A Report for
Network Rail and ORR
from
Asset Management Consulting
Limited (AMCL)

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15th December 2011

Review of Phase 1 AIS
Review Report

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AMENDMENT HISTORY		
Version	Sections	Amendment Details
Draft A	All	Initial draft for client review
Draft B	All	Inclusion of client comments and consideration of Network Rail report: 'Overview of Confidence Grading Summary for September 2011 IIP Submission'
Version 1.0	All	Inclusion of final client comments

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Executive Summary

AMCL (Asset Management Consulting Limited) is the Independent Reporter for Asset Management to both Network Rail and the Office of Rail Regulation (ORR) for Control Period 4 (CP4).

Network Rail is currently developing a revised Asset Information Strategy (AIS). The revised AIS consists of two key phases:

- Phase 1 - the Asset Data Improvement Programme (ADIP) to support Network Rail's immediate asset information requirements for development of the Initial Industry Plan (IIP) and subsequent Strategic Business Plan (SBP) for CP5; and
- Phase 2 - an Asset Information Strategy for Network Rail detailing the longer term provision of better quality asset information for the Great Britain (GB) rail industry, referred to by Network Rail as ORBIS (Offering Rail Better Information Services). This work stream was ongoing and only a High-Level Vision (HLV) ('Asset Information Strategy Vision and Approach (v1.3)') was available to AMCL at the time of this review.

AMCL was commissioned to undertake an independent review of Network Rail's AIS Phase 1 ADIP work stream, which Network Rail has stipulated in the ADIP document, should be read in conjunction with the Asset Information Strategy Vision and Approach (AIS HLV).

The conclusions from this independent review of Phase 1 of Network Rail's Asset Information Strategy by AMCL are:

General

- The ADIP and AIS HLV are directly mapped to Network Rail's ongoing AMIP and the capability statements documented in AMCL's Asset Management Improvement Roadmap (v1.0), although they are behind the timescales originally defined in the Roadmap.

AIS Phase One - ADIP

- The ADIP team has performed efficiently and effectively in the timescales available, although the time available has been constrained by the programme being significantly behind the dates in the original AMCL Roadmap.
- The level of consultation, communication and programme management of ADIP plans, progress and outputs has been commendable and well received by internal Network Rail stakeholders.

- Based on Network Rail's own assessment of confidence grades, the actual output of the ADIP for IIP lags behind original ADIP targets for a number of assets, particularly in terms of inventory data.
- Whilst the ADIP work to support IIP has made enhancements in Network Rail's understanding of the what, where and, to some extent, the performance and condition of its asset base, further work is currently being specified by Network Rail for delivery prior to SBP to support the ongoing development of Asset Policies. An enhanced understanding of asset degradation and the relationship between degradation, root causes of failure and the impact of failures on train services will, in AMCL's view, be necessary to demonstrate that the SBP Asset Policies represent the lowest whole life cost solutions for delivering specified levels of outputs and should therefore be considered for inclusion in the future ADIP as appropriate.
- The work delivered through the ADIP to date is considered by AMCL to be consistent with Network Rail's obligations under the Network Licence.
- Asset information confidence grading targets for SBP require clarification and justification for the different types of Asset Information to ensure they are appropriate for the criticality of the information to decision-making within Network Rail.

AIS Phase Two – High Level Vision

- Network Rail's AIS HLV represents a potentially revolutionary step forward in the company's approach to asset information.
- Further consultation, or clarification of any consultation undertaken, with external (non-Network Rail) stakeholders is required.
- Network Rail has stated that actual costs of the overall ORBIS strategy are in the region of £324m, with underwritten benefits of £270m in CP5 and c.£500m in each of the following two control periods.
- The AIS HLV appears to be well aligned and integrated with the overall business objectives, Asset Management Policy and Strategy.
- The AIS HLV also appears well mapped and aligned to the AMCL Roadmap Capability Statements, although none of the Roadmap elements are considered by AMCL to be fully satisfied by the work to date, partly due to work commencing after the AMCL Roadmap identified start dates. This should be reviewed further based on the wider reaching ORBIS strategy.
- If fully implemented and achieved with an appropriate cost benefit ratio, the overall approach outlined in the AIS HLV should achieve Network Rail's stated goal, in the same document, of

industry best practice by the second half of CP6. To assure and demonstrate this, an appropriate and structured Asset Information management benchmarking programme would need to be established.

- At the time of writing the overall ORBIS strategy was available to AMCL as the AIS HLV only. The implementation and realisation of benefits against the significant likely costs requires appropriate review and assurance both following the ORBIS strategy publication and during its implementation.

Following completion of this review it is recommended that:

1) A review, commencing in January 2012, should be undertaken of the ADIP priorities, plans and deliverables to support SBP, including:
    a. The justification for the targets for asset data confidence, for the different types of asset information for SBP; and
    b. The consideration, where included within the ADIP plans, of wider Asset Management data issues for SBP, such as understanding asset degradation, unit costs, root cause analyses and the potential impact of this information on Asset Policy justification.
2) A detailed assessment should be undertaken of the completed ORBIS strategy and associated business case and implementation plan, commencing in January 2012.
3) Evidence should be provided by Network Rail that external stakeholders' requirements have been elicited and reflected in the development of the overall ORBIS strategy following its publication.
4) By the end of the 2012/13 financial year, Network Rail should establish an appropriate, structured benchmarking programme to assure the continued development and implementation of the ORBIS strategy achieves industry best practice by the second half of CP6.

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1 Introduction

1.1 Context

AMCL (Asset Management Consulting Limited) is the Independent Reporter (Part B: Asset Management) to both Network Rail and the Office of Rail Regulation (ORR) for Control Period 4. AMCL also fulfilled this role during Control Period 3.

As part of this role AMCL undertook extensive audits of Network Rail's six-task Asset Information Strategy that was launched in 2004 to address the then Network Licence Condition 24. This work culminated in a final Summary Report, produced in April 2008, to inform the ORR's decision that Network Rail had achieved Technical Compliance with Condition 24. Condition 24 was subsequently removed from the current Network Licence for Control Period 4,, with asset information requirements incorporated into the current Licence Condition 1.

The various AMCL reviews and audits of Network Rail's six-task strategy produced a suite of recommendations that were subsequently consolidated into a Masterlist and are tracked through ongoing periodical tripartite meetings between AMCL, Network Rail and the ORR.

Network Rail has since developed a process-led organisational structure, including an Asset Management directorate incorporating an Asset Information function headed by a new role of Director, Asset Information. Under the revised structure Network Rail is currently developing a revised Asset Information Strategy (AIS) to support it's own objectives and assure continued compliance with the revised Network Licence. The revised AIS consists of two key phases:

- Phase 1 - the Asset Data Improvement Programme (ADIP) to support Network Rail's immediate asset information requirements for development of the Initial Industry Plan (IIP) and subsequent Strategic Business Plan (SBP) for CP5; and
- Phase 2 - an Asset Information Strategy for Network Rail detailing the longer term provision of better quality asset information for the Great Britain (GB) rail industry, referred to by Network Rail as ORBIS (Offering Rail Better Information Services). This work stream was ongoing and only a High-Level Vision (HLV) (‘Asset Information Strategy Vision and Approach (v1.3)’) was available to AMCL at the time of this review...

1.2 Objective and Scope

The stated objective of this project was for AMCL to undertake an independent review of Network Rail's Phase 1 ADIP work stream.

The scope of the work was an independent review of the Phase 1 documentation, including the review and consolidation of current asset improvement initiatives, to establish the extent to which it addresses both Network Rail's own objectives and the asset information requirements that the ORR will expect Network Rail to produce to inform and support the Periodic Review 2013 (PR13) regulatory review process.

Any recommendations identified and accepted through the above scope of work will be added to the master list of Asset Information recommendations.

1.3 Purpose of Document

The purpose of this document is to report AMCL's independent findings against the above objective and scope.

1.4 Methodology

The methodology followed by AMCL in undertaking this review is summarised in the following table.

ID	Phase	Activity
1	Preparation	ORR Scope and Engagement Meeting
2		Project KO and Logistics (Network Rail)
3		Identify relevant documentation and stakeholders
4	Review of Phase 1 AIS Documentation and Development	AIS Phase 1 Document Review
5		Associated Documentation Review
6		Network Rail AIS Developer Interviews (x3)
7		AMEM Based BPR of AIS Phase 1 Documentation
8		Network Rail Director, Asset Information Interview
9	AIS Phase 1 Requirements	ORR Interviews - PR13 Asset information Requirements
10		Network Rail AIS Customer Interviews (x5)
11		Requirements Gap Analysis
12	Analysis and Recommendations	Mapping of AIS Phase 1 to Outstanding Asset Information Recommendations
13		Assess Consistency with Asset Management Roadmap
14		Assess Criticality of Asset Information to Asset Policies, IIP and SBP
15		Assess Continued Compliance with the Revised Network Licence
16		Review Network Rail's Assessment of the Current Suitability of Asset Information
18	Reporting	Prepare draft report
19		Presentation of interim findings

ID	Phase	Activity
20		Meetings to discuss draft report
21		Network Rail / ORR review and feedback
22		Accommodate feedback and prepare final report

Table 1 Summarised Methodology

2 Network Rail's Asset Information Strategy

2.1 Overview

Network Rail has identified a need for extensive enhancement of the management of asset information within the organisation to meet its own business objectives and the needs of its industry partners. To this end it has identified both short-term requirements to support its current activities and a longer-term vision, objectives, goals and direction for the management of asset information within a devolved GB railway.

The support of Network Rail's own short-term asset information requirements, which are centred around the current PR13 regulatory review process are being managed through the ADIP work stream. The longer-term approach is being managed through the development of a revised AIS known as ORBIS.

The ADIP, which is the focus of this review, is considered further in Section 2.4. The following two sections consider the overarching ORBIS strategy, to provide some initial context.

