A Report for
Network Rail and Office of Rail Regulation
from
Asset Management Consulting Limited (AMCL)

Version 1.0
28th September 2012

Review of Asset Information Strategy
Phase 2: ORBIS

Controlled Copy No:	**UN**

APPROVAL				
Version	Date	Compiled by	Reviewed by	Authorised by
1.0	28th September 2012	David Smallbone	David McLeish	Richard Edwards
Asset Management Consulting Limited File Ref: 007/305				

DISTRIBUTION			
Name	Controlled Doc. No.	From (version)	To (version)
1 copy of document each to:-			
Jim Bostock (ORR)	1	Draft A	C
Marius Sultan (ORR)	2	Draft A	C
Dan Boyde (Network Rail)	3	Draft A	C
AMCL File	4	Draft A	C
Uncontrolled copies distributed as required			
C = Current version			

AMENDMENT HISTORY		
Version	Sections	Amendment Details
Draft A	All	Initial draft for client review of factual accuracy
Draft B	All	Revisions following Network Rail and ORR feedback on Draft A
1.0	All	Revisions following Network Rail and ORR feedback on Draft B

Original held by Asset Management Consulting Limited at
221 St. John Street, Clerkenwell, London, EC1V 4LY
Tel: +44 (0) 20 7688 2828, Fax: +44 (0) 20 7688 2829

Executive Summary

Asset Management Consulting Limited (AMCL) is the Independent Reporter for Asset Management to Network Rail and Office of Rail Regulation (ORR). As part of that role it was mandated to carry out a review of Phase 2 of Network Rail's Asset Information Strategy (AIS) with a particular focus on the Offering Rail Better Information Services (ORBIS) business change programme. This report documents the findings of that review.

Network Rail has an obligation to manage its Asset Information under the terms of its Network Licence. In relation to the current Licence requirements, this review was mandated to consider Network Rail's current Asset Information (including Information Technology (IT)) strategies with regard to:

- Capabilities;
- Fitness for purpose;
- Efficiency; and
- Comparison with best practice.

The scope of work specified by the mandate was to carry out an independent review of Network Rail's AIS Phase 2: ORBIS, to establish the extent to which it addresses:

- Network Rail's own objectives;
- The Asset Information requirements that the ORR will expect Network Rail to produce to inform and support the 2013 Periodic Review (PR13) process; and
- The longer-term provision of Asset Information to the GB rail industry.

In addition, another element of the work was to review Network Rail's progress against the improvement specifications and capability statements set out in the Roadmap[1]. The Roadmap is a high-level plan to improve Network Rail's Asset Management Capability, based upon AMCL's assessments using the Asset Management Excellence Model™ (AMEM).

The initial focus of the review was the document 'Asset Information Strategy: Vision and Roadmap (v1.0)' published in September 2011 (hereafter 'Vision & Roadmap') which sets out Network Rail's aspirations for improving its Asset Information capability and the plans to deliver these improvements.

[1] AMCL 'Asset Management Improvement Roadmap' (2010) - updated 2012.

As the review was carried out over the period April to July 2012, up to nine months of progress had been made since publication in some of the areas under consideration. This review has therefore been carried out from two perspectives:

- A review of the material in place as of September 2011 to establish the credibility and viability of the ORBIS Programme; and
- An assessment of development and achievements since September 2011 to determine progress of the programme and implications for the longer-term delivery of its objectives.

The review consisted of an evaluation of documented material, interviews with the Network Rail Asset Information and ORBIS teams, their customers and stakeholders (both within and outside of Network Rail) and analysis of specific projects and technical systems.

Overview of Findings Against Mandate Requirements

In general, this review further validates the findings of the most recent AMEM Assessment[2], namely that the Vision & Roadmap represents a major step forward in terms of Network Rail's approach to Asset Information. It is considered to contain all of the elements required for a good practice AIS and provides a solid foundation on which to develop the Asset Information capability within Network Rail and the wider industry.

It also validates further that while Asset Information and ORBIS have made a lot of progress since September 2010, the initial delay in mobilising the Asset Information Directorate and developing the AIS prior to that point have left a challenging trajectory to recover to the agreed Roadmap targets by the publication of the Strategic Business Plan (SBP) in January 2013 and the end of the current Control Period (CP4).

