Oliver Stewart
Senior Executive, RAIB Relationship and Recommendation Handling
Telephone 020 7282 3864
E-mail oliver.stewart@orr.gsi.gov.uk

7 December 2020

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

Dear Andrew,

RAIB Report: Structural failure caused by scour at Lamington Viaduct, South Lanarkshire on 31 December 2015

I write to provide an update[1] on the action taken in respect of recommendations 1, 2 & 3 addressed to ORR in the above report, published on 14 November 2016.

The annex to this letter provides details of the action taken regarding the recommendations. The status of recommendations 1, 2 & 3 is **'Implemented'**.

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 8 December 2020.

Yours sincerely,

Oliver Stewart

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

Recommendation 1

The intent of this recommendation is to improve the management of scour risk and increase the quality of information available to staff responsible for making decisions about the safety of structures.

Network Rail should review and improve the management of scour risk by Scotland Route. The review should encompass formal procedures, the way in which they are implemented and the competencies of staff. Any lessons learnt should be applied to other Routes where appropriate. The improved measures for the management of scour risk should provide for:

a. Prompt holistic evaluations of all relevant existing information (including poor structure condition, shallow foundation depth, possible future changes in river bed level and scour assessments) whenever new information is received about a structure at risk of scour damage, followed by timely:

- implementation of necessary remedial work; or
- effective risk assessment (including any necessary investigations) for any decision to defer or omit remedial work recommended by the examination regime or other specialists; and
- implementation of any temporary mitigation found necessary by these risk assessments.

b. Circumstances where water level monitoring is not a reliable measure of risk from scour or water action.

c. Circumstances where structure degradation, climate change and other factors mean that historic behaviour of a structure and the surrounding environment is not a good indicator of future behaviour.

d. Enhanced measures for automatic monitoring of parameters such as water level, flow rate, bed level (ie direct measure of scour) and structure movement.

ORR decision

1. We consider the measures specified by Network Rail sufficient to meet the requirements of the recommendation. Our 2017-18 and 2018-19 inspections found that the Scotland Route's remote river level monitoring systems were often not fully functioning. The most recent update provided by Network Rail identified that 93% of Network Rail's structures in Scotland, which and are listed in the Adverse and Extreme Weather Plan (i.e. are considered "at risk of scour and flooding") and have been fitted with remote monitoring systems, are fully functional.

2. 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.

Previously reported to RAIB

3. On 6 October 2017 ORR reported the following:

'ORR is content that the information provided so far by Network Rail is broadly acceptable although nothing is mentioned specifically about the Scotland Route, which is identified in the recommendation.

The response indicates Network Rail rely heavily on water level markers, the reliability of which is questioned in the RAIB report. Subsequent discussion with Network Rail indicates a more nuanced position, that they consider water level markers can be effective when used correctly and in the right circumstances.

We will continue to monitor delivery Network Rail's delivery against the milestones in the report and any subsequent changes that need to be made to guidance following completion of the research.'

Update

4. On 14 May 2019 Network Rail re-submitted the following closure statement and supporting evidence:

5. In response to the four areas identified by RAIB in the recommendation for improved measures for the management of scour risk, Network Rail state the following:

'a) Network Rail has published new scour standard NR/L3/CIV/295 - Scour assessment of bridges, culverts and retaining walls, (attached).

The new standard mandates:

- *Stage 1 scour assessments for all at-risk assets*
- *Stage 2 scour assessments to be carried out within 12 months for all assets deemed to be at higher risk of scour (scoring ≥ 16 at Stage 1)*
- *Action to permanently reduce the scour risk for all assets scoring ≥ 16 at Stage 2 shall be carried out within two years*
- *For those structures that are ≥ 16 after a stage 2 scour assessment, a risk assessment is to be carried*
- *out and suitable mitigation put in place until the scour risk is permanently reduced.*

Additionally, Network Rail's new examination standard is proposing:

- *Underwater exam interval shall be reduced to a maximum of yearly for assets scoring ≥ 16*

- *During each examination report evaluation, a review of the risk from scour shall be undertaken.*

b) Consistent with current industry best-practice and the latest CIRIA guidance issued in 2015 Network Rail believe that for early warning, analogues for scour such as water level are currently the most reliable measure.

