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Office of Rail and Road and Network Rail

Independent Reporter Review of Data Quality

Final Report

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This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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Abbreviations

Abbreviation	Definition
A1	Data Quality Compliance Level A1 (99% compliance threshold for asset data quality)
A2	Data Quality Compliance Level A2 (95% compliance threshold for asset data quality)
ADG	Asset Data Governance
ADQ	Asset Data Quality
AIRS	Asset Information Reporting Team
AIS	Asset Information Services
CARRS	Civil Asset Register and Reporting System
CP	Control Period
CRI	Composite Reliability Index
DAMA	Data Management Association
DDaT	Digital, Data and Technology Services
DEAM	Director of Engineering and Asset Management
DQ	Data Quality
DQMR	Data Quality Measurement Report
EAI	Exchange of Asset Information
EGI	Equipment Group Identifier
ELR	Engineer' s Line Reference
EM	East Midlands
EP	Electrical Power
FP	Funding Period
GBR	Great British Railways
GSM-R	Global System for Mobile Communications-Railway
HCE	Hidden Critical Element
INM	Integrated Network Model
IR	Independent Reporter
IT	Information Technology
KVL	Key Volume Line
LNE	London North East
LNW	London North Western

Abbreviation	Definition
MAA	Moving Annual Average
NC	Network Capability
NEST	Network Enterprise Systems Tool
NR	Network Rail
OPAS	Operational Property Asset System
ORBIS	Offering Rail Better Information Services
ORR	Office of Rail and Road
P&R	Planning & Regulation team
Q	Question
QA	Quality Assurance
RACI	Responsible, Accountable, Consulted, Informed
RADAM	Regional Asset Data Analysis Manager
RAM	Route Access Manager
RDM	Rail Data Marketplace
RDS	Railway Data Standards
SME	Subject Matter Expert
S&C	Switches and Crossings
VeRA	Verification of Route Availability

Executive Summary

Purpose

Arup, supported by Winder Phillips Associates, has been appointed by the Office of Rail and Road (ORR) and Network Rail (NR) as Independent Reporter to undertake a review of Network Rail's arrangements to improve data quality, in line with Network Licence requirements and commitments made to ORR.

The review provides independent assurance over the design, implementation and effectiveness of data quality improvement initiatives across both regulatory data assurance and asset data improvement. Its findings are intended to inform ORR's confidence in current arrangements and provide assurance, and support regulatory oversight, ahead of Funding Period 1 (FP1).

Methodology

The review has been undertaken using Arup's established Independent Reporter methodology of Mobilise → Assess → Develop → Recommend, which has been applied consistently across previous Independent Reporter commissions.

This approach ensures that findings are evidence-led, traceable, and reflect both the design of processes and their effectiveness in practice. The approach is proportionate and risk-based, combining:



Scope of the Review

The review focuses on two primary areas: Regulatory Data Assurance and Asset Data.

It assesses the effectiveness of actions taken by Network Rail to strengthen regulatory reporting, including data governance, assurance arrangements, training, and data quality monitoring. It also evaluates whether asset data initiatives are delivering sustained improvements in data quality.

In relation to Regulatory Data Assurance, the review considers the application of the Data Assurance Best Practice Guide [1], the provision of training and data quality monitoring arrangements and the implementation and effectiveness of second-level assurance.

In relation to Asset Data Improvement, the review assesses the application of the Asset Data Governance (ADG) Framework [2] and associated initiatives and the consistency and effectiveness of A2 data quality scoring processes and systems.

Summary of Findings

Regulatory Data Assurance

Our review found that Network Rail has established a clear and structured framework for regulatory data assurance, supported by the Data Assurance Best Practice Guide [1], associated training, and defined assurance processes. The Central Regulatory Reporting team demonstrates strong ownership of these arrangements, and training has been delivered at scale with additional support available where required.

However, these arrangements are not yet consistently embedded across the wider organisation. While there is no indication that good practice is being actively disregarded, there is limited evidence that data providers routinely apply or reference the Best Practice Guide and associated controls in practice as part of routine reporting. This indicates that the framework and Guide are not yet fully operating as a standardised approach across Regions and disciplines.

Second-level assurance arrangements have strengthened through increased automation and improved tooling, including dashboards and system-based calculations. These enhancements reduce reliance on manual

processes and provide greater visibility of changes in reported data. However, the review was constrained by limited access to supporting evidence, including sample data and documentation, which restricted the ability to test assurance processes in practice. As a result, while key elements of the framework are in place, there is less evidence of consistent and effective application across all measures.

Regional data quality monitoring arrangements are established, but vary in structure and maturity, reflecting Network Rail's devolved operating model. This variability (between different Regions) leads to differences in how data quality controls are monitored, applied and evidenced in practice, limiting overall consistency.

Overall, regulatory data assurance arrangements are in place, but further work is required to demonstrate consistent application and effectiveness across the organisation.

Asset Data Improvement

Our review found that Network Rail has developed a comprehensive ADG Framework, supported by data quality measurement processes and governance forums. These arrangements demonstrate clear intent and are broadly aligned with good practice.

However, as with Regulatory Data, there is a consistent gap between documented governance arrangements and their application in practice. Evidence was incomplete and inconsistent across the Regions reviewed, including Scotland, Eastern and Southern, limiting the ability to form a full comparative view of governance maturity. While all Regions described active governance activity, there is limited evidence that processes are consistently implemented, monitored, or linked to measurable improvements in data quality over time.

The A2 data quality (DQ) scoring process is a clearly defined measure that assesses a specific subset of attributes and focuses on two of the six DAMA (Data Management Association) dimensions. Consequently, systems may be deemed compliant despite underlying data errors. As a result, parts of the business view A2 primarily as a compliance exercise, limiting its effectiveness in driving sustained data quality improvement. This is reflected in largely static DQ scores, despite stakeholder perceptions of improvement. There is a risk that the A2 metric does not provide a sufficiently robust basis for decision-making, particularly where asset data is critical to planning, maintenance, and investment activities.

Overall, while the governance framework is established and aligned to good practice, we found limited evidence to demonstrate consistent implementation, clear accountability, and measurable impact across the organisation.

Conclusions and recommendations

The report presents four key conclusions:

- Network Rail has established a substantial data quality framework; however, its effectiveness is not consistently evidenced.
- Data governance has developed with second-level assurance in place for selected measures and Regions but provides limited assurance over its effectiveness.
- A2 asset data quality scoring provides a structured, useful but limited view of asset data quality.
- Reliance on legacy systems and manual processes for asset data management, including both day to day management and A2 asset data quality monitoring, creates inefficiency and avoidable risk.

Network Rail has made substantive progress in establishing data quality frameworks and processes in response to ORR requirements, demonstrating clear organisational commitment and providing a strong foundation. However, while frameworks are well defined, the implementation varies across Regions and disciplines, limiting confidence in system-wide assurance.

Overall, the Independent Reporter has limited confidence in the consistent and effective application of data quality assurance arrangements across Network Rail. While key frameworks and processes are in place, there is insufficient evidence to demonstrate that they are consistently embedded, operating as intended, or driving measurable improvements in data quality outcomes.

The effectiveness of existing arrangements is constrained by several overarching factors. While governance and assurance activities are taking place across the organisation the current control environment does not consistently demonstrate how these activities translate into measurable improvements in data quality outcomes. Governance processes are not routinely operating as evidenced closed-loop controls making it challenging to determine whether issues are being systematically identified, addressed and prevented from recurring. Accountability for data quality remains distributed across multiple Central and Regional teams, with differing interpretations of ownership, reducing transparency and limiting visibility of outcomes.

In addition, current measurement and reporting approaches, including A2 scoring, do not fully capture the aspects of data quality most critical to operational decision-making, further constraining the ability to demonstrate progress and impact. This reduces confidence in the reliability and credibility of data assurance and creates a material risk to demonstrating robust regulatory reporting ahead of FP1, where confidence in data quality will be critical to effective oversight and decision-making.

Recommendations

The recommendations that follow are therefore focused on strengthening the effectiveness of Network Rail to implement existing arrangements, rather than introducing new governance, with the aim of enabling a more consistent, transparent and outcome-driven approach to data quality management.

Table 1: Recommendations

Recommendation	Detail	Benefits
Recommendation 1 **Seek to improve data literacy across Network Rail, including re-iterating the purpose and value of data quality (Q1-5)**	a. There is a challenge that data initiatives rely on compliance, rather than understanding. b. Consider prioritising a Data Literacy Programme across Network Rail, targeted at practitioners, data owners, data users and leaders responsible for regulatory outputs and asset stewardship. c. Clarify and communicate 'line of sight' showing how data quality supports both regulatory assurance and business decision-making (including investment planning, operations and maintenance).	Practitioners more likely to undertake action to improve data quality; leaders more likely to sponsor investment and team time. Common language to drive a better alignment between Central, Regional and Route-based teams within Network Rail. Data foundations are identified as a key enabler for future data use cases (e.g. those in the GBRX AI Action Plan), which will require improved data literacy across Network Rail to achieve. Enables improvements in governance, without introducing further heavy or restrictive processes.
Recommendation 2 **Continue to improve asset data quality measurement linked to business decision-making and continuous improvement (Q5)**	a. The A2 metric has limited value in supporting the prioritisation of asset data quality improvements. b. Clarify the purpose, approach and limitations of the A2 metric. c. Continue current initiative to improve the value through expanding to cover other business critical attributes, applying tighter thresholds (e.g. A1) and maintaining focus on volume of exceptions to drive continual improvement. d. Consider if measures of accuracy for some key attributes (e.g. location) require further attention. We'd note that measuring accuracy is often a 'high value, high cost' undertaking, so this will need to be targeted and value-driven. e. Resolve documentation gaps in terms of defining purpose, approach and logic of asset data quality monitoring and scoring.	Data can be used to identify genuine data quality concerns and impacts and drive improvements rather than static compliance. Quality improvements are linked to a business use case and purpose.
Recommendation 3	a. Resources are limited to invest in data quality initiatives. Therefore, focus on	Project handover of data is a key creation point in the asset data lifecycle; focusing

Recommendation	Detail	Benefits
Prioritise investment in systems to utilise limited funding in a manner that most effectively improves data quality. This includes Exchange of Asset Information and data quality reporting automation (Q5)	incremental improvement of Exchange of Asset Information, leveraging existing initiatives within Network Rail and wider Transport environment. b. Continue work to automate regulatory reporting and asset data quality monitoring. This could consider Agentic AI approaches to automate repetitive activity.	attention on getting data right at the start reduces effort (of both data management and quality reporting) later in the lifecycle. Reduces cost of data quality management, which increases organisational capacity for improvement initiatives, and enables more timely and actionable insights linked to other recommendations.
Recommendation 4 **Implement corrective actions to address a number of variances found in governance practice during the course of this review (Q1-5)**	a. Continue to leverage wider data initiatives to align data into a "single source of truth" for reporting and data quality management. b. Consider defining and communicating clear accountability and ownership for data quality reporting, assurance, remediation and issue resolution across Central, Regional, technical and data provider functions. c. Consider establishing a consistent enterprise-wide RACI and evidencing ownership through governance, processes and assurance activities including consistent use and evidencing use of checklists. d. Consider 'closed-loop' assurance approach i.e. to document, log and evidence where data quality issues have arisen and how they have been addressed. e. Review ELR reference data used in A2 reporting and whether should include inactive lines for some disciplines, e.g. Drainage (see Section 5.6.1.1). f. Consider whether issues with Integrated Network Model data that is corrected by macro prior to running data quality scores (e.g. left/right rail; year of manufacture) would be better fixed in the source data. g. Review discrepancies between A2 Business Rule definitions and logic applied in data checks and update either document or check logic to ensure alignment in line with intention of check.	Greater confidence in reported data quality and assurance outcomes. Strengthens transparency, auditability and organisation-wide assurance by reducing reliance on local knowledge, improving traceability of data and enabling more effective operation of data quality controls. Clearer accountability and ownership for data quality activities, remediation and reporting across the organisation. Consistent data quality management across Regions and disciplines.

Acknowledgements

The Independent Reporter Team would like to thank both ORR and Network Rail staff for their assistance with this study.

1. Introduction

1.1 Background to the Assessment

Accurate and complete data is a core requirement under Network Rail's Network Licence. In recent years, ORR has identified a number of data quality concerns across regulatory reporting and asset management, leading to formal correspondence and commitments by Network Rail to address these issues. This review provides independent assurance over the delivery and effectiveness of those commitments.

Under the Network Licence, Network Rail is required to maintain appropriate and comprehensive information on its assets at both a Network-wide and Route level. This includes information relating to asset condition, capability and capacity.

The Licence requires that this information is:

- maintained at both a Central (Network-wide) and Route-specific level
- accurate and readily accessible

These requirements establish a clear expectation that asset information is consistently maintained across the organisation and is of sufficient quality to support effective management, decision-making and regulatory assurance.

This review has been commissioned in the context of ORR's formal concerns about the quality of data provided by Network Rail. In its letter of 18 December 2023[1], ORR highlighted that accurate and complete data is fundamental to its ability to hold Network Rail to account and to make informed decisions in the public interest. ORR identified recurring issues across areas including maintenance and renewals, operational performance and Network capability, and required Network Rail to provide an improvement plan covering governance, accountability, timelines, error reduction and assurance arrangements.

Network Rail responded on 13 February 2024[2], acknowledging the concern and setting out a programme of improvement activity, including a Data Assurance Framework, Best Practice Guide, training, monitoring and second-level assurance. This Independent Reporter review has therefore been commissioned to provide assurance on the implementation and effectiveness of those regulatory data quality actions, alongside Network Rail's wider asset data improvement initiatives.

This review provides ORR with independent assurance on data quality arrangements ahead of FP1.

1.2 Scope of the Review

The review focuses on two primary areas: Regulatory Data Assurance (Q1–Q3) and Asset Data Improvement (Q4–Q5). It assesses the effectiveness of actions taken by Network Rail to strengthen regulatory reporting, including data governance, assurance arrangements, training and data quality monitoring. It also evaluates whether asset data initiatives are delivering sustained improvements in data quality.

The review considers the effectiveness of governance frameworks, the application and consistency of A2 data quality scoring, and the implementation of Regional data improvement plans. The detailed scope of the review is set out through the specific questions that follow.

1.2.1 Regulatory Data Assurance

- Q1: Assess whether the Best Practice Guide has been applied effectively for recent reporting.

[1] Data quality compliance letter to Network Rail dated 18 December 2023

[2] Data quality compliance letter to ORR dated 13 February 2024

- Q2a: Review the scope and resourcing of training provided to data providers across Regions.
- Q2b: Assess the data quality monitoring arrangements across Regions, including the resources allocated, and provide comparative observations.
- Q3a: Confirm implementation of second-level assurance.
- Q3b: Test the effectiveness of these assurance processes in practice through a risk-based sample of regulatory datasets.

1.2.2 Asset Data Improvement

- Q4: Review how the Asset Data Governance (ADG) Framework and the initiatives relating to the Data Quality Measure Framework are being applied to support governance, measurement, and accountability for asset data quality, including A2 scoring.
- Q5a: Review whether A2 level data quality scores are applied consistently according to the established process and criteria.
- Q5b: Review consistency of processes and systems in place and their application of data quality scoring across disciplines.

1.3 Objectives of the Review

The objectives of this review are to:

- Provide independent assurance on the effectiveness of data quality improvement initiatives.
- Assess whether these initiatives are delivering sustained improvement.
- Identify any gaps, risks or areas for further action to strengthen confidence in data quality and governance.

1.4 Structure of this Report

This report presents an evidence-based assessment of Network Rail's data quality arrangements. It comprises:

- **Executive Summary** outlining key findings and recommendations.
- **Introduction** setting out the context, scope and objectives.
- **Methodology** section describing the Independent Reporter approach, including the lines of enquiry, evidence base and analytical approach.
- **Detailed Findings** sections structured around the five review questions.
- **Conclusions and Recommendations** from this review.

Supporting information, including detailed evidence sources and stakeholder engagement, is provided in the appendices.

2. Methodology

2.1 Overall Review Approach

The review was undertaken in accordance with Arup's Independent Reporter methodology, structured across four stages: Mobilise, Assess, Develop and Recommend. This provides a systematic, evidence-based approach to assessing performance against defined objectives and ensures clear traceability from source evidence through to findings, conclusions and recommendations.

The methodology is underpinned by:

- triangulation of evidence, combining documentation review, stakeholder engagement and data analysis
- proportionality, focusing on areas of greatest materiality and risk
- traceability, ensuring all findings are supported by auditable evidence
- ongoing validation and challenge, through structured engagement with Network Rail and ORR

The assessment was undertaken independently and in accordance with the agreed scope of the Independent Reporter commission. Engagement with Network Rail and ORR was maintained throughout the review, including initial alignment sessions, interim discussions to test emerging findings, and final validation of conclusions.

2.2 Evidence Base and Limitations

The findings presented in this report are based on a triangulated evidence base comprising documentation review, stakeholder engagement and targeted data analysis and validation. Comparative analysis was undertaken across Regions and asset groups to assess differences in governance maturity and implementation. Specific engagement with data owners and system teams was used to clarify calculation processes and interpretation of business rules.

The Independent Reporter relied on information and access provided during the course of the review. As such, the conclusions reflect the evidence made available within the review period, with any limitations in data availability, including the timeliness of provision of certain information, considered in the interpretation of findings.

A sample-based approach was agreed for Regional engagement and evidence. Scotland, Eastern and Southern Regions were identified by Network Rail to be representative of the devolved structure. Findings relating to Region governance and practices are therefore based on evidence gathered from these Regions and should be considered in that context.

The Independent Reporter also asked Network Rail if there was a definition of Appropriate Data (in reference to the Licence Condition which states "The licence holder shall maintain:…appropriate information about the Relevant Assets"). Whilst this term does not appear to be in everyday use within Network Rail, there were several engagements within the course of this review where Network Rail demonstrated how they make choices about data in a manner that is aligned to achieving a business outcome. This includes data specification, data quality management and both regulatory and internal reporting.

There were specific limitations in the availability and completeness of evidence, including:

- limited access to dataset samples to enable full testing of regulatory data assurance processes in practice
- incomplete and inconsistent provision of Regional governance artefacts and reporting outputs, limiting comparative assessment across Regions
- limited opportunity to engage with certain stakeholder groups to validate how processes operate in practice

In particular, there were two areas where access to information was not available within the required timeframe to inform this report:

- access to representative sample data for the Regulatory Reporting workstream
- engagement with Route Asset Managers to obtain their perspectives on asset data quality and management in practice

These limitations do not alter the overall direction of findings, which are supported by multiple evidence sources and consistent themes identified across provided documentation and stakeholder engagement. However, they constrain the level of assurance that can be provided, particularly in relation to demonstrating the consistent application and effectiveness of data quality controls across the organisation.

Where evidence was incomplete or unavailable, this has been treated as limiting the ability to demonstrate effective control operation and has therefore been reflected in a reduced level of confidence in the consistency and effectiveness of arrangements.

The conclusions of this report should therefore be considered in the context of the evidence available, with areas of limited evidence interpreted as reducing overall assurance.

2.3 Approach to Assessment

The four methodology stages were applied as follows:

- Mobilise: Scope, stakeholders and data requirements were defined. A review plan was agreed, including confirmation of the asset groups in scope (Drainage, Switches & Crossings (S&C) and Track).
- Assess: Current arrangements for governance, processes and data were evaluated against the lines of enquiry, drawing on the defined evidence base.
- Develop: Findings were synthesised to identify key themes, systemic issues and root causes, with cross-checking between evidence sources.
- Recommend: Recommendations were developed on a prioritised basis, reflecting risk, impact and deliverability, and aligned to organisational objectives.

Findings were developed through iterative analysis and validation, including internal challenge sessions and engagement with key stakeholders to refine conclusions. Consistent with the evidence limitations outlined in Section 2.2, conclusions reflect both the strength of available evidence and areas where evidence was insufficient to demonstrate effective and consistent application.

2.4 Lines of Enquiry

The review was structured around three lines of enquiry, which informed both evidence gathering and assessment:

- Governance: Roles, responsibilities, oversight arrangements and decision-making processes.
- Effectiveness: Process delivery, consistency and efficiency, including evidence of implementation in operational practice.
- Data Validation: Accuracy, completeness and assurance of reported data, including associated control and validation processes.