2.2 Asset Information Strategy

2.2.1 Status

Network Rail's ORBIS strategy was under development at the time of this review, with a detailed implementation programme and business case anticipated by the end of September 2011..

It is considered by AMCL that due to the criticality of the ORBIS strategy to future Asset Management within a devolved GB rail industry, these should be subject to comprehensive review and consideration when available. This view is based on the need for appropriate asset information to provide the foundation and input for optimised Asset Management decisions at all levels within any organisation. As demonstrated by the Asset Knowledge Enablers box in the internationally recognised Asset Management Conceptual Model, adopted by the Institute of Asset Management, shown in Diagram 1.

The need to review the forthcoming ORBIS strategy to ensure a good practice approach will be in place at an appropriate time is considered by AMCL to be even more vital given the current work to move to a devolved rail industry within Great Britain. Devolution will force the need for definitive asset information specification, management, review and audit to a level not previously undertaken in the industry.

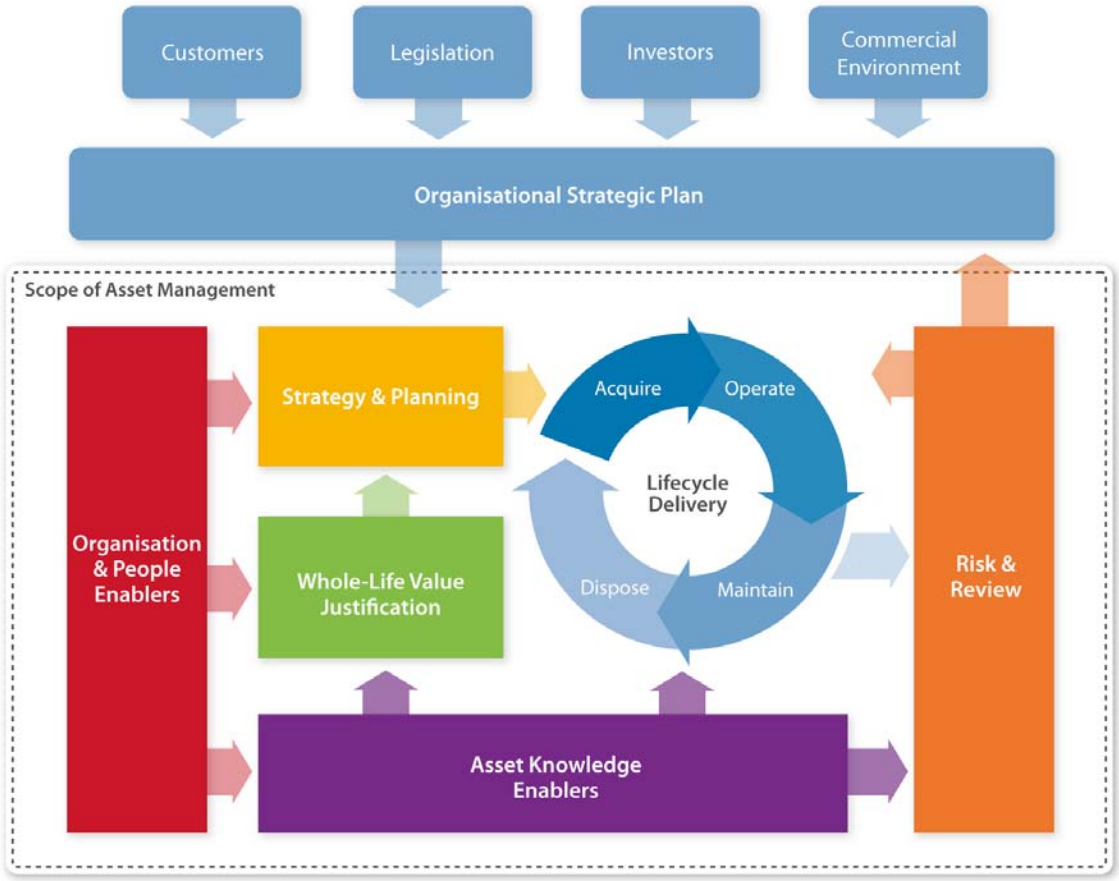


Diagram 1 Asset Management Conceptual Model

As a forerunner to the ORBIS strategy, Network Rail produced an 'Asset Information Strategy Vision and Approach (v1.3)' (AIS HLV) in March 2011, which outlines Network Rail's high-level consideration and approach to these issues. At this stage the vision essentially takes the form of a future state picture outlining the relationships between the Network Rail Asset Information function, the asset information types, inter-relationships and products and the key business processes and stakeholders, including the future devolved routes.

2.2.2 Alignment

The alignment of the AIS HLV with Network Rail's overall Promise, Asset Management Policy, Asset Management Strategy and other key documents, along with the role the AIS HLV itself plays in the overall system are clarified at the start of the document.

2.2.3 AIS HLV Objectives

The AIS HLV is underpinned by the following primary objectives, further supported by second-level objectives and goals:

1) To align information products and services with key business processes, to deliver maximum business effectiveness from information-enabled process changes.
2) To implement a robust 'data to intelligence' information handling process, with the requisite controls and competencies for each information type to deliver trusted information.
3) To deliver the industry five key information types, with a clear relational linkage between infrastructure asset hierarchies, the capacity/capability model of the network and the spatial model of the network, to deliver a single joined-up model of the network and its assets.

It is also noted that realisation of the vision will further improve safety for people working on, or using, the railway and improve the value for money the railway delivers.

The HLV document outlines the approach for each of the primary objectives. The alignment of asset information products with business processes is summarised in the following diagram.

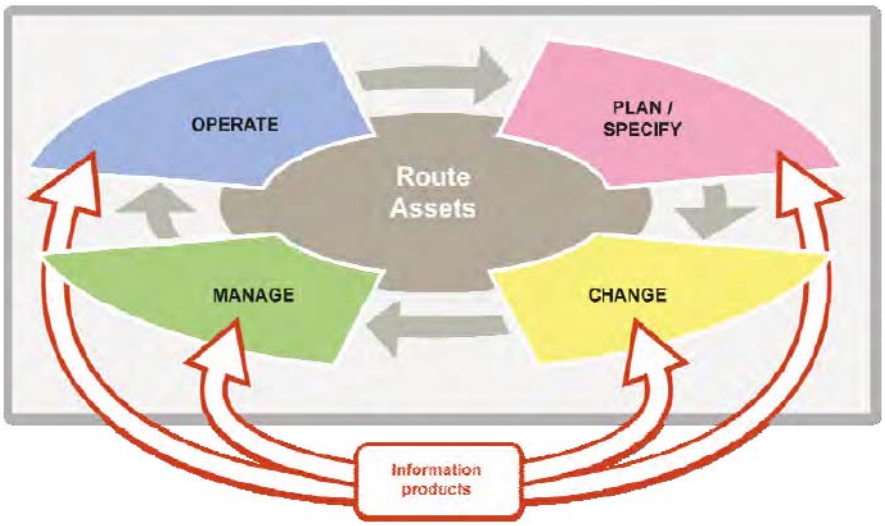


Diagram 2 Network Rail's AIS HLV Process Orientation

To implement a robust 'data to intelligence' information handling process, Network Rail has adopted a structured approach developed by the National Criminal Intelligence Services National Intelligence Model (NIM), which is based on:

- Asset Information Specifications that set out the information that needs to be collected;
- Asset Knowledge Standards that set out how information is evaluated; and
- Asset Information Plans that set out how data is collected.

Network Rail's overall approach to achieving this objective is shown in the following diagram and is considered to align well with the approach to asset information defined in AMCL's Asset Management Improvement Roadmap (v 1.0).

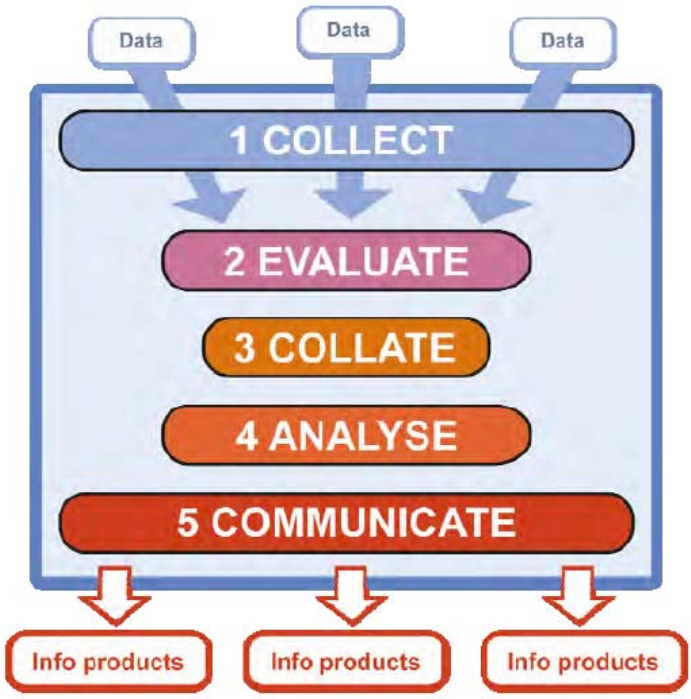


Diagram 3 Network Rail's AIS HLV National Intelligence Model Orientation

The third objective, to deliver the industry five key information types, is based on the following approach, which is clearly described, at an outline level, in the document text.