The challenge is to ensure that where water level markers are used, they are accurate. Network Rail will therefore re-confirm the accuracy of water level markers (where used to manage higher risk structures during extreme weather) using robust hydraulic assessment and adjust accordingly.

Interim guidance has been produced for assessing water level marker heights, (see attached).

All water level markers that are used to manage the risk of scour at an asset shall be assessed and adjusted as necessary by December 2018.

c) The new examination management standard will require the scour assessment and structure examination processes to be better integrated. Following scour assessment, ongoing scour risk will be managed by monitoring change in condition during exam evaluations.

Network Rail's new examination standard shall mandate that during each examination report evaluation, a review of the risk from scour shall be undertaken.

d) Network Rail commissioned a technology landscape report to explore enhanced automatic monitoring techniques. It was concluded that whilst many of the technologies can be utilised to provide enhanced underwater survey information, 'live' monitoring of scour is more suited to confirming that it is safe to re-open a structure to traffic following closure due to high water levels.

Network Rail's research and development team produced a "Challenge Statement" for engagement with industry partners to explore the above enhanced automatic monitoring measures, (see attached).

Datum is currently developing a 'ScourMATE' solution to measure scour depth close to the foundations of bridge piers and abutments. Datum is targeting April 2018 for an on-site test installation.

Recommendation 2

The intent of this recommendation is to enhance response arrangements for operations staff dealing with structures over or adjacent to water, which can suffer damage (including scour damage) that is not immediately apparent.

Network Rail should review, and if necessary, enhance its processes for operations staff responding to defect reports (eg track faults) where these may relate to structures over, or adjacent to, water. The enhancements should provide responses

which take account of the risk that the defect is a consequence of structural damage caused by water action (eg scour, impact from floating debris, debris blockage etc.).

ORR decision

6. Network Rail has made changes to the relevant track inspection standard with the aim of being able to of being able to identify damage to structures by making sure suitably competent staff are aware of issues as early as possible.

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
- has taken action to implement it.

Status: Implemented.

Previously reported to RAIB

8. On 6 October 2017 ORR reported the following:

ORR is content with the approach Network Rail are taking, although we have asked them to justify the focus on track faults as we consider the recommendation to have a wider application than this. The text of the recommendation asks Network Rail to 'review, and if necessary, enhance its processes for operations staff responding to defect reports', but the response only refers to a review of the current requirements for responding to track faults.

Update

9. On 7 October 2019 Network Rail provided the following update:

Lamington Viaduct
Rec 3 Closure Staten

10. Network Rail state the following:

NR/L2/TRK/001/mod13 (Track hand back) has been updated and re-issued to include the requirement for the on-call track attendee to an incident to escalate to an on-call Structures Engineer or on-call Earthworks Engineer if the track support (bridge/embankment) could have been undermined by flood/high water or landslip at or near the rough ride report location. For example, flood water at the bottom of embankments, physical indicators of ground movement such as leaning trees, scars or bulges in the embankment; or high, possibly fast moving, water under bridges carrying the railway over water.

TEF3202 has also been updated, divided into sections, to align to the different scenarios which require the completion of this hand back form.
The form now includes a specific section (Part G) for recording the inspection to determine whether the track support is at risk. Part E (Inspection to determine action required when the track is flooded) and Part F (Inspection following rough ride report) include a prompt to complete Part G.

The NR/L2/TRK/001/mod13 update and the TEF3202 were issued and briefed in September 2019.

Recommendation 3

The intent of this recommendation is to ensure that the latest version of all relevant documentation and processes are being used by control room staff. The documentation and other processes should be updated and checked periodically to ensure that they remain fit for purpose.

