

Oliver Stewart  
RAIB Recommendation Handling Manager



6 August 2025

Mr Andy Lewis  
Deputy Chief Inspector of Rail Accidents

Dear Andy,

**RAIB Report: Collision between passenger trains at Salisbury Tunnel Junction, Wiltshire on 31 October 2021**

I write to provide an update<sup>1</sup> on the action taken in respect of recommendations 4, 5 & 7 addressed to ORR in the above report, published on 24 October 2023.

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 4, 5 & 7 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

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

## Recommendation 4

*The intent of this recommendation is for Network Rail to be able to make more effective decisions regarding the management of emerging and potential low wheel/rail adhesion conditions.*

Network Rail, working in co-operation with train operators, Rail Safety and Standards Board and other relevant stakeholders, should undertake research into real-time data that could be used to give an indication of the wheel/rail adhesion conditions on its network and how this could be used to support operational decisions to implement mitigation measures.

This review should include consideration of the following:

- a. monitoring data, including that drawn from on-train data recorders, wheel slide protection activity, and records of wrong side track circuit failures
- b. reports of low adhesion from train drivers and staff
- c. weather and low adhesion forecasts.

This review should take account of good practice in other parts of the rail sector both in the UK and abroad

## ORR decision

1. The aim of the recommendation was for Network Rail to explore methods to more effectively detect and mitigate the effects of low adhesion. Network Rail, in cooperation with RSSB and the wider sector commissioned research considering different aspects of detecting and mitigating low adhesion, and how that information can be shared between the infrastructure and operators in real time.
2. Network Rail, in collaboration with RSSB, have undertaken and completed a thorough review of all current methods of monitoring adhesion levels in real time including new and emerging technologies and products available on the market for the adoption across the industry. As part of this, RSSB has provided Network Rail with findings and extensive information about real -time data that could be used to inform decision making regarding low adhesion. On the basis that the review has been completed, the recommendation can be closed.
3. However, challenges remain – for example there is no system that could be applied with equal reliability across all routes and regions, due to factors such as the vehicle fleets and local topography. A further challenge for Network Rail has been the lack of an agreed definition of ‘real-time’.
4. Network Rail is taking steps to include mandatory adhesion control measures in the autumn approach documentation for 2025 provided to the regions. We are interested to know how the different control measures are being used, why certain measures are or are not used, and how that information is communicated to the Network Rail Technical Authority, other regions and informs planning for the next leaf

fall season. We will continue to pursue these matters as part of our business as usual inspection of Network Rail.

5. After reviewing the information provided 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 close it

**Status: Closed.**

### **Previously reported to RAIB**

6. On 23 October 2024 ORR reported the following:

Network Rail, in cooperation with RSSB and other stakeholders has commissioned research projects aimed at improving understanding of low wheel/rail adhesion and how to mitigate the consequences.

The research projects are summarised as follows:

- VTG wheel flat prevention – iwagon (RSSB, VTG, Knorr-Bremse)
- High Speed Cryogenic Rail Head Blasting to Alleviate Low Adhesion (Sheffield University/Cryogrip)
- Notus wheel slip (SWR - also applicable to rec 8)
- Trialling Low Adhesion Estimation through Image Machine Learning (Sheffield University/RSSB)
- Adhesion Monitoring and Treatment (Network Rail)
- 'Real Time' Low Adhesion Data (RSSB)
- Adhesion Research Group (ARG) – minutes of 6 Feb 2024 meeting (RSSB)
- Adhesion management for the operators (Encompass Engineering)
- High Pressure Water using Abrasive Suspension (LNT Solutions)
- Water-Trak NTL fleet fitment project report (Water-Trak)

Network Rail concluded the research highlights many technical options for recording low adhesion in real time to manage emergent low wheel rail adhesion conditions and the information has been provided to practitioners in the routes.

Before closing the recommendation, we are considering if the research will enable Network Rail to make more effective decisions regarding the management of emerging and potential low wheel/rail adhesion conditions.