In terms of the mandated themes for investigation, the following is a summary of high-level findings:

- **Capabilities**: The proposed improvements in the Vision & Roadmap present a long-term solution that AMCL considers addresses the existing shortfall between Network Rail's Asset Information capability and current best practice. A significant increase in Asset Information capability is required to deliver the CP5 policies and further evidence will be required by the SBP to demonstrate that this improvement trajectory will be met.

[2] AMCL 'AMEM Assessment IIP Update Report' (May 2012)

- **Fitness for purpose**: The majority of the current systems appear to be fit-for-purpose for delivering the current Asset Information requirements, but will need substantial development and integration to deliver the proposed future capabilities. The majority of ORBIS deliverables are planned for CP5 and CP6 and are therefore not intended to impact on the SBP or influence the data supporting in the PR13 process. ORBIS has challenging timescales to deliver a fit-for-purpose Asset Information Specification supported by fit-for-purpose Asset Information Systems and Architectures in time for policy implementation and benefits realisation during CP5.
- **Efficiency**: A strong initial business case for ORBIS is presented in the Vision & Roadmap, which is based on sound evaluation for a programme in its early definition phase. The robustness of this business case was tested through modelling a pessimistic scenario based on an existing assessment[3] of the capability of Network Rail's Information Management (IM) team in realising project benefits. The results emphasise the importance of fully delivering the identified benefits to achieve a positive business case. A benefits realisation and tracking process is therefore required to support delivery of efficiencies by ORBIS, Asset Information and the Central and Route Asset Management Teams. This needs to be supported by clear definitions of roles and responsibilities for delivering ORBIS benefits in the devolved organisation.
- **Comparison with Best Practice**: Elements of the current Asset Information organisation and ORBIS programme are considered to be current good or best practice (including the Vision & Roadmap, Organisation Structure and Programme Design). The proposed future capability set out in the Vision & Roadmap is likely to be comparable with contemporary best practice, but this is some way off. Other individual elements of the current Asset Information approach and ORBIS programme need further development to address gaps to best practice, particularly the Asset Information Specification and detailed System Architecture. High-level benchmarking suggests the ambition of ORBIS is high, due to the scale and complexity of the changes proposed.

Specific Findings Against Scope Themes

The findings of this review have been cross-checked against Network Rail's plans for improving Asset Management Capability to determine where further specific actions or evidence are required within ORBIS to demonstrate that the agreed Roadmap targets will be delivered.

[3] The Hackett Group: Network Rail 2010 G&A Benchmark - Preliminary Results, 16th September 2010

Since the publication of the Vision & Roadmap and subsequent mobilisation of the ORBIS programme, significant progress has been made in a number of key areas. ORBIS and Asset Information have also adapted well to the challenges of devolution: moving to a Route-centric operating model and engaging directly with the Routes to build their relationship and improve understanding of the benefits of Asset Information services and ORBIS.

Therefore the focus of this review has been on identifying any areas of AIS and ORBIS where:

- There appear to be gaps or misalignment to Network Rail's overall Asset Management Strategy and subsequent Asset Information Requirements; or
- Further evidence is required from Network Rail to demonstrate it has a clear understanding of the Asset Information it needs to deliver CP5 (and beyond) in a way that is cost-effective and demonstrates value for money.

This review has identified the following specific findings against broad themes based on the mandated scope, including any opportunities for improvement:

Asset Management System and Asset Knowledge Capability

Network Rail's overall approach to Asset Information is consistent with that set out in its Asset Management Policy as that of a key enabler in the Asset Management Framework, with the Asset Information Strategy clearly present in the Asset Management Documentation Hierarchy. However, as observed in an earlier AMCL report[4], the Asset Management Policy sets a target for being best practice in Britain by the end of CP4, whereas the majority of ORBIS improvements are delivered over CP5.

