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21 March 2012

Ms Carolyn Griffiths
Chief Inspector of Rail Accidents
Rail Accident Investigation Branch
Block A, 2 nd Floor
Dukes Court
Dukes Street
Woking GU21 5BH

Dear Carolyn

Derailment of an engineering train between Gloucester Road and Earl's Court stations on London Underground

I write to report¹ on the consideration given and action taken in respect of the recommendations addressed to ORR in the above report, published on 21 March 2011.

The annex to this letter provides details of the consideration given/action taken in respect of each recommendation where all nine recommendations have been implemented²

We do not propose to take any further action from that shown 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 again³.

We expect to publish this response on the ORR website on 4 April 2012

Yours Sincerely

Chris O'Doherty

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

² In accordance with Regulation 12(2)(b)(i)

³ In accordance with Regulation 12(2)(c)

Initial consideration by ORR

1. All nine recommendations contained in the report were addressed to ORR when RAIB published the report on 21 March 2011.
2. After considering the report and recommendations ORR we passed recommendations 3, 4 5, 6, 8 and 9 to Tube Lines and recommendations 1, 2 7 and 8 to London Underground asking them to consider and where appropriate act upon them and advise ORR of their conclusions. Tubelines and London Underground provided a combined response to ORR on 9 May 2011.
3. The consideration given and actions taken in respect of all nine recommendations is shown below.

Recommendation 1

The purpose of this recommendation is for data from any equipment used to assess the track asset to show clearly what safety faults have been identified and where they are located. This will help to promote a situation where those track faults that are more reliably detected by asset inspection equipment are acted upon

London Underground, in consultation with Tube Lines, should arrange for all data on track faults identified by asset inspection equipment, such as the asset inspection train, to be presented clearly. The procedures for managing the data should indicate how required remedial actions are planned, prioritised and executed by those in receipt of the data.

Actions taken or being taken to address the recommendation

4. In the response received on 9 May, London Underground and Tube Lines confirmed the following actions:
 - *Current Track Recording Vehicle (TRV) – discrete gauge faults to be added to Safety Standard Discrete fault report issued on day of run;*
 - *Tube Lines' Procedure for TRV Response (P-943 Management of Safety Standard TRV Inspections and Corrective Maintenance) has been drafted and implemented;*
 - *P-943 has been reviewed along with P-165 Track Maintenance Regime to ensure it covers the key points on how remedial actions are planned, prioritised and executed;*
 - *Asset Performance Directorate (APD) procedures and processes for dealing with TRV faults have been reviewed to confirm these cover the key points on how remedial actions are planned, prioritised and executed;*
 - *Current procedures, defining the management of Ultrasonics Inspections and similarly how remedial actions are managed, have*

been reviewed. Correct alignment of procedures with P-165 confirmed; 20 May 2011.

- *Current APD procedures defining the management of Ultrasonics Inspections have been reviewed to confirm these cover the key points on how remedial actions are planned prioritised and executed; 3 June 2011*
- *Maximo⁴ reporting has been enhanced to ensure Safety Standard faults are actioned within action times and/or by exception risk assessments (Temporary Approved Non Compliances) completed and mitigations implemented until repairs complete. 10 June 2011*

Compliance reports are provided automatic distribution to zone Maintenance managers and engineers.

ORR Decision

5. Tube Lines has confirmed that a discrete fault means a single fault at one location. Previously, the output from the track recording vehicle provided 'track quality' information through mathematical algorithms analysing a number of discrete faults. The output did not actually highlight the individual faults, for some track measurements (one being gauge) which were near or exceeded safety parameters the TRV output has now been changed to highlight these exceedances and it is now clear to maintenance staff what the exceedances are and how to action them through the new procedure (p-943 Management of Safety Standard TRV inspections and corrective actions)

6. After reviewing all the information received from London Underground and Tube Lines, ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, London Underground in consultation with Tube Lines has:

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

7. We do not therefore propose to take any further action unless we become aware that the information provided above becomes inaccurate in which case we will write again to RAIB.

Status – Implemented

⁴ Asset management system used by Tube Lines to: record infrastructure faults; assign timescales for fault rectification work; record rectification work that has been completed; plan and record track patrols and inspections; and store track asset register.

Recommendation 2

The purpose of this recommendation is for London Underground to make improvements to the way in which track faults are identified and classified during track inspections, thus reducing the risk that faults will be overlooked.