These lines of enquiry were applied consistently across all evidence sources to enable a structured and comparable assessment.

2.5 Document Review

A structured review of key documentation was undertaken to establish the intended control framework and expected practice.

The purpose of the document review was to:

- Define expected processes and controls requirements.
- Identify areas of ambiguity or inconsistency in documented requirements.
- Establish a baseline against which observed practice could be assessed.

2.6 Stakeholder Engagement

Stakeholder engagement was undertaken through a programme of structured interviews, workshops and process walkthroughs. This was used to:

- Understand how processes operate in practice.
- Test alignment between documented requirements and delivery.
- Validate and challenge emerging findings.
- Capture perspectives from both strategic and operational roles.

2.7 Data Sources

The findings presented in this report are based on a triangulated evidence base comprising documentation review, stakeholder engagement and targeted data analysis and validation. A full list of documents, interviewees and meetings are provided in the Appendices.

The documentation review included:

- the Data Assurance Best Practice Guide and associated annexes and checklists
- ADG Framework and supporting standards
- data quality specifications, business rules and process documentation
- regulatory reporting guidance, training materials (including numbers and attendance records) and assurance artefacts
- previous review outputs, audit findings and relevant governance documentation

Stakeholder engagement included structured discussions with:

- Central Regulatory Reporting and Planning & Regulation (P&R) teams
- Asset Information Reporting Team (AIRS) and asset data teams
- Regional Asset Data Analysis Managers (RADAMs) and stakeholders across three Regions as agreed between NR/ORR/Arup (Scotland, Eastern and Southern)
- data providers and subject matter experts involved in regulatory reporting and asset data processes

As part of the assessment of regulatory data assurance, targeted engagement was also undertaken with key stakeholders responsible for the implementation of second-level assurance. This included:

- the Regulatory Compliance & Reporting Manager
- the AIRS team responsible for the Network Capability and Composite Reliability Index (CRI) measures
- the Head of Financial Control & Analysis, whose team is responsible for the Effective Volumes measure

These discussions also included detailed walkthroughs with data owners and system teams to clarify calculation processes and interpretation of business rules.

The review drew on a range of data sources and reporting outputs, including:

- regulatory reporting datasets and Annual Return documentation
- Data Quality Measurement Reports (DQMRs) and supporting dashboards

- assurance checklists, trackers and governance artefacts
- sample extracts from relevant asset systems (including Ellipse and the Integrated Network Model (INM))
- supporting lookup tables, reference files and calculation tools used in data quality processes

2.8 Data Sampling and Validation

For the asset data quality workstream, a targeted sampling and validation exercise was undertaken across three asset groups to assess the application and reliability of the asset data quality measurement process. Drainage, Switches & Crossings and Track were selected to provide representative coverage of asset types and data characteristics.

Network Rail provided extracts from relevant asset systems, including Ellipse and the INM, covering all assets across all Routes within these disciplines. The data included all fields required to perform the current asset data quality checks.

A detailed, independent verification exercise was undertaken to re-produce the reported Data Quality Scores and list of exceptions (assets which failed the data quality checks) and compare these to the corresponding output data quality reports from 2025/26 Period 13 for each Route as provided by Network Rail. Historical DQMRs were also provided to allow analysis of trends in data quality scores.

This analysis included:

- independent replication of A2 data quality scores
- comparison of independently generated results with reported outputs
- review of calculation logic, data transformations and supporting artefacts
- analysis of recent historical trends

The purpose of this exercise was to provide assurance over the reliability of reported data, identify any systemic issues and risks, and inform targeted recommendations.

2.9 Synthesis and Assessment

Findings were developed through structured synthesis of the evidence base, including:

- consistency checks across Regions, asset groups and functions
- assessment of materiality, focusing on issues with the greatest potential impact
- identification of root causes, distinguishing between isolated issues and systemic weaknesses

Findings were iteratively validated through internal review and challenge sessions, to ensure robustness and consistency, including testing of emerging findings and refinement of conclusions.

This approach ensures that conclusions are evidence-based and reflect both the design of processes and their effectiveness in practice.

2.10 Development of Recommendations

Recommendations were developed to address identified gaps and risks, with consideration of:

- alignment to the lines of enquiry and underlying root causes
- practicality and deliverability
- degree of impact and risk mitigation
- contribution to sustainable improvement

Recommendations are presented in a prioritised format to support implementation planning.

3. Findings: Regulatory Data Assurance – Q1, Q2 & Q3

3.1 Overview

This section presents the Independent Reporter's findings on the effectiveness of Network Rail's regulatory data assurance arrangements, following the concerns raised by ORR in 2023 regarding data quality and reporting practices.

The assessment considers three related elements of Network Rail's improvement response: the application of the Data Assurance Best Practice Guide, the training provided to data providers, and the data quality monitoring arrangements in place across Regions. These elements were intended to strengthen the consistency, accuracy and auditability of regulatory reporting across the organisation.

This section responds to the following scope questions:

Scope question Q1: Assess whether the Best Practice Guide has been applied effectively for recent reporting

Scope question Q2a: Review the scope and resourcing of training provided to data providers across Regions

Scope question Q2b: Assess the data quality monitoring arrangements across Regions, including the resources allocated, and provide comparative observations

3.2 Context and Scope

Following ORR's concerns regarding regulatory data quality, Network Rail committed to strengthening its approach through a standardised Best Practice Guide, supporting checklists, training for data providers, and enhanced data quality monitoring and assurance processes.

These measures should be considered as linked parts of the same assurance framework. The Guide sets out expected practice; training is intended to support awareness and adoption of that practice; and monitoring provides a mechanism for checking whether data quality issues are being identified, managed and escalated where required.

The review therefore considered whether these measures have been implemented as intended, whether they are operating effectively in practice, and whether they are supporting consistent and reliable regulatory reporting across Regions and disciplines.

Overall, Network Rail has established the main components of a regulatory data assurance framework. However, the effectiveness of that framework depends on the extent to which these components are consistently applied, evidenced and reinforced across the wider organisation.

3.3 Organisational Context

Regulatory Reporting is carried out by multiple data owners in Regional, Route and Central teams, supported by the Central AIRS Team.

3.4 Data Analysis and Interpretation – Application of Best Practice Guide

Scope question Q1: Assess whether the Best Practice Guide has been applied effectively for recent reporting

Network Rail has established a comprehensive Data Assurance Best Practice Guide, supported by structured annexes and checklists. The Guide provides a clear articulation of expected processes and controls to support consistent regulatory reporting, and the Central Regulatory Reporting team demonstrates strong ownership and understanding of these arrangements.

However, there is limited evidence that the Guide is consistently applied as an embedded control across the wider organisation. While awareness of the Guide appears to be high across both Central and Regional stakeholders, evidence of its consistent application as a formal, evidenced control, beyond the Regulatory Reporting Team, is limited.

Stakeholders were generally able to describe the purpose of the Guide and their role in the reporting process. However, its application appears to rely heavily on experience and established local ways of working rather than consistent, documented use of defined controls. The Guide is accompanied by checklists to assist with assurance checks. When we spoke to a small number of data providers, although they understood the importance of assurance (as per the Guide), they were unable to provide evidence that the template checklists had been routinely and consistently completed and retained as part of the reporting record. Assurance activity appeared to be undertaken but not formally evidenced.

There was also limited evidence of formal challenge or escalation where expected assurance steps were not completed, suggesting that compliance with the Guide is not consistently enforced as a mandatory control.

There is no evidence that the Guide is being deliberately disregarded. However, reliance on experienced individuals creates a risk that established practice is not consistently replicated across teams, particularly where roles change or new staff are onboarded.

The presence of experienced, long-serving staff provides a degree of confidence in some level of assurance being undertaken. In its current form, the approach is better characterised as informal adherence to good practice rather than consistent compliance with a defined and evidenced control standard.

3.5 Data Analysis and Interpretation – Training of Data Providers

Scope question Q2a: Review the scope and resourcing of training provided to data providers across Regions

Network Rail has developed and delivered a structured training programme to support implementation of the Best Practice Guide. The training covers regulatory reporting requirements, data quality expectations and the importance of maintaining consistent standards. It has also been delivered to a broad audience of data providers, with targeted one-to-one support available where required.

This represents a positive step and has helped establish a common baseline of awareness among those involved in regulatory reporting. Training attendance appears to cover the majority of data providers involved in regulatory reporting processes, although coverage is dependent on role and timing of delivery.

However, training has not yet clearly translated into consistent operational application. There is limited evidence that training has resulted in measurable changes in behaviour or improved consistency of reporting practice across Regions. When we spoke with ORR about improvements in reporting practice as a result of the training package, they were unable to cite demonstrable changes in quality from their perspective and in particular felt unable to challenge the detail of reported metrics.

Delivery of the Best Practice Guide briefings is also reliant on a relatively small Central team. This creates a risk that reinforcement of learning may be limited, particularly where there is turnover of data providers, changes in reporting responsibilities, or increased demand for support. This is particularly relevant in areas with higher staff turnover or where responsibilities for reporting are distributed across multiple teams.

A comprehensive training programme is available which has been delivered to a broad audience, but there was no evidence of knowledge being checked creating a risk of the knowledge and best practice not being sustained or consistently reinforced over time. This reduces the effectiveness of the briefing as driver of behavioural change.

3.6 Data Analysis and Interpretation – Data Quality Monitoring Arrangements

Scope question Q2b: Assess the data quality monitoring arrangements across Regions, including the resources allocated, and provide comparative observations

Data quality monitoring arrangements are in place across Network Rail and support the regulatory reporting process. Monitoring activity is evident across the Regions reviewed and is supported by first- and second-level assurance processes.

In practice, monitoring is carried out through a combination of periodic reporting, data checks, manual validation, reconciliation across systems, and local review of data quality issues by asset and reporting teams. Across all Regions, common features include the use of spreadsheet-based tracking, manual reconciliation between systems, and reliance on subject matter expertise to identify and resolve issues.

However, monitoring arrangements vary across Regions, reflecting Network Rail's devolved operating model. There are differences in how monitoring is structured, resourced and applied, including who owns monitoring activity, the extent of dedicated resource, the tools and processes used, and the completeness of outputs available for review.

For example, some Regions operate more structured governance forums or reporting cycles, while others rely more heavily on localised processes and informal coordination between teams. Similarly, the level of dedicated resource supporting data quality monitoring varies, with some Regions having more clearly defined roles than others.

This variation reflects differences in operating models and local practices and means that monitoring is not applied consistently across Regions.

The clearest evidence for how monitoring operates in practice came from Regional engagement with RADAMs and data providers. This indicated that monitoring often relies on local processes, specialist knowledge and manual reconciliation. The document review supported this by highlighting differences in the completeness and visibility of evidence across Regions.

In several cases, reported outputs were available, but the underlying assurance process used to produce those outputs was not consistently evidenced. This limited the ability to assess how issues were identified and resolved.

Monitoring activity appears generally effective in supporting regulatory reporting requirements. However, it is primarily focused on compliance with reporting obligations, rather than the wider use of data quality information to support operational decision-making. In some cases, teams rely on parallel or local processes to meet business needs.

There was also limited evidence that monitoring consistently operates as a closed-loop control. While issues are identifiable through monitoring outputs, there is limited evidence that these are consistently tracked through to resolution or linked to measurable improvements in data quality over time.

3.7 Implications and Insights

Network Rail has established the key components of a regulatory data assurance framework, including a well-defined Best Practice Guide, training for data providers and active data quality monitoring arrangements.

However, these components are not yet consistently embedded or operating together as an integrated, evidence-led control framework. Across Q1 and Q2, the primary issue is not the absence of process, but the variability in how processes are applied, evidenced and reinforced in practice.

As a result, regulatory data assurance remains partly dependent on local practice, behaviours and individual experience, rather than on consistently applied and evidenced controls. This limits the auditability of assurance activities and reduces confidence that regulatory reporting processes are being applied consistently across the organisation.

Critically, this limits Network Rail's ability to demonstrate that regulatory data has been subject to a consistent and repeatable assurance process, and that identified data quality issues are being systematically addressed and improved over time.

Addressing this will require a shift from reliance on informal good practice to consistent application of defined, evidenced controls, supported by reinforced training and more standardised monitoring arrangements across Regions.

3.8 Conclusion (Q1)

The key issue is not the absence of guidance, but that the guidance itself is not embedded as part of routine reporting practice. As a result, there is limited evidence provided to demonstrate active data governance activity. This limits auditability and reduces confidence that regulatory reporting processes are being applied in a standardised and controlled way across the organisation.

In particular, the absence of consistent checklist usage and supporting evidence increases the risk that assurance activities are applied unevenly, which in turn introduces the potential for inconsistent or inaccurate reporting outcomes. This limits Network Rail's ability to demonstrate to ORR that all regulatory data has been subject to a consistent and auditable assurance process.

3.9 Conclusion (Q2a)

Training has been delivered and supports awareness, but it is not sufficient on its own to embed consistent behaviours.

It requires ongoing reinforcement through governance, monitoring and accountability. Without this, training risks operating as a one-off intervention rather than a sustained driver of consistent reporting practice.

In its current form, training appears to have been effective in raising awareness, but there is limited evidence that it has driven measurable improvements in the consistency or quality of regulatory reporting outputs.

3.10 Conclusion (Q2b)

Monitoring arrangements are in place, but they are not consistently standardised or evidenced across the organisation. Variation in ownership, resourcing, tools and outputs limits comparability between Regions and reduces transparency over whether monitoring is driving measurable improvement in data quality.

This reduces confidence that identified data quality issues are being managed in a consistent and systematic way across the organisation, and limits visibility of whether interventions are effective over time.

As a result, monitoring currently operates as a set of localised activities rather than a consistent, organisation-wide assurance framework.

3.11 Data Analysis and Interpretation - Evidence of implementation of second-level assurance

Scope question Q3a: Confirm implementation of second-level assurance

Scope question Q3b: Test the effectiveness of these assurance processes in practice through a risk-based sample of regulatory datasets

The owners of the data that underpins the Regulatory Measures are responsible for the accuracy of the data, and so are responsible for first-level assurance. The focus of this question is on second-level assurance activities that are carried out to check the reported figures before they are provided to ORR. These fall into two areas, which we have reviewed:

- Assurance undertaken by data providers; these are the team responsible for calculating the measures and producing the reported figures, and who undertake second-level assurance activities
- Assurance undertaken by the P&R Team; this team is responsible for collating the Annual Return and acting as a gatekeeper for some data provided to ORR as part of the Data Protocol, and they undertake a further light-touch assurance (which Network Rail has described as 'third-level' assurance)

This section outlines our findings from discussions with the teams responsible for providing and assuring the Network Capability, CRI (Composite Reliability Index) and Effective Volumes measure, and with the P&R team. The original aim was to test sample data sets for the effectiveness of the assurance processes. However, as we were not provided access to the data provider teams until late into the project, we received limited sample data which severely restricted the level of testing we could do in this area.

3.11.1 Assurance by data providers

There was a consistent theme across each of the three measures considered that the calculations are now undertaken automatically through relevant systems. This includes Hyperion for Effective Volumes, and via Power-BI for the other two measures. This reduces the risk of errors creeping into the process through manual intervention or copying and pasting data into calculation files. Network Rail stated that, while the process to generate the Effective Volumes figures has been unchanged for at least five years, the calculations of the other two measures have more recently shifted from being in calculated in Excel to being automated through Power-BI.

The automated second-level assurance provides confidence that reported figures are complete and effort can instead be used for improvement activity and trend analysis as opposed to on the underlying data, e.g. confirm no blank periods, cross-check against previous year and spot checks of the outputs. It also supports providing data owners with information to help them undertake first-level assurance through verifying the accuracy of the underlying data.

CRI and Network Capability Measures

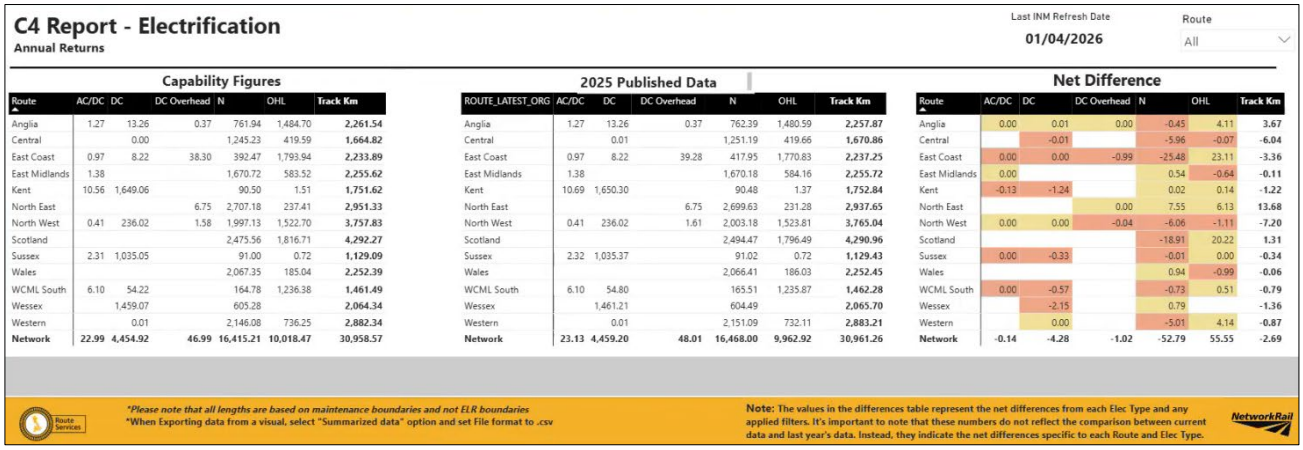
As the AIRS team is responsible for collating and providing the CRI and Network Capability measures, we have addressed our findings relating to these measures together.

Network Rail informed our team that the AIRS team has introduced new processes for these measures in response to ORR concerns around data quality. The team has developed a set of dashboards in Power-BI which automates the calculation process, while providing access to the underlying data in a meaningful format to support understanding of changes to these measures.

The dashboards show the latest figures for each measure (refreshed for every 4-week period) alongside the last reported figures, e.g. from the previous Annual Return. This provides a clear view of how these measures have changed since last reported. The system allows a drill down into the data which is used to calculate the measures and to provide visibility of changes and trends over time.

This is illustrated through the screen shots in Figure 1 and Figure 2 using an example of the "C4 Electrification Capability" measure. Figure 1 shows the current electrification capability by Route in the left table and the equivalent figures from the last Annual Return in the middle table, with the right-hand table showing the variance. Figure 2 shows a drill-down into the current capability figures below the Route level.