The AIS has been developed in line with the two-phase approach set out in Network Rail's Asset Management Strategy. The Phase 1 AIS outputs clearly referenced agreed Roadmap targets. However, the Phase 2 AIS Vision & Roadmap that defines ORBIS has yet to be shown to fully align to the Asset Management Strategy and Roadmap targets. This inconsistency means there is a risk that even with the successful delivery of ORBIS, Network Rail may not achieve the identified trajectory and targets associated with Asset Information. In particular, Network Rail's latest forecasts suggest that while some elements of good practice are currently in place, the AMCL Roadmap targets for two of the three activities in Asset Knowledge will be missed, namely 'Asset Information Systems' and 'Asset Knowledge and Data'.

[4] AMCL 'Review of Phase 1 AIS' (2011)

There are only a limited number of projects in the ORBIS scope that are intended to deliver improvements in time to influence the PR13 evaluation, with the majority being delivered in CP5 and CP6. These include the on-going Asset Data Improvement Programme (ADIP) that was in place for AIS Phase 1 and some early ORBIS projects (including the deployment of handhelds and Master Data Management).

The Asset Information Strategy has been built on existing good practice frameworks for managing information and some benchmarking and best practice sharing has been carried out during the development of the ORBIS programme and individual projects. However, this appears to have been on a case-by-case basis to date. There is therefore an opportunity to co-ordinate benchmarking activities across Asset Information, Asset Management and Network Rail as a whole to exploit the opportunities for best practice sharing with comparator organisations and demonstrate continuous improvement.

Asset Information Requirements and Business Case

The 'Needs and Frustrations' process for identifying asset information requirements appears robust and has captured options across all asset types that reflect likely improvement opportunities. These have been developed into business value propositions against the '7 layers of asset information' framework.

The ADIP element of the Phase 1 work has delivered improvements in the quality of the asset information available for defining and justifying Network Rail's CP5 Asset Policies. However, further evidence will be required to demonstrate that the information supporting the policies is sufficiently robust by SBP. The process for demonstrating and evaluating this has now been established through ADIP and the relevant Arup (Independent Reporter: Part A) Data Quality audits..

A clear Asset Information Specification supported by Asset Knowledge Standards does not currently exist for the information required to deliver Network Rail's CP5 Asset Policies and establishing this should be a priority for Network Rail. It is not clear that the current scope of the Master Data Management element of ORBIS addresses this for all assets and information types within appropriate timescales.

The overall business case for ORBIS (at September 2011), including the proposed benefits for each Asset Group[5] level, appears to have been based on a sound evaluation process for a programme in an early 'definition' phase trying to secure initial funding.

The differences between the benefits estimated for each Asset Group appear to result from realistic assumptions, based on the differences between discrete and continuous assets, the predictability of degradation and the capabilities of the existing systems. The opportunity to test and challenge assumptions between Asset Groups is currently being explored further.

A breakdown of these benefits to specific Route-based initiatives and Asset Information services (and hence underlying capabilities and ORBIS projects) is under development. The business case is dependent on Routes signing up to deliver the allocated efficiencies and therefore is currently theoretical until a firm plan for benefits realisation is in place for each Route. This exercise is currently underway, however it is understood that this is a complex task and the resource is constrained. It is therefore not clear if this will be delivered in sufficient time to support the SBP.

The single option 'package' presented in the Vision & Roadmap means that only limited analysis of the robustness of the business case is possible. Investment appraisals usually present a range of alternative options that meet the requirements to provide justification for the preferred course of action. Similarly, while the underlying assumptions for organisation size indicate that some activities and services can be scaled to meet demand from the Routes, it has not been shown how this could work in practice for 'low demand' or 'high demand' scenarios.

In addition, plans are still being developed for ORBIS projects and benefits realisation, so there a relatively high degree of uncertainty which is not reflected in the current business case. The base case is strongly positive and delivers a good benefit-cost ratio, even over a shorter evaluation period than that presented in the Vision & Roadmap (CP6 vs. CP7). However, sensitivity testing suggests that under a set of alternative pessimistic assumptions, the business case may not be positive until CP7. This shows the importance of implementing best practice benefits realisation and understanding how to flex the programme to accelerate these benefits where possible so the base case trajectory can be met or outperformed.

Service Level Agreements for the services provided by the Asset Information Organisation to the Routes are still in development so it is not clear what levels of coverage, quality and

[5] i.e. Track, Signalling, Electrical Power, etc.

confidence are required to support delivery at Route level and the impacts of over / under-performance on efficiency forecasts.