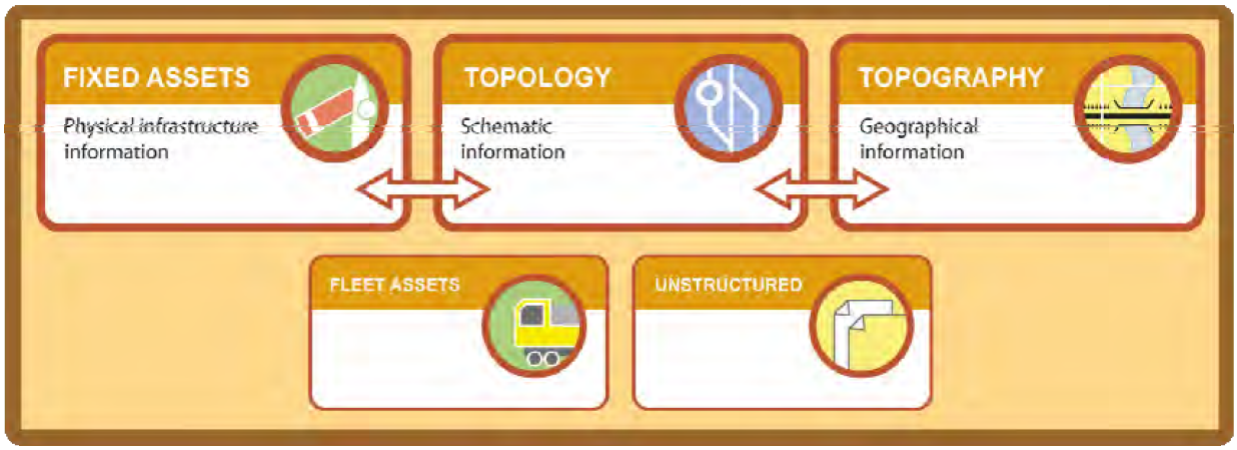


Diagram 4 Network Rail's AIS HLV Five Core Asset Information Types

2.2.4 Systems Architecture

It is against the five core asset information type structure described above that the AIS HLV defines some general principles for the future systems architecture. At this stage, the principles and supporting justifications are at a very high-level only, with determination of the systems architecture being clarified as part of the future ORBIS strategy implementation activity. However, some key decisions are clarified in the AIS HLV, including:

- The use of Ellipse - the company's existing central infrastructure asset register and work management system - as the default asset register for most assets types.
- Key exceptions to the above rule being the Operational Property asset group, which will remain in the proprietary OPAS system and certain other asset-related data, such as the geospatial shape of the network.
- The consolidation and development of a single topology (schematic) model of the GB rail network as a means of organising and disseminating capacity and capability information..
- The continued use of the GIS platform underpinning Network Rail's current Corporate Network Model to develop a multi-layered topography model. Notably, during the review process, this was identified by the Track asset group as one of the key benefits of the proposed HLV for the management of track assets.

2.2.5 Overall Vision Picture

The core of the AIS HLV is the picture shown overleaf which summarises how the three key objectives will be realised in the devolved industry.

The document further breaks the picture down and provides a high-level description of each individual element of the picture before going on to provide a range of vision example scenarios.

It is clear that significant consideration, consultation and planning has gone into the development of the Vision Picture and the document itself should be referred to for a greater understanding than can be portrayed here.

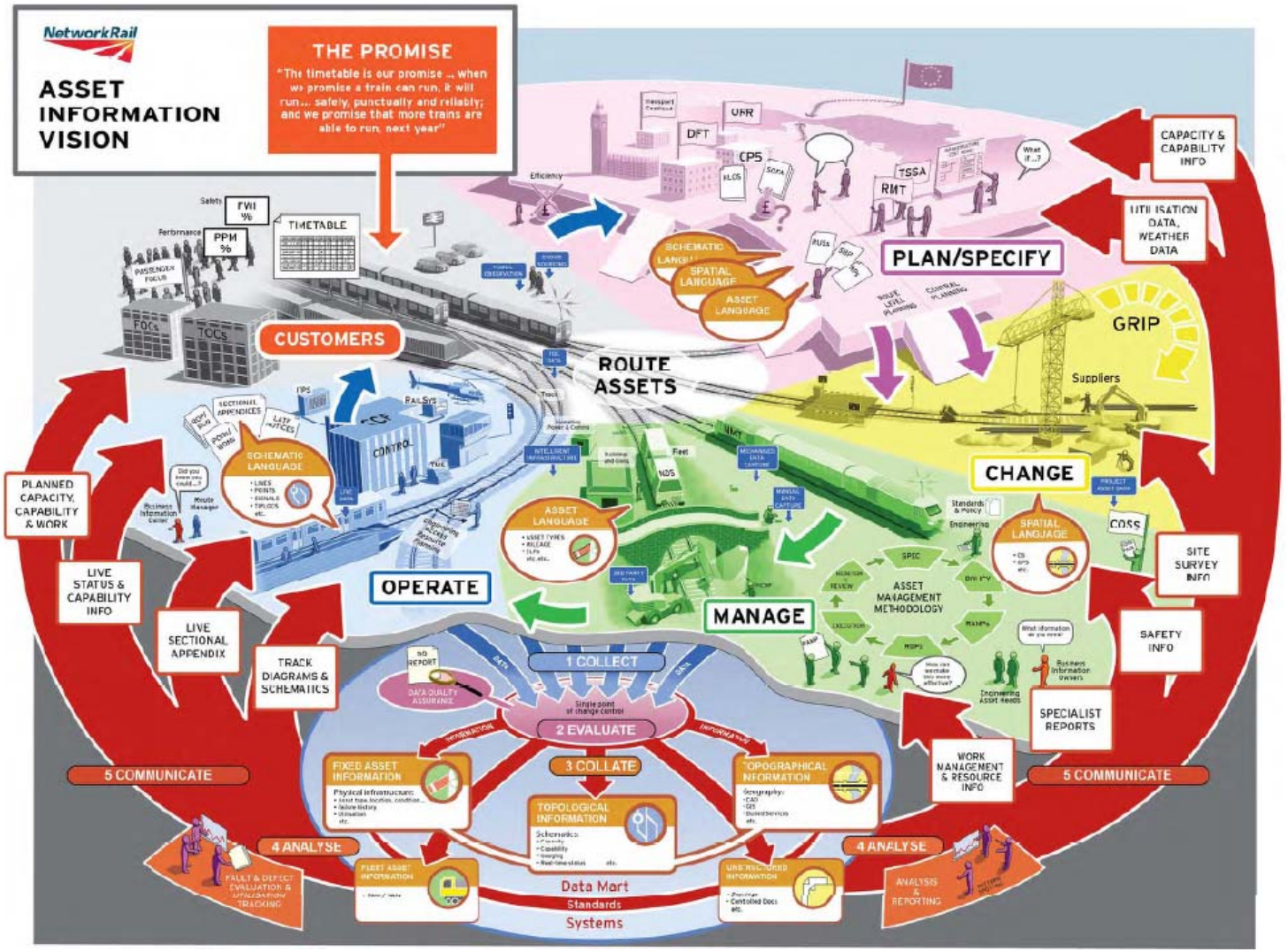


Diagram 5 Network Rail's AIS Vision Picture

2.2.6 Implementation Plans

As stated, it is clear that significant consideration, consultation and planning has gone into the development of the Vision Picture and the document as a whole. However, at the time of the review - or as provided to AMCL - it was purely a vision and not yet implemented. The future implementation is also assumed to be subject to relevant authority and business case approval (see Section 2.2.1).

The AIS HLV document does contain a suite of high-level implementation mechanisms, plans/roadmap and milestones. These include the following relationship mapping between the three primary objectives, the asset information architecture and the seven-layer information architecture model (shown in the top right of the following diagram).

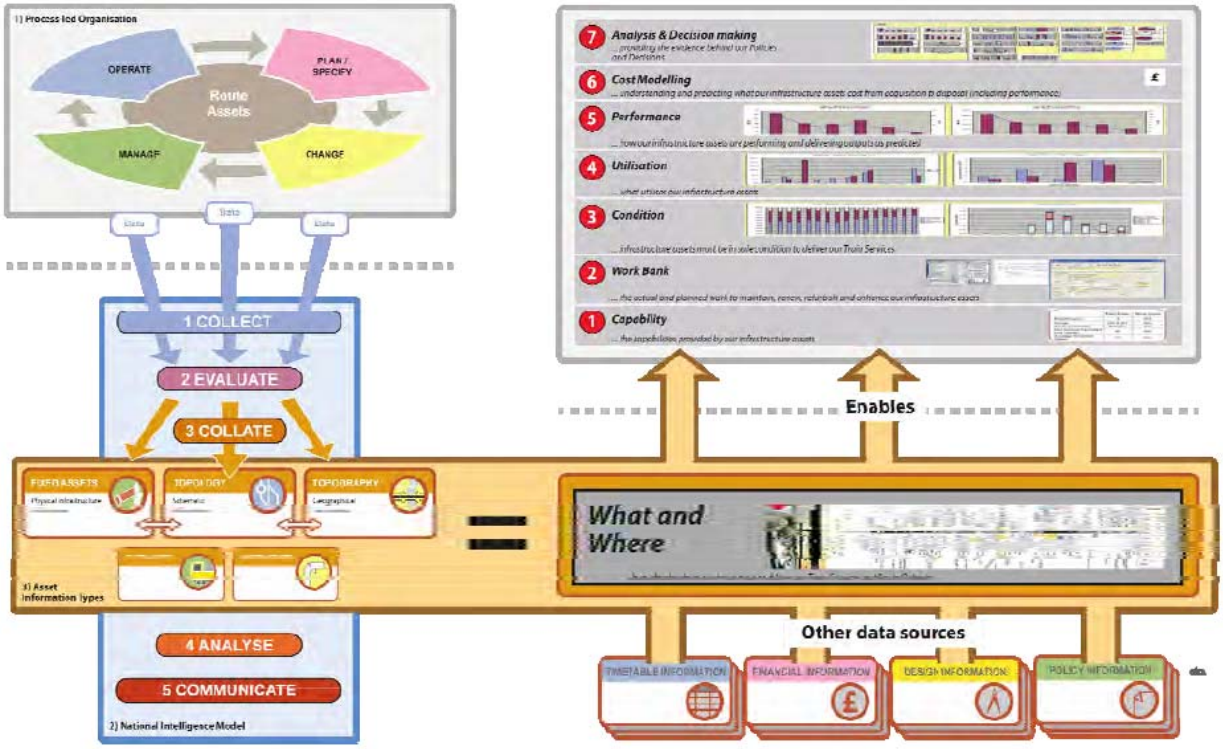


Diagram 6 Network Rail's AIS HLV Application of the Information Architecture Model

High-level implementation plans for the seven-layer Information Architecture Model are broken down in the appendices of the document.