### **Update**

7. ORR wrote to Network Rail with the following question

*The intent of the rec is for Network Rail to be able to make more effective decisions regarding the management of emerging and potential low wheel/rail adhesion*

*conditions. Can you explain how the research done will inform better decision making regarding low wheel/rail adhesion conditions?*

8. Network Rail responded on 15 October 2024 as follows:  
*The research highlighted many technical options of recording low adhesion in real time to manage emergent low wheel rail adhesion conditions. All Routes and practitioners now have these options available to them to adopt and to share their outputs through the SDS/SDMs at their respective JSMGs and SMTs.*

9. On 26 March Network Rail provided the following update:

Copy of the in use enhanced Adhesion Matrix.



Copy of Copy of  
Copy of IA RHTT Servi

Copy of the Guidance for the enhanced Adhesion Matrix.



Guidance.doc for IA  
and Adhesion Index.di

## Recommendation 5

*The intent of this recommendation is for Network Rail to improve wheel/rail adhesion conditions through the application of improved understanding of the effectiveness of railhead treatment regimes.*

Network Rail should undertake research to better understand:

- a. the factors that affect the rate of build-up of leaf fall contamination, for instance, the environment, meteorological conditions, topography, tree species and railway operations
- b. the relationship between different types of contamination and low railhead adhesion
- c. the effectiveness and longevity of currently available alternative railhead treatment regimes.

The findings from this research are to be used to support the seasons delivery specialist in decision-making relating to the necessary frequency of railhead treatment and understanding the impact of missed or delayed treatment.

## ORR decision

10. In response to the recommendation, RSSB undertook knowledge search S381 An overview on wheel/rail contamination and railhead treatments. We consider

the research to be detailed and thorough. The requirements of the recommendation have therefore been achieved.

11. The research found high-pressure water jets used on the Rail Head Treatment Train fleet (RHTT) is currently the most effective control. The research also found a lack of a consistent testing methodology for railhead treatment methods and products. In addition, the impact of different treatments and methods when used together was not well understood.

12. Network Rail plan to conduct laboratory tests of different treatment methods and products, with particular consideration given to the impact of using different treatments together. We have challenged Network Rail to explain how the findings from the research may be used to support seasons delivery specialists in decision-making regarding railhead treatment. We are supportive of the work done so far and will continue to pursue the appropriate implementation of the findings, via our business as usual interactions with Network Rail.

13. After reviewing the information provided 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 close it

**Status: Closed.**

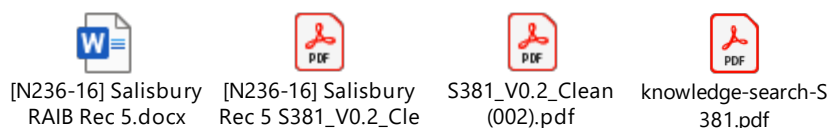
### Previously reported to RAIB

14. On 23 October 2024 ORR reported the following:

RSSB has produced a draft Knowledge search summarising the findings of more than 60 other reports into the causes of low wheel/rail adhesion. The draft report has been provided to ORR and is being peer reviewed. Network Rail expect the finalised version of the report to be circulated to routes and regions in November 2024. To close the recommendation, we have asked Network Rail to explain the changes that will be made to railhead treatment systems and approach as a result of the research.

### Update

15. On 18 February 2025 Network Rail provided the following closure statement and supporting documents:



16. On 26 March 2025 Network Rail provided the following update:

*Copy of the knowledge and guidance of best cleaning methodologies, practice, and products. This guidance was socialised with all Routes, TOCs and Ops across the Network with an ask to consider the best practice stipulated in the report as well as a consideration to consider new and emerging technologies to mitigate low adhesion where relevant to their operation. There is plenty of evidence that these are being considered as demonstrated by the National Overview and I suggest that Lisa Angus and the National Weather Team provide the overview of all the new and emerging stuff taking place on the back of Recs and best practice – including live network trials such as Water Trak and DVRS fitment. This also includes as part of Rec 4 the use on real time monitoring of low adhesion and its benefits. All Routes proactively manage low adhesion sites for both WSTCF and station over runs by the use of Intelligent Infrastructure and driver reports through WSP systems and ROLAs. These are all collated each year and the National Weather Team can provide the data on proactive mitigations for leaf fall 2024.*