Figure 1: Dashboard example - C4 Electrification Capability



C4 Report - Electrification

Annual Returns

Last INM Refresh Date: 01/04/2026

Route: All

Capability Figures

Route	AC/DC	DC	DC Overhead	N	OHL	Track Km
Anglia	1.27	13.26	0.37	761.94	1,484.70	2,261.54
Central		0.00		1,245.23	419.59	1,664.82
East Coast	0.97	8.22	38.30	392.47	1,793.94	2,233.89
East Midlands	1.38			1,670.72	583.52	2,255.62
Kent	10.56	1,649.06		90.50	1.51	1,751.62
North East			6.75	2,707.18	237.41	2,951.33
North West	0.41	236.02	1.58	1,997.13	1,522.70	3,757.83
Scotland				2,475.56	1,816.71	4,292.27
Sussex	2.31	1,035.05		91.00	0.72	1,129.09
Wales				2,067.35	185.04	2,252.39
WCML South	6.10	54.22		164.78	1,236.38	1,461.49
Wessex		1,459.07		605.28		2,064.34
Western		0.01		2,146.08	736.25	2,882.34
Network	22.99	4,454.92	46.99	16,415.21	10,018.47	30,958.57

2025 Published Data

ROUTE_LATEST_ORG	AC/DC	DC	DC Overhead	N	OHL	Track Km
Anglia	1.27	13.26	0.37	762.39	1,480.59	2,257.87
Central		0.01		1,251.19	419.66	1,670.86
East Coast	0.97	8.22	39.28	417.95	1,770.83	2,237.25
East Midlands	1.38			1,670.18	584.16	2,255.72
Kent	10.69	1,650.30		90.48	1.37	1,752.84
North East			6.75	2,699.63	231.28	2,937.65
North West	0.41	236.02	1.61	2,003.18	1,523.81	3,765.04
Scotland				2,494.47	1,796.49	4,290.96
Sussex	2.32	1,035.37		91.02	0.72	1,129.43
Wales				2,066.41	186.03	2,252.45
WCML South	6.10	54.80		165.51	1,235.87	1,462.28
Wessex		1,461.21		604.49		2,065.70
Western		0.01		2,151.09	732.11	2,883.21
Network	23.13	4,459.20	48.01	16,468.00	9,962.92	30,961.26

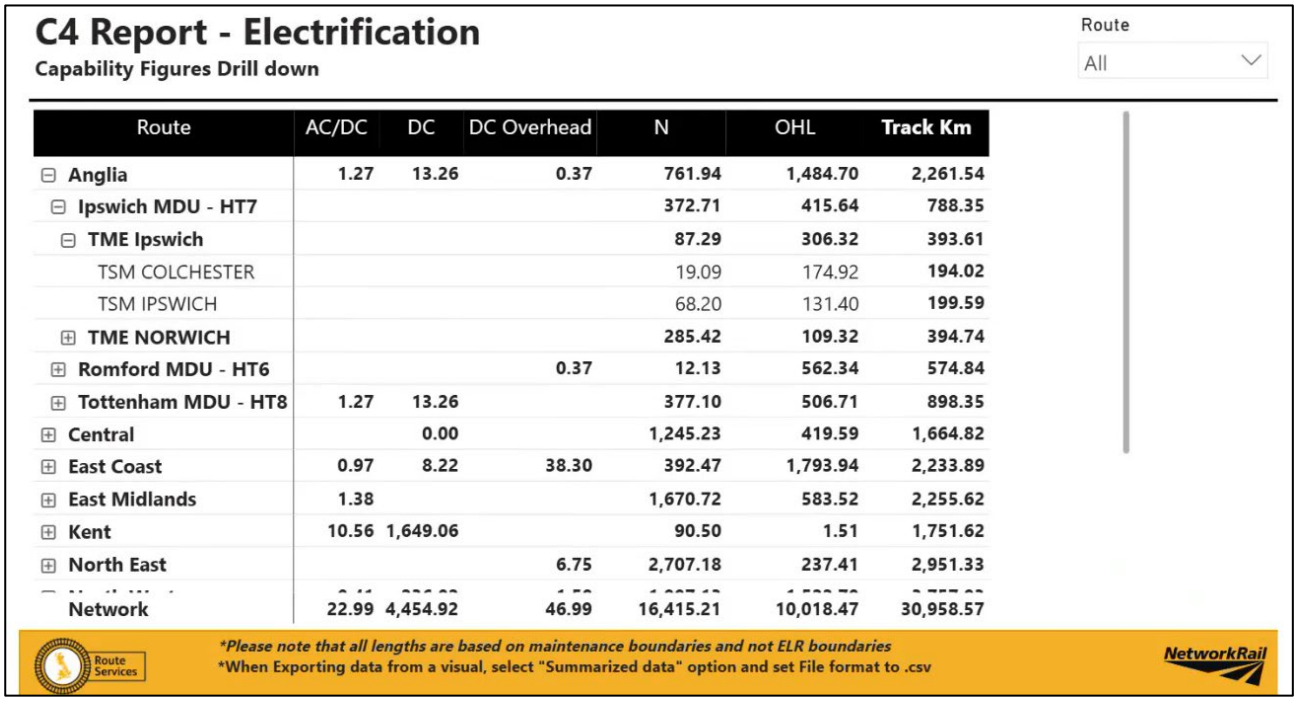
Net Difference

Route	AC/DC	DC	DC Overhead	N	OHL	Track Km
Anglia	0.00	0.01	0.00	-0.45	4.11	3.67
Central		-0.01		-5.96	-0.07	-6.04
East Coast	0.00	0.00	-0.99	-25.48	23.11	-3.36
East Midlands	0.00			0.54	-0.64	-0.11
Kent	-0.13	-1.24		0.02	0.14	-1.22
North East			0.00	7.55	6.13	13.68
North West	0.00	0.00	-0.04	-6.06	-1.11	-7.20
Scotland				-18.91	20.22	1.31
Sussex	0.00	-0.33		-0.01	0.00	-0.34
Wales				0.94	-0.99	-0.06
WCML South	0.00	-0.57		-0.73	0.51	-0.79
Wessex		-2.15		0.79		-1.36
Western		0.00		-5.01	4.14	-0.87
Network	-0.14	-4.28	-1.02	-52.79	55.55	-2.69

*Please note that all lengths are based on maintenance boundaries and not ELR boundaries
*When Exporting data from a visual, select "Summarized data" option and set File format to .csv

Note: The values in the differences table represent the net differences from each Elec Type and any applied filters. It's important to note that these numbers do not reflect the comparison between current data and last year's data. Instead, they indicate the net differences specific to each Route and Elec Type.

Figure 2: Dashboard example - C4 Electrification - drill down view



C4 Report - Electrification

Capability Figures Drill down

Route: All

Route	AC/DC	DC	DC Overhead	N	OHL	Track Km
⊟ Anglia	1.27	13.26	0.37	761.94	1,484.70	2,261.54
⊟ Ipswich MDU - HT7				372.71	415.64	788.35
⊟ TME Ipswich				87.29	306.32	393.61
TSM COLCHESTER				19.09	174.92	194.02
TSM IPSWICH				68.20	131.40	199.59
⊞ TME NORWICH				285.42	109.32	394.74
⊞ Romford MDU - HT6			0.37	12.13	562.34	574.84
⊞ Tottenham MDU - HT8	1.27	13.26		377.10	506.71	898.35
⊞ Central		0.00		1,245.23	419.59	1,664.82
⊞ East Coast	0.97	8.22	38.30	392.47	1,793.94	2,233.89
⊞ East Midlands	1.38			1,670.72	583.52	2,255.62
⊞ Kent	10.56	1,649.06		90.50	1.51	1,751.62
⊞ North East			6.75	2,707.18	237.41	2,951.33
Network	22.99	4,454.92	46.99	16,415.21	10,018.47	30,958.57

*Please note that all lengths are based on maintenance boundaries and not ELR boundaries
*When Exporting data from a visual, select "Summarized data" option and set File format to .csv

The dashboards provide both the AIRS team (in their capacity as data providers) and more critically, the owners of the data, with a clear view of where underlying data has changed since last reported. They equip data owners with the tools to know where they need to focus to assure the underlying data and reported measures. Data owners can then provide confirmation and commentary on reasons for change on a periodic basis through the year. For example, variances may be due to genuine changes in capability (e.g. new electrification) or the result of data cleansing exercises to improve the accuracy of the underlying data. This means that when compiling the Annual Return, material variances can be identified in advance throughout the year, so there should be a 'no surprise' approach. Data owners have access to these dashboards and the AIRS team also provides the information via Excel for those less familiar or comfortable using Power-BI.

This process directly supports the assurance of the underlying data. The AIRS team has advised that there are two key processes for updating these measures:

- Dashboard refresh, undertaken by the contracted Power-BI technical support team.

- Post-refresh Quality Assurance checks, undertaken by both the technical support team and the AIRS team.

Network Rail advised that the process for the first phase is formally documented, although the Reporter team has not seen this.

This second phase reflects the second-level assurance activities undertaken on these Power-BI produced measures. These cover:

- technical support checks, as undertaken by the technical support team, which are based on a defined set of validation checks to ensure the data has successfully refreshed and maintained data integrity
- further verification checks, as undertaken by the AIRS team, which validate outputs, completeness and that they align with expected values (e.g. no unexplainable outliers, material changes from previous report can be explained)

The AIRS team provided a summary of the technical support checks undertaken by the contractors ("PWC Annual Return QA Checks [3]"), noting that this was a collated summary provided by the contractors, rather than a formal documented process. The work instructions for each measure have also been provided by the AIRS team which documents the verification checks undertaken by the AIRS team. These range from simple verification checks - such as ensuring that all data has been correctly exported from Power-BI into CSV files, to sense checking differences in the comparator tables (between last published results and new results) to ensure that differences are logical and can be explained.

From our review, it is clear there are procedures in place to carry out effective second-level assurance, focusing on completeness of data and reviewing trends to ensure no unexpected outputs. The AIRS team noted that these procedures are currently captured in multiple places (the formal contractor refresh processes and the AIRS team work instructions) and so there is an opportunity to consolidate these into a single assurance document.

The AIRS team confirmed that the completion of these activities is not formally documented each period, so no evidence is available to confirm application.

In summary, our review has found that the team has introduced valuable tools to support data owners with identifying, reviewing and confirming changes in their data, which directly supports the underlying assurance activities. The automation of the process reduces the risk of manual input errors and allows more time to undertake sense checks on the outputs, and there is evidence of robust Quality Assurance (QA) processes in place for the teams to follow to provide assurance of the reported measures.

Effective Volumes

The Group Finance team is responsible for providing the Effective Volumes measures and associated second-level assurance. Unlike the other measures, Network Rail said that the calculation process for this measure has been automated for many years (at least five years) and that the assurance processes that are in place have been broadly unchanged over this time.

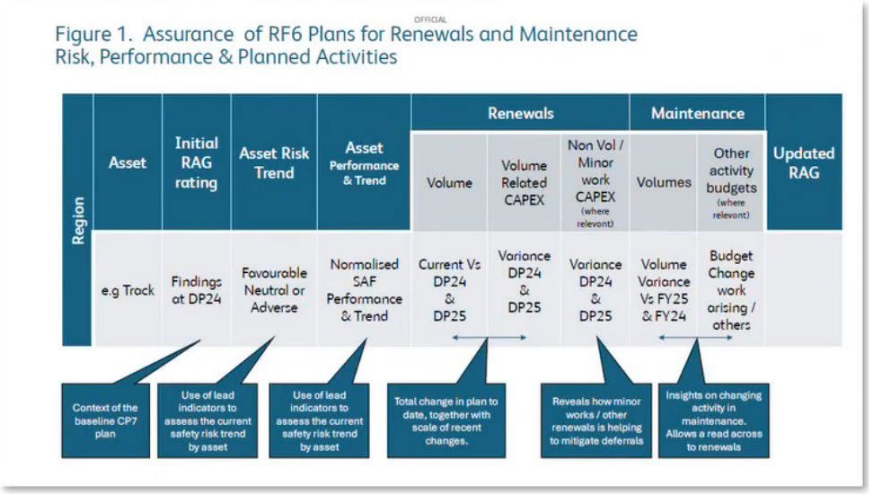
Information provided by Network Rail states that the second-level assurance activity is undertaken by Group Finance (alongside the Technical Authority) who "*take the lead in reporting Effective Volumes, conducting data quality checks, and ensuring compliance with the ORR data protocol by aligning with the P&R team*".

Network Rail stated that the core second-level data assurance activities undertaken include reviewing how figures have changed from previous reports and challenging the Regions to provide an explanation. This process occurs at the end of each period, with the Group Finance team issuing reports highlighting changes to ensure either they can be explained or the underlying data is corrected before the period is locked down for reporting. In our meeting with Network Rail, we were shown examples of the emailed reports that are sent out seeking this information.

The theme of this process is documented in the assurance plan, as shown in Figure 3. This extract comes from the "Network Rail Asset Renewal and Maintenance Volume: 2025/26 Period 6 Reforecast (RF6) Review [4]".

Figure 3: Extract from the "Network Rail Asset Renewal and Maintenance Volume: 2025/26 Period 6 Reforecast (RF6) Review"

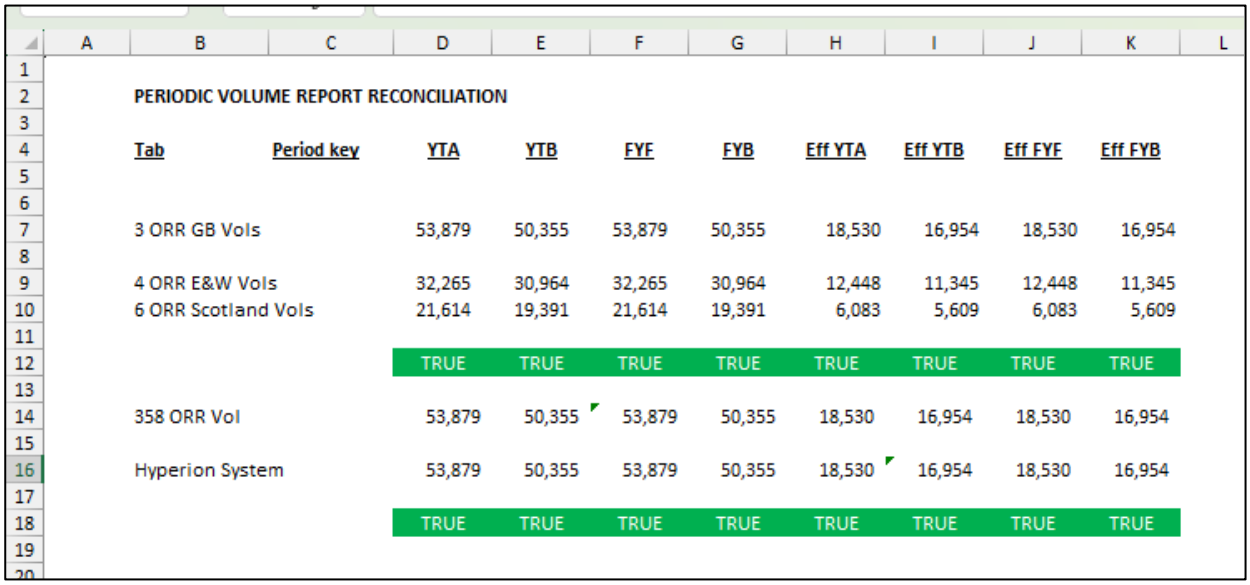
The assurance work commenced with a review of current business insights into safety and asset performance risk, making comparisons between the 'as is' and that forecast at DP24. This set the context for the consideration of plan proposals and changes. Establishing this risk context allows a 'read across' to changes in renewal volumes, other CAPEX (minor works) and maintenance volumes (and related budgets) testing movements since both DP24 and DP25. Figure * below sets out in principle the approach adopted.



To support our review, we have been provided with the 2025/26 Period 13 Effective Volumes report [5] which shows how the measures are calculated based on data extracted from Hyperion. Given the data provided has already been processed in Hyperion and is effectively already summarised as outputs (i.e. the 'raw data' figures are the actual summarised figures by Region and Key Volume Line (KVL) alongside the 'effective' figures once weightings applied), we have only been able to confirm that the data is transposed correctly into the reports.

The spreadsheet contains some very simple reconciliation checks, predominantly to ensure that the reported figures add up (GB volumes match the sum of the England & Wales and Scotland figures) and are complete (that the reported figures match the raw data). A screenshot is shown in Figure 4.

Figure 4: Screenshot from 2025/26 Period 13 Effective Volumes Report



PERIODIC VOLUME REPORT RECONCILIATION

Tab	Period key	YTA	YTB	FYF	FYB	Eff YTA	Eff YTB	Eff FYF	Eff FYB
3 ORR GB Vols		53,879	50,355	53,879	50,355	18,530	16,954	18,530	16,954
4 ORR E&W Vols		32,265	30,964	32,265	30,964	12,448	11,345	12,448	11,345
6 ORR Scotland Vols		21,614	19,391	21,614	19,391	6,083	5,609	6,083	5,609
		TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
358 ORR Vol		53,879	50,355	53,879	50,355	18,530	16,954	18,530	16,954
Hyperion System		53,879	50,355	53,879	50,355	18,530	16,954	18,530	16,954
		TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE

Assurance by P&R Team

We have separately reviewed the assurance processes undertaken by the P&R team. This team is effectively the 'gatekeeper' for data submissions outlined in the Data Protocol and for the Annual Return and so their activity has been described to the Independent Reporter team as light-touch assurance (effectively a third-

level of assurance after that undertaken by the data owners and then the data providers). In practice, this means ensuring that the data is complete and in the right format, along with simple sense checks (e.g. is there a material change from last year). The data providers are responsible for assuring second-level assurance, and so this covers a final check before submission.

The P&R team have a 10-step "Post-Collection Data Quality Assurance Checklist" [6] that they follow to assure each Tier 1, 2 and 3 measure within the Annual Return. We have been provided with the version for the 2026 Annual Return for review. This checklist is followed once data has been received from the relevant data provider.

Our review has found that the checklist is comprehensive, covering simple data verification exercises, ensuring a clear audit trail for the data, that it is compliant with the specification and that it has been signed off by stakeholders.

Evidence of the use of this checklist has been provided in the form of an Assurance Tracker which the P&R team compile each year for the Annual Return and is described as follows:

"The Assurance Tracker […] provides a centralised and auditable record of assurance activity. Specifically, it captures:

- *Confirmation that key stages of the assurance process have been completed.*
- *Evidence of overarching validation checks and consistency reviews carried out at the reporting level.*
- *Documentation of issues identified, including root cause, impact and remediation actions (primarily recorded in column T and supported by additional fields in the attached document).*
- *Traceability of each review and challenging data providers, ensuring transparency over how issues have been assessed and resolved."*

We have seen the tracker files for both the 2025 Annual Return [7] and the 2026 Annual Return [8]. From our review, the latest status of each measure is tracked. Two assurance columns are marked with "Y" when activity complete ("P&R Collation/Review" and "Draft […] Checked"), with a further column used to capture detailed notes on any issues found, challenges raised and actions taken.

This file effectively tracks a binary view of whether the P&R checks have been completed, rather than providing confirmation that each of the key stages as listed in the Checklist are complete. For example, it does not explicitly record that stakeholder review and sign off has been received (step 9 of the checklist). This indicates that the file is used to confirm when the assurance process is complete rather than providing evidence that each relevant step of the process has been undertaken. There is evidence of issues being captured in this tracker.

The P&R team has advised that the assurance processes put in place have been observed to support a substantial improvement in the quality of data provided in the most recent year, with no material issues raised. However, we have not been provided with any tangible evidence which can directly support this.

During Control Period 6 (CP6), Network Rail and ORR jointly maintained a Data Quality log [9] which captured all issues raised in relation to data quality, actions planned to resolve this, action owners and a tracker of whether complete. Since CP7, we have been advised that a different system has been introduced, which provided a more focused 'action plan' process. Under this approach, only persistent or material issues are formally logged. As before, ownership and actions are defined. This change in approach means that we cannot draw a direct comparison from these data sources in terms of quantity of issues or concerns raised regarding data quality. There is a possibility that leading indicators or trends are overlooked through the move to tracking only larger incidents of non-compliance.

The P&R team has advised that *"This revised approach has demonstrably improved our control environment. Over the first two years of CP7 (Year 1 and Year 2), issues have been effectively managed through enhanced processes, earlier engagement and stronger oversight, such that there has been no requirement to formally invoke the 'action plan' log. As a result, there are no recent logs available to share"*. As such, we have not had the opportunity to review any examples of these documents.

3.12 Implications and Insights

We have seen clear evidence of how the team responsible for providing the data for the Network Capability and CRI measures have recently introduced dashboards and processes to support Routes in assuring the data that feeds into these measures. This process directly supports the assurance of the underlying data by ensuring that changes in any measures are investigated and documented through the year to feed into the Annual Return commentary.

For the three measures reviewed, the process for generating the figures is now automated which reduces the risk of errors creeping in from manual processing of information. The second-level assurance for these measures is now focused on ensuring that the data is complete and that, through spot-checks, any material variances from previous reports are identified, leading to assurance and clarification from the data owners being sought. While the QA checks that are carried out by the data provider teams are not clearly documented, the dashboards and reports sent to the Routes demonstrate how these teams support the assurance of these reported measures.

As well as the first- and second-level assurance, the P&R team have a clearly documented 10-step process for final assurance before data is released. While this process is comprehensive and we have been advised that it is followed, the evidence that each of these steps has been carried out for each measure was not explicitly captured in the information provided.

3.13 Conclusion (Q3)

Second-level assurance arrangements are in place for selected regulatory measures, with automation through systems such as Power-BI and Hyperion. This reduces risks associated with manual calculation and enables Central teams to undertake sense and completeness checks prior to reporting.

In addition, the review identified ambiguity in ownership and accountability across the data quality landscape, including responsibilities for regulatory reporting processes, standardised outputs, assurance activities and remediation. The respective roles of Central teams, Regional teams, technical functions and data providers were not always clearly defined or consistently evidenced. This lack of clarity constrains the ability to demonstrate effective control operation, including the systematic identification, assignment and resolution of issues through to closure, and increases reliance on local knowledge and judgement.