London Underground, in consultation with Tube Lines, should review standard 1-159 'Track- dimension and tolerances' with a view to making changes to the standard or take other appropriate steps to make it easier for patrollers and inspectors to identify and record issues of concern.

Actions taken or being taken to address the recommendation

8. In the response received on 9 May, London Underground and Tube Lines confirmed the following actions:

London Underground and Tube Lines agreed to initiate a Fault Management Working Group to address this recommendation and recommendation 8. The first meeting was held on 14 April and included London Underground APD. The workstream will comprise a number of workshops to consider the improvements possible and a potential trials period followed by full implementation with the following milestones

- *By 14 July 2011: Conduct workshops to:*
 - *(i) review the standard;*
 - *(ii) identify improvements;*
 - *(iii) develop proposed trials or implementation approach.*

The workshops will include London Underground (Engineers and Maintenance Managers) and Tube Lines' Engineers, Managers, and APD practitioners (including patrolmen, PM3/4 Inspectors and Health and Safety Representatives).

- *July – October 2011: Potential trials of solutions identified in the workshops followed by review of effectiveness and detailed planning.*
- *Timescale to be confirmed: Potential implementation of solutions, noting this may involve briefing and training and review of licensing. The detail will depend upon the outputs from the above.*

ORR Decision

9. London Underground have organised Fault Management Workshops drawing on the experience of inspection and maintenance managers, inspector track patrollers and Health and Safety representatives. The workshops (completed in November 2011, with ORR attending one) reviewed the requirements of the standard, the problems of applying the standard in practice and discussed solutions and identified improvements.

A meeting to review the outputs of the workshops together with a human factors analysis took place on 2 March 2012.

10. After reviewing all the information received from London Underground and Tube Lines, ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, London Underground in consultation with Tube Lines has:

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

11. We do not therefore propose to take any further action unless we become aware that the information provided above becomes inaccurate in which case we will write again to RAIB.

Status – Implemented

Recommendation 3

The purpose of this recommendation is to allow sufficient time for track patrols and inspections. This will enable staff to meet the requirements of the relevant standards for these activities, so that track faults are not missed.

Tube Lines should review and revise its patrol route risk assessments, and inspection routes, taking account of human factors issues, to ensure there is sufficient time available to complete thorough and detailed patrolling and inspection activities in accordance with relevant standards.

Actions taken or being taken to address the recommendation

12. In the response received on 9 May, Tube Lines confirmed the status of the following reviews:

	<i>Patrolling</i>	<i>PM3 Plain Line Inspections</i>	<i>Ultrasonics</i>
<i>Jubilee Line</i>	<i>Assessment completed in December 2010. Supplementary measure on Neasden P & C added. New route numbers assigned and some altered routes introduced due to move to nights on Wembley to Stanmore, revised routes on Maximo. Complete</i>	<i>Assessment complete. Consultation with Health and Safety Representatives to be complete by 31 May 2011.</i>	<i>Assessment completed in December 2010</i>

Northern Line	<i>Assessment the same as last year other than a bespoke patrol of Highgate test track introduced. The Northern Line patrolling regime is being reviewed to ensure consistency with other lines and possible optimisation for flat bottom track</i>	<i>Assessment completed 2010. Changes being reviewed. If necessary an implementation plan to be developed by 20 May 2011</i>	<i>Assessment completed in December 2010</i>
Piccadilly Line	<i>Assessment complete and some supplementary measures introduced. New route numbers assigned Route status on Maximo to be confirmed by 21 May 2011. Consultation with London Underground Piccadilly Line Operations in progress</i>	<i>Assessment in place (Dec 2010) remains unchanged. This will be reviewed when new patrol regime implemented.</i>	<i>Assessment completed in January 2011.</i>

ORR Decision

13. Tube Lines has now completed a review of track patrol routes, plain line/points and crossings/ultrasonic inspections which consider the complexity of the route and the time required to undertake an effective patrol/inspection. This has resulted in additional and altered routes on the Piccadilly and Jubilee lines. The Northern Line routes were reviewed early in 2010. Human factors assessed the process for reviews and as part of this assessment a number of patrol routes were sampled.

14. After reviewing all the information received from Tube Lines, ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, it has:

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

15. We do not therefore propose to take any further action unless we become aware that the information provided above becomes inaccurate in which case we will write again to RAIB

Status – Implemented

Recommendation 4

The purpose of this recommendation is for patrollers and inspectors to be adequately trained and undertake regular assessments to ensure their ongoing competence.