The overall high-level timescales, with the caveat of indicative only, for implementation across the remainder of Control Period 4 (CP4) and the whole of CP5 and CP6 are also provided in the form of a high-level roadmap (see Diagram 7 below). Once again these are aligned against the three primary objectives.

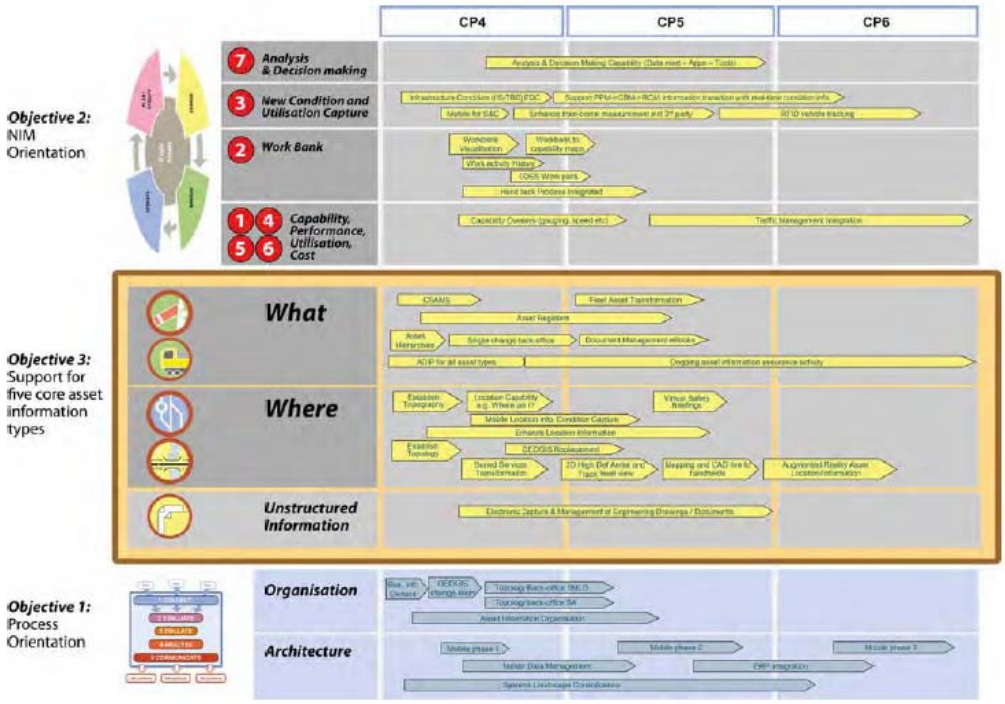


Diagram 7 Network Rail's AIS HLV Indicative High-Level Roadmap

The high-level roadmap is further supported by key milestones across each of the remaining years of CP4 and the first and second halves of CP5 and CP6.

The key deliverables are also directly mapped to Network Rail's current Asset Management Improvement Programme (AMIP) and each of the key milestones and capability statements, upon which the AMIP is based, emanating from AMCL's Asset Management Improvement Roadmap (v1.0).

2.2.7 Strategy Enablers

The AIS HLV also considers a number of enabling factors, including high-level organisational design, structure and locations and the associated timelines/roadmap, programme development methodologies, including the designing and costing of the programme, and proposed programme governance and key personnel.

Although limited documented evidence was available at the time of writing, it is understood that significant development of the organisational design had already been completed but was not shared with AMCL as union negotiations on the organisation design were commencing at the time..

Further development of the overall implementation plan and costs/benefits, representing a significant amount of work since the publication of the AIS HLV document itself were also communicated to AMCL during the review but were not made available for review.

Finally, the AIS HLV document appendices include high-level definition of the inputs and outputs to the vision, reference to relevant frameworks and good practice and details of the extensive Network Rail consultation process undertaken.

2.3 Asset Information Strategy Findings

Following the review of the available documentation and multiple stakeholder interviews during the review process, it is AMCL's considered opinion that:

- Network Rail's AIS HLV represents a potentially revolutionary step forward in the consideration, specification, collation, management and use of asset information within the organisation and for its external stakeholders.
- The document is well presented and comprehensive at the vision level.
- The AIS HLV itself appears to be well considered and structured and utilises existing approaches, methodologies and systems where appropriate to facilitate the implementation in the timescales identified.
- The identified vision has been created to support the process of devolution within the GB rail industry, although significant work is still required in this area as the overall move to devolution unfolds.
- Network Rail stakeholders have been extensively consulted in its development and unanimously appear to support the approach and the work of the development team.
- Interviews with stakeholders identified anecdotal evidence that there had already been a notable change in culture with Network Rail with respect to the value and use of asset information. This is believed to have been partly driven by the requirements of the PR13 regulatory review process and the support provided to this by the Phase 1 ADIP work stream of the overall ORBIS strategy (See Sections 2.4 and 2.5) but also by the development of the AIS HLV itself and the establishing and leadership of the new Asset Information function.
- Further consultation, or clarification of any undertaken consultation, with external (non-Network Rail) stakeholders would be valuable to assure the overall development and implementation process and value of the future ORBIS strategy to the wider industry.
- AMCL's initial understanding was that the scale of the cost/benefits of ORBIS strategy was approximately £250m to £300m but this has since been clarified by Network Rail to be

£324m, with underwritten benefits of £270m in CP5 and approximately.£500m in each of the following two control periods. Potential opportunities of £191m for Control Period 5 have been identified in the Track asset group alone.

- The AIS HLV appears to be well aligned and integrated with the overall business objectives and key elements of Network Rail's Asset Management system, including the overall Promise and the Asset Management Policy and Strategy.
- It is also directly mapped to Network Rail's ongoing AMIP and the capability statements documented in AMCL's Asset Management Improvement Roadmap (v1.0).
- If fully implemented, via the overall ORBIS strategy, and achieved with an appropriate cost/benefit ratio, the approach outlined in the AIS HLV would achieve Network Rail's stated goal (see Section 3.6.5 of the AIS HLV) of the organisation's Asset Information management being recognised as industry best practice by the second half of CP6.
- To assure and demonstrate this, an appropriate and structured Asset Information management benchmarking programme would need to be established.
- Whilst recognising that extensive and apparently good practice work is continuing on the development of the overall ORBIS strategy, at the time of writing this was available to AMCL as the AIS HLV only. The implementation and realisation of benefits against the significant likely costs requires further documented assurance and continuing review as they are developed and implemented over the next two-and-a-half Control Periods.

2.4 Asset Data Improvement Programme

2.4.1 Status and Context

Network Rail's ADIP document was published (at version 1.9) in March 2011, alongside the overall AIS HLV.

It is understood to have been a 'one-off' publication of the document to provide the ORR and AMCL, as Independent Reporter, with an overall summary of the context, intent and progress of the ADIP at the time of publication. The 'one-off' nature of the document is due to a number of the work streams within the ongoing ADIP being considered by Network Rail as 'live' in terms of scope, with requirements and plans potentially expanding and contracting as requirements are refined and new requirements identified. It was also stated that over time, the ADIP would become the business-as-usual (BAU) asset data improvement element of the overall ORBIS strategy, as evidenced in the high-level AIS roadmap in Diagram 7.

The published ADIP document provides an overview of the context, interfaces and overall plans for the development of asset information to support Network Rail's immediate and short-term requirements for asset data and its management and assurance. The management and processes appear to be well integrated with the overall approach defined in the AIS HLV and it is stipulated that the two documents should be considered in parallel.

Prior to publication of the document to summarise the works, the ADIP itself is understood to have been formalised around the start of the 2011 calendar year. Subsequent to this it is understood initial discussions had been held with the various asset group leads during the summer of 2010 but detailed asset information requirements were not mature enough at that stage to be fully defined. Following the initiation of more formal PR13 development work within Network Rail prior to the end of 2010, along with the appointment of the Director, Asset Information and consolidation of the Asset Information team, a more definitive clarification of requirements was possible.

The ADIP was subsequently developed to focus on improving Network Rail's asset data and information to support the Initial Industry Plan (IIP) submission in September 2011 and the subsequent development of asset information for SBP, along with associated governance and assurance procedures. It is also noted that due to relevant synergies the ADIP included work to help close relevant asset information recommendations previously put forward by AMCL as Independent Reporter.

2.4.2 Scope

Overall the ADIP is aligned to the submissions of the IIP in September 2011, the Strategic Business Plan (SBP) in January 2013 and the CP5 Delivery Plan in April 2014, with specific asset information deliverables for each as shown below.

Workstream	IIP September 2011	SBP January 2013	Delivery Plan April 2014
Asset Information	Fit for purpose asset information to support CP5 Asset Policies.	Fit for purpose information available to support bottom up SBP plans.	Data maintenance and assurance processes fully implemented and working.

Diagram 8 Network Rail's ADIP Delivery Milestones

The ADIP document published (v1.9) is clarified as intended to document the plans to meet the first of these milestones, i.e. to deliver fit-for-purpose asset information to support the IIP submission in September 2011. The diagram below provides an overview of the ADIP activities, processes and related work streams.

