence of people in the gap, and*
- *non-engineering measures to reduce the likelihood of people falling into the gap and to mitigate the consequences if they do so.*

The risk assessments also:

- *include specific PTI control measures relevant to the stations we see the highest number of PTI incidents so they provide clearer information on the significant specific contributory factors that might lead to a fall between the train and the platform,*
- *provide greater detail on specific areas of higher risk that might be relevant to a PTI incident at these stations / platforms,*
- *provide further detail on the assessment of the different specific risks that might arise in relation to PTI incidents and greater detail about contributory factors, including customers who are travelling whilst intoxicated, vulnerable customers, etc.,*
- *provide further information on the likelihood of a fall down the gap which informed the risk rating in our Customer Risk Assessments,*
- *provide greater detail and clarity on the potential incident severity for each risk*
- *have been restructured to ensure that the order of controls followed the hierarchy of controls, and*
- *ensure that there is greater consistency between the trains and stations Customer Risk Assessments.*

I have also attached some examples of our updated risk assessments (Appendix 3).



Appendix 3 examples
of updated Customer

We provided the plan for the update of the Customer Risk Assessments to you on 27 July 2021 and have attached an update of the plan (Appendix 2). We are happy to meet to discuss progress in this plan if you wish to discuss this further.

9. On 25 January 2022 LUL provided the following update:

In your email of the 22 December, you acknowledged the work we are doing to define a tight curve and noted LU's intent to produce a site specific risk assessment for each platform that is categorised as 'tightly curved' or 'higher risk due to platform characteristics. You requested the following:

1. The timescale for completion of the risk assessment work

There are two strands to our PTI risk assessment work:

Risk assessments for platforms defined as tightly curved

Since our correspondence on the 18 November 2021, the TfL Engineering Team has defined ‘tightly curved’ platforms. Our next step is to review this definition against the 361 LU station platforms that are most likely to fall within this definition. This will allow us to identify LU station platforms which meet the definition of ‘tightly curved’.

Once we have identified all ‘tightly curved’ platforms, we will review the incident data at these platforms, and then determine the approach we will take at these platforms (e.g. whether a detailed engineering assessment and cost benefit analysis and/or Customer Risk Assessment review) and build this into our existing plan (on a prioritised basis based on risk). We plan to complete this review by the end of June 2022.

We will then update our PTI risk assessment plan. At the moment, we are uncertain about the scale of work which will arise from the review of tightly curved platforms, so it is difficult to commit to a timebound plan at the moment. However, we anticipate that we will have an updated plan by the end of August 2022. We will, of course, share this with ORR.

Risk assessments for platforms defined as high risk based on the number of fall down the gap incidents

Site visits to the top 12 stations for fall down the gap incidents were completed in September 2021. Following these visits, a number of operational, procedural and customer experience-related recommendations were made (including colleague briefings, reviews of signage and public address announcements at some platforms, potential improvements to lighting and white and yellow lines). These have been incorporated into the LU PTI Improvement plan. Action owners and timescales are in the process of being identified. We will share this plan with the ORR by the end of February 2022.

2. Confirmation of when the time bound programme for the implementation of any additional control measures that are justified will be ready

A package of PTI works which sets out plans for making any infrastructure changes identified by our risk assessment review at our top 12 fall down the gap stations is currently being developed by the LU Asset Strategy Team, with the relevant input from the SHE team and operational teams.

Our safety improvement programme will be developed in light of our funding arrangements. We are due to agree the next financial settlement with the Department for Transport by 4 February 2022. Following this, we will be in a better position to update on timescales for the implementation of these. We will update the ORR on status of this by the end of May 2022.

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

You asked whether we had completed our work to identify all tightly curved platforms and whether we had completed the risk assessment of each tightly curved platform.