S381\_V0.2\_Clean.pdf

## **Recommendation 7**

*The intent of this recommendation is to reduce the risk of overrunning signals at danger where there is a line speed change on the approach after the preliminary caution signal.*

Network Rail should review the decision not to retrospectively apply technical instruction TI022 'Provision of TPWS at signals' issue 4 to existing signals. Should retrospective application of TI022 be found appropriate, Network Rail should implement the required changes to existing Train Protection and Warning System equipment.

## **ORR decision**

17. As set out in our initial response to the recommendation, Network Rail sought to demonstrate that a network-wide programme of retrospective application of TI022 would not be reasonably practicable. We challenged Network Rail to explain the cost benefit analysis that supported this decision. Network Rail demonstrated the CBA tool and explained that it is only used as a guide to prompt further investigation and a full risk assessment is carried out. Signals are assessed periodically as per asset management policies to ensure that they are compliant with the latest control and safety standards.

18. With regard to signal SY31, Network Rail has reevaluated previous calculations and concluded the TPWS in this instance was in the optimum position. This was done by competent staff using the latest version of the available calculations.

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

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

**Status: Closed.**

**Previously reported to RAIB**

20. On 23 October 2024 ORR reported the following:

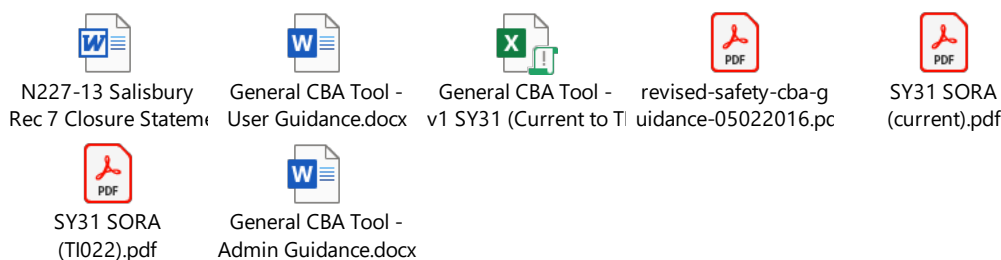
Network Rail has closed the recommendation on the basis that a network-wide programme of retrospective application of TI022 would not be reasonably practicable. Retrospective application of TI 022 is done where reasonable opportunity arises, typically as part of wider renewal scheme.

We challenged Network Rail to explain the conclusion that the costs of a programme of retrospective fitment to TI 022 would be grossly disproportionate. Network Rail have engaged consultants to establish the gross disproportion factor (GDF), but the cost benefit analysis for retrospective application of TI 022 used a GDF of 6, (which is the highest GDF scale applied to level crossings) and was still red, due to only a small change in FWI.

To support this conclusion, we have further challenged Network Rail to demonstrate: the calculated benefit from fitting extra TPWS; the cost of fitting the equipment as a special exercise; and the cost of fitting it as part of a wider scheme. Network Rail are currently engaged in further discussions with us to demonstrate the adequacy of their risk assessment and the conclusion that fitting TPWS is not reasonably practicable.

**Update**

21. On 24 October 2024 Network Rail provided the following closure statement and supporting documents:



## Previously reported to RAIB

### Recommendation 4

*The intent of this recommendation is for Network Rail to be able to make more effective decisions regarding the management of emerging and potential low wheel/rail adhesion conditions.*

Network Rail, working in co-operation with train operators, Rail Safety and Standards Board and other relevant stakeholders, should undertake research into real-time data that could be used to give an indication of the wheel/rail adhesion conditions on its network and how this could be used to support operational decisions to implement mitigation measures.

This review should include consideration of the following:

- a. monitoring data, including that drawn from on-train data recorders, wheel slide protection activity, and records of wrong side track circuit failures
- b. reports of low adhesion from train drivers and staff
- c. weather and low adhesion forecasts.