Network Rail should review and improve the management and assurance systems for all control centre processes relating to the safety of railway infrastructure used by Scotland Route. The review should encompass both documented processes and the way they are implemented. It should include:

- procedures directly relevant to control room staff;
- inputs required from other parts of Network Rail;
- inputs required from external organisations; and
- arrangements for prompt updating and periodic verification of processes.

Any lessons learnt should be applied to other Routes as necessary

ORR decision

11. Network Rail have updated their National Operating Procedure for weather arrangements to make clear that risks relating to both structures and earthworks are considered in an extreme weather event.

12. 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.

Previously reported to RAIB

13. On 6 October 2017 ORR reported the following:

The text of the recommendation asks Network Rail to 'review and improve the management and assurance systems for all control centre processes', but the response only refers to EWAT. We have asked Network Rail the justification for this.

We have also asked Network Rail to explain what assurance processes they have in place, or are planning to put in place, to ensure operational staff have the most up to date documentation to inform decisions regarding control measures to be put in place following the reporting of defects.

Update

14. On 3 December 2019 provided the following closure statement:


Lamington Viaduct
Rec 3 Closure Staten

15. Network Rail state the following:

National Control Instructions NR/L3/OPS/043/7.1 and NR/L3/OPS/043/7/2 were updated and reissued as National Operating Procedure NR/L3/045/3-17 Weather Arrangements, incorporating additional measures for Supply Chain Operations. NR/L2/OPS/021 Weather: Managing the Operational Risks was updated to ensure that both structural and earthwork risks were considered at Delivery Unit level prior to an EWAT. During extreme weather events, evidence of structural considerations, where appropriate, shall be included within the EWAT notes.

As part of a further review into NR/L2/OPS/021, a number of Level 3 modules will be created, of which structures shall be one, and these will outline the route risks to be considered during an extreme weather event. These modules will be written primarily by a subject matter expert within the relevant function with input from the National Weather Specialist and the Operations Standards Development Coordinator. As part of the briefing of NR/L2/OPS/021, there will be a route requirement to collate the risk and management plans within the various Level 3 modules into one over-arching weather management plan which will be available to control, and any other relevant staff. The rewritten L2 standard and the L3 modules will be subject to the regular review processes within Network Rail: any significant, material changes to processes will facilitate the revision of effected modules.

Scotland continue to use their updated weather plan to manage extreme weather response, which include responding to structural issues. Work has taken place with the route to map their scour and structure risk sites on the Network Rail Weather Service, which will provide email alerts when pre-agreed thresholds are met. This is

a piece of work that is being undertaken by a number of other routes with our forecasting partners, MetDesk.

Update November 2019
As part of a further review into NR/L2/OPS/021, a number of Level 3 modules (NR/L3/OPS/021) have been created, of which structures is one. These outline the route risks to be considered during an extreme weather event. The modules, which cover Extreme Weather Response (EWR) by functions, as well as Seasonal Management, EWR process guidance and weather management specific tools, have been written primarily by a subject matter expert within the relevant function with input from the National Weather Specialist and Operations Standards Development Coordinator. As part of the briefing of NR/L2/OPS/021, there is a route requirement to collate the risk and management plans within the various Level 3 modules into one over-arching route plan, known as the Integrated Weather Management Plan (IWMP), which is being made available to Route Operations Controls, and any other relevant staff, through a phased introduction. The rewritten L2 standard and newly created L3 modules are subject to the regular review processes within Network Rail: any significant, material changes to processes will facilitate the revision of effected modules.

Previously reported to RAIB

Initial consideration by ORR

1. All 3 recommendations were addressed to ORR when the report was published on 14 November 2016.
2. After considering the recommendations ORR passed all three recommendations to Network Rail 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. ORR also brought the learning points in the report to the attention of other infrastructure managers as it was concluded that that there are equally important lessons for them. ORR did not ask these organisations to provide a reply.

