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Mr Andrew Hall
Deputy Chief Inspector of Rail Accidents
Cullen House
Berkshire Copse Rd
Aldershot
Hampshire
GU11 2HP

Dear Andrew,

RAIB Report: Derailment in Summit tunnel, near Todmorden, West Yorkshire

I write to report¹ on the consideration given and action taken in respect of recommendations 1, 2, 3 and 4 addressed to ORR in the above report, published on 29 September 2011.

The annex to this letter provides details in respect of each recommendation. The status of recommendations 2, 3 and 4 is '**Implemented**'. We do not propose to take any further action in respect of these recommendations unless we become aware that any of the information provided becomes inaccurate, in which case I will write to you again.

The status of recommendation 1 is '**Implementation ongoing**'. ORR will advise RAIB when further information is available regarding actions being taken to address this recommendation.

We will publish this response on the ORR website on 3 September 2015.

Yours sincerely,

Oliver Stewart

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

Initial consideration by ORR

1. All 5 recommendations were addressed to ORR when the report was published on 29 September 2011.
2. After considering the recommendations ORR passed all 5 recommendations to Network Rail Ltd asking it to consider and where appropriate act upon them and advise ORR of its conclusions. The consideration given to each recommendation is included below.

Recommendation 1

The intent of this recommendation is to reduce the amount of ice forming in Summit tunnel's ventilation shafts by improving the arrangements for managing the water seeping through the shaft's lining, e.g. by changing the drainage arrangements. These changes should also stop the water from falling directly onto the tracks below.

Network Rail should review how the arrangements for managing water within Summit tunnel can be improved, decide what actions it is reasonably practicable to take, and implement them. The review should specifically consider what can be done to manage the water seeping through the ventilation shaft linings and reduce the amount of ice forming during periods of freezing temperatures.

Brief Summary on what was previously reported to RAIB

3. On 3 April 2014 ORR reported to RAIB that Network Rail had reviewed the arrangements for managing water and ice within Summit tunnel and:
 - Ring-dams and downpipes had been cleaned out and, where necessary, renewed;
 - A temporary cowl had been installed on shaft No.10. Another was to be installed on shaft No.11 by 31 October 2014; and
 - Permanent cowls were to be installed by 31st March 2016.

Steps taken or being taken to address the recommendation

4. Network Rail sent ORR the following closure statement on 3 February 2014:

Remedial Works to Tunnel Positive Drainage System

The condition of the existing water management measures within the shafts of Summit tunnel were evaluated in April 2011. The evaluation was based on previous inspection reports, Network Rail Engineer site visits and additional inspections undertaken following the incident.

Based upon the findings of the above evaluation, maintenance works to the existing water management measures within the shafts of Summit tunnel were carried out in November 2011. These comprised repair works to the troughs that collect water ingress through the shaft and the connecting pipes that allowed the water to be discharged into the track drainage system.

Completion of Tunnel Ice Formation Mitigation Project data gathering exercise

The Tunnel Ice Formation Mitigation Project was commissioned to look into long term solutions for the prevention and/or management of ice within tunnels. The

ice mitigation principle of this study is to keep shaft temperatures above freezing, by reducing the intake of cold external air into shafts without compromising passenger aural comfort and smoke dispersion in the event of a fire.

Temporary cowls were installed to 1 No. shaft at both Summit and Blea Moor Tunnels. Further shafts at both locations were left uncapped but fitted with monitoring equipment to act as a 'control' for the evaluation of the data gathered from the capped shafts.

The findings of the project are summarised below: -

- 1) In very cold periods, the capped shafts remained significantly warmer than the uncapped shafts.*
- 2) At no point during the trials did any part of a capped shaft drop below zero, therefore there was no risk of ice formation.*
- 3) For several periods during the trials, parts of the uncapped shafts dropped below zero, which could have facilitated ice formation.*
- 4) Ventilation control appears to offer significant reduction in the risk of ice formation in shafts, although it was noted that the weather during the trial period was not as severe or prolonged as Winter 2010/2011 when the derailment occurred in Summit tunnel.*
- 5) The completed monitoring exercise provides the design philosophy for the permanent installation at Summit Tunnel, confirming that the principle that impeding air flow through the shafts viably raises ambient temperature and therefore mitigates against the formation of ice.*
- 6) The design development of the permanent installation will need to consider the long-term impacts of reducing shaft ventilation with regard to smoke evacuation/fire safety, air quality and to satisfy mandated aural comfort criteria.*
- 7) Post-installation monitoring will be undertaken to validate performance of the installed cowl.*

Implemented measures to mitigate ice formation

Remedial works to improve water management have been completed as noted above.

