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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: Freight train derailment at Willesden High Level Junction, north-west London on 6 May 2019

I write to report[1] on the consideration given and action taken in respect of the recommendations addressed to ORR in the above report, published on 25 August 2020.

The annex to this letter provides details of actions taken in response to the recommendations and the status decided by ORR. The status of recommendation 1 is **'Progressing'.** The status of Recommendations 2 & 4 is **'Implemented'**. The status of recommendation 3 is **'Implementation on-going'.**

ORR will advise RAIB when further information is available regarding actions being taken to address these recommendations.

We will publish this response on the ORR website on 25 August 2021.

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 4 recommendations were addressed to ORR when the report was published on 25 August 2020.

2. After considering the recommendations ORR passed recommendations 1, 2 & 3 to Network Rail and recommendation 4 to DB Cargo asking them to consider and where appropriate act upon them and advise ORR of its conclusions. The consideration given to each recommendation is included below.

3. The report was brought to the attention of infrastructure managers other than Network Rail and tram operators. ORR also wrote to the Freight Technical Committee stating that the meeting panel agreed that the report, in particular recommendation 4, should be brought to the wider attention of ECMs and owners and operators of freight wagons. We considered that this could be most effectively done through the Freight Technical Committee, although we did not request a response from individual members.

4. This annex identifies the correspondence with end implementers on which ORR's decision has been based.

Recommendation 1

The intent of this recommendation is to make best use of routinely collected track geometry information for the purpose of understanding the condition of track bed and earthwork assets and how this may affect the safe running of trains.

Taking into account findings from its ongoing research programmes, Network Rail should investigate whether recent advances in computing techniques allow data recorded by its track geometry measurement trains to be analysed in a way that enables the identification of track movement trends that are indicative of underlying problems with the track bed and/or supporting earthworks. If reasonably practicable, it should develop and implement analysis tools and processes and make these available to engineers responsible for the management of such infrastructure assets

ORR decision

5. Network Rail has provided information setting out the scope and expected outputs of the R&D project aimed at using track geometry data to give early warning of embankment failures. However the plan lacks sufficient detail and a timescales for us to make a clear judgment on whether it will addresses the recommendation.

6. We have asked Network Rail to set out how they will use the findings of the R&D project to develop an analysis tool for its engineers. From our regular liaison meeting and regulatory work we believe Network Rail have done much of the required R&D project to analyse track geometry data and embankment failures to investigate whether track geometry data can give early warning of embankment failures. We are discussing the detail of this work with Network Rail and if it has included use of tools such as TIGER (Track Integrated Geometry Engineer Reports) and LADS (Linear Asset Decision Support).

7. 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 implement it, but ORR has yet to be provided with a detailed action plan and timescales

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 3 December 2020 Network Rail provided the following initial response:

Action Plan

Network Rail Geotechnical department will:

1. Carry out an R&D project to analyse track geometry data and embankment failures to investigate whether track geometry data can give early warning of embankment failures.
2. Consult the RAM(G) & RAM(Track) Asset technical Review on track geometry recording data from measurement trains and embankment failure data to identify data sets for analysis;
3. Review the need for implementing analysis tools for decision-making processes for earth embankment and track assets vulnerable to progressive or rapid failure of embankments. Update control documents as necessary.

Evidence required to support closure of recommendation

1) Updated control documents, including the briefing of changes to the earthworks and track RAM teams;

2) Enhanced data availability between management of Track and Management of Earthworks to allow track geometry data to be made available to RAM (G) and earthwork data to RAM (Track) to allow timely interventions.

Recommendation 2

The intent of this recommendation is that the significance of incomplete measurements made by track geometry measurement trains is made visible and managed accordingly.

Network Rail should review the arrangements it uses to alert its track maintenance teams to missing data from its track geometry measurement trains, including the reports required by NR/L2/TRK/038 and other information that is made available, and the actions they then take. It should make enhancements to its processes,

instructions and guidance to address deficiencies that could impact on the safe running of trains

ORR decision

9. Network Rail has updated the arrangements for alerting track maintenance teams to missing data from track geometry measurement trains and made changes to the reporting arrangements in NR/L2/TRK/038.