Plans, Deliverability and Risks

The programme appears to have been well-managed since its initiation and it is important that ORBIS maintains this momentum, with appropriate governance and project management processes.

The overall ORBIS Programme has an eight-year timeframe over which significant industry change is expected, so it will need to be supported by a robust and flexible change control process that enables it to adapt and respond to this challenging business environment.

The dedicated ORBIS Project Management Office (PMO) and governance structure provide assurance that these systems of control are in place and it has been recognised internally as a step forward for planning and managing change in Network Rail which will be applied more widely across the portfolio of change projects.

Devolution presents both an opportunity and a potential challenge to Network Rail and Asset Information in particular. The challenge will be to get the Routes to create or sign up to benefits realisation plans based on better Asset Information services. As outlined above in ' Asset Information Requirements and Business Case', the potential downside risk to benefits delivery is significant and needs to be mitigated. Therefore the benefits realisation plans need to track whether Asset Information has over / under-performed in delivering its services and whether the Routes have successfully realised the expected benefits / efficiencies. ORR expects to see any mandated activities in the Routes reflected in the SBP.

The wider Asset Management business change programme, including the current restructuring as a service organisation may present further challenges to Asset Information, in that key roles defined for the Asset Information Organisation (such as Business Engagement and Communications) may need to be integrated with the wider team.

The interfaces between individual plans and projects for specific systems need to be better understood, particularly where there are systems that were not initially in the scope of ORBIS but are required for the delivery of the overall Asset Management capability improvement, such as FMS and Netraff.

The approach taken with the Linear Asset Decision Support (LADS) project to prototype early and test benefits assumptions would appear to be good practice and should be considered for other key projects.

Technology, Systems Architecture and Integration

The use of existing IM resource including the Information Systems Strategy team within ORBIS demonstrates good alignment with the wider Network Rail IT strategy.

Clear principles and concepts for the Systems approach are set out in the documentation, although from reviewing specific examples it does not appear that these have always been applied consistently across the portfolio.

The Systems Architecture presented in the Vision & Roadmap is at a relatively high level and needs to be developed further to demonstrate a working, robust data model. Data flows and interfaces between specific systems are not clear in the current documentation and are required to provide assurance that the proposed systems will support these.

A detailed review of the Master Data Management and Asset Management Platform Integration (AMPI) projects identified that decisions made early in the ORBIS programme may have repercussions in terms of future systems integration and upgrades. These considerations do not currently appear to be reflected in an overall Systems Plan which includes these decision points.

Sessions with representatives from Asset Groups, systems users and ORBIS representatives highlighted system-specific considerations in terms of capability and whether these are 'fit for purpose', Ellipse and ESRI, the core systems identified for the Asset Management Platform, are well established in the Asset Management domain. Historic issues have been more about the management of data using these systems, which is linked more to people and process rather than system functionality and this is being addressed by ADIP. However, Ellipse 6.3.3 goes out of support during the ORBIS timeline. While the 'Ellipse and ESRI upgrades' project should address this, it is not clear what the impacts of these upgrades will be on other elements of the programme or the opportunity to migrate to another system. These are additional key decision points that need to be identified in the Systems Plan.

There were two key systems covered in the review that are bespoke to Network Rail and have either limited or no support. GEOGIS is an ageing platform which is to be migrated to the Rail Infrastructure Network Model (RINM) and whose data is understood to have some quality

issues. The strategy for FMS is unclear as despite its known limitations and lack of a dedicated team to provide 3rd line and development support, it is listed as 'Tolerate' in ORBIS pending a review of Fault Management in Network Rail. This is understood to be in part due to ownership issues which were only recently addressed through transferring ownership of FMS into Asset Information.

In terms of upcoming capability, an in-depth review of Informatica's capabilities as an MDM system was not carried out, but it is understood that this is an established system and is likely to be fit for purpose. Decisions regarding other key future systems (such as RINM) are still being made and so were not assessed.

While most asset-specific systems requirements were in the Vision & Roadmap scope, improvement plans to address shortfalls in Buildings & Civils Asset Management (BCAM) systems were dependent on the BCAM improvement programme. These have been held up by the initial focus on process within BCAM, but are now being aligned to ORBIS. This alignment still needs to be demonstrated to show that these systems issues will be addressed.