A temporary shaft cap has been installed to Summit Tunnel Shaft No 10 as part of the Tunnel Ice Formation Mitigation Project and found to be effective in mitigating ice formation. This shaft cap will be maintained, and now that monitoring is completed and monitoring equipment removed, a temporary shaft cap can be fitted to Shaft 11. Works to fit this shaft cap will be completed by 31st October 2014. These cowls will ensure ambient temperatures remain above freezing in the applicable shafts.

A CCTV camera was installed beneath shaft 10 as part of the Tunnel Ice Formation Mitigation Project to validate the results of the monitoring undertaken. This was found to have limited value as clear views up the shaft were not possible. The power and communications to support the CCTV remain in place and will be re-activated if prolonged cold weather is forecast.

Installation of Permanent Cowls

A project to undertake renewal works to the Shafts 10 & 11 in Summit Tunnel has been implemented.

This project will address condition issues that are the root cause of significant water ingress; poor brickwork and corroding metallic shaft eye structures, as well as installing permanent cowls to reduce risk of ice formation from residual water ingress.

The current programme for completion of these works is 31st March 2016, subject to consents and development.

The design of the permanent cowl structures will utilise the now validated findings of the Tunnel Ice Formation Mitigation Project. Until the permanent cowls are installed the temporary cowls, which were found to be effective in mitigating ice formation, will be maintained on shaft 10 & 11 where significant ice formation occurred in the winter of 2010/11.

Implemented Procedural Changes to mitigate ice formation / provide safe passage of trains.

Improved procedures for undertaking ice patrols (Detailed in the action plan noted for close out of Summit Tunnel RAIB Recommendation No 4).

Improved procedures around Extreme Weather conference calls. (Detailed in the action plan noted for close out of RAIB Recommendation No 5).

ORR Decision

5. ORR continues to evaluate the information that Network Rail has provided to determine whether the recommendation can be reported as implemented. To aid this decision we have asked Network Rail to confirm that the timebound actions outlined within the closure statement have either been completed or remain on track.

6. ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

- taken the recommendation into consideration; and
- is taking action to implement it, with a deadline of 31 March 2016.

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

Recommendation 2

The intent of this recommendation is to prevent the first train, after a cessation of traffic due to extreme weather, from passing at the line's maximum permitted speed through or over an unsafe structure. By identifying which structures on a route are at risk of becoming unsafe due to extreme weather, Network Rail can then check their state prior to reopening the route, eg by using the first service train to examine the route, a route proving train or staff on foot.

Network Rail should identify the structures (as defined in NR/L3/CIV/006/1C) where passengers or staff might be put at risk when train services are resumed following an extended cessation of traffic during, or following, periods of extreme weather (as

defined in NR/L2/OPS/021). Network Rail should then put in place procedures that result in checks that it is safe for trains to operate at the permitted line speed over or through these structures before resuming the train service

Brief Summary on what was previously reported to RAIB

7. On 13 October 2014 ORR reported that Network Rail had identified the structures where passengers or staff might be put at risk when train services are resumed following an extended cessation of traffic during, or following, periods of extreme weather, and had enhanced its Extreme Weather Action Team (EWAT) meeting agenda to require checks to be made to ensure that it is safe for trains to operate at the permitted line speed over or through these structures before resuming the train service. ORR did not consider that the information provided by Network Rail fully satisfied the requirement of the recommendation.

Steps taken or being taken to address the recommendation

8. On 7 July 2014, ORR met with Network Rail to discuss this recommendation and the action they needed to take in order to implement it.

9. On 14 August 2014, Network Rail provided the following update:

Network Rail has identified the structures where passengers or staff might be put at risk when train services are resumed following an extended cessation of traffic during, or following, periods of extreme weather. The attached "At Risk Register" contains this list. Network Rail has enhanced their Extreme Weather Action Team (EWAT) meeting agenda, (copy attached). The enhanced agenda requires that checks are made to ensure that it is safe for trains to operate at the permitted line speed over or through these structures before resuming the train service.



B&C At Risk Register - Anglia v1 270510.xl
EWAT Agenda.pdf

10. On 3 October 2014, following consideration by R3G, ORR wrote back to Network Rail:

- noting that data had only been provided for one Route (Anglia), and seeking additional information to show what information is available across the network;
- noting that the Risk Register provided did not show any tunnels, or any other structures, which are 'at risk' in terms of ice fall and requested that Network Rail explain how the risk register provided fulfils the requirements of the recommendation, particularly regarding risk '...following an extended cessation of traffic during, or following, periods of extreme weather'; and
- seeking an explanation of how the sample EWAT agenda complies with the requirement of the recommendation, or provide additional information showing where the relevant instructions are.