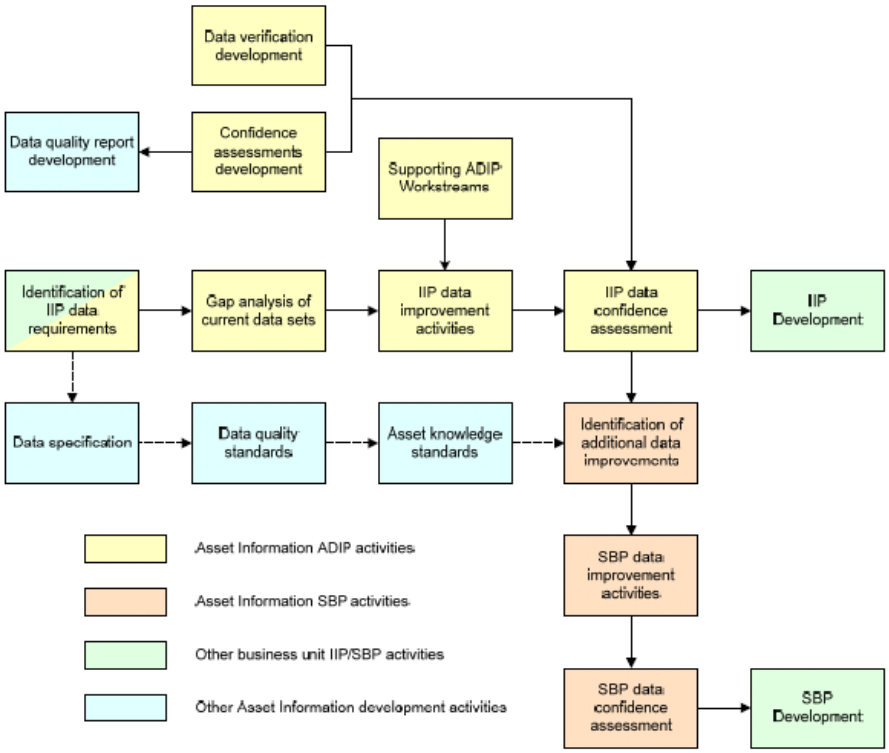


Diagram 9 Network Rail's ADIP Overview

At the time of writing, work was understood to be largely complete on the delivery of information for the IIP process and the ADIP team are working with Asset Heads and their teams to establish requirements for further refinement and development of asset information to support SBP.

The ADIP has also now fully incorporated the previous business-as-usual (BAU) Data Quality Improvement Programme (DQuIP), the development plan for which was revised to target the IIP critical asset types (see Section 2.4.3).

Other existing work streams supporting the ADIP are noted as:

- GEOGIS Backlog;
- Civils work stream 5;
- Assets out of Use; and

- Managing S&C as a System.

2.4.3 ADIP Development Process

Taking into account the restrictive timescales between ADIP initiation and deliverable milestones to support the IIP, the ADIP development process for IIP appears to have followed an effective process, with extensive consultation with Engineering, Maintenance and Asset Heads or representatives acknowledged and well evidenced throughout.

An initial exercise to identify assets, components and attributes critical to IIP cost modelling activities was undertaken as part of Network Rail's 10-Step Asset Policy development process to prioritise asset data improvement activities for IIP and considered the following:

- Overall aggregate expenditure;
- Safety (e.g. assets with low spend may be safety critical);
- Performance (e.g. assets with low spend may be performance critical); and
- Sustainability Impact on whole-life costs (e.g. drainage may be relatively low spend but may be key to reducing overall costs).

An assessment of current data quality for each asset group was subsequently undertaken to establish current status. Notably, for the Civils, Operational Property and Signalling asset groups it was considered by Network Rail that data quality was already suitably understood as a result of recent Civils work stream 5, OPAS and DQuIP work, respectively. Whilst the data quality may not be at the level required in all these areas, it is AMCL's view that the recent workstreams would have provided Network Rail with the necessary understanding of this for the purposes of initial gap analyses. For Track, Electrical Power and Telecoms asset groups, a desktop exercise was undertaken comparing the latest centrally held data with local knowledge from the Maintenance Delivery Units. The results of this were used to inform an alphanumeric assessment of reliability and accuracy. As well as using the data extract returns from the Maintenance Delivery Units to update centrally held data sets, the outcomes of the studies were used to initially prioritise the ADIP data improvement activities for IIP. Both the alphanumeric assessments and the data improvement priorities were agreed with relevant stakeholders.

Data improvement plans (Block Plans) were developed for each asset group identifying current asset data quality and target milestones, agreed with stakeholders, to form the basis for the development and implementation of detailed ADIP plans through to IIP and beyond. An example of the Block Plan for Plain Line Track is given in Diagram 10 overleaf..

					Stage 1				Stage 2				Stage 3				Stage 4				Stage 5	Stage 6	
				B4				B4				B4				B3				B2 -	B2-		B2 +
Track Priority Grouping	Asset Type	Key Attribute to be validated (including specification)	Core System / asset register to update	Baseline Confidence Grading 01/10/2010	Data Validation Method	Route Coverage	Key Stakeholders	Actual Confidence Grading 17/12/2010	Data Validation Method	Route Coverage	Key Stakeholders	Target Confidence Grading 25/2/2011	Data Validation Method	Route Coverage	Stakeholders	Target Confidence Grading 31/3/2011	Data Validation Method	Route Coverage	Stakeholders	Target Confidence Grading 27/05/2011	Target Confidence Grading 30/09/2011 IIP submission	Potential Key post IIP activities where already identified	Target Confidence Grading 30/06/2013 (time of SBP submission)
Running Lines	Track type	Jointed - CWR rail type ratio	GEOGIS	C4	Desktop Survey	National	TME's	B4															
									Track Geometry Train - Dip Angle measurements	M&C (London to Nottingham) East Coast (London to Doncaster)	EDC / AI	B4	Track Geometry Train - Dip Angle measurements	National	EDC / AI	B3	Track Geometry Train - Dip Angle measurements	National	EDC / AI	B2	B2		B2
									NMT - Forward facing video review/validation	M&C (London to Nottingham) East Coast (London to Doncaster)	EDC / AI		NMT - Forward facing video review/validation	National / 80% network minimum	EDC / AI		NMT - Forward facing video review/validation	National / 80% network minimum	EDC / AI				
									Fishplate Lubrication/expansion switches - Ellipse work history records	M&C (London to Nottingham) East Coast (London to Doncaster)	Maintenance / AI		Fishplate Lubrication/expansion switches - Ellipse work history records	National	Maintenance / AI		Fishplate Lubrication/expansion switches - Ellipse work history records	National	Maintenance / AI				
													Targeted visual site inspection	Sample to validate above methods and to address any data uncertainties	Maintenance / RAMs / AI		Targeted visual site inspection	National	Maintenance / RAMs / AI				
	Rail Profile / Track Cross section	BS 95R BH BR 98 FB BR 109 FB BS 110A FB BS 113A FB UIC 60	GEOGIS	C5	Desktop Survey	National	TME's	B4															
									UTU train - rail profile match (6 rail profile templates) vs GEOGIS	M&C (London to Nottingham) East Coast (London to Doncaster) (whatever we can get from UTU for these routes)	EDC / AI	B4	UTU train - rail profile match (6 rail profile templates) vs GEOGIS	60% network coverage?	EDC / AI	B3	UTU train - rail profile match (6 rail profile templates) vs GEOGIS	60% network coverage?	EDC / AI	B2	B2		B2
													Targeted visual site inspection	remaining 40% (targeted) and sample to address any data uncertainties following UTU match (M&C and LNE)	Maintenance / RAMs / AI		Targeted visual site inspection	National	Maintenance / RAMs / AI				
	Rail Age Left and Right	Year format	GEOGIS	C5	Desktop Survey	National	TME's	B4															
												B4	Targeted visual inspection in locations where Track type and Rail Profile have changed following automated matching above (track geometry and UTU)	Locations where GEOGIS is currently incorrect/unknown through data validation (M&C and LNE)	Maintenance / RAMs / AI	B4	Targeted visual inspection in locations where Track type and Rail Profile have changed following automated matching above (track geometry and UTU)	National	Maintenance / RAMs / AI	B3	B3		B3
	Sleeper Type	Hardwood or Softwood Concrete (see standard NR/L2/TRK/2049 and AF classification) Steel	GEOGIS	C5	Desktop Survey	National	TME's	B4															
												B4	NMT - Forward facing video review/validation (where possible) Visual site inspection	M&C (London to Nottingham) East Coast (London to Doncaster)	EDC / Maintenance / RAMs / AI	B4	NMT - Forward facing video review/validation (where possible) Visual site inspection	National	EDC / Maintenance / RAMs / AI	B3	B3		B3
	Fastening Type	A AD Clip B Bullhead Key E Elastic Spike F Fastclip H Heyback Clip M Mills Clip P Pandrol Fastening S SHC Clip Other	GEOGIS	C5	Desktop Survey	National	TME's	B4															
												B4	NMT - Forward facing video review/validation (where possible) Visual site inspection for locations where Sleeper Type is being validated	M&C (London to Nottingham) East Coast (London to Doncaster)	EDC / Maintenance / RAMs / AI	B4	NMT - Forward facing video review/validation (where possible) Visual site inspection for locations where Sleeper Type is being validated	National	EDC / Maintenance / RAMs / AI	B3	B3		B3
	Sleeper Age	Year format	GEOGIS	C5	Desktop Survey	National	TME's	C5															
												C5	To be inferred from Sleeper Type and Rail	M&C (London to Nottingham) East Coast (London to Doncaster)	AI	C5	To be inferred from Sleeper Type and Rail	National	AI	C4	C4		C4
	Sleeper Condition	Condition Score	GEOGIS / ELLIPSE	D6								D6				D6				D6	D6	Identify visible indicator for Sleeper Condition and score	tba
	Rail Profile / Track Cross section	Condition Score	GEOGIS / ELLIPSE	D6								D6				D6				D6	D6	Produce rail condition indicator and condition trend indicator	tba

Diagram 10 Example Block Plan for Plain Line Track

Each of the individual Block Plans was rolled-up to provide the overview of start, target and milestone accuracy and reliability ratings by asset group shown in Diagram 11, which was current at the time the AIS Phase 1 ADIP (v1.9) document was published in March 2011. The table provides an overview of estimated confidence levels for data at that time and target levels for what was anticipated could be achieved given the available ADIP resources. Specifically, the three columns on the right relate to an initial Network Rail estimate of what might be achievable by the dates shown and were not considered formal targets by Network Rail.