High-level benchmarking, carried out by IBM, of the total cost and timescales for ORBIS against other EAM programmes suggests that ORBIS is ambitious and of a greater scale and complexity than its peers. The most comparable programme identified was delivered for less cost and within shorter timescales. As an initial study, this indicates there is potentially a high risk in the programme due to its size and Network Rail should explore further opportunities with this peer group to understand what lessons can be learned to mitigate these risks.

Data Governance and security & continuity arrangements are in place through Asset Information and standard IM practices. However, there have been historic occurrences of Asset Information data being lost or damaged due to user actions and sufficient measures will need to be in place to assure that this is not a future risk.

Future governance of Systems Architecture and Data Integrity will be essential, especially with the introduction of the planned Mobile Enterprise Application Platform (MEAP) and future integration of systems and data flows. The current deployment of iOS devices appears to be successful and supporting Network Rail's short-term goals. Network Rail needs to build on this to define the future role of smart devices in supporting improved Asset Management and include appropriate decision points for implementing its device strategy in its plans.

Organisation, People and Culture

An enthusiasm and common sense of purpose was observed across the stakeholders interviewed from the core Asset Information and ORBIS teams.

The new organisation structure has been developed and delivered in line with planned timescales, including the move to Milton Keynes. Current resource levels are behind target but it is understood this is being addressed through a recruitment plan and business-as-usual Asset Information services have not been affected.

Engagement with the Routes has been accelerated and a Communications Strategy has been developed since the Vision & Roadmap, with pilot sessions to explain ORBIS and Asset Information to frontline staff.

The Breakthrough projects appear to be making good progress and changing working practices and this needs to be reinforced through the above Communications Strategy and capturing learning from the frontline staff.

A competence framework for Asset Information is being created and this will be used to identify competence gaps and address these through training and recruitment as required.

The Asset Information Services Pack and general ORBIS branding are helping to establish the current AIS and Asset Information Organisation but this will only be validated with delivery of the identified outcomes.

Recommendations

AMCL has already proposed the 2012 Improvement Specification for Asset Knowledge activities as part of the 2012 AMCL Roadmap Update. The following recommendations are therefore provided within this context to address specific issues identified during this review.

Asset Management System and Asset Knowledge Capability

1) The existing AIS and ORBIS documentation (including supporting justification and appendices) should be reviewed, refreshed as appropriate and demonstrably mapped to the deliverables for Asset Knowledge specified in the 2012 AMCL Roadmap Update. Any gaps against the specifications in the Roadmap need to be addressed. The following deliverables will need to be covered in the evidence provided as part of the SBP submission in January 2013, with the mapping identifying where each deliverable is covered:

a. Asset Information Strategy;
b. Asset Information Specification;
c. Data Dictionary;
d. Asset Information Plan;
e. Data Confidence Assessment;
f. Data Management Processes; and
g. Asset Information Systems Plan (covering the 'Asset Systems and Architectures' requirements in the 2012 AMCL Roadmap Update).

2) The revised AIS should formally demonstrate alignment with the Asset Management Improvement Plan and explicitly reflect the deliverables in 2012 AMCL Roadmap Update by January 2013.

3) Each Asset Information deliverable supplied for the SBP should include a section on continuous improvement, aligned to the Asset Management Improvement Plan and outlining how and when the content will be reviewed for fitness-for-purpose and updated as appropriate, including any planned updates before the end of CP4.

Asset Information Requirements and Business Case

4) The Asset Information Specification and Data Dictionary that are being supplied for the SBP in January 2013 should build on the existing Asset Information Services Pack, Asset Information Architecture and Data Dictionary. These should set out Network Rail's business requirements for Asset Information to deliver its obligations under its Network Licence for the remainder of CP4 and to safely and effectively implement its new Asset Policies from the start of CP5.

5) The Asset Information Specification that is being supplied for the SBP in January 2013 requires an information criticality analysis, which should utilise the detailed benefits analysis work undertaken by ORBIS since September 2011. Within it the costs of obtaining data and maintaining systems should be evaluated against the improved decision-making capability and/or efficient delivery of works and the consequences of the data not being available.