Tube Lines should review its training and competence management processes for patrollers and inspectors. The review should aim to establish a comprehensive training programme for each grade of staff and a regular cycle of rigorous competence assessments.

Actions taken or being taken to address the recommendation

16. In the response received on 9 May, Tube Lines confirmed the following actions:

- *The T001 Track Patrollers and PM3 inspectors training material has been updated and is regularly reviewed in light of changes to requirements or standards. PM3 updated September 2010. PM1 and PM3 training material held on Tubelines' centralised IT system. Ongoing reviews will take place when changes are identified.*
- *The PM1, PM3 and PM4 assessments and portfolio of evidence are encased within our Safety Critical Licensing Scheme and is a robust system of training, mentoring and assessment of candidates. Work instructions, valid assessments and portfolios of staff competence are held by the Competence Assurance manager.*
- *All identified PM3 Inspectors have been through Tubelines' PM3 training course. Portfolios of competence held by the Competence Assurance Manager for each licensed PM3 Inspector, completed February 2011.*
- *A programme of workshops has been developed for track personnel who are responsible for conducting joint inspections with patrol personnel covering their roles and responsibilities. Completed April 2011. Workshop material is available and signature sheets of attendees held. All new staff identified as having to undertake joint inspections will attend the joint inspection workshop.*
- *A review of the joint inspection form and process of monitoring the outcome of joint inspections is currently being undertaken by the Competence Assurance Manager. Planned for June/July 2011. New form and monitoring process will be implemented when new track organisation comes into effect.*
- *The PM4 training material is reviewed when changes to process, procedures or standards are made – Ongoing PM4 training material was updated in 2010 and course material is held on Tubelines' centralised IT system*
- *All identified staff with the responsibility for conducting PM4 Inspections on Tubelines Track Assets have undertaken training, mentoring and formal on site observational assessments before being issued with Safety Critical License. PM4 portfolios of staff's competence to undertake Junction Work Inspections are held by the Competence Assurance Manager.*
- *The ongoing verification of applied competence is included in Standards 2-049 and 2-050, see recommendation 6 actions for status and roll out.*

ORR Decision

17. Soon after the incident Tube Lines upgraded the training material associated with patrolling and inspections. These staff are now incorporated into the safety critical licensing scheme, requiring them to be assessed and to produce a portfolio of evidence. ORR raised concerns that the process only seemed to get the patrollers and inspectors to the point where Tubelines considered they could be issued with a safety critical license to perform the activity, it did not demonstrate that they were managing on-going competence.

18. Tube Lines have since confirmed that staff competence is validated through the supervisory and management inspections (defined by standards 2-TLL-049 & 5). Tube Lines are currently undertaking verification activity (to be complete by November 2012) to ensure these standards have been implemented and are effective.

19. After reviewing all the information received from Tube Lines, ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, it has:

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

20. We do not therefore propose to take any further action unless we become aware that the information provided above becomes inaccurate in which case we will write again to RAIB

Status – Implemented

Recommendation 5

The purpose of this recommendation is for Tube Lines to modify its processes to make sure it assesses the effect of vacancies in safety-critical positions within Tube Lines asset maintenance organisation immediately. This should enable appropriate steps to be taken so that there is no detrimental effect on safety-critical activity.

Tube Lines should modify its processes to include the requirement to actively monitor and assess safety critical vacancies within its asset maintenance organisation. Where key vacancies are identified the reasons for not filling the post should be explored and assessments undertaken to understand and control the risk arising. The review of key vacancies should not be limited to management grades but should include key personnel, such as those involved in asset inspections and asset condition recording.

Actions taken or being taken to address the recommendation

21. In the response received on 9 May, Tube Lines confirmed it had taken the following actions

A list of vacancies and mitigation for the roles will be recorded in the Health Safety and Environment Report submitted to the Health Safety and Environment Committee

In summary, each period the vacancies are reviewed by the Asset Engineers in their respective areas. The mitigation of how the responsibilities of each vacancy are being covered is considered to determine and ensure that critical activities are being carried out and that steps are in place to address the vacancy. The Asset Engineers use the various meetings they have in their asset area to keep this information up to date. This is reviewed at the Head of Assurance 4 weekly meeting with the asset engineers and the status of the vacancies and how mitigated is included in the Performance Report to the Companies Health Safety and Environment Committee to enable Executive Level monitoring and action where necessary.