This review should take account of good practice in other parts of the rail sector both in the UK and abroad

### ORR decision

1. Network Rail, in cooperation with RSSB and other stakeholders has commissioned research projects aimed at improving understanding of low wheel/rail adhesion and how to mitigate the consequences.
2. The research projects are summarised as follows:
  - VTG wheel flat prevention – iwagon (RSSB, VTG, Knorr-Bremse)
  - High Speed Cryogenic Rail Head Blasting to Alleviate Low Adhesion (Sheffield University/Cryogrip)
  - Notus wheel slip (SWR - also applicable to rec 8)
  - Trialling Low Adhesion Estimation through Image Machine Learning (Sheffield University/RSSB)
  - Adhesion Monitoring and Treatment (Network Rail)
  - 'Real Time' Low Adhesion Data (RSSB)
  - Adhesion Research Group (ARG) – minutes of 6 Feb 2024 meeting (RSSB)
  - Adhesion management for the operators (Encompass Engineering)
  - High Pressure Water using Abrasive Suspension (LNT Solutions)
  - Water-Trak NTL fleet fitment project report (Water-Trak)
3. Network Rail concluded the research highlights many technical options for recording low adhesion in real time to manage emergent low wheel rail adhesion conditions and the information has been provided to practitioners in the routes.



4. Before closing the recommendation, we are considering if the research will enable Network Rail to make more effective decisions regarding the management of emerging and potential low wheel/rail adhesion conditions.

5. After reviewing the information provided 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 close it

**Status: Open.**

### Information in support of ORR decision

6. On 20 December 2023 Network Rail provided the following initial response:

#### Action Plan

##### Please provide milestones with dates

Several routes have engaged in the development of train mounted camera systems to observe and report rail head contamination in real time. Such observations support a more targeted approach to managing low adhesion areas as they manifest in real time.

Additionally, there has been active engagement between operators and NR Routes in enhancing Reports of Low Adhesion (ROLAs) and sharing the benefits of using ROLA information in real time to proactively manage low adhesion.

The leading indicators used in Autumn 2023 can be used to measure all interventions, with Routes providing analysis and evidence of benefit to safety and train performance during the leaf fall period.

There are also many research and development programmes in place with RSSB under the Adhere Programme which is managed through the Adhesion Research Group (ARG). The programmes have been used to determine the methodology to investigate the properties of low adhesion in the lab and on the live rail network, including the environmental and meteorological conditions.

- a) By **April 2024** a concise overview will be provided of all the current deployment of technology. This will be done in collaboration with RSSB.
- b) ROLAs are in operation now.
- c) Review of adhesion forecasting model with NRs weather service provider MetDesk- **March 2024**

##### Evidence required to support closure of recommendation

- Route reports on benefit of real time adhesion monitoring (as per a.)
- Route reports on changes and extent of contamination emerging in real time and its impact of train safety and performance (as per b.)

- Outcome of the Review of the adhesion forecasting model (as per c.)

7. On 20 May 2024 Network Rail provided the following updated action plan:

#### Action Plan

##### Please provide milestones with dates

A number of Routes are engaged with Train Operators in the development of WSP systems that can map low adhesion conditions on real time, train mounted camera systems (including AIVR) to observe and report rail head contamination in real time as well as other technologies to predict low adhesion that supports a more targeted approach to managing low adhesion areas as they manifest in real time.

Active engagement between operators and NR Routes in enhancing ROLAs and sharing the benefits of using ROLA information in real time to proactively manage low adhesion – also utilise and build on the adoption of leading indicators used in autumn 2023 that can be used to measure all interventions with Routes providing analysis and evidence of benefit to safety and train performance during the leaf fall period.

There are also many research and development programmes in place with RSSB under the Adhere Programme managed through the Adhesion Research Group (ARG) that have been used to determine the methodology to investigate the properties of low adhesion in the lab and on the live rail network, including the environmental and meteorological conditions.

Update: Following a meeting between NR and RSSB on 11.04.24 and a report received from RSSB that illustrates the various technologies and products for real time reporting of low adhesion. Shows evidence of the processes, methods, and technologies available for monitoring adhesion levels in real time. (April 24).