10. Network Rail has also enhanced its track geometry traces to highlight sections of recorded track where the TRV speed has dropped below minimum required to produce valid track geometry data.

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
- has taken action to implement it

Status: Implemented

Information in support of ORR decision

12. On 3 December 2020 Network Rail provided the following initial response:

Action Plan

Network Rail issued a special inspection notice (SIN167) requiring all Routes to undertake checks on sections of the network where dynamic geometry measurement is not undertaken. The outputs from this inspection notice provided a backdrop for developing a proof of concept to define the outputs required to address missing mileages from track geometry recording measurements.

Network Rail has now commissioned a new software development that will identify these missing sections of track that have not been inspected by the measurement fleet or manual inspections. A project plan has been produced with key milestones identified as below:

- *December 2020 – engagement with market to secure resources needed to carry out the software development*
- *July 2021 – Award contract to successful contractor*
- *April 2023 - System operational*
- *May 2023 to Aug 2023 – Develop communication and deployment plan*
- *Aug 2023 to April 2024 - Roll out to all end users for full operational deployment*

Evidence required to support closure of recommendation

Presently the Track Engineer and Maintenance teams are sent track geometry traces and the train log following validation of geometry data. Both these documents indicate where sections of track have been missed, what data was lost and the point at which the measurement dropped out or re-started. This process is

very labour intensive and requires manually analysing train borne data to identify mileages that have not been measured and compare these against manual inspection measurements.

A new software solution commissioned by Network Rail will enable maintenance teams to receive notification of all lines that have been dynamically or manually measured and any gaps that have not been covered. This will be automated removing the workload and inaccuracy of undertaking manual analysis. The software will enable an assessment to determine whether the missed section of track requires replanning to record it or if a local engineers' inspection is needed to apply any mitigations, as necessary. The software solution will provide the following outputs:

- *Planned train-borne inspections coverage Completed manual and train-borne inspections*
- *Missed sections from train-borne sections and details of:*
  - *when the subsequent train-borne recording is due*
  - *when the missed section will exceed its standard maximum inspection interval.*

Network Rail will demonstrate that the outputs from this software solution will enable the Track Engineer and Maintenance teams to identify and address any missed mileages between dynamic and manual track measurements.

ORR review of NR response and action plan

13. **On 22/02/2021 at the CP3 Panel -** It was agreed that the NR response to the recommendation didn't address the issues raised by the recommendation. It covers identification of "blackholes" in the TRV coverage (i.e. track where the TRV doesn't run),this was not the issue at Willesden but was an issue at East Somerset Junction which led to RAIB recommendation 3 in the East Somerset Junction report which is being addressed by the Network Rail work cited above, and being tracked to closure through our recommendation process for that report.

14. The Willesden Network Rail response failed to address the issue raised in recommendation 2 regarding geometry data streams lost when the TRV operates at low speed. It is where these data streams are lost that the recommendation requires NR to provide alerts to track maintenance teams. We raised this with Network Rail in writing.

15. In response to our challenge we met with Network Rail (Ian Barber) on 8/4/2021 (via MSTeams) where they agreed with our challenge and advised of the work they had put in place to address the issues regarding geometry data streams lost when the TRV operates at low speed, and that this work was in addition to and alongside that being done for the East Somerset Junction recommendation.

The work streams to identify the data lost when TRVs operate at low speed are:

- Colouring the trace lines where data is lost in gold
- Marking the whole 1/8th where the data was lost as a fail/invalidated 1/8 – Aim being to aid the track workers identify on the ground the actual 1/8 where the recording failed. 1/8ths being readily identifiable
- Provision of information in the train log section of the reports

- Update to the TIGER guide section re invalidated data

These changes are live and operational and were notified to SMT TMEs etc (ie staff who receive and work with the TRV reports and traces) through the long established Track Geometry change notice process. (Notices 59 & 60). The notices were sent out on the 1/3/21

16. Network Rail confirmed these changes in an email and provided copies of the change notices, and updated TIGER guide.

17. On 13 July 2021 Network Rail provided the following closure statement confirming the above action:

[N189-06] Willesden Rec 2.doc

18. Network Rail state in summary the following:

The Network Rail Network Technical Head Track has reviewed the arrangements used to alert track maintenance teams to missing data from TRVs, including the reports required by NR/L2/TRK/038 and other information that is made available, and the actions they then take.