None of the grades given in the table have been measured by Network Rail. The October level was determined through asking relevant people what they thought the quality of data was, the December level being a refinement of that based on outputs from the Delivery Unit desktop survey, which, as noted, helped inform the initial ADIP plans.

The March and September 2011 and June 2013 levels were Network Rail targets for what could possibly be achieved by the ADIP resources at that time. As such they do not constitute actual data quality requirements for IIP or SBP. They were also stated by Network Rail has having little relevance now given the continued development of the asset policies since March. However, no further or more contemporary targets have been made available to AMCL.

Discipline	Baseline Oct 2010	Actual Dec 2010	Target Mar 2011	For IIP Sep 2011	For SBP Jun 2013
Track	B4	B4	B3	B2	B2/A2**
Signalling	B3	B3	B3	B2	A2**
Electrical Plant	C4	C4	B3	B3	B2**
Telecoms	C5	C5	B3	B3	B2**
Structures	B4	B4	B3	B2	B2/A2**
Ops Property	B4*	B3*	B3*	B3	B2**
Rail Mounted Plant	?	?	?	B3	B2**

**Not yet supported by evidence based assessments - currently underway*

*** SBP confidence ratings indicate only what could be achieved in the timescales but other factors, e.g. time, cost, effort and impact may suggest that this is not necessarily what is delivered*

Diagram 11 Network Rail's Asset Group Confidence Ratings, Targets and Milestones

Note: The B2/A2 target ratings for Track and Structures in June 2013 are understood by AMCL to consist of a 'basic' B2 target for that milestone and a more aspirational target of A2 identified by those particular asset groups.

2.4.4 ADIP Outputs

At the time this review was undertaken there was therefore no measured assessment of actual data quality available to AMCL against the targets shown above, or any other relevant targets. In October 2011, following the completion of this review, Network Rail published its 'Overview of Confidence Grading Summary for September 2011 IIP Submission'[1] report. The report provides an overview of the work undertaken by Network Rail during September 2011 to provide a high level confidence assessment of a defined set of asset data. Network Rail also stated in that report that it anticipated that subsequent assessments in support of the future SBP submission will provide increased levels of confidence and that the developing Asset Information function will facilitate the implementation of a more sophisticated assessment methodology and ongoing management of data quality assessments. The scope, constraints and assumptions related to the confidence grading are clearly stated in the Network Rail report but in summary, the confidence grades proposed are as shown in Diagram 12 below.

[1] Network Rail: Overview of Confidence Grading Summary for September 2011 IIP Submission; v0.7, 17th October 2011

Asset group	Asset	Inventory	Condition
Track	Plain Line	B3	B2
	Switches and crossings	B3	B2
Signalling	Interlockings	B3	B2
	Point operating mechanisms	B3	B2
	Train detection	B3	B2
	Colour light signals	B3	B2
Telecoms	Station information and security systems (SISS)	B3	B3
Structures	Metal underbridges	C2	C2
	Masonry underbridges	C2	C2
	Tunnels	B2	B2
Earthworks	Embankments	B2	B3
	Soil cuttings	B2	B3
Ops Property	Buildings	B3	B3
Electrical power	OLE	C3	B4
	Conductor rail	C3	B3
	HV switchgear	C3	B4
	Signalling power supplies	C3	B4

Diagram 12 Network Rail Summary of Confidence Grades

It can be seen that the assessed confidence grades in Diagram 12 are provided at a greater level of asset granularity than the overall September 2011 target in Diagram 11 but that, in general terms, condition data has met the previous forecasts (see Diagram 11) for all assets assessed except the following:

- Structures:
  - Metal Underbridges; and
  - Masonary Underbridges.
- Electrical Power:
  - OLE;
  - HV Swithgear; and
  - Signalling Power Supplies.

For inventory data the general pattern is that the assessed confidence grades are below the overall September 2011 target provided in Diagram 11, with only the SISS (Telecoms), Tunnels (Structures) and Buildings (Ops Property) assets meeting the relevant target. It should be noted

that, as stated, the targets in Diagram 11 were relevant at the time the AIS Phase 1 ADIP (v1.9) document was published in March 2011 and are considered by Network Rail to have been superseded by the more recent Asset Policy development work. They are also interim assessments and focused on the way in which data is used in the Infrastructure Cost Model (ICM). As stated a full explanation of the context and constraints associated with the confidence grading summary can be found in Network Rail's 'Overview of Confidence Grading Summary for September 2011 IIP Submission' report. However, they do provide the only framework available to AMCL for assessment of the progress of the ADIP against original plans and targets. In general, it would appear that the progress achieved by Network Rail via the ADIP has been significant but at the time of assessment the confidence grades lagged behind original ADIP targets for a number of assets, particularly in terms of inventory data.

The appropriateness of the alphanumeric accuracy and reliability rating system utilised by Network Rail has not been subject to examination as part of this review. It is anticipated that such an examination will form a key part of the Part A reporter's assessment of data. The overall approach, subject to further verification of the evaluation matrix, would appear to represent a sound and significantly improved approach to the monitoring and assurance of data quality. It should provide clear analysis of progress, or otherwise, both internally and externally, such as to the ORR, if made available.

Network Rail's Asset Data Confidence Grading Matrix (derived from the NIM evaluation matrix) which the assessment is based on is included in Appendix A for reference and would appear to provide an evaluation structure which is consistent with common practice in the field.

2.4.5 ADIP Implementation

The actual implementation of the ADIP to support Network Rail's IIP requirements appears to have been efficient and effective, given the restrictive timescales between ADIP initiation and deliverable milestones to support the IIP. Interviews were held with lead representatives from each of the asset groups during the review and each considered that the ADIP work to date had been well targeted and had delivered significant improvements in asset data within the time available.

Starting with the Block Plans and prioritised data improvement areas (see Section 2.4.3) the ADIP team developed a comprehensive and detailed Gantt Chart to manage the overall work and various interfaces. During the review, evidence was provided of the continued management and updating of the extensive overall plan.

Each element of work within the plan appears to have been well defined and subsequently ratified with the relevant asset heads, including challenging of requirements, rationalisation and appropriate structuring of data to align with future requirements and the AIS HLV. Evidence was provided of the email chains confirming approval/sign-off of various elements and the stakeholder authorised and detailed Work Instructions for all data gathering exercises.

Evidence was also provided of detailed progress reporting and continued consultation with stakeholders throughout the implementation process, including consideration of expansion or contraction of scope as opportunities were identified and assessed. This included the documented tracking of all data requests received, the relevant dates, owners, requirements and close-out arrangements.

Upon completion of each element of the ADIP undertaken, a close-out report, accepted by the relevant asset group stakeholders, was produced. Again, this process was extensively evidenced by the ADIP team and fully supported by the stakeholders interviewed. Each of the reports reviewed included key elements, such as:

- Purpose;
- Scope;
- Approach/Methodology;
- Findings; and
- Summary and Next Steps.

The overall ADIP programme includes extensive plans, across approximately 550 lines, for the implementation of the initial desktop survey, the GEOGIS Backlog programme and multiple physical data accuracy verification processes across most asset groups. The programme also includes a number of data improvements activities running through to the end of 2012 and the ADIP team are understood to currently be refining requirements, plans and deliverables across the asset groups for improvement and collation prior to SBP.

The need for further work is supported by the recent publication of Network Rail's draft Asset Policies as part of the progressive assurance process.. These identify a number of areas where it is recognised by Network Rail that further data improvements need to be made going forward to fully support whole-life cost modelling and the justification of the Asset Policies across the board.

Notwithstanding the concerns raised by AMCL about the delay in the start of the ADIP and overall ORBIS strategy implementation, the ADIP team itself is commended by AMCL for its approach to, and the scale of, the management and delivery undertaken within the restrictive timescales it was presented with to support the IIP submissions.

2.5 Asset Data Improvement Programme Findings

Following the completion of the review of the ADIP documentation, provided evidence and multiple stakeholder interviews, it is AMCL's considered opinion that:

- The ADIP forms an effective approach to consolidating a number of previously separate asset data/information improvement initiatives in a manner which aligns with the AIS HLV and best supports the IIP development process in the time available since the ADIP's formalisation.
- The ADIP team has performed efficiently and effectively in the timescales available post ADIP formalisation and has done so with significant flexibility to try and optimise deliverables within the various constraints.
- The level of consultation, communication and programme management of plans, progress and outputs which has been fully evidenced during the review process represents a good standard of management and has exceeded that of other Network Rail internal Asset Management initiatives previously audited by AMCL.
- The ADIP work to date has been well received by Network Rail internal stakeholders.
- Based on Network Rail's own assessment of confidence grades, the actual output of the ADIP for IIP lags behind original ADIP targets for a number of assets, particularly in terms of inventory data.
- Whilst the ADIP work to support IIP has made enhancements in Network Rail's understanding of the what, where and, to some extent, the performance and condition of its asset base, further work is currently being specified by Network Rail for delivery prior to SBP to support the ongoing development of Asset Policies. An enhanced understanding of asset degradation and the relationship between degradation, root causes of failure and the impact of failures on train services will, in AMCL's view, be necessary to demonstrate that the SBP Asset Policies represent the lowest whole life cost solutions for delivering specified levels of outputs and should therefore be considered for inclusion in the future ADIP as appropriate.
- Further benefits could have been gained for IIP and SBP by the implementation of the ADIP programme, supported by greater knowledge across the business of asset information requirements and specification, at an earlier point in time.