ORR Decision

22. After reviewing all the information received from Tube Lines, ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, it has:

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

23. We do not therefore propose to take any further action unless we become aware that the information provided above becomes inaccurate in which case we will write again to RAIB

Status – *Implemented.*

Recommendation 6

The purpose of this recommendation is for Tube Lines to ensure that systematic and regular reviews are undertaken of the quality of track patrols and inspections, including the recording of faults found and their rectification. This should achieve a more rapid identification of lapses in the quality of track patrols and inspections which could result in safety-critical faults not being identified and rectified.

Tube Lines should improve its assurance processes to ensure a robust system of assurance activities is undertaken, with particular emphasis on practical activities. The activities should target the quality of track patrols and inspections, and the identification and prioritisation of faults. The improvements should include a process for following-up and rectifying issues identified.

Actions taken or being taken to address the recommendation

24. In the response received on 9 May, Tube Lines confirmed the following actions

- *a standard has been developed and issued for the Zone Maintenance and Inspection Managers to verify and ensure the quality of the inspection processes and work bank quality – Standard 2-049 Plain Line.*
- *A standard has been developed and issued for S&C – Standard 2-050.*
- *Both the above standards have been briefed out*

- *Zone Maintenance Managers and Inspection Managers to confirm their plan to meet the requirements of 2-049 and 2-050 3 June 2011*
- *Implementation of Standards 2-049 and 2-050 to be verified June/July 2011*
- *Asset engineers to provide 4 weekly reports on surveillance and monitoring activities (From Tubelines FIR)*
- *A risk based plan of surveillance activities against the key risks has been prepared (From Tubelines FIR)*
- *Implemented a database to capture actions arising from surveillance and monitor to close out (From Tubelines FIR)*

ORR Decision

25. Tube Lines has now defined the process for checking the quality of track patrols and inspections which aims to ensure the competence of the staff undertaking those inspections. The surveillance plan for the Northern Line has been signed off by Tube Lines (central) assurance team. Surveillance plans for the Piccadilly and Jubilee lines are still being validated by the assurance team which in the meantime is carrying out its own extra surveillance. Verification is planned to take place over the next ten months to check that maintenance managers are working to them and that they are effective.

26. After reviewing all the information received from Tube Lines, ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, it has:

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

27. We do not therefore propose to take any further action unless we become aware that the information provided above becomes inaccurate in which case we will write again to RAIB.

Status - *Implemented*

Recommendation 7

The purpose of this recommendation is for London Underground to make improvements to its processes for following-up issues found during its audit and surveillance of Tube Lines track maintenance activities.

London Underground should improve its assurance processes to ensure that issues identified during audit and surveillance of Tube Lines track maintenance activities are actively monitored and addressed by Tube Lines in a timely manner.

Actions taken or being taken to address the recommendation

28. In the response received on 9 May, London Underground confirmed the following actions.

- *Register to be developed of current issues and concerns monitored by London Underground Head of Track Engineering with a complimentary and formally defined process, through which unresolved concerns will be escalated until a satisfactory resolution is obtained (process to include review at Asset Performance Review Meeting (APRM) and escalation steps to include presentation at the LU Head of engineering Technical meeting)- from 19 May 2011*
- *Schedule to be an agenda item and raise any Tubelines issues and concerns at the Tubelines APRM – from 19 May 2011*
- *Regularly report findings of London Underground and Tubelines surveillance activities to the Tubelines APRM under an agenda item covering surveillance – from 19 May 2011*

ORR Decision

29. After reviewing all the information received from London Underground, ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, it has:

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

30. We do not therefore propose to take any further action unless we become aware that the information provided above becomes inaccurate in which case we will write again to RAIB

Status – *Implemented.*

Recommendation 8

The purpose of this recommendation is for London Underground to consider how the level of risk from ML faults should be evaluated after patrols and inspections have taken place in order to clarify the action required where there are multiple faults.

London Underground, in partnership with its track maintainers, should review standard 1-159 'Track- dimension and tolerances' with the aim of providing guidance on the assessment of risk from ML faults. The guidance should address how the effect of other ML or SS faults in the same location or immediate vicinity should be evaluated so that impending problems at particular locations can be identified.

Actions taken or being taken to address the recommendation

31. In the response received on 9 May, London Underground confirmed the following actions

London Underground and Tubelines have agreed to initiate a Fault Management Working Group to address this recommendation and recommendation2. The first meeting was held on 14 April led by Stephen Barber(London Underground) and Jonathan Bray(Tubelines, also including London Underground Asset Performance

Directorate. The workstream will comprise a number of workshops to consider the improvements possible, a potential trials period followed by full implementation with the following milestones;

- *By 14 July 2011: Conduct workshops to:*
 - *(i) review the standard;*
 - *(ii) identify improvements;*
 - *(iii) develop proposed trials or implementation approach.*

The workshops will include London Underground (Engineers and Maintenance Managers) and Tube Lines' Engineers, Managers, and APD practitioners (including patrolmen, PM3/4 Inspectors and Health and Safety Representatives).