6) Improvements to the Data Dictionary supplied for the SBP in January 2013 should include targets for coverage, quality and confidence, including any allowed variability in these standards by Route.

7) Benefits attributed to ORBIS but delivered by the Routes should be supported with a benefits realisation plan and tracking process that is consistent with the Route-level submissions for the SBP in January 2013.

Plans, Deliverability and Risks

8) The Asset Information Plan supplied for SBP in January 2013 should be based on the existing ORBIS Programme Plan and augmented to meet the specification in the 2012 AMCL Roadmap Update. It should provide an appropriate level of detail for a programme plan, covering how Asset Information activities will be delivered and how these will be developed. It should also include a schedule for regular updates to ORR on ORBIS progress with key milestones and deliverables identified to demonstrate delivery of the plan and highlight any risks.

9) The suite of Asset Information documents should be added to the scope of the existing change control processes in the PMO by October 2012 to enable benefits to be accelerated and mitigate risks where possible.

10) The dependencies, outcomes and benefits of the ORBIS Programme should be modelled to a suitable level of granularity using an appropriate tool. This will enable robust modelling of any change impacts. This process should be specified as part of improvements to the change control process by October 2012 and the tool should be populated by SBP in January 2013.

11) The SBP in January 2013 should be clear on any Asset Information services or activities that will be mandated on the Routes.

12) Network Rail should formalise its approach for continuous improvement within ORBIS and Asset Information over the course of the programme, including benchmarking its services and learning from the experiences of comparator organisations to mitigate risks and drive efficiencies. These should be included as a chapter on Continuous Improvement in each of the SBP deliverables (by January 2013).

Technology, Systems Architecture and Integration

13) High-criticality Asset Information Systems should be identified by the SBP in January 2013, based on total cost of ownership and the importance of the data held within them (as defined in the Asset Information Specification).

14) High-criticality Asset Information Systems not within the ORBIS scope should be clearly identified in the Asset Information Systems Plan by SBP in January 2013, along with a RACI approach to ownership and development of the system.

15) The Asset Information Systems Plan supplied for the SBP in January 2013 should demonstrate that high-criticality Asset Information Systems either are or will be 'fit for purpose' to deliver the Asset Information Specification, particularly for systems with known issues such as GEOGIS, FMS and those in the BCAM improvement programme.

16) The Asset Information Systems Plan supplied by SBP in January 2013 should build on existing Systems Plans and Architectures to provide a better understanding of interdependencies and data flows and how these support the Asset Information Specification for CP5 and beyond.

Organisation, People and Culture

17) Roles and accountabilities for Asset Information should be clearly identified in the suite of Asset Information documents provided for SBP in January 2013, with particular emphasis on Data Management and Assurance processes in the devolved structure.

18) By March 2013 Communications and Business Engagement activities should be integrated with wider Asset Management System business change projects to reduce overloading on Route-based teams and optimise feedback from the Routes to identify improvements.

19) By March 2013 the Competence Framework should be aligned to the wider Asset Management Competence Framework and also support the roles and accountabilities for managing Asset Information.

AMCL would like to take this opportunity to thank all those who contributed to this review.

Table of Contents

Glossary

Term	Description
ADIP	Asset Data Improvement Programme
AIS	Asset Information Strategy
AMCL	Asset Management Consulting Limited
AMEM	Asset Management Excellence Model
AMIP	Asset Management Improvement Programme
AMPI	Asset Management Platform Integration
AMS	Asset Management Strategy
AMSG	Asset Management Steering Group
BAU	Business As Usual
BCAM	Buildings & Civils Asset Management
CPx	Control Period x
DfT	Department for Transport
DRAM	Director of Route Asset Management
EAM	Enterprise Asset Management
GIS	Geospatial Information System
GRIP	Governance for Railway Investment Projects
HAM	Head of Asset Management
HLSD	High Level Solution Design
HR	Human Resources
IAMP	Integrated Asset Management Platform
IIP	Initial Industry Plan
IM	Information Management
IT	Information Technology
ITIL	IT infrastructure Library
KPI	Key Performance Indicator
LADS	Linear Asset Decision Support
LCx	Licence Condition x
MD	Managing Director
MDM	Master Data Management
MEAP	Mobile Enterprise Application Platform
NCIS	National Criminal Intelligence Service
NIM	National Intelligence Model
NR	Network Rail
ORBIS	Offering Rail Better Information Services