When I wrote to you in January 2022, we had planned to complete the review of all potential tightly curved platforms by the end of June 2022, to determine the approach that we would take at these platforms and update our PTI risk assessment plan by the end of August 2022. We have made progress in this complex area, but due to COVID related absence, ongoing industrial action and some of the resources required to work on this being diverted to other priority workstreams (Safe Track Access and Health Surveillance) we have allowed further time to fully complete the work by the end of August 2022. Following this our PTI plan will be updated by the end of October 2022 at the latest and this plan will be shared with the ORR. We shared the latest version of the plan with Kerry Williams on 17 June 2022. We have continued our work on detailed risk assessments of our stations which have the highest number of PTI incidents.

We have completed detailed risk assessments, engineering solutions assessments and cost benefit analysis at 8 of the top stations for PTI incidents. Where the risk at these stations has been assessed as tolerable as per our Safety Decision Making Standard, but we consider that there are opportunities to further improve safety, we have identified engineering solutions and incorporated these activities into a package of works ready to progress when we are in a position in which are funding allows further investments of this type. The remaining 3 assessments are on track to be completed by the end of August 2022.

11. On 25 July 2022 LUL provided the following update:

Risk assessments for platforms defined as tightly curved

As outlined in Lilli Matson's letter to Oliver Stewart on the 25 January 2022, the TfL Engineering Team has defined 'tightly curved platforms'. We continue our programme to review the curves on the 361 LU station platforms which are most likely to fall within this definition against this new definition.

Once we complete this review, which will allow us to identify the LU station platforms which meet the definition of 'tightly curved', we will review the incident data at the relevant platforms. We will then determine the approach that we will take at these platforms (e.g. whether a detailed engineering assessment and cost benefit analysis and / or Customer Risk Assessment review) and build this into our existing LU Network Platform Train Interface plan. We have made progress in this complex area, but due to COVID related absence, ongoing industrial action and some of the resources required to work on this being diverted to other priority workstreams (Safe Track Access and Health Surveillance), we have allowed further time to complete the work to identify 'tightly curved' platforms by the end of August 2022 and the review of incident data at these platforms by the end of September 2022.

Once we have completed the steps outlined above, we will update our PTI risk assessment plan (which is a key part of the LU Network Platform Train Interface plan). Until the work to identify the tightly curved platforms and the PTI risk on these platforms is complete, we are uncertain about the scale of the work that result from this, so it remains difficult to commit to a timebound plan at the moment. However, we anticipate that we will have an updated plan by the end of October 2022. We will

of course share this with you. The most recent version of our Network PTI Plan is included as Appendix 4 of this letter.



Appendix 4 -
Network PTI Plan.pdf

Risk assessments for platforms defined as high risk based on the number of fall down the gap incidents

As discussed at our meeting on 16 June 2022, detailed risk assessments, engineering assessments and cost benefit analysis have been completed for 8 of the 12 stations that have platforms which we have defined as high risk (based on the number of fall down the gap incidents). Infrastructure changes have been proposed at some of these stations following these assessments. A sample of these were shared with you on 17 June 2022. Appendix 1 of this letter sets out further information on the platforms affected and proposed infrastructure changes. There are 3 remaining detailed risk assessments, engineering assessments and cost benefit analysis to be done and these are on track to be completed by the end of August 2022. Baker Street, platform 2, is subject to a separate project (more details below) so a detailed risk assessment will not be undertaken here at present. We spoke through this approach with you on the 6 July 2022.

Site visits to the top 12 stations for fall down the gap incidents were also completed in September 2021. Following these visits, a number of recommendations were made, including colleague briefings, reviews of signage and public address announcements and at some platforms potential improvements to lighting and white and yellow lines. Some of these have been progressed, such as making sure any faults have been rectified like water ingress and cleaning white / yellow lines and under platform markings.