Recommendation 1

The intent of this recommendation is to improve the management of scour risk and increase the quality of information available to staff responsible for making decisions about the safety of structures.

Network Rail should review and improve the management of scour risk by Scotland Route. The review should encompass formal procedures, the way in which they are implemented and the competencies of staff. Any lessons learnt should be applied to other Routes where appropriate. The improved measures for the management of scour risk should provide for:

a. Prompt holistic evaluations of all relevant existing information (including poor structure condition, shallow foundation depth, possible future changes in river bed level and scour assessments) whenever new information is received about a structure at risk of scour damage, followed by timely:

- implementation of necessary remedial work; or
- effective risk assessment (including any necessary investigations) for any decision to defer or omit remedial work recommended by the examination regime or other specialists; and
- implementation of any temporary mitigation found necessary by these risk assessments.

b. Circumstances where water level monitoring is not a reliable measure of risk from scour or water action.

c. Circumstances where structure degradation, climate change and other factors mean that historic behaviour of a structure and the surrounding environment is not a good indicator of future behaviour.

d. Enhanced measures for automatic monitoring of parameters such as water level, flow rate, bed level (ie direct measure of scour) and structure movement.

ORR decision

4. ORR is content that the information provided so far by Network Rail is broadly acceptable although nothing is mentioned specifically about the Scotland Route, which is identified in the recommendation.

5. The response indicates Network Rail rely heavily on water level markers, the reliability of which is questioned in the RAIB report. Subsequent discussion with Network Rail indicates a more nuanced position, that they consider water level markers can be effective when used correctly and in the right circumstances.

6. We will continue to monitor delivery Network Rail's delivery against the milestones in the report and any subsequent changes that need to be made to guidance following completion of the research.

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 fully scoped and time-bound plan for implementation.

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 11 July 2017 Network Rail provided the following initial response:

Following the Lamington incident, Network Rail carried out a 'National review of scour, flooding and associated extreme weather processes'. All routes were visited and the following procedures were covered:

- *Use of scour database*
- *Scour assessments*
- *Extreme weather processes*
- *Underwater exams*
- *Remediation*
- *Remote monitoring*
- *Research and Development*

Section 11.1 of the report details Network Rail's programme for improvement, the implementation of which will addresses RAIB's recommendation 1 findings as detailed below:

a) Network Rail will address part a) within a new Standard for scour management due for publication by September 2017.

b) Consistent with current industry best-practice and the latest CIRIA guidance issued in 2015 Network Rail believe that for early warning, analogues for scour such as water level are currently the most reliable measure. The challenge is to ensure that where water level markers are used, they are accurate. Network Rail will therefore re-confirm the accuracy of water level markers (where used to manage higher risk structures during extreme weather) using robust hydraulic assessment and adjust accordingly.

Water level markers to be assessed and adjusted as necessary by December 2018.

A simple periodic report will monitor water level marker assessment progress and marking of bridges on site.

c) The new scour management standard will require the scour assessment and structure examination processes to be better integrated. Following scour assessment, ongoing scour risk will be managed by monitoring change in condition during exam evaluations.

d) Network Rail will review all currently installed water level and flow rate monitoring and provide a report on the success of these installations. A best practice guide will be produced for the monitoring of scour sites using latest available technology. The report will be completed by October 2017.

Additionally, Network Rail will provide a report detailing research that it is supporting into monitoring of bed level (i.e. direct measure of scour) and structure movement by July 2017.

Following the completion of the research, Network Rail will review its application and update the best practice guide as necessary.

Recommendation 2

The intent of this recommendation is to enhance response arrangements for operations staff dealing with structures over or adjacent to water, which can suffer damage (including scour damage) that is not immediately apparent.

Network Rail should review, and if necessary, enhance its processes for operations staff responding to defect reports (eg track faults) where these may relate to structures over, or adjacent to, water. The enhancements should provide responses which take account of the risk that the defect is a consequence of structural damage caused by water action (eg scour, impact from floating debris, debris blockage etc.).