Term	Description
ORR	Office of Rail Regulation
PLO	Process-Led Organisation
PMO	Project (or Programme) Management Office
PRxy	20xy Periodic Review
RAM	Route Asset Manager
RINM	Rail Infrastructure Network Model
Roadmap	Network Rail Roadmap for Asset Management Capability improvement
RoI	Return on Investment
SBP	Strategic Business Plan
SLA	Service Level Agreement
SME	Subject Matter Expert
VfM	Value for Money
Vision & Roadmap	AIS Vision and Roadmap v1.0 (September 2011)
WLCC	Whole-LifeCycle Cost

1 Introduction

1.1 Background

As part of its role as Independent Reporter for Asset Management, Asset Management Consulting Limited (AMCL) has undertaken extensive audits of Network Rail's 6-task Asset Information Strategy (AIS) that was launched in 2004 to address Licence Condition 24. Licence Condition 24 (LC24) committed Network Rail to establish and maintain an asset register, the purpose of which was to ensure that the company holds and has appropriate access to and records of knowledge of the relevant assets, including knowledge of their condition, capability and capacity, in the manner and to the extent and standard which best achieves:

- The maintenance of the network;
- The renewal and replacement of the network;
- The improvement, enhancement and development of the network; and
- The operation (including timetabling) of the network.

This AMCL work culminated in a final Summary report in April 2008 to help inform Office of Rail Regulation's (ORR) subsequent decision of whether Network Rail had achieved technical compliance with LC24. In April 2009, ORR updated the Network Licence, and LC24 was replaced by the new Licence Condition 1 (LC1). The requirements for Asset Information have been retained and form part of the Asset Management section in LC1.

The outstanding recommendations from these audits have been consolidated into a master list and are tracked through regular tri-partite meetings. In early 2009, Network Rail initiated their Transformation Programme which included the following workstreams to cover Asset Management:

- Asset Policy;
- Asset Information; and
- Efficient Infrastructure Delivery.

The Asset Policy and Asset Information workstreams were delivered together as an 'Asset Management' workstream, with an interface to the enabling Systems and Data workstream. The output from this work was not reviewed by AMCL.

Another element of the Transformation Programme was Network Rail's Process-Led Organisation (PLO) workstream, a re-organisation that included the creation of an Asset

Management directorate and the appointment of a Director of Asset Information within that directorate. This post was filled in September 2010. Network Rail has since developed its updated Asset Information Strategy to support its corporate objectives, including continued compliance with the revised Network Licence, and the Asset Information requirements of the wider GB rail industry. This update to the AIS consisted of two phases.

- Phase 1 was a review and consolidation of the Asset Information improvement initiatives already in progress. These initiatives supported the provision of the necessary Asset Information to develop the Control Period 5 (CP5) Initial Industry Plan (IIP), published in 2011, and subsequently support the CP5 Strategic Business Plan (SBP) by January 2013. Network Rail has termed this phase the Asset Data Improvement Programme (ADIP). AMCL reviewed[6] the initial development of the ADIP and how this would support the CP5 IIP.
- Phase 2 defines Network Rail's strategy for the longer-term provision of Asset Information. This includes the definition of requirements, process mapping, a review of system functionality, better integration and a plan for introduction of new systems. The updated AIS was published in September 2011 and subtitled ORBIS (Offering Rail Better Information Services)

These workstreams are part of Network Rail's Asset Management Improvement Roadmap, that makes the following commitments:

- Asset Information vision, direction statement and detailed plan for strategy development to be issued February 2011; and
- A resourced and costed plan for proposed system development to be included in the IIP submission in September 2011.

The mandated purpose of the project documented in this report was to carry out a review of Phase 2 of Network Rail's AIS with particular focus on ORBIS. In relation to current Licence requirements, this review gave consideration to Network Rail's current Asset Information (including Information Technology (IT)) strategies with regard to:

- Capabilities;
- Fitness for purpose;
- Efficiency; and
- Comparison with best practice.