Governance structures and assurance mechanisms are in place. However, they are not yet consistently operating as auditable, organisation-wide control frameworks capable of providing reliable assurance of sustained data quality improvement.

4. Findings: Asset Data Improvement – Q4

4.1 Overview

This section presents the Independent Reporter's findings in relation to the effectiveness of governance and associated frameworks supporting asset data quality (Q4). The review assesses how the ADG Framework, supporting standards, and related data quality initiatives are being applied in practice to support governance, measurement and accountability for asset data.

The intent of this section is to provide an evidence-led assessment of current governance arrangements. It focuses on the extent to which governance frameworks are implemented in practice, whether governance processes are operating consistently across Regions, and the degree to which governance arrangements are driving measurable improvements in data quality outcomes.

Where possible, findings have been supported with examples, comparative analysis, and metrics, to provide context on scale and significance.

This section responds to the following scope question:

Scope question Q4: Review how the ADG Framework and the initiatives relating to the Data Quality Measure Framework are being applied to support governance, measurement, and accountability for asset data quality, including A2 scoring

4.2 Context and Scope

Network Rail operates within a regulatory environment that requires asset data to be accurate, complete, and sufficiently assured to support both operational decision-making and regulatory reporting to ORR.

To support this, Network Rail has developed a comprehensive governance and assurance landscape, including the ADG Framework, multiple data quality specifications (in the best practice guide and elsewhere), and supporting improvement actions.

Our review indicated that these frameworks are conceptually aligned to good practice and reflect strong governance intent. However, a key question for this review is the extent to which they are consistently applied and effective in practice.

4.3 Organisational Context

The organisational context for asset data governance is characterised by a federated operating model, with responsibilities distributed across Regional, Route-based and Central functions. The devolved operating structure allows Routes and Regions flexibility in how they structure resources and allocate accountability. The Regions involved in this enquiry demonstrated differences in approach, with accountability for data reporting sitting in Routes where 'devolution max' was in place (Eastern), whereas Regional teams take more of a lead in other areas (Southern). Scotland, at the time of enquiry, was yet to fully embed a recent re-organisation therefore precise structures and accountabilities remained fluid in some areas. The structure described in Section 4.3.1 gives an overview of the roles involved, agnostic of devolved operating structure in place.

4.3.1 Governance Structure and operating model

Governance of asset data involves multiple stakeholders, including:

- RADAMs
- Route and Delivery Unit teams responsible for asset data at source
- Central reporting and regulatory functions

- Technical authority and asset data governance teams
- Information Technology (IT) and system management functions

The pre-engagement review identified a broad governance ecosystem comprising frameworks, standards, methodologies and Regional initiatives. While these demonstrate substantial governance activity, the hierarchy and ownership of these artefacts is not always clearly defined.

4.3.2 Regional operating model

Each Region operates within this overarching framework but applies governance in different ways. Strong governance forums were demonstrated by Scotland through Director of Engineering and Asset Management (DEAM)-led accountability and Regional data initiatives. Southern also outlined their strong local governance controls and discipline-led processes, with structured forums and emerging tooling. Eastern operates a more devolved model ("devolution max"), with responsibilities distributed across Routes and functions rather than concentrated into the Region.

This variation in governance maturity risks introducing complexity and tensions through levels of centralisation versus local autonomy and operational implementation of governance processes. Greater consistency or centralisation of reporting would reduce this risk.

4.3.3 System and process landscape

The organisational context is also shaped by a complex and fragmented data and reporting landscape. There are multiple enterprise systems such as Ellipse and INM which require manual reconciliation and often local workarounds to ensure the submitted data meets with reporting requirements. A particular example is at the start of the lifecycle where asset data is created or updated as an outcome of engineering work. Network Rail has identified 'Exchange of Asset Information (EAI)' as a key focus area to address this. The CP5 ORBIS (Offering Rail Better Information Services) programme ran an EAI workstream, but was unable to complete during the programme timescale. Network Rail DDaT are currently running an EAI project, but small scale and focused on data specifications, rather than data exchange. These factors create a reliance on Subject Matter Expert (SME) and local data managers' knowledge and operational expertise to facilitate the often-duplicative work.

These characteristics were consistently identified across all three Regions and are a key factor influencing how governance processes are implemented in practice.

4.3.4 Data Owners (Asset)

We also received input from the Central Head of Asset Data, the Asset Engineer (Data), and those who collate Asset Data for the purposes of regulatory reporting across Effective Volumes, Drainage and Network Capability.

The individuals encountered in this review who were involved in collating data inputs had been in post for many years. All had high confidence in their ability to deliver the required inputs accurately, including the necessary assurance checks. They did describe members of their team being more closely involved in receipt of the training and application of the guide and associated Annex templates.

4.3.5 Drivers of change

The Central asset data team appeared committed to improving reporting and data quality, with multiple improvement workstreams in place to drive change. They had a strong understanding of the ADG framework and the importance of data as an asset, comparable to how rail engineers value traditional (physical) assets. The Central asset data team informed our team of several improvement initiatives, including:

- data quality improvement initiatives (e.g. A2 review, dashboards, data standards development)
- system modernisation (e.g. transition to more integrated platforms and introduction of the 'Object Library' for new assets)
- wider organisational transformation (e.g. rail reform / Great British Railways (GBR) alignment)

- A project to simplify and streamline the content and number of data standards, including seeking to elevate key standards to be Railway Data Standards (RDS). This will establish a consistent, cross-industry standards set that supports interoperability across organisations, data domains and asset types

While these initiatives are positive, they are at various stages of maturity, and often struggle to attract adequate funding support. These initiatives generally seem to support data quality improvements over time, but could also introduce additional complexity and will require governance arrangements to be adaptable, consistent and sustainable.

4.4 Data Analysis and Interpretation – Reviewing Frameworks

4.4.1 Review of current practice

Network Rail has established a substantial governance and assurance landscape for asset data quality, including the ADG Framework, data quality specifications, standards, guidance, assurance artefacts and supporting processes.

Governance activity and commitment to improving asset data quality are evident across all Regions. However, while frameworks and assurance processes are in place, there is limited evidence of consistent implementation across Regions or that these processes are driving measurable improvement.

Assurance outputs provide a snapshot of data quality but do not consistently track issue resolution or improvement over time, limiting visibility of whether governance is delivering sustained improvement.

Multiple isolated systems are in place to record ‘as built’ in the various disciplines. The lack of interoperability between these systems requires multiple, parallel assurance processes, increasing complexity, effort and inefficiency. A common repository for such data would produce a more optimised landscape with only one assurance process being required.

4.4.2 Data gaps and limitations

The review identified material limitations in the completeness and comparability of Regional evidence.

Scotland was the only Region to provide a comprehensive asset data quality reporting submission during the review period, providing visibility of data quality performance, governance activity and improvement initiatives. Evidence from the other two Regions was incomplete, with key governance artefacts and reporting outputs not available for review. It was not clear whether these artefacts did not exist, were not consistently produced, or were not made available during the review.

As a result, the evidence base is incomplete for two-thirds of the Regions reviewed, limiting the ability to compare governance arrangements on a like-for-like basis.

The completeness of Scotland’s submission provides a clearer line of sight into governance activity and reported outcomes. However, the current evidence does not allow a reliable conclusion as to whether this reflects a more mature and consistently applied governance approach, or simply more complete documentation and submission discipline. For Eastern and Southern, partial evidence reduces visibility of how governance is operating in practice and whether assurance activities are being applied consistently and effectively.

4.4.3 Governance and accountability

Governance structures, forums and assurance arrangements are in place across the Regions reviewed. However, responsibilities for governance, assurance and data remediation are not always clearly defined or consistently evidenced across Regions or between Regional and Central teams.

The consolidated RADAM findings identified recurring ambiguity in five key areas:

- ownership of ORR reporting processes
- responsibility for standardised reporting outputs
- data access and enterprise system ownership

- accountability for remediation activities
- the role of Central teams versus Regional teams

In Scotland, accountability for asset data governance sits within the DEAM structure.

In Eastern, responsibilities were described as fragmented across Routes, Delivery Units, Regional assurance, Technical Authority, Central reporting teams and IT, within a devolved ("devolution max") model. The RADAM role was characterised mainly as assurance/support rather than end-to-end ownership.

In Southern, Regional governance processes and discipline meetings were described, but governance accountability appears to rely partly on locally developed arrangements and operational practice rather than a consistently evidenced enterprise-wide operating model.

In all Regions, responsibilities between Regional teams, Planning & Regulation, AIRS and Central governance functions are not always clearly defined.

Our review found that improved access to centrally held data (i.e. data available as a single view of truth to all users) would support more effective governance by enabling consistent reporting, clearer accountability, and more efficient resolution of data quality issues. This may remove some of the duplication and reconciliation process which currently inhibits efficiency and increases the risk of data quality issues.

4.4.4 Evidence of sustained improvement

There is limited evidence that governance forums and assurance processes are consistently operating as mechanisms for driving sustained data quality improvement.

While governance activity is evident across Regions, there is limited evidence that:

- issues identified through governance are consistently translated into actions
- actions are tracked through to completion
- outcomes are measured and evidenced over time

As a result, governance is not operating as a closed-loop control and it is not possible to demonstrate that governance activity is delivering sustained improvement in data quality at either a Regional or enterprise level.

There is a recognition, particularly in the Central Asset Data team, that quality of base asset data is crucial to ensuring overall data quality. Several improvement actions exist and should be supported to continue, including:

- improved dashboard for data quality reporting
- introduction of an 'Object Library' to standardise the recording of 'as built' data across engineering projects, disciplines and supply chain.
- creation of a 'Data Community' to ensure those involved in the management of data are supported and valued: ensuring data is valued as an asset.

4.5 Implications and Insights

While Network Rail has established a comprehensive governance framework for asset data quality, these arrangements are not yet consistently evidenced as effective control mechanisms across Regions.

As a result, there is limited assurance that governance is driving sustained, measurable improvement in data quality, and limited confidence that governance effectiveness can be consistently demonstrated or compared across the organisation.

4.6 Conclusion (Q4)

The issues identified indicate that current governance arrangements are not yet consistently enabling data quality to be managed and improved as a controlled, organisation-wide capability.

In particular, the lack of consistent evidence, absence of closed-loop assurance, and reliance on manual processes mean that improvement in data quality cannot be reliably demonstrated or sustained over time. This introduces a risk that data quality continues to be managed through local effort and workarounds, rather than through standardised, repeatable processes.

As a result, even where activity and initiatives are in place, there is limited visibility of whether these are translating into measurable improvements in data quality outcomes. This reduces the effectiveness of governance as a mechanism for supporting decision-making and for providing confidence in the underlying data used for regulatory reporting and asset management.

Addressing these gaps would enable Network Rail to move from a position where governance activity is evident, to one where data quality improvement is demonstrable, consistent and evidence-based across the organisation.

5. Findings: Asset Data Improvement – Q5

5.1 Overview

This section presents the Independent Reporter's findings in relation to the application and consistency of asset data quality measurement processes across Network Rail, with a particular focus on A2 data quality scoring. The assessment considers whether A2 data quality scores are applied in accordance with established processes and criteria, and the extent to which these processes are implemented consistently across disciplines and Regions.

Our review has focused on the operation of the A2 data quality framework in practice, including the underlying business rules, calculation methodologies, and reporting processes used to generate A2 scores. It also considers whether supporting systems and tools enable consistent, reliable and traceable data quality measurement, and whether outputs provide a comparable view of data quality across asset types.

Findings are based on an evidence set comprising documentation review, stakeholder engagement, and targeted data sampling and verification. This includes independent replication of A2 scoring outputs for three asset groups as agreed with ORR and Network Rail to test alignment between documented processes and delivered outcomes. These were Drainage, Switches & Crossings and Plain Line Track.

The intent of this section is to provide an evidence-led assessment of:

- the extent to which A2 data quality scoring processes are implemented as designed
- the consistency of application of data quality scoring across disciplines and Regions
- the reliability of A2 outputs as a measure of asset data quality
- the degree to which current processes support effective monitoring and improvement of data quality

Findings are supported by examples, comparative analysis and verification results, where available, to provide context on the scale and materiality of observed issues.

This section responds to the following scope questions:

Scope question Q5a: Review whether A2 level data quality scores are applied consistently according to the established process and criteria

Scope question Q5b: Review consistency of processes and systems in place and their application of data quality scoring across disciplines

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5.2 Context and Scope

Network Rail measures asset data quality based on checking the proportion of assets for each asset type (e.g. Culverts) for which the input data for a defined set of data fields ("attributes") within the relevant asset database are compliant against a defined set of data quality rules. For example, the proportion of Culvert assets within Ellipse for which the data input for the "Culvert Material" attribute pass the defined rules. These scores are referred to as the "A2 level data quality scores" and are currently reported periodically in a set of Route-based Data Quality Measurement Reports [10].

These are termed the "A2 scores" because ORR determined in CP5 that Network Rail's asset data quality should reach A2 for all asset types (except Buildings which should reach A1). In this context, A2 means that all asset types should score 95% compliance against each measured attribute (with A1 meaning 99% compliance).

For each asset type, a set of attributes has been defined against which to check data quality, ranging from four attributes for Power Transformers to 20 attributes for Earthworks asset types. We understand that the list of attributes which are currently monitored has remained broadly unchanged since CP5.

Each attribute is subject to three defined data quality checks, which are defined in the "Data Quality Attributes and Business Rules 2026 May.xlsx" file [11] (subsequently referred to as the 'Business Rules file' in this report) which was provided to the Independent Reporter team for this review. The three checks, defined as Business Rules, fall into three broad categories:

- Business Rule 1 (or "Master"): check the field has been populated, i.e. not blank.
- Business Rule 2 (or "Meta"): check that the field has been populated in the right format.
- Business Rule 3 (or "Business"): check that the field has been populated with a valid entry.

Scores are calculated periodically for each asset type and attribute for each Route and presented in the DQMRs. These reports are produced centrally by the AIRS team in Network Rail. The AIRS team confirmed that the underlying DQMR process is an inherited one dating from around 2018, and that while detailed review of the logic had been carried out for some asset types following a transition from accessing data from Business Objects to using Azure, this was not the case for S&C and so an independent verification would be particularly valuable because there has been more limited historical review of the inherited calculation logic.

An example of these reports is shown in Figure 5 for Drainage assets for the London North East and East Midlands Route (LNE & EM)[3] for 2025/26 Period 13. It shows the Data Quality (DQ) Score for each attribute and the number of exceptions by Business Rule. (An 'exception' is a failure against the Business Rule, e.g. an unpopulated field would be an exception for Business Rule 1). A maximum of one exception is recorded per asset based as Business Rules are evaluated sequentially until a failure is identified. For example, if an asset fails Business Rule 1, it is marked as an exception for that Business Rule and the other two rules are not checked. For these asset types, the DQ Score for an attribute is calculated as the proportion of assets which passed all three Business Rules.

Figure 5: Example DQMR scoring report for Drainage assets for the London North East and East Midlands Route for 2025/26 Period 13

LNE & East Midlands

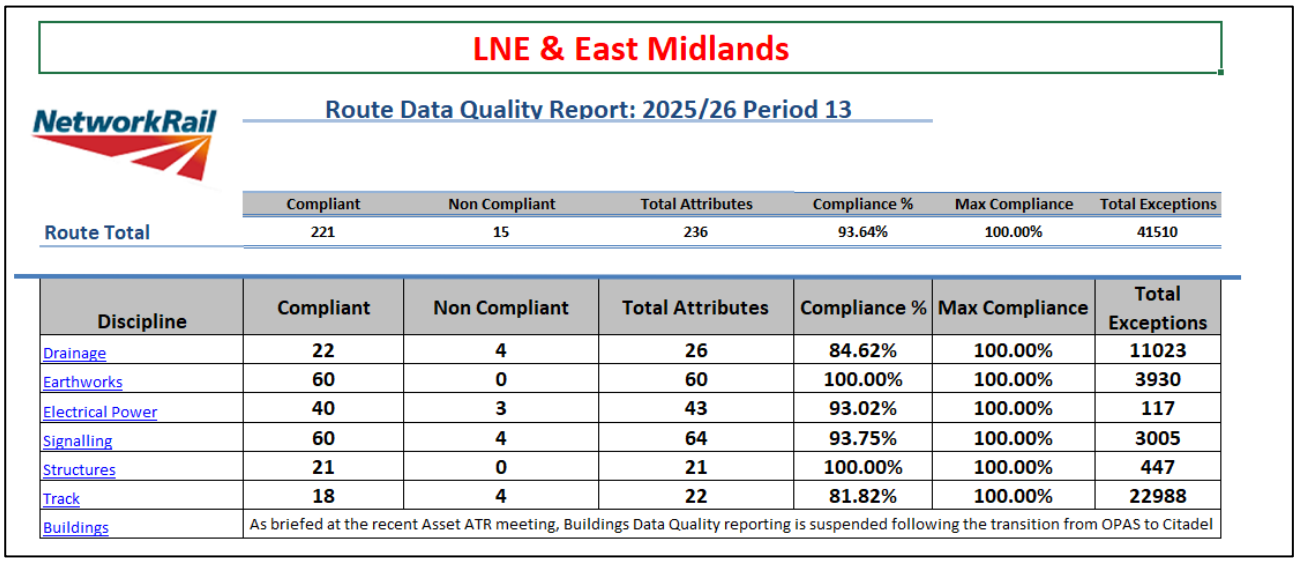
	Attributes	DQ Score	Check 1 Failures	What is Check 1?	Check 2 Failures	What is Check 2?	Check 3 Failures	What is Check 3?
Catchpits	Unique Asset ID	100.00%	0	Is Not Null	0	Numeric field (Max Length 10)	0	Must be a unique ID (no duplicates)
	Start Mileage	99.68%	1	Is Not Null	22	Numeric field	58	(Start Mileage = End Mileage) AND does the mileage fall within the mileage range for its ELR
	End Mileage	99.68%	0	Is Not Null	22	Numeric field	58	(Start Mileage = End Mileage) AND does the mileage fall within the mileage range for its ELR
	ELR Name	99.90%	0	Is Not Null	0	Alphanumeric field (Length= 3 or 4)	35	Lookup ELR extents from INM
	Drainage Chamber Cover Dama	99.50%	183	Is Not Null	0	Numeric field & Length = 1	0	Accepted values are 0-3
	Date Inspected	100.00%	0	Is Not Null	0	Date format	0	Date must not be more than today's date
	Chamber Material	93.48%	2367	Is Not Null	0	Alphanumeric	0	Lookup accepted values in design document - table +DCM
Pipe - Surface Water	Unique Asset ID	100.00%	0	Is Not Null	0	Numeric field (Max Length 10)	0	Must be a unique ID (no duplicates)
	Start Mileage	99.78%	0	Is Not Null	0	Numeric field	49	Does it fall within the mileage range for its ELR
	End Mileage	99.77%	0	Is Not Null	0	Numeric field	52	Does it fall within the mileage range for its ELR
	ELR Name	99.94%	0	Is Not Null	0	Alphanumeric field (Length= 3 or 4)	18	Lookup ELR extents from INM
	Date Inspected	100.00%	0	Is Not Null	0	Date format	0	Date must not be more than today's date
	Pipe Material	92.54%	2233	Is Not Null	0	Alphanumeric	0	Lookup accepted values in design document - table +PMA
Culvert	Unique Asset ID	100.00%	0	Is Not Null	0	Numeric field (Max Length 10)	0	Must be a unique ID (no duplicates)
	Start Mileage	99.60%	0	Is Not Null	0	Numeric field	8	Does it fall within the mileage range for its ELR
	End Mileage	99.62%	0	Is Not Null	0	Numeric field	7	Does it fall within the mileage range for its ELR
	ELR Name	99.78%	0	Is Not Null	0	Alphanumeric field (Length= 3 or 4)	10	Lookup ELR extents from INM
	Culvert Material	34.22%	2927	Is Not Null	0	Alphanumeric	0	Lookup accepted values from design document - table +CVM
	Culvert Shape	34.56%	2912	Is Not Null	0	Alphanumeric	0	Lookup accepted values from design document - table +CVS
	Date Inspected	100.00%	0	Is Not Null	0	Date format	0	Date must not be more than today's date
Channel	Unique Asset ID	100.00%	0	Is Not Null	0	Numeric field (Max Length 10)	0	Must be a unique ID (no duplicates)
	Start Mileage	99.64%	0	Is Not Null	0	Numeric field	11	Does if fall within mileage range for its ELR
	End Mileage	99.62%	0	Is Not Null	0	Numeric field	12	Does if fall within mileage range for its ELR
	ELR Name	99.89%	0	Is Not Null	0	Alphanumeric field (Length= 3 or 4)	5	Lookup ELR extents from INM
	ELR Side - Up and Down	99.26%	0	Is Not Null	33	Text field (Length = 2 or 4)	0	Accepted values are UP or DOWN
	Date Inspected	100.00%	0	Is Not Null	0	Date format	0	Date must not be more than today's date

The DQMRs include a 'dashboard' sheet which summarises the proportion of attributes for each discipline that are compliant for that Route, with compliance meaning meeting the A2 criteria of at least 95%. The screenshot in Figure 6 shows the dashboard for the LNE & EM Route for 2025/26 Period 13, showing there

[3] As noted in Section 4.5, the Route definitions used in the DQMRs are not aligned with the latest Network Rail Route structure. All references to Routes in this section reflect the Route definitions used for reporting in the DQMRs

were four non-compliant attributes for Drainage (as can be seen in Figure 5) out of a total of 26 attributes being tested, giving a compliance score of 84.62%. These dashboards also show the total number of exceptions for each Discipline, which can highlight where there are still many data issues despite good compliance scores. In this example, Earthworks is a good case in point, with Compliance at 100%, yet nearly 4,000 errors still in the system for the data being measured. This can be an issue for individual attributes too. Another example (not shown in these figures) is the "Age of Rail" attribute for Plain Line. LNE & EM scored 99.39% against this attribute in Period 13, but there were still 2,368 exceptions. This indicates that a score of just over 95% (i.e. just A2 compliant) could mean up to 20,000 exceptions still in the system for that Route alone.