Evidence to changes made in operational documents include the new process for identifying new high-risk sites for low adhesion (New Adhesion Matrix – developed as part of Rec 1 Salisbury) based on WSP and ROLA and forward facing cameras from class 158 (One Big Circle).

##### Evidence required to support closure of recommendation

- RSSB Report identifying all the current systems, processes, methods, and products in place to monitor and reporting of real time low adhesion. June 2024
- Route reports on benefit of real time adhesion monitoring - **ROLA information and data from current WSP mapping systems as well as forward facing camera footage mounted for adhesion purposes (One Big Circle Data sets)**
- Route reports on changes and extent of contamination emerging in real time and its impact of train safety and performance (**ROLA forms and train performance data**)
- Evidence to changes made in operational documents based on the learning from real time monitoring – **New Adhesion Matrix used to determine new high risk sites for low adhesion which takes into account real time information of conditions and specific sites.**
- Evidence provided by Routes on enhanced safety and train performance in using intervention metrics – **interventions versus real train service performance (as supplied by Wessex in Leaf Fall 2023 and adopted by Routes in Leaf Fall 2024)**

8. On 20 May 2024 Network Rail provided the following closure statement:



Rec 4 Salisbury Close  
Out Statement.docx

9. On 16 September 2024 Network Rail provided the following update:  
*Work completed to date*

*A number of Routes (Wessex, Wales and Anglia have engaged in the development of train mounted camera systems to observe and report rail head contamination in real time that supports a more targeted approach to managing low adhesion areas as they manifest in real time. Complete*

*Active engagement between operators and NR Routes in enhancing ROLAs and sharing the benefits of using ROLA information in real time to proactively manage low adhesion through the adoption of leading indicators was used in autumn 2023. These were used to measure all interventions with Routes providing analysis and evidence of benefit to safety and train performance during the leaf fall period. Complete and shared as part of the NWT outputs for Leaf Fall 2023*

*There are also many research and development programmes in place with RSSB under the Adhere Programme managed through the Adhesion Research Group (ARG) that have been used to determine the methodology to investigate the properties of low adhesion in the lab and on the live rail network, including the environmental and meteorological conditions. Complete – Methodology document shared with Industry through ARG 2023*

*The adhesion forecast in agreement with Met Desk can now be extended for any Route wishing to do so. We have also agreed with Met Desk that the Long Range Forecast will be used to support decisions within the Route to extend the treatment of the season if they feel it is required using the LRF on the Tactical Autumn Teleconference (TAT) calls. Complete (March 2024)*

*Work to do (include dates)*

*The work for part a has been completed and shared with all Routes with a request that SDS/SDMs discuss these opportunities with all their Operators through their JSMGs. The close out statement was completed in May 2024 and provided to the ORR.*

*Routes need to work with their TOCs and FOCs through their JSMGs to manage the flow of Adhesion Forecast information to drivers in advance of low adhesion conditions. Routes and ROCs also need to manage on train borne data in real time through their Adhesion Controls as part of their standard seasonal preparations in managing Leaf Fall (August – September 2024)*

*Routes need to agree on how they are going to proactive interventions for WSCTF through RCM and brief Adhesion Controls on the agreed process for each ROC (as part of the seasonal preparation for Leaf Fall 2024)*

## **Recommendation 5**

*The intent of this recommendation is for Network Rail to improve wheel/rail adhesion conditions through the application of improved understanding of the effectiveness of railhead treatment regimes.*

Network Rail should undertake research to better understand:

- a. the factors that affect the rate of build-up of leaf fall contamination, for instance, the environment, meteorological conditions, topography, tree species and railway operations
- b. the relationship between different types of contamination and low railhead adhesion
- c. the effectiveness and longevity of currently available alternative railhead treatment regimes.

The findings from this research are to be used to support the seasons delivery specialist in decision-making relating to the necessary frequency of railhead treatment and understanding the impact of missed or delayed treatment.