Two changes have been implemented to existing reports provided to maintenance teams, to clearly identify where TRV dynamic track geometry data is missing (was not recorded) or has been invalidated during processing. The enhanced information provided is a direct input into existing track geometry reviews by Track Maintenance Engineers and Section Managers. The changes have been briefed to maintenance teams via the Track Asset Technical Review.

In view of the actions taken the intent of this recommendation has been met and therefore is considered CLOSED

Recommendation 3

The intent of this recommendation is to ensure the timely identification of unsafe changes in track geometry arising from known defects in supporting earthwork structures.

Network Rail should review and update, as necessary, its processes and guidance for the management of earthwork structures such that when ongoing movement is identified in a supporting earth embankment adequate monitoring of the track is established. The frequency of the monitoring and associated alert arrangements need to be such as to allow timely action to be taken in the case of a rapid deterioration of the track geometry, in order to prevent any impact on the safe running of trains. It should also review and enhance the arrangements for the department responsible for management of earthwork structures and the department responsible for track maintenance to inform the other of the potential susceptibility and, therefore, the need for enhanced monitoring

ORR decision

19. Following challenge from ORR, Network Rail have provided a revised plan aimed at improving communication and transfer of information and between Track Maintenance Teams and Earthwork Management Teams, such that when ongoing movement is identified in a supporting earth embankment adequate monitoring of the track is established.

20. 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 implement it by 31 December 2021.

Status: Implementation ongoing. **ORR will advise RAIB when actions to address this recommendation have been completed.**

Information in support of ORR decision

21. On 17 October 2020 provided the following initial response:

Action Plan

Network Rail Geotechnical and Track departments will work together to:

1. Review the following documents:
- *NR/L2/CIV/086: Management of Earthworks Manual*
- *NR/L2/CIV/086/Mod01: Earthwork Evaluations*
- *NR/L2/CIV/086/Mod04: Earthwork Interventions*
- *NR/L2/CIV/086/Mod05: Earthwork Mitigations*
- *NR/L2/CIV/086/Mod09: Earthworks Adverse / Extreme Weather Risk Assessment*
- *NR/L2/TRK/001 (all modules)*

2. Identify deficiencies in existing control measures that could lead to rapid deterioration of the track geometry as a result of earth embankment failure;
3. Consult the RAM(G) & RAM(Track) Asset technical Review (ATR); and review any local procedures / documents to identify best practice in recording the decision making for monitoring and mitigations;
4. Review the need for formalising periodic review of earth embankments susceptible to progressive rapid failure, as part of routine asset management process between geotechnical and track asset management teams. Update control documents as necessary;
5. Review the need for formalising the decision-making processes for earth embankment and track assets vulnerable to progressive rapid failure of embankments. Update control documents as necessary.

The report and action plan was briefed at the Geotech ATR and will be briefed by Dec 2020 at the Track ATR. The Directors of Engineering and Asset Management will also be asked to act locally so that the intention of the recommendation is achieved in practice while the standards are being updated.

22. On 29 April 2021, in response to questions raised by ORR, Network Rail provided the following update:

This action plan (Version 2) follows a discussion held between Network Rail and ORR on 8th March 2021 regarding the scope of work required to address this recommendation.

ORR and Network Rail were in general agreement that formalised communications and transfer of information and between Track Maintenance Teams and Earthwork Management Teams will help achieve timely action when implementing monitoring and mitigation measures for these assets.