Figure 6: DQMR 'dashboard' sheet for London North East and East Midlands Route for 2025/26 Period 13



LNE & East Midlands

NetworkRail

Route Data Quality Report: 2025/26 Period 13

	Compliant	Non Compliant	Total Attributes	Compliance %	Max Compliance	Total Exceptions
Route Total	221	15	236	93.64%	100.00%	41510

Discipline	Compliant	Non Compliant	Total Attributes	Compliance %	Max Compliance	Total Exceptions
Drainage	22	4	26	84.62%	100.00%	11023
Earthworks	60	0	60	100.00%	100.00%	3930
Electrical Power	40	3	43	93.02%	100.00%	117
Signalling	60	4	64	93.75%	100.00%	3005
Structures	21	0	21	100.00%	100.00%	447
Track	18	4	22	81.82%	100.00%	22988
Buildings	As briefed at the recent Asset ATR meeting, Buildings Data Quality reporting is suspended following the transition from OPAS to Citadel					

Telecoms asset data quality is also monitored using the same process, but the results are captured in a separate report [12]. We understand that this is because these assets are not typically contained within Routes and Regions (but tend to be cross-Route) and so are centrally managed.

As noted in the DQMR above, DQ Scores have not been calculated for Operational Property (Buildings) or for some Structures attributes for over two years due to challenges with accessing data in the format needed for testing since the migration from the OPAS (Operational Property Asset System) system to Citadel and from CARRS/VeRA (Civil Asset Register and Reporting System / Verification of Route Availability) to NEST (Network Enterprise Systems Tool).

While the A2 framework provides a common structure for measuring data quality, the processes, data sources, and calculation methods used to produce DQ scores vary across disciplines. This review therefore considers both whether the defined process and Business Rules are applied consistently in practice, and the extent to which underlying systems, data sources and calculation approaches vary across disciplines. In doing so, the review assesses the alignment between documented processes and the implemented calculation logic used to produce reported DQ scores.

5.3 Organisational Context

Accurate, complete and reliable asset data is fundamental to Network Rail's ability to meet its Network Licence obligations and to support effective asset management. In this context, A2 data quality represents a baseline standard intended to ensure that asset data is sufficiently robust to support operational, maintenance and investment decision-making.

In recent years, Network Rail has sought to enhance its use of data through programmes such as Intelligent Infrastructure, which aim to embed data-driven decision-making and improve the alignment between strategic objectives and operational activities. The Intelligent Infrastructure programme is intended to deliver a range of benefits, including improved safety outcomes, enhanced asset and train performance, better passenger experience, increased sustainability and productivity, and more reliable and connected railway operations aligned to wider strategic objectives.

This has been supported by the development and deployment of a range of discipline-specific systems and tools, including those supporting track, signalling, civils and geotechnical asset management, alongside enterprise platforms for data integration, work management and assurance. These systems increasingly enable the capture, processing and application of asset data across the organisation, including through enhanced analytics, visualisation and inspection technologies. The effectiveness of such initiatives is inherently dependent on the consistency, reliability and traceability of underlying data and associated quality measures.

Consistent application of A2 data quality scoring processes and criteria is therefore critical to ensuring that reported data quality metrics provide a reliable and comparable view across asset disciplines. Variability in processes, systems or interpretation of scoring rules may be exacerbated where different disciplines utilise distinct tools, data structures or interim arrangements, particularly where systems are at differing stages of maturity or transition. Such variability may undermine confidence in reported outputs and limit their utility for both regulatory reporting and internal decision-making. This review therefore considers the extent to which existing governance frameworks, processes and systems support the consistent and effective application of A2 data quality scoring across the organisation.

5.4 Data Analysis and Interpretation - Application of A2 Scoring

Scope question Q5a: Review whether A2 level data quality scores are applied consistently according to the established process and criteria

Our review of the A2 framework and data quality scoring process has found that it provides a consistent basis for measurement and is broadly in line with the established defined process and criteria. However, we have observed that the design and application limits its effectiveness as a true indicator of data quality. This section summarises 9 key findings from our review.

A2 provides a consistent basis for measurement across each asset discipline and Route

The A2 data quality scoring process applies a consistent approach for measuring asset data quality. We have reviewed the Business Rules file to confirm that there is a clear set of Business Rules which define the three sets of checks that are to be carried out for selected attributes within each asset discipline, covering completeness, data format and validity. An example of the Business Rules that applied to Drainage assets is shown in the DQMR extract in Section 5.2.

Documentation of the A2 data quality scoring process has notable gaps

As outlined in Section 5.2, the Reporter team was provided with the Business Rules file which defines the Business Rule checks to apply for each asset type, and process guides which outline the steps to follow to calculate the DQ Scores for Drainage [13], Track [14] and S&C assets [15].

These documents provide clear technical information on the Business Rules that should be applied and on producing the periodic DQMRs. However, they do not provide any documentation or guidance on the overarching purpose of the A2 DQ Score process and so this appears to be a gap.

Similarly, neither the Business Rules file nor the process documents provide any guidance on what the process is aiming to measure for each asset type, nor why the current attribute list was chosen. While the core principle is that it is measuring the proportion of assets that are compliant with the Business Rules, our review of the underlying code identified differences in how the measures are calculated in practice.

Example: for the three asset types under review, our review of the logic applied in the calculation files shows that the reported DQ Scores are based on three slightly different measures:

- Drainage: DQ scores calculated as proportion of all assets that pass all three checks.
- Track: DQ scores calculated as proportion of all relevant track mileage that pass all three checks.
- S&C: DQ scores calculated as proportion of those assets that are in scope that pass all three checks.

Our review has confirmed that this information is not documented in either the Business Rules files or in the process guides.

Evidence of some misalignment between the defined Business Rules and the check logic applied

In our review of the DQ Score calculation processes for the above three asset types, we have identified instances where the logic applied to calculate the DQ Scores does not align with that described in the Business Rules files. These fall into three broad areas, as evidenced by examples from our review, and full details are provided in Appendix E. Only the first of these potentially leads to material difference in some reported DQ Scores.

For Track (Plain Line), some manual adjustments are made to the data from the INM system before data quality checks are carried out. This means that the DQ Scores are not accurately reflecting the data as held in INM. For some attributes, this can have a material impact on the reported DQ Score.

Example: without this adjustment there would be an additional 60,000 exceptions for the "Year of Manufacture" attribute, which would suppress the DQ Score for some Routes (e.g. for LNE/EM from 91% to 63%).

For both Track and S&C, we have observed some Business Rules where the logic differs from the definition; in most of these cases, we have concluded that the logic applied appears to better reflect the data required to be held within the field, indicating that it is the Business Rules definitions that require updating.

For S&C, the Business Rules file includes a list of Ellipse Equipment Group Identifiers (EGI) codes which the check should apply to for each S&C attribute (i.e. for some attributes, the checks only apply to a subset of S&C assets). However, the list of EGI codes in this document are the same for every attribute and so do not accurately show which EGI codes the checks should be applied to. This indicates that the Business Rules definitions require updating to ensure transparency of the data checking process.

A2 only measures two elements of the Data Management Association (DAMA) framework, completeness and validity

The DAMA framework defines six dimensions that can be considered when reviewing data quality; accuracy, completeness, consistency, timeliness, validity and uniqueness. As noted in the "Asset Data Quality Specification Maintenance Process" document supplied by Network Rail, the current A2 process *"primarily measures completeness and compliance of records and is not a comprehensive measure of all standard data quality dimensions"*.

As stated above, the existing documentation doesn't provide a purpose for the assessment. There is an opportunity as part of an update to the documentation to include a rationale for DAMA dimensions to be evaluated, which will form the basis of an assessment and update of the Business Rules.

A particular limitation in the current process is that data accuracy is not part of the measurement, which was highlighted in discussions with asset engineers as one of their concerns with the value of the measure.

Example: An example quoted was the importance of an attribute such as "Pipe Size" being accurate (noting that this attribute is not currently covered by data quality checks). If this is not accurately recorded in Ellipse, then when this is due to be replaced, an engineer is likely to order the wrong part but only realise this when they arrive on site, leading to cost and time inefficiencies.

We recognise that checking accuracy of data is clearly a significant exercise and not one which could be easily embedded into a data quality measurement process such as this. As such, it is managed through quality assurance processes at source. It is highlighted here as it is perceived to be a limitation to the usefulness of the reports by some Network Rail staff in the Regions. This also links to the lack of overarching documentation of what the A2 scores are measuring (and critically, not measuring), which may lead to a risk of misunderstanding what it is representing.

DQ scoring only covers a small fraction of total attributes

One issue that was raised in discussions with key stakeholders, both in Technical Authority and the RADAMs, is that the current process only covers a small fraction of all attributes in the system – as these have not changed for many years and there was no provided documentation explaining why they were

originally selected. As outlined below ('*The attributes monitored have been broadly unchanged since CP5*'), an exercise was undertaken in 2025 to review the measured attributes to check whether they were still relevant and supported the performance or maintenance of the railway.

Evidence: There are currently 337 distinct attributes that are covered by the "Data Quality Attributes and Business Rules 2026 May" [16] document, although only 271 of these are currently being monitored. Once these 337 distinct attributes are broken down into sub-types, this equates to a total of 3,344 attributes. For example, there are ~50 different types of signal, so one distinct signalling attribute expands out to ~50 different attributes in the system being monitored.

When we consider that (a) only 80% of these distinct attributes are currently being monitored and (b) there are over 250,000 attributes in Ellipse alone (which accounts for around 45% of all distinct attributes being monitored), this indicates a very small proportion of asset attributes are actually being tested through this process (less than 1%).

The table in Figure 7 summarises the number of defined distinct attributes by discipline alongside the number that are being reported for compliance in the DQMR Dashboards and the number that are being actively monitored in the DQMRs today.

Figure 7: Summary of Disciplines and Attributes defined, listed in DQMR dashboard and those that are actively monitored

Discipline	Defined Attributes	Attributes in DQMR Dashboards	Attributes Actively Monitored
Drainage	26	26	26
Earthworks	60	60	60
Electrical Power	47	47	45
Operational Property	51	0	0
Signalling	64	64	64
Structures	31	21	21
Telecoms	36	36	36
Track	22	22	19
TOTAL	**337**	**276**	**271**

We have reviewed the attributes that are not currently monitored and these fall into three broad categories.

- *Attributes not available* – following migration into replacement systems, some attributes for Operational Property, 8 Structures attributes and 2 Electrical Power (EP) attributes are no longer available to be assessed. The EP attributes are incorrectly included in the A2 compliance scores in the DQMR dashboard.
- *Attributes not reported in DQMRs* – this covers two Structures attributes and there is no documentation to outline why these are not included.
- *Unmonitored attributes reported as A2 compliant in the DQMRs* – 3 of the 10 Plain Line attributes are included in the DQMRs and reported as compliant, but are not actually currently monitored, and it is not documented within the Business Rules file that this is the case. We have also observed that Table 34 of the Annual Return references the DQ scores for 8 Plain Line attributes, which indicates that one of the non-monitored attributes is being included.

Further details on our findings are provided in Appendix E.

DQ attention tends to be focused on this small fraction of attributes because they drive A2 scores and compliance reporting. However, this means that less attention is focused on other data in the system which are also important, e.g. for planning and budgeting purposes.

The attributes monitored have been broadly unchanged since CP5

The attributes currently monitored have been broadly unchanged since CP5 and as previously noted, we have not seen any documentation which summarises the A2 process and in particular, how the current attribute list was originally selected.

The Technical Authority already recognises this limitation. To reflect this, a project was commissioned in early 2025 to review the list of monitored attributes with Route teams to identify those which are particularly important to the business and so should be brought into the measure. A set of 95 new attributes were identified as outlined in the "Candidate Asset Attributes" file [17] supplied by Network Rail, with a further 17 existing attributes identified to be removed (including the three unmonitored Track attributes listed above). These attributes were identified following extensive engagement by the Asset Data Steward with RADAMs. Each Region provided a list of short-listed attributes along with a justification as to why they are important to monitor. For example, Wales & Western proposed 12 Plain Line attributes which fell into two camps; those that *"are used in wider ORR reporting and their DQ should be monitored"* and those where the *"data must be captured and consistently presented to comply with the requirements of Network Rail standards applicable to track maintenance and renewal works*".

As well as asset-specific attributes, the review identified a set of 16 distinct 'fundamental' attributes considered critical for all asset disciplines, for example Region and Route. These fundamental attributes are currently reported in separate dashboards by the Technical Authority, but outside the A2 scoring process. The project remains ongoing and these changes have not yet been implemented into the A2 scoring process. This is not planned to happen until the project to upgrade the current reporting process into new automated dashboards is complete, as covered in section 5.5. The cost of updating the existing process would be material given some of the current challenges (as covered later in this section) and so this will mean adopting a cost-effective approach to implement both the system and process changes at the same time.

Once the new reporting process has been implemented, the intention is to review and update the attributes being monitored on a six-monthly cycle, in liaison with key stakeholders in the Regions. One RADAM highlighted the importance of this; the list of attributes seen as important when the process was set up may not capture those that are important today. Therefore, this process will allow the Regional teams to take into account any future use of the data, so to ensure that the data being monitored continues to reflect those areas of most importance.

Compliance thresholds of 95% allow for significant residual exceptions

The A2 scoring process is binary, in that when a Route achieves the 95% A2 score for an attribute, it is seen as compliant. This can lead to a Route not continuing to drive further improvement once compliance is achieved. However, even with scores above 95%, there could still be thousands of exceptions, as is shown in the charts in Figure 8. Using an example of Earthworks for LNE & EM, as noted in Section 5.2, the A2 Compliance score for this Discipline was 100% despite nearly 4,000 exceptions. Looking at DQMRs for the last four years shows Compliance has always been 100% but the number of exceptions has been steadily rising. This ties into the A2 process being seen as a compliance exercise rather than one which is necessarily driving continuous data quality improvement.

Example: LNE & EM scored 99.39% against the "Age of Rail" attribute for Plain Line in Period 13, but there were still 2,368 exceptions (failures) – this indicates that a score of just over 95% (i.e. just compliant), could mean up to 20,000 exceptions still in the system for that Route alone.

To push for continuous improvement beyond simply achieving "A2", Network Rail has advised that there are plans to move certain asset types to a target of achieving A1 standards, i.e. 99% of assets pass the checks. However, as in the example above, even achieving this level of compliance may still leave numerous exceptions. As such, putting the primary focus of the reports on the number of exceptions may be more appropriate, with the DQ scores used as a secondary measure to enable comparison between Routes or asset type.

A2 reports provide a snapshot each period but may be out of date once published

The process for producing the A2 reports takes several days. This means that there is a lag between data being extracted from the systems and reports being circulated. As such, the reports are potentially out of date by the time Routes see them. The proposed move to automated dashboards which provide a 'live' view of data quality will resolve this.

The A2 measure does not indicate any notable improvement in DQ

Our review of recent trends in DQ Scores and the number of exceptions for each asset discipline and Route has shown that there has been limited evidence of any improvement in the A2 measure over the last three years. This review is based on two sources of data; the Route-based DQMRs for Period 13 in each of the last four years, and a summary file produced by the AIRS team showing the trend in exceptions over the last three years ("Region Exceptions P01 26 27.xlsx" [18]).

This finding could reflect the limitation of the A2 measure, rather than any trends in asset data quality. One interviewee advised our team that data quality in their area has been improving, but they would be surprised if it showed up in the A2 scores because of the limitations already highlighted. The interviewee had developed separate reports to assess data quality, using different measures that were considered more pertinent.

The charts in Figure 8 show the recent trends in overall number of reported exceptions for all Regions by asset discipline (i.e. assets that did not pass all three Business Rule checks). Apart from Track assets, these show a stable or rising (worsening) trend in each case over the last two years.

We have investigated the trends for Drainage, Track and S&C in more depth (note, the exceptions chart for Track in Figure 8 covers both Track (Plain Line) and S&C).

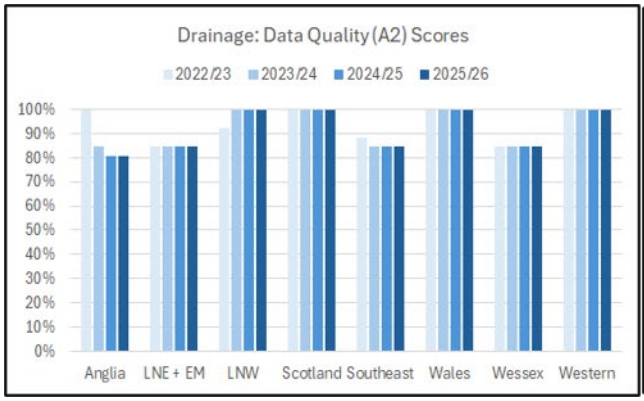
Figure 8: Graphs showing trends in overall number of reported exceptions for all Regions by asset discipline

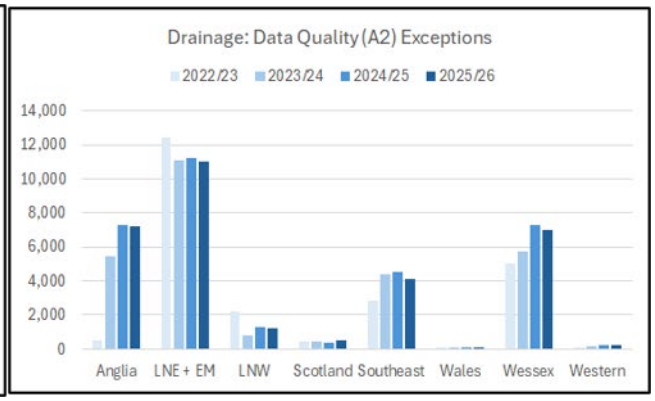


5.4.1 Drainage

The charts in Figure 9 show how the A2 compliance for Drainage (i.e. proportion of the 26 monitored attributes which are A2 compliant) has moved in the last 4 years for each Route and the number of exceptions. This highlights how the A2 compliance score alone can mask potential underlying issues. For example, the A2 compliance score for Wessex has remained static while a rising trend in exceptions was being observed.