ORR decision

9. ORR is content with the approach Network Rail are taking, although we have asked them to justify the focus on track faults as we consider the recommendation to have a wider application than this. The text of the recommendation asks Network Rail to ‘review, and if necessary, enhance its processes for operations staff responding to defect reports’, but the response only refers to a review of the current requirements for responding to track faults.

10. 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; but
- has not fully set out how it will be delivered.

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

11. On 11 July 2017 Network Rail provided the following initial response:

Network Rail proposes to address the intent of this recommendation by reviewing the current requirements for responding to reports of track faults on structures over or adjacent to water. The review will consider the adequacy of current inspection arrangements, to determine whether current processes are sufficient to identify the root cause of track defects resulting from structural damage caused by water action and whether any further requirements and / or guidance should be implemented.

This will be carried out in two stages, as follows:

<u>Stage 1</u>

Network Rail will:

- *review current standards, controls and processes for responding to track geometry faults initiated from the Fault Management System (FMS);*
- *carry out cross engineering discipline consultation to ascertain current route business processes in place and any associated documentation; and*
- *determine any inadequacies and formulate an assessment of change required to the current controls as appropriate.*

<u>Stage 2</u>

If the review identifies enhancements required to current processes to fully meet the intent of the recommendation, Network Rail will:

- *identify the work required to address inadequacies and prepare a resourced programme to amend and implement the relevant standards, controls, processes and / or guidance; and*
- *submit a request for an extension to the recommendation timescale to undertake the programme of works and implement the changes.*

The response to this recommendation will be led by the Professional Head of Track but will require cross disciplinary input to deliver any changes identified.

Recommendation 3

The intent of this recommendation is to ensure that the latest version of all relevant documentation and processes are being used by control room staff. The documentation and other processes should be updated and checked periodically to ensure that they remain fit for purpose.

Network Rail should review and improve the management and assurance systems for all control centre processes relating to the safety of railway infrastructure used by Scotland Route. The review should encompass both documented processes and the way they are implemented. It should include:

- procedures directly relevant to control room staff;
- inputs required from other parts of Network Rail;
- inputs required from external organisations; and
- arrangements for prompt updating and periodic verification of processes.

Any lessons learnt should be applied to other Routes as necessary

ORR decision

12. The text of the recommendation asks Network Rail to 'review and improve the management and assurance systems for all control centre processes', but the response only refers to EWAT. We have asked Network Rail the justification for this.

13. We have also asked Network Rail to explain what assurance processes they have in place, or are planning to put in place, to ensure operational staff have the most up to date documentation to inform decisions regarding control measures to be put in place following the reporting of defects.

14. 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 timebound plan.

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

15. On 11 July 2017 Network Rail provided the following initial response:

Route Controls continuously review the weather model to determine the level of action required for local weather management, in conjunction with the current National Control Instructions (NCI), Instruction: 7-1, Issue: 5 (NR/L3/OCS/043/7.1), and, Instruction: 7-2, Issue: 5 (NR/L3/OCS/043/7.2). NB; The NCI is being developed and updated and re-issued as a National Operations Procedure (NOP) as part of an ongoing project to align the current 3 modules for the Operations, Control and Station staff. Scotland Route

Control have newly developed weather management plans, which covers all types of extreme weather events and aligns with the EWAT conferences. These EWAT now involve more of a focus on infrastructure and structural issues which delivers a strong balance between the need to operate a train service and the safety impact of extreme weather events.

Network Rail's National Control Manager will review the current Route EWAT processes to ensure that structural considerations form part of this process by all Routes in the event of extreme weather events. Routes will submit their current local EWAT management plans to the National Control Manager and they will check that consideration is being given to provide mitigation at high risk structures where necessary. Where this is not being carried out a recommendation will be made for those routes to have this included in their strategy for weather management. This will occur through the re-issue of NR/L2/OPS/021.

Action to be carried out through National Control Manager by National Weather Specialist and / or Planning and Resilience Manager - Weather.