## **ORR decision**

10. RSSB has produced a draft Knowledge search summarising the findings of more than 60 other reports into the causes of low wheel/rail adhesion. The draft

report has been provided to ORR and is being peer reviewed. Network Rail expect the finalised version of the report to be circulated to routes and regions in November 2024. To close the recommendation, we have asked Network Rail to explain the changes that will be made to railhead treatment systems and approach as a result of the research.

11. After reviewing the information provided 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 close it

**Status: Open.**

### Information in support of ORR decision

12. On 20 December 2023 Network Rail provided the following initial response:

#### Action Plan

#### Please provide milestones with dates

a.) There is a wealth of information available regarding the factors that affect the rate of build-up of leaf fall contamination, the environment, meteorological conditions, topography, tree species and railway operations. Network Rail in partnership with the Adhesion Research Group will develop a summary document that describes the learning and implementation from previous R & D. This document will be drafted by **June 2024**.

b.) The document referred to above will demonstrate the relationship between different types of contamination and low railhead adhesion and will be supported by evidence from laboratory tests undertaken at Sheffield and Huddersfield Universities respectively. It will also be supported by data provided from historic real world low adhesion trials (see below). The draft document will be available in **June 2024**.

c.) The effectiveness and longevity of current available alternative rail head treatment regimes were tested in trials undertaken by Supply Chain Operations at East Lancs Railway in autumn 2022, and at RIDC Melton in January 2023. (Details and results of the trials are below).

Trials undertaken by Supply Chain Operations at the East Lancs Railway in autumn 2022, and at RIDC Melton in January 2023 assessed what were considered the two most advanced alternative technologies to water jetting (Laser and Plasma treatments). The trials used various contaminations (such as oils and leaves) and measured coefficient of friction consistently using tribometer trolleys, and abundance of contamination using chemical analysis of swabs. The trials concluded that the water jetting system currently in operation throughout the leaf fall period is the optimal developed solution to cleaning the rail head. Removal of contamination and effect on railhead friction far outperformed the alternatives, with the

report noting it “consistently excelled in lowering the quantity of abundance found on the railhead. Indicating the effectiveness of displacing railhead contaminants”

The table below shows the coefficient of friction improvements and reduction in contaminants delivered by water jetting.

60mph Multi-Layered Testing								
Contamination	Run Number	Rail	Friction Coefficient			Contamination Abundance - Oil		
			Plasma	Laser	Water Jetting	Plasma	Laser	Water Jetting
Natural	Run 1	North	-0.15	-	0.04	-	-	-7%
		South	-0.08	0.06	-0.04	-	-52%	-4%
Engine Oil	Run 2	North	-0.04	-	0.29	679%	-	-82%
		South	0	0.01	0.29	147%	-51%	-99%
Engine Oil/Vegetation	Run 3	North	-0.04	-	0.24	92%	-	-12%
		South	0.04	-0.01	0.03	173%	-5%	-57%
Engine Oil/Vegetation/Bearing Oil	Run 4	North	-0.01	-	0.70	-9%	-	-31%
		South	0.01	-0.02	1.25	-64%	129%	-84%
		Weather	Overcast	Overcast	Passing Clouds			
		Temperature (Celsius)	12.9	13.6	3			
		Humidity (%)	63	61	75			
		Wind Speed (mph)	13	8	10			

From these and other trials the optimal frequency of cleaning is site specific as contamination can build up relatively quickly between current treatments – keeping the rail head clean and free of contamination would require cleaning between every train – or cleaned by every train (in some circumstances).

These findings have provided the industry with several options to support Seasonal Delivery Specialists making good decisions in the timely planning and application of additional mitigation measures when sites are missed by the rail head treatment trains. The findings also suggest that alternative and targeted deployment of rail head treatment more frequently based on real time low adhesion information rather than running large pre-planned circuits would be optimal. The current deployment of rail head treatment is not reactive and covers large areas of the network that is not always affected by low adhesion issues.