Figure 9: Charts showing movement of A2 compliance for Drainage by Route and Exceptions

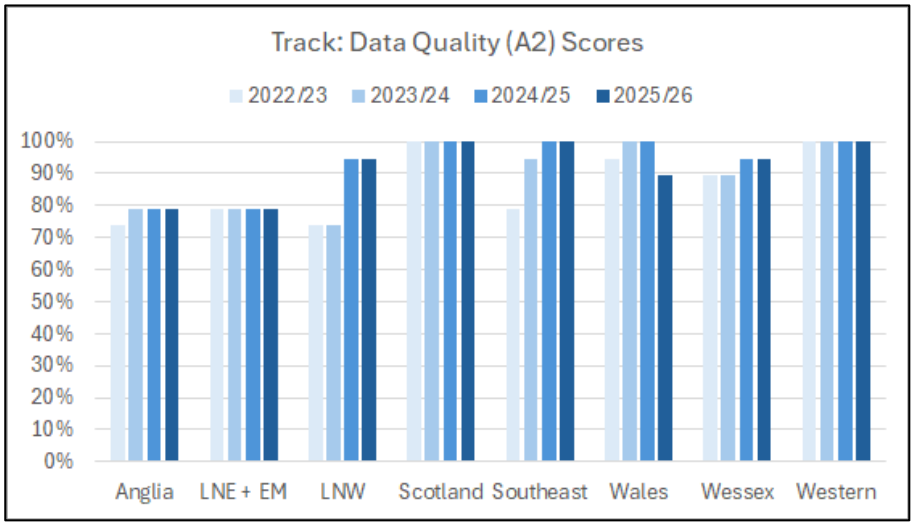




5.4.2 Track

There has been some observed improvement in A2 compliance scores for Track (both Plain Line and S&C), particularly in London North Western (LNW) and Southeast. These scores are derived based on the proportion of the 22 attributes which achieve 95% or more, with 10 of these attributes relating to Plain Line (3 of which are not actually monitored as noted previously) and 12 relating to S&C.

Figure 10: Track Data Quality scores by Route



When the number of exceptions for Plain Line and S&C are reviewed separately (Figure 11), it shows the improvement in Track A2 compliance is mostly due to S&C, where there has been a demonstrable improvement for some Regions. It is notable that only 6% of the reported Track exceptions relate to S&C assets with the remainder linked to Plain Line, yet it is the S&C improvement which is driving the observed change in the headline A2 compliance figures because of the nature of the calculation.

This highlights the continued high number of Plain Line assets failing the data quality checks, with only marginal improvements seen over the last three years. This may partly reflect A2 scores potentially driving some complacency, particularly once compliance achieved. For each of Anglia, Scotland, Southeast, Wales and Western, the DQ Scores for every Plain Line attribute have been over 95% (compliant) in every year, yet the chart shows a combined 26,000 data quality failures across attributes in these Routes and Regions.

This can also be seen in LNW, which Figure 11 shows had nearly 20k exceptions in the most recent year, down just 4% from two years prior. Figure 12 shows how the exceptions are primarily in one attribute and that there has been some marginal improvement which indicates some focus on this. However, no change in exceptions is noted for the other attributes, which are still material, yet are all deemed A2 compliant.

Figure 11: Charts showing Exceptions for Plain Line and S&C Data Quality



Figure 12: Example showing Exceptions by Attribute for LNW Route

LNW		DQ Scores				Number of Exceptions			
		2022/23	2023/24	2024/25	2025/26	2022/23	2023/24	2024/25	2025/26
Plain Line	Rail Type	✓ 99.8%	✓ 99.8%	✓ 99.8%	✓ 99.8%	13	13	13	13
	Sleeper Material	✓ 99.0%	✓ 99.5%	✓ 99.5%	✓ 99.5%	1,219	1,186	904	934
	Year of Rail Manufacture	✗ 92.2%	✗ 93.4%	✗ 93.8%	✗ 94.0%	14,796	14,397	14,348	13,733
	Age of Rail (Year Laid)	✓ 98.8%	✓ 99.0%	✓ 99.0%	✓ 99.1%	2,358	2,358	2,370	2,368
	Age of Sleeper	✓ 98.6%	✓ 98.7%	✓ 98.7%	✓ 98.7%	1,848	1,907	1,954	1,970
	Presence of check rail	✓ 99.8%	✓ 100.0%	✓ 100.0%	✓ 100.0%	2,047	1,989	1,968	1,942
	Age of Longitudinal Timbers	✓ 100.0%	✓ 100.0%	✓ 100.0%	✓ 100.0%	2	2	2	2
	Total					**22,283**	**21,852**	**21,559**	**20,962**

5.4.3 Summary of findings

To summarise the findings in Section 5.1, in direct response to Question 5a as to whether the A2 data quality scores are applied consistently according to the established process and criteria, the review identified that:

- A2 provides a consistent basis for measurement across each asset discipline and Route.
- Documentation of the A2 data quality scoring process has notable gaps.
- There is evidence of some misalignment between the defined Business Rules and the check logic applied.

We have observed the following concerns with the established process and criteria which impact on the effectiveness of the approach:

- A2 only measures two elements of the DAMA framework, completeness and validity.
- DQ scoring only covers a small fraction of total attributes.
- The attributes monitored have been broadly unchanged since CP5.
- Compliance thresholds of 95% allow for significant residual exceptions.
- The reports provide a snapshot each period but may be out of date once published.
- Limited improvement in DQ has been observed via the A2 measure despite anecdotal views that overall DQ is improving.

5.5 Data Analysis and Interpretation - Consistency of A2 Data Quality Processes and Systems

Scope question 5b: Review consistency of processes and systems in place and their application of data quality scoring across disciplines

This sub-question focuses on how the processes and systems for reporting data quality scores differ across disciplines. There is overlap with the previous question and so some of the previous findings are also relevant here. This section is focused on the processes and systems that are used for Data Quality Scoring, for which there is one key finding as described below.

DQ process is heavily reliant on legacy systems and manual processes creating inefficiency and risk

While many of Network Rail's data reporting processes have migrated to automated systems such as Power-BI, the asset data quality reporting still relies on legacy systems such as Microsoft Excel and Access. These files are typically those that were inherited in 2018 with minimal changes made. Different processes are in place for the different asset groups and as such, the application of data quality scoring is dependent on discipline-specific implementations, with variations in calculation logic, tooling and varying degrees of automation.

There has been a reluctance to change the process given the proposals to implement a new system approach for reporting asset data quality. For some processes, it is seen as a major undertaking to apply changes or resolve all the known issues due to the current structures and prevalence of hard-coding. Current system issues were also quoted as the reason why the DQMRs are still based on an out-of-date Route structure (reports are provided for 8 Routes rather than the current 14), due to the work involved in updating. The AIRS team observed that, in some cases, it would be better to simply redevelop from scratch.

For some Disciplines (e.g. S&C), the process relies on inherited code in MS Access which is acknowledged by the AIRS team as a challenge. Discussion with the AIRS team has highlighted there are some checks within this code which may not be working as intended and / or the logic that is being applied is not aligned with the definitions in the latest Business Rules (this was noted in the key findings above).

The process is time-consuming; the AIRS team advised it takes approximately 85 hours per reporting period to produce the A2 scores and lists of exceptions. This reflects the level of manual intervention required in the current approach and further highlights the lack of a consistent, automated system across disciplines. The AIRS team believes that the process is long-overdue modernisation to make it more efficient and introduce more automation. This is particularly noticeable given many other similar reporting processes in Network Rail have been automated through use of systems such as Power-BI in recent years. As previously noted, this has not been progressed due to plans to develop dashboards within the Technical Authority.

Given the time taken to produce the DQMRs each period, once they are published there is a risk that the information is out of date. This is because of the gap in time between data extraction and report publication, due to the current process.

The Technical Authority had started to develop a set of dashboards within Power-BI for reporting data quality, including the A2 scores. However, while prototype dashboards have been produced, which the Independent Reporter (IR) team has been provided with screenshots of in relation to Drainage, we have been advised that the high cost of fully developing the dashboards was not determined to be a good use of funds, given that upcoming Network Rail investments in Microsoft Fabric and Purview are likely to replace the need for Power-BI Dashboards.

To avoid the cost of abortive work, progress on the existing dashboards has been paused while this alternative approach is specified and reviewed. The intention is that the existing reporting process will be replaced by dashboards in this system which will be automatically produced and based on live data. This will significantly reduce the workload on the existing team each period and will ensure that Routes have access to live information on data quality. The proposed update to monitored attributes is planned to be tied in with this process. This avoids updating the legacy systems to incorporate these attributes, when they are due to be replaced.

The expectation is that the new reporting system will be implemented in the first half of 2027 although this is not confirmed.

5.6 Asset Data Quality Verification Results

5.6.1 Methodology

To review and verify the A2 data quality scores, the Independent Reporter undertook a targeted review of the A2 scoring process for three asset groups: Drainage, S&C, and Track Plain Line. This work formed part of the Data Analysis workstream and was intended to follow the A2 assessment process for the three selected asset types, using document review, data sampling and validation of reported outputs against the underlying rules and process artefacts.

This exercise involved:

- Tracing the end-to-end A2 scoring process, from source data extraction through to reported outputs in the DQMRs.
- Reviewing discipline-specific process guides and business rules, to define the expected validation and scoring logic.
- Applying the defined business rules independently to the supplied datasets, using a structured and repeatable analytical approach, including development of code-based routines to replicate A2 scoring calculations.
- Comparing independently derived outputs to reported DQMR results, including both data quality scores and exception counts.

Where differences were identified between the Independent Reporter's outputs and reported results, these were investigated through iterative review and engagement with the AIRS team. This included clarification of data transformations, interpretation of business rules, and examination of underlying calculation logic within existing tools (e.g. Excel and Access).

Our team then compared the documented business rules and process guidance with the implemented logic within existing calculation tools, and therefore the final reported outputs produced by Network Rail to provide a robust basis for assessing the consistency, transparency and reliability of A2 data quality scoring in practice. This allowed our team to test whether reported data quality scores for Period 13 could be replicated from the data and supporting documentation provided by Network Rail, and to identify any areas where the current process, logic or supporting artefacts could not be readily reconciled.

The asset data initially provided to the Independent Reporter was not a direct match to the dataset used in the Network Rail Period 13 process. The review identified a small number of differences in the assets included in the supplied sample when compared with the data used to generate the P13 DQMR. Where the same underlying dataset as that used for the P13 process was applied, the reported DQ scores matched directly. This is relevant context when considering the scale of any observed differences between the Independent Reporter's calculations and Network Rail's reported outputs.

Our detailed findings from this verification exercise are included in Appendix E alongside the complete outputs of our calculations for reference.

5.6.1.1 Key Findings: Verification of Drainage A2 Scores

No material concerns were found with the Drainage A2 scores. We were able to replicate list of exceptions and the DQ Scores, and we have validated the calculations undertaken in the relevant spreadsheets provided.

One minor discrepancy was identified. A small number of Drainage assets (76) were flagged as exceptions in the A2 process against "ELR Name". On review, these appear to be assets which are partly on inactive (disused) ELRs. The process currently only checks against active ELRs in INM, but it can be valid for such an asset to be partly located on an inactive line. Therefore, a very small number of exceptions are being raised which may be valid. While it has no material impact on the DQ Scores, we suggest that Network Rail review the reference data used to perform this check.

5.6.1.2 Key Findings: Verification of Track (Plain Line) A2 Scores

The process for calculating Track (Plain Line) A2 scores requires several steps where the data extracted from INM is manipulated before the exceptions are identified and the scores are calculated. There are two core changes applied.

Firstly, a small number of fields which are blank in INM depicting the year of manufacture or installation are populated. This is a manual step which is only applied where only one of either the "Left Rail" or "Right Rail" field has been populated. In these cases, the blank field is set to be the same as the other field. Business Rule 1 for these attributes checks whether they have an input value. In these circumstances, the check will not highlight that the data in INM is not fully populated. While this may be seen as a reasonable assumption, the rationale is not documented anywhere in the process guidance and it does not appear to align with the intention of the process. This is not a material issue, affecting only a minimal number of assets in our data sample (73 out of over 300,000).

Secondly, before the DQ Scores are calculated, a macro is run which updates the data for two relevant fields ("Year of Manufacture (Left)" and "Year of Manufacture (Right)") where the data in INM is in a year format which is less than 4-characters (e.g. "99" rather than "1999"). Business Rule 2 for these attributes checks whether the field has been populated in a 4-character format, therefore this macro ensures that it will not return an exception if the data in INM is not in this format. We identified just over 60,000 assets that would have failed this check if the adjustment had not been applied, mostly in Eastern and Southern. For the data sample tested, we estimate that without this adjustment, the LNE/EM DQ% score for this attribute would have reduced from 91% to 63%, while Southern would have reduced to 26%, both well below A2.

With the exception of the Year of Manufacture attribute for the reason above, we have been able to replicate a list of exceptions and the DQ Scores for this asset type.

Our review also identified two attributes where the defined calculation logic applied is not aligned with the Business Rules:

- Business Rule 2 for "Sleeper Material" has been deactivated but this is not recorded in the version of the Business Rules file we have received (this was advised by the AIRS team).
- "Age of Sleeper" checks are applied only to a subset of Sleeper Types, but this is not defined in the Business Rules file.

5.6.1.3 Key Findings: Verification of Track (S&C) A2 Scores

The Drainage and Plain Line DQ Scores are calculated in Excel which has provided transparency in the calculations undertaken. The S&C DQ Scores are calculated through an Access database, which runs via a sequence of queries and as such, is less transparent.

Following extensive review with the AIRS team, we independently replicated the process that is followed and produce the list of exceptions and the DQ Scores for this asset type.

However, our review highlighted several attributes where the calculation logic applied in the Access database does not fully align with the definition of the Business Rule check. Full details of these are covered in Appendix E, and fall into three broad categories:

- Differences in the definition of data format (Business Rule 2), for example the rule for "Age of Rail" is defined as "*Numeric AND Len = 4*" but the logic applied is "*Numeric AND Len <= 4*".
- Differences in the definition of valid values (Business Rule 3), for example the rule for "Stretcher Bar Type" states that it should be one of five defined values, but the logic applies allow for eight defined values.
- Differences in assumptions on which assets the check relates to (all Business Rules), for example the logic is only applied to assets where the Asset Class is "AU" for the "Switch / Crossing" attribute, but this does not match the EGI types listed in the definition.

5.7 Implications and Insights

One of the main issues which has arisen from our review is whether the current A2 DQ scoring process is an effective measure for driving sustained data quality improvement across Network Rail.

Feedback suggests that the A2 process is a coarse measure, which only measures a subset of attributes in systems, can be viewed as 'compliant' when many errors remain in the system, and is focused on two of the six dimensions of data quality as outlined in the DAMA. As such, there are parts of the business that find it of limited value, and as a 'compliance' measure only. The implication of this is that it is not being used effectively, while some of the challenges identified may be contributing to no apparent change in DQ scores despite the perception by teams that DQ is improving.

As a result, there is a risk that reported A2 compliance does not provide a complete or representative view of underlying data quality. In practice, this can lead to situations where a Route or Discipline is reported as compliant despite a material number of residual data issues, either because:

- only a limited subset of attributes is measured; or
- the compliance threshold (95%) permits a significant volume of exceptions.

This introduces a risk that the A2 metric may not fully support effective decision-making, particularly where asset data is relied upon for planning, maintenance, or investment activities. As highlighted through stakeholder engagement, poor underlying data quality may lead to inefficiencies, rework and cost impacts where decisions are based on incomplete or inaccurate information. This is particularly relevant for Route Asset Managers (RAMs), who rely on asset data to inform prioritisation, maintenance planning and renewals decisions. Where the A2 outputs do not reflect the attributes most critical to operational decision-making, or do not highlight underlying data issues clearly, their usefulness as a practical tool for managing asset condition and risk is reduced.

Considering the remit questions, our analysis has highlighted that the A2 data quality checks are broadly applied according to the established process and criteria, but there are some minor exceptions as outlined in the section above.

There is variable usage of these statistics within Routes and disciplines. In some cases, they are seen as valuable information which is used to drive discussions between Regions and Discipline teams, while in other cases they are seen as of limited value. This variation in usage further reduces the effectiveness of the measure as a driver for improvement, particularly where RAM SME teams prioritise alternative sources of information that better reflect operational realities.

We have observed inconsistencies in the processes and systems for reporting data quality across different disciplines. The current A2 process is inconsistent between disciplines which likely drives some of the inefficiencies in producing these reports. The introduction of dashboards would be expected to remove this inefficiency. These inconsistencies reduce confidence in the comparability of reported outputs. While these differences are generally not material at an overall level, they introduce uncertainty as to whether variations in reported scores reflect genuine differences in data quality or differences in how the process has been applied.

Planned improvements, including the review of monitored attributes and the development of automated or near-real-time dashboards, have the potential to address some of these issues by improving coverage, timeliness and consistency of reporting. However, these changes alone are unlikely to fully address the underlying limitation that the A2 process primarily measures compliance rather than overall data quality.

5.8 Conclusion (Q5)

Looking forward, the effectiveness of asset data quality monitoring will depend on both the evolution of the A2 framework and the supporting systems and processes used to deliver it. In particular, there is an opportunity to:

- broaden the scope of attributes monitored to better reflect business-critical data
- improve consistency and transparency of implementation across disciplines

- enhance the timeliness and accessibility of outputs through improved system capability

However, to maximise value, these enhancements will need to be accompanied by a clearer articulation of the purpose of data quality measurement and how outputs are expected to be used to support decision-making and continuous improvement.

6. Overall Conclusions and Recommendations

6.1 Conclusions

The review assessed Network Rail's arrangements to improve data quality across both regulatory reporting and asset data management. This included consideration of whether commitments made in response to ORR concerns have been implemented, the extent to which governance and assurance arrangements are effective in practice, and whether data quality measurement processes provide a reliable and useful basis for continuous improvement. The review did not assess the perceived or actual value and effectiveness of the data and reporting processes for the individuals and delivery areas they are intended to support, limiting insight into whether these processes meaningfully support operational decision-making.

Overall, the review concludes that while Network Rail has made substantive progress in establishing frameworks, processes and governance structures to support improved data quality, the effectiveness of these arrangements is not yet consistently demonstrated in practice. Evidence is strongest in relation to the existence of frameworks, guidance and assurance activities; however, there is more limited evidence of consistent application, clear accountability, and measurable improvement outcomes.

Taken together these findings indicate that while data quality frameworks are established, they are not yet operating as a consistently evidence-based control environment. Data governance arrangements are therefore not yet functioning as effective, closed-loop control mechanisms, and Network Rail is not currently able to demonstrate, with sufficient confidence, that regulatory data is subject to a consistent, auditable and effective assurance process across the organisation.

As a result, confidence in the extent to which these arrangements provide robust, organisation-wide assurance remains constrained. This limits the reliability and credibility of data assurance and creates a material risk to regulatory reporting ahead of FP1, where confidence in data quality will be critical to effective regulatory oversight, performance assessment and funding decisions. To provide full regulatory assurance, Network Rail would need to demonstrate that data quality processes are consistently applied, formally evidenced, and operate as closed-loop controls across all Regions and disciplines.

6.1.1 Network Rail has established a substantial data quality framework however its effectiveness is not consistently evidenced

The review found that Network Rail has established a substantial framework to support data quality improvement across both regulatory reporting and asset data management. This includes the Data Assurance Best Practice Guide, associated annexes and checklists, training materials, regulatory assurance processes, the Asset Data Governance Framework, A2 data quality measurement arrangements and Regional governance activity.

Collectively, these elements provide a clear and structured basis for improving data quality and supporting consistent regulatory reporting. In particular, the Best Practice Guide and associated training offer a well-defined approach to driving consistency, with the Central Regulatory Reporting team demonstrating strong ownership and understanding of these materials and providing targeted support to data providers where required.

However, the review found that the evidence base is stronger in demonstrating governance intent and process design than in showing consistent application across the organisation or sustained, measurable improvement over time.

6.1.2 Data governance has developed with second-level assurance in place for selected measures and Regions which again provides limited assurance over its effectiveness

The review also found evidence that second-level assurance arrangements are in place for selected regulatory measures, with automation through systems such as Power-BI and Hyperion reducing risks associated with manual calculation and enabling Central teams to undertake sense and completeness checks prior to reporting. However, the review was constrained by late access to sample data and limited documentary evidence demonstrating how these checks are performed, who completes them and how issues are resolved.

While this indicates that second-level assurance arrangements have been implemented, there is insufficient evidence to provide confidence in their consistent application or effectiveness in practice.