3 Analysis

3.1 Asset Information Recommendations

Of the four currently outstanding Asset Information Recommendations being tracked in the tripartite arrangement between the ORR, Network Rail and AMCL, it is considered by AMCL that the review of the AIS HLV and ADIP impacts the two recommendations shown in Table 2.

Rec. No.	Recommendation	Criticality	Comment
AI 9	NR should: 1. Undertake a study of actual data accuracy in order to allow comparison of current data accuracy against business requirements in order to ensure that improvement activities are correctly prioritised and are able to deliver intended benefits. 2. Implement BAU process such that it can continue to provide levels of assurance of its data accuracy.	High	The ADIP output to date provides clear evidence of the initiation of extensive physical data accuracy verification works. Further work is planned for post IIP and the purpose and extent of these plans should be considered against this recommendation once available. The identified Information Confidence Grading Matrix and the role of the Asset Information Data Quality team evidence the development of an apparently sound approach to this recommendation. Visibility of ongoing data quality assessment reports and BAU processes which support continued assurance (such as handheld technology) are required to close out this element of the recommendation.
AI 12	Network Rail should produce an Asset Information Strategy and provide an understanding to the ORR of how that strategy is going to be implemented.	High	The AIS HLV provides a clear vision and approach along with indicative timescales. This recommendation has been closed based on the subsequent availability of the detailed AIS, including an implementation plan and budgetary authority.

Table 2 Outstanding Asset Information Recommendations

3.2 Alignment with AMCL Asset Management Roadmap

Both the AIS HLV and the ADIP documents provide clear mapping of the deliverables and milestones to the relevant elements of AMCL's Asset Management Improvement Roadmap (v1.0), namely:

- 4.1 Asset Information Strategy;
- 4.2 Asset Information Specification;

- 4.3 Asset Knowledge Standards;
- 4.4 Asset Information Plan;
- 4.5 Data Collection and Validation;
- 4.6 Data Governance;
- 4.7 Business & Systems Architecture; and
- 4.8 Asset Information Systems.

It is considered that a number of the capability statements defined within each of the above Roadmap elements have been partially achieved by either the AIS HLV or the ADIP, particularly 4.1 for the AIS HLV and 4.4 and 4.5 for the ADIP. However, although well mapped and aligned, none of the Roadmap elements are considered by AMCL to be fully satisfied by the work to date. This should be reviewed further following the publication of the overall ORBIS strategy.

It should also be noted that although delivery dates have been agreed between the Joint Boards of Network Rail and the ORR for completion of Network Rail's Asset Management Improvement Programme, developed in response to AMCL's Asset Management Improvement Roadmap (v1.0), a number of those dates for the asset information elements listed above are significantly later than those originally proposed in AMCL's Roadmap.

3.3 Support of Asset Policies, IIP and SBP

The sourcing, assessment and assurance of relevant and appropriate asset information is considered by AMCL to be fundamentally critical to the development and justification of the Asset Policies, IIP and SBP. It was to support these requirements that the original dates for the development of asset information to achieve the relevant capability statements within the AMCL Roadmap were established.

As stated, the work done within the time and resource constraints of the formal ADIP programme to date is commendable. However, its time limitations are considered to be partly a result of Network Rail starting this initiative too late and therefore not aligning with the original dates of the AMCL Roadmap. If this work had aligned with the dates in the AMCL Roadmap, Network Rail would be in a stronger position in terms of quality and assurance of critical data to justify both the Asset Policies and the IIP and provide further evidence of the robustness and sustainability of the documents.

Using the time available between IIP and SBP submissions to collate and assure prioritised asset data and information to support the SBP and overall Value for Money for CP5 is considered the most critical element at this stage.

3.4 Alignment with Network Licence

Network Rail's obligations to provide asset management processes, policies and information are set out in licence condition 1. In particular conditions 1.19 to 1.22, as listed below:

- 1.19 In complying with the general duty in condition 1.2, the licence holder shall;
  - Develop the policies and criteria it will apply in respect of the maintenance, renewal, replacement, improvement, enhancement and development of the relevant assets, which shall demonstrate how the licence holder will comply with the general duty in condition 1.2;
  - Apply those policies and criteria; and
  - Make appropriate information about those policies and criteria readily accessible to persons providing services relating to railways and funders, including potential providers and potential funders.
- 1.20 The licence holder shall maintain appropriate, accurate and readily accessible information about the relevant assets, including their condition, capability and capacity.
- 1.21 ORR may permit the licence holder to exclude from the definition of "relevant assets" assets of such description or classes as shall be provided to and approved by ORR.
- 1.22 The licence holder shall from time to time and when so directed by the ORR review and, if necessary, revise the policies and criteria provided for in condition 1.19 to ensure that they remain sufficient to comply with the general duty in condition 1.2.

Following the review of the ADIP it is AMCL's opinion that, although further work remains to be done and a greater amount of work could have been completed to date, the work delivered through the ADIP to date is consistent with maintaining, and in some cases enhancing, existing levels of asset information.

It is also considered that full implementation of the AIS HLV will make significant improvements in Network Rail's capability to demonstrate compliance with the above licence conditions. However, this can only be validated via a detailed review of the overall ORBIS strategy documentation and plans.

3.5 Current Suitability of Asset Information

Network Rail's assessment of the current suitability of its asset information is considered in Section 2.4.4 of this report.

During the review it was established that Network Rail was generally targeting a 'B2' alphanumeric assessment of data as a baseline for SBP submissions. In a number of cases it was planned or anticipated to be better than this but 'B2' was stated as the general baseline target by Network Rail. Anecdotally, the source of this target was thought to be the ORR but no evidence was identified for this.

This target or baseline assessment for SBP was also recognised by the ORR during the review as a figure repeatedly discussed at related meetings. However, it is understood to not have been formally communicated by the ORR. The ORR stated that the only formal communication on the subject of asset data confidence grading requirements had been related to specific unit cost data in May 2011 and some high-level consultation documents around the same time. Furthermore, it was intending to review and establish the PR13 regulatory requirements for asset data confidence grading in the period between IIP and SBP.

As a result, although the target baseline of B2 would appear broadly sensible, given the current status of data and time to SBP, further clarification or justification of this target baseline for SBP is required. As is alignment between any confidence grading framework utilised by the ORR to define PR13 requirements and that established by the Network Rail Asset Information interim Governance & Assurance team.

4 Conclusions and Recommendations

4.1 Conclusions

The conclusions from this independent review of Phase 1 of Network Rail's Asset Information Strategy by AMCL are:

General

- The ADIP and AIS HLV are directly mapped to Network Rail's ongoing AMIP and the capability statements documented in AMCL's Asset Management Improvement Roadmap (v1.0), although they are behind the timescales originally defined in the Roadmap.

AIS Phase One - ADIP

- The ADIP team has performed efficiently and effectively in the timescales available, although the time available has been constrained by the programme being significantly behind the dates in the original AMCL Roadmap.
- The level of consultation, communication and programme management of ADIP plans, progress and outputs has been commendable and well received by internal Network Rail stakeholders.
- Based on Network Rail's own assessment of confidence grades, the actual output of the ADIP for IIP lags behind original ADIP targets for a number of assets, particularly in terms of inventory data.
- Whilst the ADIP work to support IIP has made enhancements in Network Rail's understanding of the what, where and, to some extent, the performance and condition of its asset base, further work is currently being specified by Network Rail for delivery prior to SBP to support the ongoing development of Asset Policies. An enhanced understanding of asset degradation and the relationship between degradation, root causes of failure and the impact of failures on train services will, in AMCL's view, be necessary to demonstrate that the SBP Asset Policies represent the lowest whole life cost solutions for delivering specified levels of outputs and should therefore be considered for inclusion in the future ADIP as appropriate.
- The work delivered through the ADIP to date is considered by AMCL to be consistent with Network Rail's obligations under the Network Licence.
- Asset information confidence grading targets for SBP require clarification and justification for the different types of Asset Information to ensure they are appropriate for the criticality of the information to decision-making within Network Rail.

AIS Phase Two – High Level Vision

- Network Rail's AIS HLV represents a potentially revolutionary step forward in the company's approach to asset information.
- Further consultation, or clarification of any consultation undertaken, with external (non-Network Rail) stakeholders is required.
- Network Rail has stated that actual costs of the overall ORBIS strategy are in the region of £324m, with underwritten benefits of £270m in CP5 and c.£500m in each of the following two control periods.
- The AIS HLV appears to be well aligned and integrated with the overall business objectives, Asset Management Policy and Strategy.
- The AIS HLV also appears well mapped and aligned to the AMCL Roadmap Capability Statements, although none of the Roadmap elements are considered by AMCL to be fully satisfied by the work to date, partly due to work commencing after the AMCL Roadmap identified start dates. This should be reviewed further based on the wider reaching ORBIS strategy.
- If fully implemented and achieved with an appropriate cost benefit ratio, the overall approach outlined in the AIS HLV should achieve Network Rail's stated goal, in the same document, of industry best practice by the second half of CP6. To assure and demonstrate this, an appropriate and structured Asset Information management benchmarking programme would need to be established.
- At the time of writing the overall ORBIS strategy was available to AMCL as the AIS HLV only. The implementation and realisation of benefits against the significant likely costs requires appropriate review and assurance both following the ORBIS strategy publication and during its implementation..