11. On 18 December 2014, Network Rail provided us with a copy of the National Tunnel Ice Risk Assessment which had been completed after the Summit Tunnel incident.
12. The tool is used by Network Rail to identify national tunnel assets susceptible to ice risk and ranks them accordingly by risk assessment. The risk assessment was compiled on completion of a report into mitigation of ice in tunnels and parameters for prioritising the risk.
13. The risk assessment was used by routes to identify at risk assets and provide information to produce/validate each route's extreme weather plan/register of at risk structures. As an example, Network Rail provided us with the extreme weather plan/register of at risk structures for LNW route.
14. Network Rail provided the agenda of the 1 November 2011 EWAT meeting, which was revised after the Summit tunnel incident. Within the agenda for extreme weather due to Snow/Frost/Ice, revisions have been made to Section 1.0 (Role Call) mandating the presence of Structures Asset Management and the recording of attendees/actions/mitigations taken. Within Section 3.0 'Risk Assessment and Mitigation Plans' additional actions have been added which call for tunnels and structures at risk of significant build-up of ice to be identified and staff assigned to inspect them. It calls for the risk of falling ice from a thaw following sub-zero temperatures to be assessed and mitigated and prompts consideration to cautioning the first trains through structures/tunnels or the use of proving trains following prolonged gaps in traffic.
15. Subsequently, ORR requested a copy of the At Risk Register for LNW-S (to provide complete information for the Route that could then be cross referenced to the National Risk Register.) This was received on 06 March 2015.



ORR Decision

16. Taking into account all of the information provided in the last year, Network Rail has demonstrated that relevant structures have been identified. The list of structures in the National Tunnel Ice Risk Assessment was cross referenced with the register of at risk structures provided for LNW Route. The lists were found to match, providing additional confidence in the work Network Rail has done. In addition, evidence has been provided to show that the EWAT agenda now includes specific requirements to checks that it is safe for trains to operate during or following periods of extreme weather. Taken together, it is our view that Network Rail has implemented the requirements of this recommendation.

17. Having considered the responses by Network Rail, ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

- taken the recommendation into consideration; and

- has taken action to implement it.

Status: *Implemented.*

Recommendation 3

The intent of this recommendation is to ensure that the hazards of ice formation on structures and the subsequent hazards during thaw conditions (e.g. ice falls onto the track) are included throughout Network Rail's weather management processes, so that they can be risk assessed and mitigated. For example, extreme cold weather events are not specifically included within NR/L3/TRK/1010 and EWAT conferences do not consider the hazards that might be present when operating trains once extreme cold weather conditions end and a thaw sets in.

Network Rail should review and implement changes to its weather management processes to take into account the potential hazards created by extreme cold weather events and subsequent thaw conditions (paragraphs 150a and 151d).

Brief Summary on what was previously reported to RAIB

18. On 13 October 2014 ORR reported that Network Rail had reviewed its weather management processes to take into account the potential hazards created by extreme cold weather events and subsequent thaw conditions and implemented changes to processes via Letter of Instruction (LOI) NR/BS/LI/292 which updates existing standard NR/L3/TRK/1010 with the enhanced procedures. This LOI had been distributed to the RAMS via email for onward briefing on 18 July 2013, along with guidance note 2013-GN-003-SUM-Rev1 explaining the reasons for the LOI and the changes to the EWAT agenda. ORR's view was that Network Rail had not at that time provided evidence that the processes mandated by those standards had been updated accordingly.

Steps taken or being taken to address the recommendation

19. On 7 July 2014, ORR met with Network Rail to discuss this recommendation and the action they needed to take in order to implement it.

20. On 14 August 2014, Network Rail provided the following update:

Network Rail has reviewed its weather management processes to take into account the potential hazards created by extreme cold weather events and subsequent thaw conditions. The identified changes to the processes have been implemented via Letter of Instruction NR/BS/LI/292 which updates existing standard NR/L3/TRK/1010 with the enhanced procedures, (copy attached).

The Letter of Instruction was distributed to the RAMS via email for onward briefing on 18/07/13, (copy of email attached).

Guidance note 2013-GN-003-SUM-Rev1 was also issued via email to the RAMS on 18/07/13 explaining the reasons for the Letter of Instruction and the changes to the EWAT agenda, (copy of guidance note attached).



NR_BS_LI_292.pdf



LoI 292 briefing
email.pdf



2013-GN-003-SUM-R
ev1.pdf

21. On 3 October 2014, following consideration by R3G, ORR wrote back to Network Rail seeking evidence about how the processes mandated by the revised Standards (such as local Extreme Weather Plans and Tunnel Management Strategies) have been updated accordingly.