In addition, the review identified ambiguity in ownership and accountability across the data quality landscape, including responsibilities for regulatory reporting processes, standardised outputs, assurance activities and remediation. The respective roles of Central teams, Regional teams, technical functions and data providers were not always clearly defined or consistently evidenced. This lack of clarity constrains the ability to demonstrate effective control operation, including the systematic identification, assignment and resolution of issues through to closure and increases reliance on local knowledge and judgement. Governance structures and assurance mechanisms are in place; however, accountability and ownership arrangements are not always consistently defined, communicated or evidenced in operation. They are not yet consistently operating as auditable, organisation-wide control frameworks capable of providing reliable assurance of sustained data quality improvement.

6.1.3 A2 asset data quality scoring provides a structured, useful but limited view of asset data quality

The review found that the A2 asset data quality scoring process provides a structured and repeatable approach to measuring selected aspects of data completeness and validity. It supports periodic visibility of data quality performance and enables high-level comparison across asset types and Routes. As such, A2 can be a useful tool for oversight, where applied appropriately.

However, A2 is not a comprehensive measure of asset data quality and should not be treated as such. It only covers two dimensions of the DAMA framework, completeness and validity, and it does not assess accuracy. A2 covers only a limited subset of asset attributes and can indicate compliance even where a material number of exceptions remain. The review also identified documentation gaps and inconsistencies in the implementation of A2 processes across asset groups, including differences in business rule interpretation, calculation logic and supporting systems. In some cases, misalignment between Business Rules and the logic applied for the calculations were observed.

These limitations mean that A2 provides an indicative rather than definitive view of asset data quality. There is a risk that achievement of A2 thresholds shifts focus away from unmeasured attributes or underlying data issues once compliance targets have been met.

As a result, A2 scores should be interpreted with caution, particularly where they are used as a proxy for overall data quality or to compare performance across disciplines. Used appropriately, the measure can support oversight and benchmarking; however, used uncritically, it risks overstating confidence in the quality and usability of underlying data or masking important limitations.

6.1.4 Reliance on legacy systems and manual processes for asset data management, including both day to day management and A2 asset data quality monitoring, creates inefficiency and avoidable risk

The review found that asset data quality reporting processes continue to rely on legacy systems, including spreadsheets and Microsoft Access, requiring manual data handling and specialist knowledge. In some areas, reporting processes remain dependent on inherited logic that is difficult to interpret or maintain and require significant manual intervention to produce periodic outputs. The AIRS team advised that the current A2 process requires substantial manual effort each reporting period, and that some inherited logic is difficult to interpret or maintain. This is compounded by the prevalence of manual processes to manage data across the lifecycle, which lead to resources being employed in repetitive data management tasks.

This reliance on manual and fragmented processes introduces risks to efficiency, repeatability, transparency and auditability. It also increases dependency on key individuals, making processes more difficult to sustain, scale and consistently operate in a controlled manner. In the context of ongoing regulatory assurance requirements and wider organisational change, this creates avoidable delivery and control risk.

Planned improvements, including enhanced dashboards and greater automation, have the potential to address many of these issues by reducing manual intervention and improving visibility. However, these benefits will only be fully realised if they are supported by clear documentation, disciplined change control and stronger governance over Business Rules. In particular, greater alignment between reporting approaches and business needs will be important to ensure that improvements deliver sustainable value rather than incremental process change.

6.2 Review of Previous Recommendations

Table 2: Review of Previous Recommendations

Reference	Previous Recommendations	Status update (Summer 2026)
Mandate L3AR005: CP5 Asset Data Quality Assurance - Earthworks and Structures Asset Data	2019ADQ01. NR should define and migrate to a single combined linear and spatial location referencing system. The definition should include the data requirement, the relationship between the linear and spatial facets, the accuracy and tolerance and the purpose and use of the linear and spatial facets.	This aspect was not tested in this Independent Report, but it was observed that linear and location referencing is one aspect of asset data quality that is tracked as an important attribute.
	2019ADQ02. NR should produce and implement a consolidated set of asset data requirements, including their data quality parameters. Currently the source of these is diverse including guides and manuals, conventions and derivation from sources of other purposes, for example, engineering standards.	NR is currently undertaking initiatives to improve asset data requirements, so further recommendations on this topic are not considered necessary.
	2019ADQ03. NR should strengthen their processes, procedures and controls for maintaining the alignment of multiple Central databases with overlapping datasets and data delivery into them. They should consider automation, to identify misalignment on an ongoing basis.	Recommendation 3 in this IR covers a similar topic.
	2019ADQ04. NR should undertake an assurance programme of its own asset data quality. ORR, or Reporter on their behalf, may then audit the results of the assurance programme.	Covered currently via A2; Recommendation 2 in this IR covers a similar topic.
#20507 Independent Reporter Review of Environmental Sustainability Data	SOW20507-1 Develop formal documentation of reporting procedures. Roles and responsibilities should also be documented along with any assumption taken in the methodology employed.	Reviewed in this IR; no further recommendations required.

Table 2 showcases previous recommendations from two Independent Reports that impact on the asset data and regulatory reporting domain. Network Rail were unable to provide evidence on how these were discharged. We have undertaken a brief review of these recommendations against the scope of this Independent Reporting, noting that most recommendations from the #20507 review are not relevant to this scope of work.

6.3 Recommendations

The recommendations that follow are therefore focused on strengthening the effectiveness of Network Rail to implement existing arrangements, rather than introducing new governance, with the aim of enabling a more consistent, transparent and outcome-driven approach to data quality management.

Our recommendations are based on the improvements required and are not intended to define accountability at an individual, team or directorate level. Decisions regarding ownership and implementation remain a matter for Network Rail.

Table 3: Recommendations

Recommendation	Detail	Benefits
Recommendation 1 **Seek to improve data literacy across Network Rail, including re-iterating the purpose and value of data quality (Q1-5)**	a. There is a challenge that data initiatives rely on compliance, rather than understanding. b. Consider prioritising a Data Literacy Programme across Network Rail, targeted at practitioners, data owners, data users and leaders responsible for regulatory outputs and asset stewardship.	Practitioners more likely to undertake action to improve data quality; leaders more likely to sponsor investment and team time. Common language to drive a better alignment between Central, Regional and Route-based teams within Network Rail.

Recommendation	Detail	Benefits
	c. Clarify and communicate 'line of sight' showing how data quality supports both regulatory assurance and business decision-making (including investment planning, operations and maintenance).	Data foundations are identified as a key enabler for future data use cases (e.g. those in the GBRX AI Action Plan), which will require improved data literacy across Network Rail to achieve. Enables improvements in governance, without introducing further heavy or restrictive processes.
Recommendation 2 **Continue to improve asset data quality measurement linked to business decision-making and continuous improvement (Q5)**	a. The A2 metric has limited value in supporting the prioritisation of asset data quality improvements. b. Clarify the purpose, approach and limitations of the A2 metric. c. Continue current initiative to improve the value through expanding to cover other business critical attributes, applying tighter thresholds (e.g. A1) and maintaining focus on volume of exceptions to drive continual improvement. d. Consider if measures of accuracy for some key attributes (e.g. location) require further attention. We'd note that measuring accuracy is often a 'high value, high cost' undertaking, so this will need to be targeted and value-driven. e. Resolve documentation gaps in terms of defining purpose, approach and logic of asset data quality monitoring and scoring.	Data can be used to identify genuine data quality concerns and impacts and drive improvements rather than static compliance. Quality improvements are linked to a business use case and purpose.
Recommendation 3 **Prioritise investment in systems to utilise limited funding in a manner that most effectively improves data quality. This includes Exchange of Asset Information and data quality reporting automation (Q5)**	a. Resources are limited to invest in data quality initiatives. Therefore, focus on incremental improvement of Exchange of Asset Information, leveraging existing initiatives within Network Rail and wider Transport environment. b. Continue work to automate regulatory reporting and asset data quality monitoring. This could consider Agentic AI approaches to automate repetitive activity.	Project handover of data is a key creation point in the asset data lifecycle; focusing attention on getting data right at the start reduces effort (of both data management and quality reporting) later in the lifecycle. Reduces cost of data quality management, which increases organisational capacity for improvement initiatives, and enables more timely and actionable insights linked to other recommendations.
Recommendation 4 **Implement corrective actions to address a number of variances found in governance practice during the course of this review (Q1-5)**	a. Continue to leverage wider data initiatives to align data into a "single source of truth" for reporting and data quality management. b. Consider defining and communicating clear accountability and ownership for data quality reporting, assurance, remediation and issue resolution across Central, Regional, technical and data provider functions. c. Consider establishing a consistent enterprise-wide RACI and evidencing ownership through governance, processes and assurance activities including consistent use and evidencing use of checklists. d. Consider 'closed-loop' assurance approach i.e. to document, log and evidence where data quality issues have arisen and how they have been addressed.	Greater confidence in reported data quality and assurance outcomes. Strengthens transparency, auditability and organisation-wide assurance by reducing reliance on local knowledge, improving traceability of data and enabling more effective operation of data quality controls. Clearer accountability and ownership for data quality activities, remediation and reporting across the organisation. Consistent data quality management across Regions and disciplines.

Recommendation	Detail	Benefits
	e. Review ELR reference data used in A2 reporting and whether should include inactive lines for some disciplines, e.g. Drainage (see Section 5.6.1.1). f. Consider whether issues with Integrated Network Model data that is corrected by macro prior to running data quality scores (e.g. left/right rail; year of manufacture) would be better fixed in the source data. g. Review discrepancies between A2 Business Rule definitions and logic applied in data checks and update either document or check logic to ensure alignment in line with intention of check.	

Appendix A

Statement of Works

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1. Independent Reporter Framework

2. Specification of Work – Review of Data Quality

Acronyms

NR – Network Rail
ORR- Office of Rail and Road
IR – Independent Reporter
P&R – Network Rail, Planning & Regulation
WSF – Wrong Side Failures
CRI – Composite Reliability Index

1. COMMISSION OVERVIEW	
1.1 Background	Accurate and complete data is a licence condition for Network Rail. However, over the recent years, a number of data-quality issues have been identified across various reporting areas including the Annual Return, maintenance and renewals, capital investment, scorecards, network capability, environmental measures, operational performance. These concerns prompted the ORR to formally address the matter through a letter to Network Rail on 18 December 2023, focusing on improving the accuracy of regulatory submissions. In response, Network Rail shared its proposed approach to address these specific quality issues, which ORR now wishes to review to ensure its implementation and effectiveness. The scope of this review encompasses assessment of regulatory data quality improvement actions from this letter and also other asset data improvement initiatives which Network Rail has committed to. This review will provide ORR with important assurance on data quality ahead of CP8 planning. **Reference letters:** https://www.orr.gov.uk/sites/default/files/2023-12/2023-12-18-data-quality-compliance-letter-to-nr.pdf https://www.orr.gov.uk/sites/default/files/2024-02/2024-02-13-data-quality-compliance-letter-from-nr.pdf
1.2 Business Objectives and Priorities	The objective of this review is to provide independent assurance that Network Rail's initiatives to improve data quality are being effectively implemented across asset management areas* and support compliance with Network Licence conditions. **Relevant Network License requirements**: ***Maintaining asset information (General network management)***: **5.7** The licence holder shall maintain: (a) appropriate information about the Relevant Assets, other than (for the purpose of this condition) Relevant Assets which have been allocated

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	to a Route Business, including information about their condition, capability and capacity; and (b) appropriate collated information about the Relevant Assets on a network-wide basis. **5.8** The information maintained under Condition 5.7 must be accurate and readily accessible. ***Maintaining asset information (Route business network management)***: **6.7** Each Route Business shall maintain appropriate information about the Relevant Assets which have been allocated to it by the licence holder, including information about their condition, capability and capacity. **6.8** The information maintained under Condition 6.7 must be accurate and readily accessible. ** Asset management areas refer to data and reporting that support asset management disciplines, including asset information (e.g. Inventory, Condition, Inspection) and Performance Measures (eg. Effective Volumes, WSF, CRI).* The assurance review focuses on following data areas: **Regulatory Data Assurance** – evaluating the effectiveness of actions to strengthen the accuracy and governance of regulatory reporting. **Asset Data Improvement** – assessing whether Network Rail's data quality initiatives are delivering measurable and sustained improvement in asset information.
1.3 Key Requirements	This review will provide independent assurance over Network Rail's data quality actions in two key areas - **Regulatory Data Assurance** and **Asset Data Improvement**. **<u>Regulatory Data Assurance:</u>** The reporter will assure that Network Rail has delivered the following actions committed by NR to improve the accuracy of regulatory submissions (e.g. success and supporting measures, periodic performance reporting) 1. **Data Assurance: Best Practice Guide**: ○ *Assess whether the Best Practice Guide has been applied effectively for recent reporting (Annual Return RF3), using a proportionate, risk-based sample.* 2. **Training and Setting up Data Quality Monitoring**: ○ *Review the scope and resourcing of training provided to data providers across regions.* ○ *Assess the data quality monitoring arrangements across regions, including the resources allocated, and provide comparative observations.*

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3. **Second-Level Assurance for Success and Supporting Measures**:
   - *Confirm implementation of second-level assurance for Tier1 (Q1 2024/25), Tier 2 / 3 measures (Q2-Q3 2024/25).*
   - *Test the effectiveness of these assurance processes in practice through a risk-based sample of regulatory datasets (eg. effective volumes, CRI). Sample data sets will be agreed between NR and ORR and IR following initial review of the assurance process.*

Asset Data Improvement

The reporter will assess the effectiveness and impact of Network Rail's self-initiated initiatives for asset data quality, focusing on whether they are leading to sustained improvements. Key initiatives include:

- Asset Data Governance (ADG) Framework (developed in previous Control Periods)
- Asset Data Quality Measure Framework and Dashboard
- Network Rail's Asset Data Strategies
- Data Improvement Plans (Region owned)

(It is assumed these initiatives have now been delivered)

Network Rail's A2 data quality represents the minimum standard of asset data quality that Network Rail aims to achieve. Reviewing the A2 assessment process and scope can provide context for assessing whether the above improvement initiatives support consistent, reliable, and traceable data. This also aligns with a previous IR recommendation on consistent application and oversight of data quality scoring.

Assessment focus:

4. **Effectiveness of Governance and Frameworks**:
   - *Review how the ADG Framework and the initiatives relating to the Data Quality Measure Framework are being applied to support governance, measurement, and accountability for asset data quality, including A2 scoring.*

5. **Consistency and Reliability of Data Quality Scoring:**
   - *ORR would like to check that A2 level data quality scores are applied consistently according to the established process and criteria, and whether current initiatives provide effective governance and oversight for reliable and traceable scoring.*
   - *Review consistency of processes and systems in place and their application of data quality scoring across disciplines. For areas still transitioning to new systems (eg. Ops property and Structures), IR should provide their view on the interim arrangements and the ongoing improvement initiatives.*

Scope of Attribute in A2 assessment:

NR has completed a review of its data attributes and refined the attribute set required to support asset management, combining existing A2 attributes with additional attributes.

The IR should review the initiatives by Network Rail and provide their

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	opinion on the outcome. As part of the review, the IR should consider how Network Rail's overall data governance arrangements align with wider best practice or relevant cross-industry standards. The IR should also seek clarity from Network Rail on its definition of "appropriate data" in the context of the Network Licence requirements. **Approach and methodology:** In response to the tender, the reporter should propose a proportionate methodology to deliver the above objectives. A light-touch, risk-based verification may be used, such as reviewing a representative sample of asset records to confirm that reported A2-level scores reasonably reflect actual data quality and attribute coverage. Sampling datasets (for both regulatory and asset data) will be agreed between the IR, NR, and ORR at project initiation. For asset data sampling, we would like the Independent Reporter to look at three asset groups, which should include Drainage and Switches & Crossings (S&C). The IR reporter should recommend the third asset group. **Recommendations:** Based on the findings from the assessment and sampling, the reporter will make recommendations to address any identified issues and improve data quality and governance. **Reference documents**: The reporter should consider recommendations from previous assurance reviews undertaken by ORR when reviewing and making any recommendations: https://www.orr.gov.uk/sites/default/files/om/cp5-asset-data-quality-assurance-earthworks-structures-2019-09-20.pdf https://www.orr.gov.uk/sites/default/files/2021-08/review-of-environmental-sustainability-data-august-2021.pdf
1.4 Key Deliverables (What deliverables are required and when are they required? Eg weekly/end of project)	- Progress update reports every week throughout the duration of the review, from appointment to sharing of draft findings. - A presentation of draft findings and any recommendations to be discussed at a meeting with Network Rail and ORR. - A draft report (for comment by ORR and Network Rail) covering the issues set out in the scope section above, to be provided by mid-May and; - A final report shared with Network Rail and ORR by the end of May that addresses comments provided by ORR and Network Rail on the draft report.
information if required (Eg frequency)	Progress reports and/or meetings: NR expects the awarded supplier to provide weekly progress updates, including a breakdown of time spent per personnel. Recommendations (separate or part of report): Part of report

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1.6 Place of work	Network Rail Elder Gate, Milton Keynes MK9 1EN. ORR (Office of Rail and Road) 25 Cabot Square, London E14 It is anticipated that most of the supplier's work will be conducted from their own office or on site at above addresses. Interviews with Network Rail or ORR staff may be virtual or in person as appropriate.
Expenses	The assumption is most of Reporter's work will be conducted from their own office or on site at above addresses. Travel and expenses can be claimed based on Network Rail's expenses policy available at https://www.networkrail.co.uk/who-we-are/transparency-and-ethics/transparency/our-information-and-data/#our-people.. The Supplier shall endeavour to minimise travel and expense costs throughout the duration of the contact

Appendix B

Statement of Works Response Map

Table 4: Statement of Works Response Map

Statement of Work Scope	Report Response Details
Regulatory Data Assurance	
Data Assurance: Best Practice Guide	3.4 Data Analysis and Interpretation – Application of Best Practice Guide
Training and Setting up Data Quality Monitoring	3.5 Data Analysis and Interpretation – Training of Data Providers 3.6 Data Analysis and Interpretation – Data Quality Monitoring Arrangements
Second-Level Assurance for Success and Supporting Measures	3.11 Data Analysis and Interpretation - Evidence of implementation of second-level assurance
Asset Data Improvement	
Effectiveness of Governance and Frameworks	4 Findings: Asset Data Improvement – Q4
Consistency and reliability of Data Quality Scoring	5 Findings: Asset Data Improvement – Q5
As part of the review, the IR should consider how Network Rail's overall data governance arrangements align with wider best practice or relevant cross-industry standards.	4 Findings: Asset Data Improvement – Q4 4.4.3 Governance and accountability
The IR should also seek clarity from Network Rail on its definition of "appropriate data" in the context of the Network Licence requirements.	2.2 Evidence Base and Limitations
Approach and methodology	
Proportionate methodology.	2 Methodology
Asset data sampling – consider three asset groups, to include Drainage and Switches and Crossings.	2.8 Data Sampling and Validation
Recommendations	
Based on the findings from the assessment and sampling, the reporter will make recommendations to address any identified issues and improve data quality and governance.	6.3 Recommendations
Reference Documents	
The reporter should consider recommendations from previous assurance reviews undertaken by ORR when reviewing and making any recommendations.	6.2 Review of Previous Recommendations

Appendix C

List of Documentation from Network Rail

The Independent Reporter team prepared a list of documentation for a ‘day one pack’ to allow for a swift start to the data review. The pack that Network Rail prepared contained contact details for responsible partners for Regulatory Data and Asset Data, a supplied documents narrative and links to all available documents at time of production. It was noted that additional sample data would be provided after participating Regions were identified at the kick-off meeting with proposals for these and the three sample disciplines of Track, S&C and Drainage. The majority of requested documents were provided, and others followed later during the review process. Not all requested documentation was received by the time of reporting.