- *July – October 2011: Potential trials of solutions identified in the workshops followed by review of effectiveness and detailed planning.*
- *Timescale to be confirmed: Potential implementation of solutions, noting this may involve briefing and training and review of licensing. The detail will depend upon the outputs from the above.*

ORR Decision

32. London Underground and Tube Lines have linked their review of fault identification in response to this recommendation which relates to managing and prioritising identified faults. The workshops have considered the management and prioritisation of both discrete faults and the synergy of different types of faults occurring in the same location (e.g. twist and gauge). The action plan for this recommendation aligns with the action plan for recommendation 2 and is due for completion by the end of February 2012.

33. After reviewing all the information received from London Underground and Tube Lines, ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, London Underground in consultation with Tube Lines has:

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

34. We do not therefore propose to take any further action unless we become aware that the information provided above becomes inaccurate in which case we will write again to RAIB.

Status – *Implemented*

Recommendation 9

The purpose of this recommendation is for Tube Lines to consider the use of technology to assist patrollers and inspectors in recording and classifying track faults, thereby reducing the risk that faults will be overlooked.

Tube Lines should review current technologies and, following production of an action plan, implement any that can assist patrollers and inspectors. This should include the consideration of the use of hand-held computer devices to record and classify faults and geometry recording equipment that can be moved along the track to record parameters such as track gauge and twist .

Actions taken or being taken to address the recommendation

35. In the response received on 9 May, Tube Lines confirmed the following actions.

- *Tubelines holds a four weekly Technical Meeting involving senior track engineers across the company. The meeting looks at innovations and technical developments for track engineering. This group will be used to conduct a specific review of the current developments for technologies that may assist patrollers and inspectors, inviting London Underground representatives to share thinking across the London Underground Maintainers. Tubelines also runs a corporate innovation programme to stimulate ideas from staff for improving work processes. A number of developments are in progress as follows. Timescale 30 June 2011*
- *Trialled/Using Amber trolley on Jubilee line to check particular locations on a risk basis once identified from other inspection sources. These aid detail assessment of cross level and track gauge and accurate location recording.*
- *Trialling Maximo GPS handhelds for open sections with standard fault entry to ensure accurate location recording. Trial for 3 months. Rollout will be subject to success of the trial and business case evaluation. Timescale 29 July 2011.*
- *Visual 20m location markers are being installed on the track to assist the accurate location definition of faults, noting the AIT radio tags are at start of LCS sections. Timescale 30 Sept 2011.*
- *'B Scan' ultrasonics trials have been conducted and a costed programme is being developed which will be implemented subject to a positive business case. Timescale 26 August 2011.*
- *Tubelines is in the process of replacing the current Track Recording Vehicle with a new Asset Inspection Train. The initial implementation is focused on replacing the Track Recording Vehicle's functionality but will create potentially further opportunities eg audi visual inspection and how all the information flows integrate. The opportunities will be reviewed after the initial geometry implementation. Timescale: 28 Oct 2011.*

ORR Decision

36. There is now a mechanism in place to scan the industry for innovations in track inspection and maintenance and evidence that technology is being tested to assist in inspections.

37. Several improvements have been made to date, including the hand propelled 'AMBER' measurement trolley, assisting in fault measurement (gauge, twist and cant) and accurate location of defects. Location targets have also been replaced (in many locations these had not been replaced after renewal work meaning locations were often estimated from the 10 kilometre markers). The Asset Inspection Train will commence 'shadow running' the existing Track Recording Vehicle in June 2012, although introduction on all lines is hampered by non-fitment of train protection equipment for ATO equipped lines (this is the subject of separate intervention activity). The Asset Inspection Train is expected to be running in full capacity across all the lines by approximately December 2012. Tube Lines discusses new innovations which may assist inspection/maintenance of track at the periodic Track Engineers technical meeting. There is also an innovations programme to take forward staff recommendations (this has already offered solutions to mitigate manual handling and HAV risks – subject to ORR inspection).

38. After reviewing all the information received from Tube Lines, ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, it has:

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

Status – Implemented