4.2 Recommendations

Following completion of this review it is recommended that:

1) A review, commencing in January 2012, should be undertaken of the ADIP priorities, plans and deliverables to support SBP, including:
    a. The justification for the targets for asset data confidence, for the different types of asset information for SBP; and
    b. The consideration, where included within the ADIP plans, of wider Asset Management data issues for SBP, such as understanding asset degradation, unit

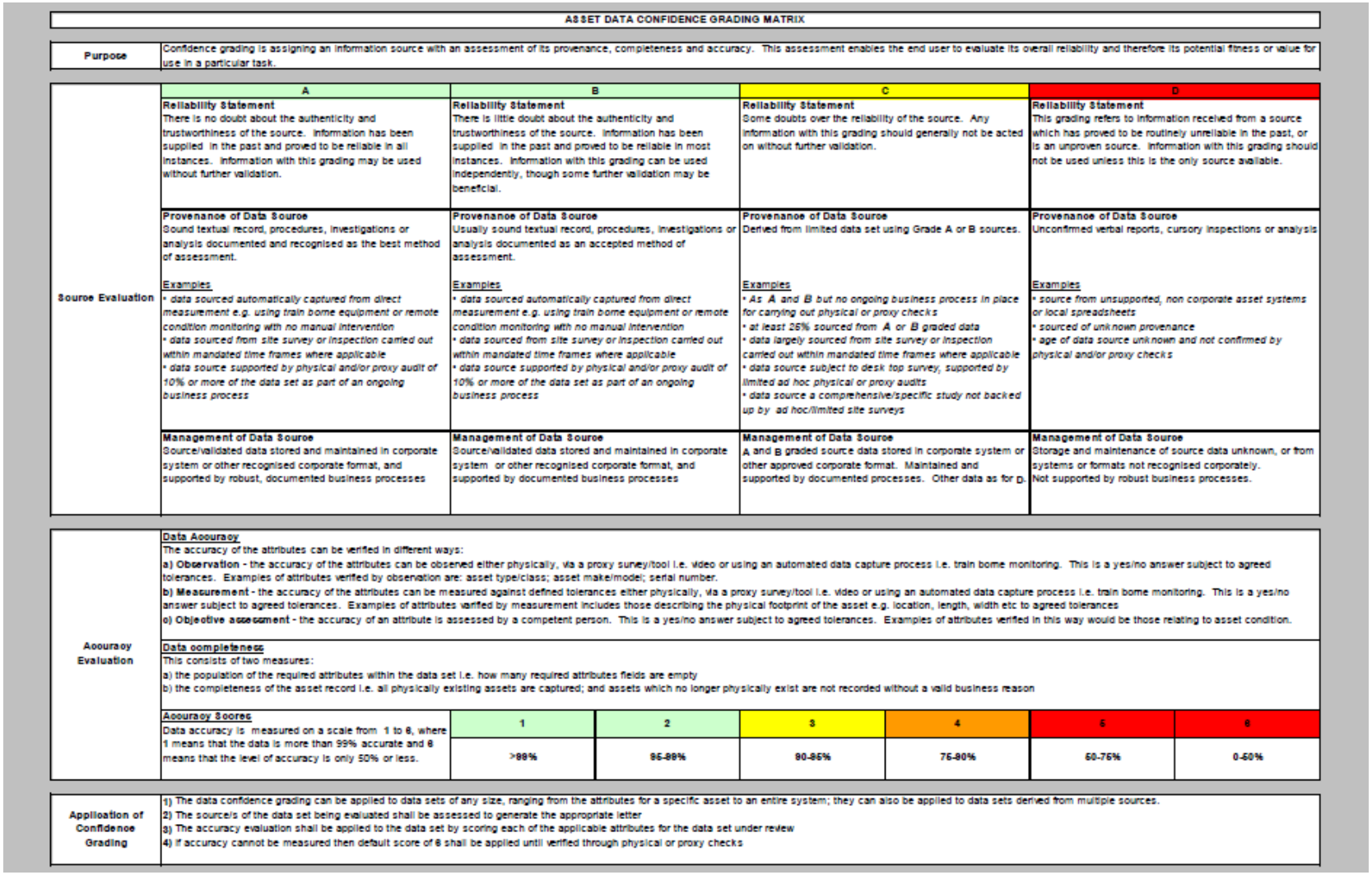
costs, root cause analyses and the potential impact of this information on Asset Policy justification.

2) A detailed assessment should be undertaken of the completed ORBIS strategy and associated business case and implementation plan, commencing in January 2012.

3) Evidence should be provided by Network Rail that external stakeholders' requirements have been elicited and reflected in the development of the overall ORBIS strategy following its publication.

4) By the end of the 2012/13 financial year, Network Rail should establish an appropriate, structured benchmarking programme to assure the continued development and implementation of the ORBIS strategy achieves industry best practice by the second half of CP6.

Appendix A Asset Data Confidence Grading Matrix



ASSET DATA CONFIDENCE GRADING MATRIX

Purpose	Confidence grading is assigning an information source with an assessment of its provenance, completeness and accuracy. This assessment enables the end user to evaluate its overall reliability and therefore its potential fitness or value for use in a particular task.

	A	B	C	D
Source Evaluation	**Reliability Statement** There is no doubt about the authenticity and trustworthiness of the source. Information has been supplied in the past and proved to be reliable in all instances. Information with this grading may be used without further validation.	**Reliability Statement** There is little doubt about the authenticity and trustworthiness of the source. Information has been supplied in the past and proved to be reliable in most instances. Information with this grading can be used independently, though some further validation may be beneficial.	**Reliability Statement** Some doubts over the reliability of the source. Any information with this grading should generally not be acted on without further validation.	**Reliability Statement** This grading refers to information received from a source which has proved to be routinely unreliable in the past, or is an unproven source. Information with this grading should not be used unless this is the only source available.
	Provenance of Data Source Sound textual record, procedures, investigations or analysis documented and recognised as the best method of assessment. Examples *• data sourced automatically captured from direct measurement e.g. using train borne equipment or remote condition monitoring with no manual intervention* *• data sourced from site survey or inspection carried out within mandated time frames where applicable* *• data source supported by physical and/or proxy audit of 10% or more of the data set as part of an ongoing business process*	**Provenance of Data Source** Usually sound textual record, procedures, investigations or analysis documented as an accepted method of assessment. Examples *• data sourced automatically captured from direct measurement e.g. using train borne equipment or remote condition monitoring with no manual intervention* *• data sourced from site survey or inspection carried out within mandated time frames where applicable* *• data source supported by physical and/or proxy audit of 10% or more of the data set as part of an ongoing business process*	**Provenance of Data Source** Derived from limited data set using Grade A or B sources. Examples *• As A and B but no ongoing business process in place for carrying out physical or proxy checks* *• at least 25% sourced from A or B graded data* *• data largely sourced from site survey or inspection carried out within mandated time frames where applicable* *• data source subject to desk top survey, supported by limited ad hoc physical or proxy audits* *• data source a comprehensive/specific study not backed up by ad hoc/limited site surveys*	**Provenance of Data Source** Unconfirmed verbal reports, cursory inspections or analysis Examples *• source from unsupported, non corporate asset systems or local spreadsheets* *• sourced of unknown provenance* *• age of data source unknown and not confirmed by physical and/or proxy checks*
	Management of Data Source Source/validated data stored and maintained in corporate system or other recognised corporate format, and supported by robust, documented business processes	**Management of Data Source** Source/validated data stored and maintained in corporate system or other recognised corporate format, and supported by documented business processes	**Management of Data Source** A and B graded source data stored in corporate system or other approved corporate format. Maintained and supported by documented processes. Other data as for D.	**Management of Data Source** Storage and maintenance of source data unknown, or from systems or formats not recognised corporately. Not supported by robust business processes.

Accuracy Evaluation

Data Accuracy
The accuracy of the attributes can be verified in different ways:
a) Observation - the accuracy of the attributes can be observed either physically, via a proxy survey/tool i.e. video or using an automated data capture process i.e. train borne monitoring. This is a yes/no answer subject to agreed tolerances. Examples of attributes verified by observation are: asset type/class; asset make/model; serial number.
b) Measurement - the accuracy of the attributes can be measured against defined tolerances either physically, via a proxy survey/tool i.e. video or using an automated data capture process i.e. train borne monitoring. This is a yes/no answer subject to agreed tolerances. Examples of attributes verified by measurement includes those describing the physical footprint of the asset e.g. location, length, width etc to agreed tolerances
c) Objective assessment - the accuracy of an attribute is assessed by a competent person. This is a yes/no answer subject to agreed tolerances. Examples of attributes verified in this way would be those relating to asset condition.

Data completeness
This consists of two measures:
a) the population of the required attributes within the data set i.e. how many required attributes fields are empty
b) the completeness of the asset record i.e. all physically existing assets are captured; and assets which no longer physically exist are not recorded without a valid business reason

Accuracy Scores
Data accuracy is measured on a scale from 1 to 6, where 1 means that the data is more than 99% accurate and 6 means that the level of accuracy is only 50% or less.

1	2	3	4	5	6
>98%	95-98%	90-95%	75-90%	50-75%	0-50%

Application of Confidence Grading
1) The data confidence grading can be applied to data sets of any size, ranging from the attributes for a specific asset to an entire system; they can also be applied to data sets derived from multiple sources.
2) The source/s of the data set being evaluated shall be assessed to generate the appropriate letter
3) The accuracy evaluation shall be applied to the data set by scoring each of the applicable attributes for the data set under review
4) If accuracy cannot be measured then default score of 6 shall be applied until verified through physical or proxy checks

Diagram 13 Network Rail's Asset Data Confidence Grading Matrix

Appendix B Glossary of Terms

Term	Description
ADIP	Asset Data Improvement Programme
AIS	Asset Information Strategy
AMCL	Asset Management Consulting Limited
AMIP	Asset Management Improvement Programme
BAU	Business-As-Usual
BPR	Best Practice Review
CP	Control Period
DQuIP	Data Quality Improvement Programme
GB	Great Britain
GIS	Geospatial Information System
HLV	High-Level Vision
ICM	Infrastructure Cost Model
IIP	Initial Industry Plan
KO	Kick-Off
LC	Licence Condition
NCAP	National Core Audit Programme
NIM	National Intelligence Model
OPAS	Operational Property Asset System
ORBIS	Offering Rail Better Information Services
ORR	Office of Rail Regulation
PR	Periodic Review
SBP	Strategic Business Plan