Appendix D

Lists of Interviewees

Table 5: List of Network Rail Interviewees

Date	Purpose	Network Rail Attendees
30/04/2026	Discuss Operational Property data and receive overview of current asset data initiatives.	Principal Asset Engineer – Data Head of Asset Data Technical Authority.
07/05/2026	Introductory session on regulatory data and information requirements.	Regulatory Compliance and Reporting Manager (P&R)
14/05/2026	Review process for producing DQMRs and cover initial clarification questions on sample data received held.	AIRS team
15/05/2026	Structured questions and answers aligned to governance, assurance and reporting.	Scotland RADAM
18/05/2026	Structured questions and answers aligned to governance, assurance and reporting.	Southern RADAM
18/05/2026	Structured questions and answers aligned to governance, assurance and reporting.	Eastern RADAM
19/05/2026	Regulatory data reporting processes.	Regulatory Compliance and Reporting Manager (P&R)
26/05/2026	Legacy data systems, A2 data quality, data accuracy and data governance.	Principal Asset Engineer – Data Head of Asset Data Technical Authority Regulatory Compliance & Reporting Specialist Planning & Regulation team.
01/06/2026	Clarification on data quality check logic for S&C attributes.	AIRS team
09/06/2026	Further clarification on data quality check logic for S&C attributes.	AIRS team
12/06/2026	Confirm process and assurance - Regulatory reporting measures data providers: CRI.	AIRS team
12/06/2026	Confirm process and assurance - Regulatory reporting measures data providers: Network Capability	AIRS team
17/06/2026	Discussion on asset data quality.	Principal Engineer responsible for Drainage assets
18/06/2026	Confirm process and assurance - Regulatory reporting measures data providers: Effective Volumes	Head of Financial Control & Analysis (Group Finance)
Requested	No response received.	RAM – Eastern Region
Requested	No response received.	S&C – Asset Discipline Lead
Requested	Individual felt unable to engage in the process.	Track – Asset Discipline Lead

Table 6: Office of Rail and Road interviewees

Date	Purpose	Office of Rail and Road Attendees
26/05/2026	To offer the ORR team who receive regulatory reporting data the opportunity to input their concerns and views on the process.	Asset Management – Senior Engineer Lead Data Governance Manager Senior Statistical Analyst.

Appendix E

Asset Data Quality (A2) Scoring Data Verification

This appendix provides more details on the findings from the review of attributes monitored and the data verification exercise to reproduce the A2 scores for a sample of asset data, as described in Section 5.4.

E.1.1 Attributes Monitored for A2

As outlined in Section 5.4, there are currently 337 distinct attributes that are covered by the "Data Quality Attributes and Business Rules 2026 May" [16] document, although only 271 of these are currently monitored. The attributes listed in this document as not currently monitored have been reviewed, and fall into three broad categories as outlined below. Inconsistency in how these attributes are treated in the DQMRs has also been identified.

E.1.1.1 Attributes not available

DQ Scores have not been calculated for Operational Property or for some Structures attributes for over two years due to challenges with accessing data in the format needed for testing since the migration from the OPAS system to Citadel (Operational Property) and from CARRS/VeRA to NEST (Structures).

These are documented in the Business Rules file as not being subject to checks due to "*data currently unavailable to Asset Information Service*" [16]. This accounts for all Operational Property attributes and 8 attributes for Structures.

The 8 Structures attributes which are not currently monitored are included in the list of 31 attributes that appear in the DQMRs. These are marked in these reports as "*To be delivered by CSAMS*" and are *correctly not included* in the compliance scores in the DQMR dashboard.

There are also 2 Electrical Power attributes which are not currently monitored but are included in the DQMRs. These are marked in these reports as "Data Quality to be assured" and *are erroneously shown as A2 compliant* in the DQMR dashboard.

E.1.1.2 Attributes not reported in DQMRs

There are two Structures attributes ("HCE Examination Date" (Hidden Critical Element) for both Overline Bridges and Underline Bridges) that are shown in the Business Rules file, but do not appear in the DQMRs. There is no documentation in the Business Rules file that these are not currently monitored.

E.1.1.3 Unmonitored attributes reported as A2 compliant in the DQMRs

Three Plain Line Track attributes are not currently monitored; Cant, Curvature and Age of Ballast. The Business Rules file does not list these as not currently monitored, and the AIRS team stated that they have not been monitored since the A2 process was inherited. While no score is shown in the DQMR for the Cant and Curvature attributes, a value of 95% is hard coded for Age of Ballast despite checks not taking place (example shown in Figure 13). All three of these attributes *are erroneously shown as A2 compliant* in the dashboard.

Figure 13: Extract from Scotland dashboard

		Scotland						
	Attributes	DQ Score	Check 1 Failures	What is Check 1?	Check 2 Failures	What is Check 2?	Check 3 Failures	What is Check 3?
Plain Line	Rail Type	100.00%	0	Is Not Null	0	Len = 1	0	Either B, F or T
	Sleeper Material	99.46%	77	Is Not Null	0	Len<=5	522	Lookup of acceptable values
	Year of Rail Manufacture	98.45%	1388	Is Not Null	0	Numeric AND Len = 4	495	Year of manufacture cannot be after the current year or year of installation
	Age of Rail (Year Laid)	99.36%	1412	Is Not Null	0	Numeric AND Len = 4	0	date cannot be in the future
	Age of Sleeper	98.60%	951	Is Not Null	567	Numeric AND Len = 4	0	<Today()
	Presence of check rail	100.00%	7	Is Not Null	0	Alpha (1 digit)	0	Valid Data = C, D, G, N, R
	Age of Longitudinal Timbers	99.86%	0	Is Not Null	1	Alpha	0	<Today()
	Cant		Data Quality to be assured					
	Curvature		Data Quality to be assured					
	Age of Ballast	95.00%	Data Quality has been assured					

An implication of this is that compliance scores are not fully reflective of the attributes being monitored. In Period 13 for LNE & EM, Track (which covers both Plain Line and S&C) was scored at 81.8% (18 out of

22) but a more accurate reflection would be 78.9% (15 out of 19). We have also observed that Table 34 of the Annual Return references the DQ scores for 8 Plain Line attributes, which indicates that one of these three non-monitored attributes is being included.

E.1.2 Key Findings: Verification of Drainage A2 Scores

Drainage A2 DQ Scores are calculated based on a series of Business Objects extracts which are downloaded each period and subjected to several pre-processing preparation steps to ensure the data is in the required format for the DQ calculations. The data is then loaded into Excel-based worksheet templates which generate DQ scores and exceptions before being consolidated into the Route DQMRs. Drainage DQ Scores for each attribute are calculated as the proportion of assets which pass all three Business Rule checks.

The supporting documentation and field interpretation prepared during the review suggested that the logic for Drainage assets was generally clear and capable of being followed through from the Business Rules to the supplied data.

Our key findings from this verification exercise were:

- Our calculations aligned closely with Network Rail's reported exceptions and DQ Scores.
- A small number of Drainage assets may be incorrectly flagged as failing ELR-related checks.
- The process remains manually intensive.

Calculations aligned closely with Network Rail's reported Exceptions and DQ%

The Independent Reporter's calculations have replicated the Drainage scores from the Period 13 data provided, with no material concerns identified overall.

Differences between the Independent Reporter calculations and Network Rail's reported exceptions were generally small. For Pipe Surface Water, the largest differences related to higher null values identified by Network Rail compared to the Independent Reporter for Pipe Material. We understand following discussion with the AIRS team that this appears to be due to differences in the data sample provided for the Independent Reporter's calculations to that used to produce the P13 Network Rail DQ Reports. For each of these cases, we were unable to find the assets listed in the Network Rail exceptions list in our data sample, which explains the discrepancies.

A small number of Drainage assets may be incorrectly flagged as failing ELR-related checks

A minor potential issue was identified in relation to checks against valid ELR names. We observed a very small number of Catchpit Drainage assets (76) being flagged as exceptions in the A2 process because the ELR name did not exist in the ELR reference file taken from INM.

We separately reviewed the Network Model which Network Rail regularly uploads to the Rail Data Marketplace (RDM) and observed that this document contains more ELRs than used for the A2 process. We understand from review with the AIRS team that the A2 reference file only includes ELRs which are live or active, whereas the Network Model includes all ELRs, including those that are inactive. Each of the ELR names flagged as exceptions by Network Rail are in the Network Model, indicating that they are currently inactive (e.g. disused line). These ELRs were "HLF1", "TYC", KID1", "SJT" and "CMM".

This indicates that the start or end of some Drainage assets are recorded on inactive ELRs. This is conceivable and so some assets might be currently being incorrectly flagged with exceptions. If Network Rail still owns the land then these drainage assets should be recorded and managed and so it would be more appropriate for the ELR checks for Drainage assets to be based on a list of all ELRs rather than active ones. We suggest that Network Rail consider the appropriate reference file to use here.

The process remains manually intensive

While no material issues were identified with the calculation of Drainage A2 scores, the current process remains manually intensive. It relies on repeated handling of data extracts, manual updates to reference and lookup files, de-duplication and consolidation across multiple templates. This increases the effort required each period and creates avoidable dependency on manual process execution.

E.1.3 Key Findings: Verification of Track (Plain Line) A2 Scores

For Track (Plain Line), the current process is undertaken through a combination of manual preparation of the INM data extract and Excel-based calculation templates. The process guide shows that the raw data is filtered, reordered and amended before being loaded into the Excel file. Plain Line DQ Scores are calculated based on the proportion of track mileage which passes all three Business Rules checks.

Our key findings from this verification exercise were

- Manual interventions are applied to the raw data before the checks are run and may influence DQ Scores.
- Misalignment has been observed between defined Business Rules and calculation logic.

Manual interventions are applied to the raw data before the checks are run and may influence DQ Scores

The process guide for Plain Line outlines several steps where the raw data from INM is amended, either before uploading to the Excel file, or via a macro within the Excel file.

Prior to uploading the data into the Excel file, the process outlines several amendments to the data related to year of manufacture ("LeftRailYearRolled" / "RightRailYearRolled") and year of installation ("LeftRailYearRolled" / "RightRailYearRolled"). An example extract is shown below:

Example steps from Plain Line process guide outlining manipulation of raw data before upload to the Excel file:

- If RIGHTRAILYEARLAID is 'blank', then RIGHTRAILYEARLAID equals LEFTRAILYEARLAID.
  - Sort by RIGHTRAILYEARLAID largest to smallest, copy data from LEFTRAILYEARLAID into blanks of RIGHTRAILYEARLAID
- If RIGHTRAILYEARROLLED is 'blank', then RIGHTRAILYEARROLLED equals LEFTRAILYEARROLLED.
  - Sort by RIGHTRAILYEARROLLED largest to smallest, copy data from LEFTRAILYEARROLLED into blanks of RIGHTRAILYEARROLLED

Network Rail applies this to where the data in INM is only populated for either the left or right rail, and updates the data used for assessment so that the blank field is updated with the data from the populated field, e.g. if LeftRailYearLaid is blank, but RightRailYearLaid says 2010, then LeftRailYearLaid will be updated to 2010. Business Rule 1 checks whether they are populated, and because of this manipulation the check will not highlight that the source data in INM is not fully populated. While this may be seen as a reasonable assumption, the rationale is not documented anywhere in the process guidance and it does not align with the intention of the process. However, our review identified only 73 assets out of over 300,000 in our data sample for which this manual intervention was being applied, so this is a minor issue in practice.

The second issue identified is that a macro is run within the Excel file which updates the data in the data checking file for two relevant fields ("Year of Manufacture (Left)" and "Year of Manufacture (Right)") where the record is not in a 4-character (year) format. Example code is shown below which shows how, for example, if the year was input as "99", then the macro updates this to "1999". For these fields, Business Rule 2 is checks for data validity using the logic: "Numeric AND Len = 4". By applying these changes, data that is not input in INM in the defined format is marked as a pass. As above, the rationale for this is not documented and it does not align with the stated intention of the checks. Our review of the code also notes that this has not been updated since 2017 and so any data input with values ranging 18 to 26 would be treated as taking the values 1918 to 1926 for the purpose of these checks.

Sample Visual Basic code from Plain Line DQ calculation file:

```
Selection.Replace What:="99", Replacement:="1999", LookAt:=xlWhole, _
        SearchOrder:=xlByRows, MatchCase:=False, SearchFormat:=False, _
        ReplaceFormat:=False
Selection.Replace What:="00", Replacement:="2000", LookAt:=xlWhole, _
```

SearchOrder:=xlByRows, MatchCase:=False, SearchFormat:=False, _

ReplaceFormat:=False

These adjustments do materially affect the reported Plain Line outputs and, consequently, Business Rule 2 rarely leads to exceptions. Our review identified just one exception across all Regions, where the field had been populated in error by an ELR. In contrast, over 60,000 assets would have failed this check had the adjustments not been applied, with the impact concentrated in Eastern and Southern. For Period 13, the LNE/EM DQ score for the affected attribute would have reduced from 91% to 63%, while Southern would have reduced to 26%.

As a point of clarity, the changes outlined above are made only to the data extracted for the purpose of the A2 exercise, and do not affect the underlying data in INM.

Misalignment has been observed between defined Business Rules and calculation logic

The reviewed material indicates that there are aspects of the Plain Line logic where the practical implementation is not fully clear from the Business Rules alone. Our interpretation of the Business Rules as they were written raised uncertainty over how the sleeper-material lookup should be applied. For example, our assumption was that the entire text as shown would be required to pass the business rule e.g. "CO-Concrete", but following further discussion with the AIRS team it became apparent that only the first letters before the dash "CO" were required for the Business Rule to be passed.

A review of the Plain Line DQ Score calculation file also identified the following points:

- Business Rule 2 for "Sleeper Material" has been deactivated but this is not recorded in the version of the Business Rules file we have received (this was advised by the AIRS team).
- "Age of Sleeper" checks are applied only to a subset of Sleeper Types, but this is not defined in the Business Rules file.

Discrepancies between Network Rail reported results and Independent Reporter calculations

"Year of Rail Manufacture (L)" Business Rule 2 – Network Rail reported 59,911 fewer exceptions

"Year of Rail Manufacture (R)" Business Rule 2 – Network Rail reported 60,061 fewer exceptions

The lower number of exceptions reported by Network Rail indicates that fewer records are being identified as failing Business Rule 2 compared to the Independent Reporter's analysis. As noted above, this is because the raw data is being transformed to a 4 digit year from 2 digits via the macro in the DQ calculation file.

"Year of Rail Manufacture (L)" Business Rule 3 – Network Rail reported 4,128 more exceptions

"Year of Rail Manufacture (R)" Business Rule 3 – Network Rail reported 3,685 more exceptions

The higher number of exceptions reported by Network Rail indicates that additional records are identified as failing Business Rule 3 compared with the Independent Reporter's analysis. The difference is because when an asset fails check 2 (above), we have not completed check 3 as stated in the Business Rules sequential evaluation logic. However, because Network Rail has passed all assets at check 2, they have reported the failures for Check 3. An example of this is MVM 0.0545 which fails check 2 in our calculations and appears in Network Rail's P13 DQ Report exceptions list for Check 3.

"Presence of Check Rail" Business Rule 2 – Network Rail reported 205 more exceptions

The higher number of exceptions reported by Network Rail indicates that additional records are being identified as failing Business Rule 2 compared to the Independent Reporter's analysis. The reason is not clear from our review, but this could be due to updates made to the system data between Network Rail extracting data for the Period 13 report and extracting data for our review. This potentially reflects the concerns around the timeliness of the DQMRs, in that by the time they are published, they may be out of date. In this example, we found 207 asset records from Southern Region which no longer fail this check, potentially indicating that corrections have been made to their system data.

E.1.4 Key Findings: Verification of Track (S&C) A2 Scores

For S&C, the current process is based on Business Objects extracts which are loaded into an inherited MS Access database. The Access database runs a sequence of queries and business-rule macros, after which outputs are transferred into Excel reporting templates and exception reports.

The AIRS team advised that this is one of the more challenging parts of the inherited process and that, unlike some other asset groups, detailed assurance of the logic had not been undertaken when the reporting process moved away from Business Objects pre-processing onto Azure-based source data. The AIRS team also acknowledged that the MS Access-based process is difficult to interpret and would benefit from modernisation.

Our key findings from this verification exercise were:

- Misalignment has been observed between defined Business Rules and calculation logic.
- A lot of manual processing is required.

Misalignment has been observed between defined Business Rules and calculation logic

Of the three asset groups reviewed, S&C presented the greatest challenge in tracing the written Business Rules through to the logic used in the calculation process. During our review, we found several areas where assumptions or further clarifications were required to understand how the checks were being applied. These included checks only applying to part of a data field, rules which apply only to subsets of S&C assets, derived calculations for certain attributes (e.g. stretcher bars), and Business Rule 3 logic which depends on separate clarifications outside the rules document itself. The Business Rules file also includes a list of all EGIs that each check should be applied to, but these are shown as the same for all attributes and do not reflect the filters applied in the logic in MS Access.

This reflects the limited documentation regarding the checks undertaken. This also highlights several deficiencies in the definitions within the Business Rules file, which therefore does not fully capture the logic applied. These fall into three broad categories and the attributes affected are summarised in the subsequent tables:

- Differences in the definition of data format (Business Rule 2).
- Differences in the definition of valid values (Business Rule 3).
- Differences in assumptions on which assets the check relates to (all Business Rules).

Table 7: Differences in the definition of data format for S&C (Business Rule 2)

Attribute	Logic applied in MS Access for Business Rule 2	Business Rule 2 as shown in NR AIRS Procedure documents
Crossing Angle	Crossing Angle (Standard) contains "-1 in" or "OTHER"	Format numeric XX.XX-1 or OTHER
Stretcher Bar Type	Must contain at least one non alphabetic character	Alpha
Number of Stretcher Bars	CountOfAsset Number must contain at least one non alpha character	Numeric
Rail Type	Must contain at least one non alphabetic character OR contain X-Other	TEXT
Switch Length	Contains A-Z before first hyphen	Alpha AND Len<=2
Age of Rail	Numeric AND Len <= 4	Numeric AND Len = 4

Table 8: Differences in the definition of valid values for S&C (Business Rule 3)

Attribute	Logic applied in MS Access for Business Rule 3	Business Rule 3 as shown in NR AIRS Procedure documents
Bearer Material	Must be CO, HW, SW, WB, SL, or CM	Must either be CO-Concrete, HW-Hardwood, SW-Softwood, WB-Waybeams, SL-Slab, CM-Composite (correlate accordingly with ref document)
Stretcher Bar Type	Must include Adjustable, Fixed, HPSS, Hy-Drive, Lock, Other, Tubular, or Non-Standard	Adjustable, Fixed Tubular, HPSS, Hy-Drive, or Lock.

Table 9: Differences in assumptions on which S&C assets the check relates to (all Business Rules)

Attribute	Additional Filters Applied to Data
Switch / Crossing Type	Asset Class = AU
Switch Type - Vertical / Incline	Asset Class = AU
Depth - Full / Shallow	Asset Class = AP
Bearer Material	Asset Class = AU
Crossing Angle	Asset Class = AX AND EGI prefix ≠ AX230RTK0001
Stretcher Bar Type	Asset Class starts with ST
Number of Stretcher Bars	Asset Class starts with ST
Rail Type	Asset Class = AU
Point End Type	Asset class = AU - S&C UNIT AND maintainer = NR - Network Rail
Switch Length	Asset class = AP AND maintainer = NR - Network Rail AND EGI prefix ≠ AP100RTK0002 / AP100RTK0003
Age of Rail	Asset class = AU AND maintainer = NR - Network Rail

Our analysis highlighted several areas where the Business Rule definitions do not match the logic applied. We recommend that Network Rail review these differences to confirm whether the logic applied in the checks is working as intended. This can be used to either inform updates to the calculation approach (which may be more appropriately applied as part of the reporting refresh) or updates to the Business Rules file to ensure alignment and clarity.

Heavy reliance on manual processing

The S&C process contains substantial manual steps in addition to the inherited Access logic. These include filtering out sidings, reshaping raw files, adding columns, importing files into Access, running individual queries, copying query outputs into Excel templates, exporting exception reports, retyping number fields, reordering columns, and manually normalising Route names before the final Route-report compilation step.

Discrepancies between calculated results

Through our independent verification exercise, we have identified several small discrepancies between the calculated outputs and the exceptions listed in the DQMRs. These discrepancies mostly reflect minor differences in the data sample provided to the Independent Reporter compared to that used for the Period 13 report, although one minor difference was identified relating to process, as below.

Point End Type – Network Rail reported 72 fewer exceptions

The difference in exception counts for this attribute relates to Business Rule 3, where the Independent Reporter identified 72 more exceptions than Network Rail. This difference is due to the Network Rail calculations treating assets with the value “NR6002-NR60 Mark 2” for this attribute as a pass, but this is not in the list of valid values we received in the Check 3 Lookup tables.

Appendix F

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