A paper is being drafted with cross industry input that proposes a number of options for the longevity of current available treatment and how we adapt so that new technology, currently under trial will reach a maturity level to be applicable for future rail head treatment. The proposed plan is to develop a business case and appropriate contract and procurement strategy for testing through CP7 and for adoption in CP8 if successful. The contracts for Railhead treatment are up for renewal and the new tender will include provision for adoption of new technology when ready for deployment.

#### Evidence required to support closure of recommendation

- A document that provides information on the learning and implementation from previous R & D. This document will be drafted by **June 2024**.
- A document that will demonstrate the relationship between different types of contamination and low railhead adhesion and will be supported by evidence from laboratory tests. This document will be drafted by **June 2024** and will be supplementary to the document referred to above.

- East Lancs Trial paper on RHTT efficacy (**available now**)
- Draft paper developed on future options of rail head treatment outlining the business case and the C & P strategy with milestones across CP7 **June 2024**

13. On 16 September 2024 Network Rail provided the following update:

*Work completed to date*

*The effectiveness and longevity of current available alternative rail head treatment regimes were tested in trials undertaken by Supply Chain Operations at East Lancs Railway in autumn 2022, and at RIDC Melton in January 2023. (Details and results of the trials or shown below).*

*Trials undertaken by Supply Chain Operations at the East Lancs Railway in autumn 2022, and at RIDC Melton in January 2023 assessed what were considered the two most advanced alternative technologies to water jetting (Laser and Plasma treatments). The trials used various contaminations (such as oils and leaves) and measured coefficient of friction consistently using tribometer trolleys, and abundance of contamination using chemical analysis of swabs. The trials concluded that the water jetting system currently in operation throughout the leaf fall period is the optimal developed solution to cleaning the rail head. Removal of contamination and effect on railhead friction far outperformed the alternatives, with the report noting it “consistently excelled in lowering the quantity of abundance found on the railhead. Indicating the effectiveness of displacing railhead contaminants”*

*The document referred to above has been shared with the industry*

*Work to do (include dates)*

*There is a wealth of information available regarding the factors that affect the rate of build-up of leaf fall contamination, the environment, meteorological conditions, topography, tree species and railway operations contained within 60 x documents that have now been reviewed. Network Rail in partnership with the Adhesion Research Group are developing a summary document that describes the learning and implementation from previous R & D. This document is currently being drafted between NR and RSSB and will be ready in draft form in September 2024. Once the draft is complete it will be shared with Prof Roger Lewis at Sheffield University for expert review in October 2024.*

*Once reviewed the document will be available for all rail industry managers, stakeholders and practitioners.*

## **Recommendation 7**

*The intent of this recommendation is to reduce the risk of overrunning signals at danger where there is a line speed change on the approach after the preliminary caution signal.*

Network Rail should review the decision not to retrospectively apply technical instruction TI022 'Provision of TPWS at signals' issue 4 to existing signals. Should retrospective application of TI022 be found appropriate, Network Rail should implement the required changes to existing Train Protection and Warning System equipment.

## **ORR decision**

14. Network Rail has closed the recommendation on the basis that a network-wide programme of retrospective application of TI022 would not be reasonably practicable. Retrospective application of TI 022 is done where reasonable opportunity arises, typically as part of wider renewal scheme.

15. We challenged Network Rail to explain the conclusion that the costs of a programme of retrospective fitment to TI 022 would be grossly disproportionate. Network Rail have engaged consultants to establish the gross disproportion factor (GDF), but the cost benefit analysis for retrospective application of TI 022 used a GDF of 6, (which is the highest GDF scale applied to level crossings) and was still red, due to only a small change in FWI.

16. To support this conclusion, we have further challenged Network Rail to demonstrate: the calculated benefit from fitting extra TPWS; the cost of fitting the equipment as a special exercise; and the cost of fitting it as part of a wider scheme. Network Rail are currently engaged in further discussions with us to demonstrate the adequacy of their risk assessment and the conclusion that fitting TPWS is not reasonably practicable.

17. After reviewing the information provided 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 close it

***Status: Open.***

## **Information in support of ORR decision**

18. On 11 June 2024 Network Rail provided the following closure statement:



[N227-13] Salisbury  
Rec 7 Closure Statement