From our analysis of our PTI incidents, we recognise that we need to help our customers adapt their behaviour on the network to help them travel safely. We will take a different approach to the Customer Experience elements of this (customer behaviour, signage, posters, P.A.s etc.). We will organise a PTI summit covering the issues and common issues at these top 12 stations. They will involve station colleagues at the stations concerned, SHE and Customer Experience. The purpose of this summit will be to understand, in greater detail, the main customer behaviours that contribute to PTI incidents at these stations. We will use this information to identify actions for influencing these behaviours in a positive way across the whole customer journey to reduce the potential for our customers to be hurt as they travel on our network. This approach has worked well in reducing customer injuries on stairs and escalators when we carried out a similar approach at our station hotspots for falls on stairs and escalators. The summit is in the process of being organised and we expect that it will have taken place and recommendations made by the end of October 2022.

In terms of the implementation of the potential infrastructure changes identified by the risk assessments noted above. These have been incorporated into a package of works ready to progress when we are in a position in which our funding allows

further investments of this type. We will keep the ORR updated on the status of this work.

Following the introduction of the S-Stock on the Metropolitan, District and Hammersmith & City line, a risk emerged where the gap between the train and the platform was larger at a small number of platforms. We made changes at a number of these platforms, including moving nosing stones, changing platform furniture, etc. We have addressed the risk at most platforms, but continue to address PTI risk at Platform 2 at Baker Street station. We have an ongoing Baker Street Platform 2 PTI.

We have made a number of changes already at the station, and the programme continues – we are currently evaluating a number of options to manage PTI risk at this platform. We will keep the ORR updated on this work as it progresses. I would be happy to organise a meeting with the ORR and this project to discuss in further detail.



Appendix 1
Detailed Risk Assess

Customer Risk Assessment Review

The customer risk assessments (CRAs) for the top 3 stations (based on the number of PTI incidents) per line were reviewed and updated by September 2021. These CRAs now include:

- *Specific PTI measures which are relevant to these stations so the CRAs provide clearer information in the significant contributory factors that might lead to a fall between the train and the platform and the controls that we have in place to manage this risk*
- *Greater detail on specific areas of higher risk that might be relevant to a PTI incident at these stations / platforms*
- *Provide further detail on the assessment of the different specific risks that might arise in relation to PTI incidents and greater detail about contributory factors, including customers who are travelling whilst intoxicated, vulnerable customers, etc.*
- *Further information on the likelihood of a fall down the gap which informed the risk rating in our CRAs*
- *Greater detail on the clarity of the potential incident severity for each risk*

We have also restructured the CRAs to ensure that the order of controls followed the hierarchy of controls. We have reviewed the trains and stations CRAs to ensure that there is greater consistency between these CRAs.

The ORR visited the Central, District, Circle and Hammersmith & City lines to review a sample of these CRAs. A number of useful suggestions were made by the ORR. We will build these into our future PTI CRA reviews.

Once the review of ‘tightly curved’ platforms has been completed, and we understand the scale of the work, we will build the CRA reviews of these stations into

our PTI plan. As per the above, we will keep you updated on the progress of this work.

Recommendation 2

The intent of this recommendation is to provide those who are responsible for managing risk with reliable risk assessment data that enables them to identify those locations on its network where the risk of harm is highest and to better inform their decisions on the need for additional risk mitigation measures.

London Underground Limited should review and update its quantified system risk model (LUQRA) to ensure that it is consistent with:

- current good practice in the rail industry;
- achieving a better understanding of how risk is distributed across its rail network;
- identifying potentially high-risk locations that warrant more detailed risk assessment;
- providing useful risk information to those with the responsibility for the safety of individual lines and stations;
- understanding the entire risk of harm, including that associated with non-fatal injuries; and
- the systematic evaluation of whether additional safety measures are justified.

In conjunction with any updates to its quantified system risk model, LUL should review and update its safety decision making standard to clarify how the model and other risk assessment processes should be applied in practice

ORR decision

12. LUL has reviewed and updated the PTI element of the LUQRA, which now includes non-fatal injuries. Review of the other 18 top events in the LUQRA is expected to be completed by 2026.

13. As part of the review process, LUL has benchmarked the LUQRA against other risk models used for assessing PTI risk in use by other UK railway infrastructure managers, including the RSSB Strategic Risk Model (SRM) used by the UK mainline.