22. On 18 December 2014, Network Rail responded:

The plan and associated process charts and route guidance notes (for inspection of vulnerable assets) formulate the routes response to extreme cold and thaw. The LNW route utilised the National Tunnel Ice Risk Assessment to validate the register of at risk structures. This process was then formalised with the publication of Letter of Instruction: NR/BS/LI/292 in July 2013 (LOI against Track Standard 1010). This LOI updated roles and responsibilities to reflect route posts, called for EWP to consider extreme cold and thaw (Old 1010 standard was heavy on flood /rain requirements to detriment of cold/ice/snow) and promoted the use of TMS's and the National Tunnel Ice Risk Assessment to identify at risk tunnels.



Tunnel Ice Alert
process chart v3 241



20111124 Cold
Temperature Alerts F



13-04-08 Icicles
Warning Plan.doc

ORR Decision

23. The evidence accompanying the Network Rail responses demonstrates that its processes have been amended as required by this recommendation. Sample evidence has also been provided to show that these changes have been implemented in the Routes.

24. Having considered the responses by Network Rail, ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

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

Status: *Implemented.*

Recommendation 4

The intent of this recommendation is to give Network Rail staff the skills and knowledge to carry out additional inspections to look for ice on structures during periods of extreme cold weather, as Network Rail infrastructure maintenance's routine inspection regime may be too infrequent. Staff need to know what they need to do, where and when they should be doing it and the actions they should take once ice is found. This will support the implementation of NR/L3/TRK/1010 and the extreme weather plan, which require these additional inspections to take place. The

staff undertaking these inspections should also know what potential hazards may be present and understand how to do the inspections while maintaining their own safety.

Network Rail should provide training and information to its staff on carrying out the inspections of those structures which are at risk from ice in extreme cold weather. The training and information should include guidance on managing the hazards to staff while carrying out these inspections.

Brief Summary on what was previously reported to RAIB

25. On 13 October 2014 ORR reported that Network Rail has produced “Notes for Guidance for competent persons inspecting ‘At Risk’ sites in extreme weather”, and that this had been issued to staff who carry out inspections of structures. Whilst noting this ORR expressed concern that no evidence had been provided of how and to whom this information has been distributed, or of what training has been given on these issues.

Steps taken or being taken to address the recommendation.

26. On 07 July 2014, ORR met with Network Rail to discuss this recommendation and the action they needed to take in order to implement it.

27. On 14 August 2014, Network Rail provided the following update

Network Rail has produced “Notes for Guidance for competent persons inspecting ‘At Risk’ sites in extreme weather”, (copy attached). This guidance was issued to Maintenance staff who carry out inspections of structures at times of adverse and extreme weather. The information includes tables designed to provide guidance to staff when a problem is found. The role of Maintenance teams is to look for ice build-up at risk sites identified in the extreme weather plan only and to report back and that any specific actions beyond this are to be carried out by competent contractors from an approved list of suppliers. Personal Safety of Maintenance staff during inspections is covered by Track Work Instruction 3G024.



Notes for guidance
for competent person



TWI3G024.pdf

28. On 3 October 2014, following consideration by R3G, ORR wrote back to Network Rail highlighting that the recommendation requires that the training and information should include guidance on managing the hazards to staff while carrying out inspections, but there is little specific information on this in the documents provided. TWI 3G024 appears to be concerned with the risk from low temperatures during routine work, and does not deal with the hazards specific to inspection of ‘at risk’ structures. Also, whilst demonstrating that the relevant documentation has been made available, no evidence had been provided of how and to whom this information has been distributed, or of what training has been given on these issues.

29. On 18 December 2014 Network Rail sent ORR presentations they produced following the Balcombe incident. The presentation is in three parts dealing with a) Notes for managers on applicable processes and governing standards, b) guidance to patrollers specifically in ice in tunnels and c) guidance for patrollers on 'other' ice risks.

30. The presentation was undertaken in conjunction with the dissemination of 'Notes for Guidance for competent persons inspecting at risk sites in extreme weather document' which had previously been sent to ORR.

31. Network Rail were not able to confirm the attendees at briefings or individual recipients of guidance. To ensure embedment of this information, Network Rail will instigated a refresh of the guidance and briefing material to all routes and will obtain positive affirmation from Network Operations that obligations in response to extreme cold weather are known and that staff responders have received technical guidance on identifying ice requiring removal and what steps to take to maintain workforce safety.



Ice Risk In Tunnels
v1 251012.ppt

ORR Decision

32. Network Rail has provided several pieces of evidence to demonstrate that the required training and information has been made available to its staff. The information provided on managing the hazards to staff while carrying out inspections is relatively brief, but is considered adequate to support a site specific risk assessment, which must by law be carried out before commencing any work that could present a risk to workers.

33. Having considered the responses by Network Rail, ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

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

Status: *Implemented.*