Therefore, Network Rail will:

1. ***Review and update as necessary NR/L2/CIV/086: Management of Earthworks Manual and NR/L2/TRK/001 and formalise a structured and documented Interdisciplinary Earthwork Asset Review held between Track Maintenance and Earthwork Managers as part of routine asset management processes. This will formalise communications and decision making on mitigations between Track and Earthworks.***

ORR feedback on the 8th March advised that Network Rail should consider further what the triggers & thresholds are for "ongoing [earthwork] movement" and the associated procedures (process-flow) to carry out adequate monitoring. Noting the existing process flow diagrams/ framework in NR/L2/CIV/086 (notably Mod.1 [evaluations], Mod.5 [mitigations], Mod.6 [monitoring] and Mod.7 [operational restriction]), Network Rail will:

2. ***Review its existing processes including NR/L2/CIV/086: Mod5 [mitigations], Mod6 [monitoring] and Mod7 [operational restriction];***

3. ***Consider triggers that indicate the need for enhanced monitoring or a Monitoring Action Plan (including the review frequency);***

4. ***Review and update, as necessary, the decision-making process/ procedure that identifies the need for a Monitoring Action Plan.***

Linked Action	***Milestones***	***Target Dates***
1	*Working group consensus on the requirement for Interdisciplinary Earthwork Asset Review for both Track and Earthworks Standards.*	*31.03.2021*

2,3,4	*Working group consensus on the decision-making processes/ procedures that lead to Monitoring Action Plan*	*23.08.2021*
1,2,3,4	*Stakeholder consultation and feedback through the ATR's on proposed changes/ updates to standards; Note: Circulation of DRAFT of changes to allow working into Winter operating procedures*	*26.08.2021*
1,2,3,4	*Stakeholder consensus and completion of all proposed updates to standards – (Standards Publication deadline)*	*01.10.2021*
1,2,3,4	*Updated standards published*	*04.12.2021*

Evidence required to support closure of recommendation:

1) *Deficiencies in the management of earthworks and track identified;*
2) *Updated control documents, including the briefing of changes to the earthworks and track RAM teams;*
3) *Enhanced and joined up asset management procedures between management of Track and Management of Earthworks to allow suitable monitoring and timely mitigation;*

Recommendation 4

The intent of this recommendation is to ensure that MGR-derivative wagons do not travel on the national network with unsafe diagonal wheel load imbalance.

DB Cargo should review the effectiveness of the maintenance processes and arrangements it uses to control the diagonal wheel load imbalance of MGR-derivative wagons. It should identify and implement any necessary changes to maintain any imbalance within prescribed safe limits. Implementation of this recommendation should consider whether:

- the means of determining and adjusting the diagonal wheel load imbalance are suitable for achieving the level of control required
- wheel load measurement is necessary as part of the VIBT maintenance cycle, or at another suitable maintenance interval.

DB Cargo should share the outcome of this review with other entities in charge of maintenance via an appropriate forum, such as the Freight Technical Committee, or other suitable means of communication

ORR decision

23. DB Cargo has addressed the specific items in the recommendation by reviewing maintenance processes for MGR-type wagons and made a number of

changes in their maintenance documentation to accommodate it. Revisions include both the maintenance interval for measuring wagon frame twist and wheel load.

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

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

Status: Implemented

Information in support of ORR decision

25. On 16 March 2021 DB Cargo provided the following summary of actions being taken before submitting a formal initial response:

DBC have reviewed the maintenance plan for the MHA/MPA wagons and are making the following changes.

1. Recording of the suspension heights to be incorporated into a specifc check sheet.
2. Revised interval for measuring wheel loads
3. Revised interval for checking frame twist
4. Revised requirements for measuring wheel loads and frame twist checks
5. Redesigned axlebox adaptor for measuring wheel loads using portable jacks
6. DBC have procured new and more accurate jacks for measuring wheelloads
7. DBC have invested in portable Weighwell equipment for measuring wheel loads in addition to portable jacks
8. VIBT record sheet, frame twist check sheet and wheel load check sheets being revised
9. Method of measuring suspension using GO/NO GO gauges under review

We are currently inspecting and measuring several wagons to validate all the changes

26. On 5 August 2021 DB Cargo provided the following formal initial response:

In response to the ORR letter dated 9th October 2020 and previous correspondence from DB Cargo (DBC) 6th March 2021 regarding RAIB report: Freight Train Derailment at Willesden High Level Junction, North West London, please find below DBC's response to the recommendation that 'DB Cargo should review the effectiveness of the maintenance processes and arrangements it uses to control the diagonal wheel imbalance of MGR-derivatives wagons.