14. In conjunction with the updating of the LUQRA, LUL is updating the risk standards Safety Decision Making and the Assessment and Management of Health, Safety & Environment risk. We will provide RAIB with an update once the changes have been formalised.

15. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, LUL has:

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

Status: Progressing

Information in support of ORR decision

16. On 18 November 2021 LUL provided the following initial response:

Following our internal investigation into this tragic event, we started a process to review our quantified risk assessment model – the LU Quantified Risk Assessment (LUQRA). Our review of the PTI model in the LUQRA is addressing the issues identified in the RAIB’s report:

- *current good practice in the rail industry,*
- *achieving a better understanding of how risk is distributed across its rail network, and*
- *understanding the entire risk of harm, including that associated with non-fatal injuries.*

To address these recommendations, a benchmarking exercise will be completed with other PTI quantified risk assessment models in the rail industry to identify current good practice and make recommendations for improving the LUQRA PTI risk model in line with this good practice. Last month we had an initial meeting with RSSB to identify other PTI QRA models that are currently used in the rail industry. We will speak to the owners of those models and identify any potential improvements to the LUQRA to ensure we are following good practice.

The PTI LUQRA risk model will be expanded to include risk for PTI incidents which lead to major and minor injuries as well as fatalities. This will ensure the PTI LUQRA understands the entire risk of harm (including those associated with non-fatal injuries) and achieves a better understanding of how risk is distributed across its rail network. The model will cover all PTI events with the potential to lead to injury or fatalities.

Our benchmarking exercise, review and update of the PTI LUQRA model will be completed by March 2022.

We are also taking learnings from this review and will incorporate it into reviews of other top events in the LUQRA where appropriate. Some of the other LUQRA risk models have already had non-fatal injuries added into the top events and the rest of the models will be expanded to include this as they are updated over the next 5 years.

Recommendation 2 in the RAIB report also suggested the LUQRA should be reviewed and updated to

- *identify potentially high-risk locations that warrant more detailed risk assessment and*
- *provide useful risk information to those with the responsibility for the safety of individual lines and stations.*

We have considered this aspect of the recommendation and consider that these issues are more appropriately addressed in our response to Recommendation 1. As noted above, we have identified potentially high-risk locations that warrant more detailed risk assessment (as set out in Appendix 2). This has informed our approach in considering the risks and mitigation actions which are appropriate for those platforms. The information which has emerged from our review of PTI risk on our platforms has been shared with those responsible for customer safety on in our trains and stations teams – both management, station staff and train operators.

The RAIB report also recommended that we review our Safety Decision Making standard. TfL is currently completing a root and branch review of its entire SHE Management System. In response to recommendation 2 of the RAIB report, we have prioritised an interim review and update of our Safety Decision Making standard, and our Business Case Development Manual. This will ensure that there is clarity on how the model and other risk assessment processes should be applied in practice and will include a systematic evaluation of whether additional safety measures are justified. We plan to complete this update to the standard by March 2022.

We are also currently reviewing and updating the SHE risk operating model as part of the SHE Management System improvement work. The purpose of the review is to set out an SHE risk management framework which enables implementation, promotes continuous improvement and ensures that the processes, systems and responsibilities for SHE risk management are as clear as possible. As part of this work, we are reviewing:

- *Systems and processes for identifying and analysing SHE risks and strategic SHE concerns,*
- *How SHE risks are escalated within the hierarchy of risks in TfL, and*
- *How management of SHE risk aligns with the TfL Enterprise Risk Management Framework.*

The SHE Management System Improvement project is a three-year programme. We aim to complete the risk management elements by March 2023. We would be happy to provide updates on progress as part of our regular engagement.

17. On 25 January 2022 LUL provided the following update:

In your email of the 22 December, you acknowledged the planned review of the LU QRA, including LU's intent to increase its scope to include non-fatal injuries across all top events over the next five years. You noted that our initial focus is on the PTI QRA and that the learning from this will be considered in other reviews of the other top events. You requested the following:

1. The output of the review of the LU QRA PTI once completed (due March 2022)

As noted in my letter of 18 November, we plan to complete our review of the LUQRA PTI model in March 2022. The model will be formally published to coincide with the opening of the Elizabeth line (planned to be 20 March). The output of the PTI LUQRA review will be shared with the ORR as soon as practicable after this date.

2. The programme for the review of the remainder of the LU QRA over the remaining 5 year period previously noted

We have already started to make changes to the LU QRA. Non-fatal injuries have now been included in three of the LUQRA top events.

The remaining LUQRA top events will be reviewed and non-fatal injuries added into the models over the next 5 years. A gap analysis will also be completed to identify non-fatal risks that are not currently covered by the LUQRA top events and then an appropriate QRA will be built to quantify those risks. We expect this work to be

completed by 2026 subject to being able to resource with the required expertise. A detailed version of the plan can be found in Appendix A to this letter.

18. On 19 July 2022 LUL provided the following update:
You asked whether we had completed our review of the PTI elements of the LU QRA.

I can confirm that the PTI QRA model has been updated and it has been published internally. The updated model includes non-fatal injuries, as well as fatal injuries. We carried out a detailed benchmarking exercise to compare the LUQRA PTI model with industry best practice. This review had input from risk experts at the RSSB, Crossrail and HS2 and was compared to the UK's Light Rail Safety Risk Model. Our benchmarking exercise concluded that the list of hazards in the LUQRA PTI model remain appropriate. It did identify a number of opportunities to improve some aspects of the LU QRA PTI model. We are now considering next steps on these points. We presented our findings to Kerry Williams and Monica Babb on 6 July and we will share a full copy of the report with them by 26 July 2022.

19. On 25 July 2022 LUL provided the following update:

The review of the LU QRA PTI

The review and update of the LUQRA PTI model was completed in May 2022 (to coincide with the opening of the Elizabeth line). The LU QRA report and the results of the updated LUQRA PTI model are attached to this letter as Appendix 2. The updated LUQRA PTI model includes non-fatal injuries for all lines.



Appendix 2 LUQRA
PTI Update Report.p

Including non-fatal injuries in the LUQRA

Following the 2022.01 release of the LUQRA in May 2022, non-fatal injuries are now included in 7 of the current 19 LUQRA top events (PTI, Assaults, Flooding, Power failure, Falls on Stairs, Structural Failure and Station Fire).

As part of our LUQRA programme, the remaining LUQRA top events will be reviewed and non-fatal injuries added into the models over the next 5 years. A gap analysis will also be completed to identify non-fatal risks that are not currently covered by the LUQRA top events and then an appropriate QRA will be built to quantify those risks. We expect this work to be completed by 2026, subject to being able to resource with the required expertise.

Good practice in the rail industry

We completed a detailed benchmarking study which identified other PTI risk models in the rail industry and considered any best practice in these models that could be adopted by the LUQRA. TfL benchmarked our LUQRA PTI model with the RSSB's SRM, HS2's risk model, Crossrail's risk model and the LRSSB risk model. The

findings and recommendations from the benchmarking study can be found in the report in Appendix 3 of this letter.



Appendix 3 PTI
Benchmarking Repo

In summary, the study has shown that generally the LUQRA PTI model is in line with good practice demonstrated in the industry. Some improvements were identified and an action plan has been outlined in the report. We spoke through the study at our meeting on 6 July 2022.

TfL Safety Decision Making Standard

A review of the two risk specific standards (Safety Decision Making Standard and the Assessment and Management of Health, Safety & Environment risk) is currently taking place as part of the SHE Management System Project. Our SHE Risk and Data Science team have updated the standards. The next step in our change process is to consult on the proposed changes within the wider SHE Team and with colleagues across TfL. This will take place during September 2022, with the aim to submit a formal change request to the Directors Risk and Assurance Change Control Team for review in October 2022.