DBC have reviewed the maintenance of its MGR and derivative wagons and are the following has been completed:

1. DBC reviews and investigates all incidents and issues involving DBC vehicles, logging all events in its Hazard and Near Miss System. DBC investigates when appropriate all issues associated with wagons, derailments, loading etc. which are

reviewed by DBCs ECM functions to ensure the maintenance and inspection of vehicles is appropriate and sufficient.

2. DBC has revised the maintenance interval at which the inspection and measuring of wagon frame twist checks are to be completed. Wagon frame twist check are to be completed at every VIBT (2 yearly interval).

3. The methodology for frame twist checks now incorporates a method using a Theodolite. Incorporating this method allows greater flexibility at maintenance locations to complete the required checks.

4. The maintenance interval for wheel weighing has been modified. Wheel weighing will be undertaken when the suspension either at one or both ends of the wagon are renewed.

5. With regards to frame twist and wheel weighing this will still be completed as and when required due to incidents or issues or when performance trends dictate.

6. The method for weighing wheels has been revised to incorporate specific track requirements (as per the frame twist checks). A new design of axlebox adaptor allowing new and more accurate calibrated jacks to measure wheel weights. This methodology measures individual wheel loads.

7. An alternative method for measuring wheel weight has also been implemented. Wheel weights can also be measured using static Weighwell equipment. This equipment measures individual wheels and axleloads.

8. All of the above has been incorporated into revised maintenance documentation for DBCs MGR and Derivative wagons, DBS/TB/0421 is a Technical Bulletin which covers updates to the main maintenance plan DBS/ES/0081.

9. DBS/TB/0421 also incorporates specific equipment and requirements for measuring dimensions between the wagon solebar and Eyebolt. The requirement for recording the dimensions and calculating the allowable differences between specified dimensions has been incorporated into the wagon VIBT examination paperwork. An additional requirement to measure the Eyebolt/solebar dimensions following wagon movement has also be implemented, this is to allow for the wagon suspension to settle.

10. DBS/TB/0421 incorporates a check sheet for recording wheel cone packing which is used for compensating for wheel diameter difference and wagon frame twist. A requirement is now in place to check this at every wheelset exchange, frame twist check and VIBT.

11. DBS/TB/0421 incorporates a check sheet to record the wheel weighs and calculate the allowable difference between specified values.

12. As part of the ongoing review and evaluation of imbalanced wagon loads and loading issues, DBC is a member of the NFSG Freight Derailment Working Group and works closely with other FOCs and users of DBC leased wagons to ensure any issues and/or incidents are reviewed and investigated as required.

13. As DBCs MGR and Derivative wagons are leased to Network Rail, DBC are a member of Network Rail's SOC Freight Derailment Working Group, working with Network Rail and other FOCs to review loading of DBC leased wagons.

14. As part of Network Change being implemented by Network Rail, DBC have agreed to install RFiD tags to its wagon fleet, the MGR and Derivative wagons have been priorities to allow better identification of wagons through WILD and wagon imbalanced load reporting.

15. DBC is working with Network Rail to implement LUCY which is an extension of the current WILD data reporting process. The system merges data from multiple reporting systems (Headcodes, Origin, Destination, Vehicle Owner/Operator, ECM, RFiD etc.) to enhance the reporting of wagon imbalances and WILD.

DB Cargo will continue to review and investigate safety related incidents and review and monitor hazard identification and logs in-line with monitoring processes detailed within SMSs and the ECM directive.