[6] Review of Phase 1 AIS, 15th December 2011

1.2 Scope

The scope of work specified by the mandate was to carry out an independent review of Network Rail's AIS Phase 2: ORBIS, to establish the extent to which it addresses:

- Network Rail's own objectives
- The Asset Information requirements that the ORR will expect Network Rail to produce to inform and support the PR13 regulatory review process; and
- The longer-term provision of Asset Information to the GB rail industry.

The scope of work included the following:

- Review of the identification of Asset Information needs including coverage of all information types;
- Review of the business case and justification of costs and benefits;
- Review of individual plans, processes within the ORBIS Roadmap;
- Review of the incremental benefits of ORBIS by considering optimal staging and front loading of the programme;
- Review of the proposed system architecture and data models, flows and integration with corporate systems;
- Review of alignment with Network Rail's Asset Management Strategy (AMS);
- Review of alignment with the Asset Policies including appropriate consideration of criticality analysis;
- Review of the deliverability of the ORBIS programme and risk assessment (including but not limited to the impact of devolution);
- Benchmarking against best practice from other utilities and consider the merits of alternative solutions;
- Review of the security arrangements of the IT systems and data;
- Review of the proposed method of delivery, the skill-set and competence of programme team;
- Review of the competence and skill-set requirements of the 'to-be' organisation; and
- Comparison of ORBIS with best practice including ISO 8000.

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

The scope of this review excluded the audit of data in the Asset Information systems for accuracy and reliability.

1.3 Structure of Document

The remainder of this document sets out the approach and findings of the review as follows:

- The Methodology and Approach used for the overall review (Section 2);
- A background to Asset Information in Network Rail, including an overview of the organisation, strategy development, capability assessments and the Vision & Roadmap (Section 3);
- Detailed findings on the alignment of the Asset Information Strategy to the overall Asset Management System and delivery of improvements to Asset Knowledge Capability (Section 4);
- Detailed findings on Asset Information Requirements in Network Rail and how any gaps are being addressed by ORBIS, along with the Business Case for ORBIS (Section 5);
- Detailed findings on the Plans, Deliverability and Risks for the ORBIS programme (Section 6);
- Detailed findings on the Technology, Systems Architecture and Integration required to support the Asset Information requirements and how these are being developed through ORBIS (Section 7);
- Detailed findings on the wider Organisation, People and Culture elements of Asset Information and ORBIS (Section 8); and
- A summary of Findings and Recommendations (Section 9).

These are supported by Appendices providing further detail on the above areas.

2 Methodology and Approach

2.1 Methodology

The scope of the AIS and ORBIS programme is wide and affects many activities within Network Rail and the wider GB rail industry. In particular, it was important to build an understanding of the following elements of the AIS:

- Strategic elements that outline the future state of Network Rail's Asset Information capability, vs. the Tactical elements required to implement the strategy; and
- Elements that relate to general Asset Management and business change activities vs. specific Technical elements that are required to support this in terms of IT and systems capabilities.

These gave four broad headings to be considered during the review:

1) *Outcomes*: A review of the proposed future capabilities of the Asset Information organisation from an Asset Management perspective, assuming successful delivery of the ORBIS programme.
2) *Architecture*: A technical review of the proposed systems architecture delivered by ORBIS in terms of the IT systems and interfaces delivering the outcomes in 1, assuming successful delivery of the ORBIS programme.
3) *Plans and Deliverability*: A review of the proposed business change plan for ORBIS, including:
    a. An assessment of the baseline plan specified in the AIS Phase 2: ORBIS document, under the assumption that ORBIS delivers to its expected timescales, focusing on the interim capabilities of Network Rail at each key milestone.
    b. An assessment of the deliverability of this plan and the work done since publication of the initial plan to determine the implications for the overall delivery of the Outcomes (in 1) and interim milestones.
4) Systems Integration: A technical review of the approach, risks and issues associated with the implementation of the Plans (in 3) and implications for the successful delivery of the Outcomes (in 1), focusing on the IT-specific activities within ORBIS.

The overall methodology is demonstrated in Figure 1, with the scope elements from Section 1.2 mapped to each part of the review.

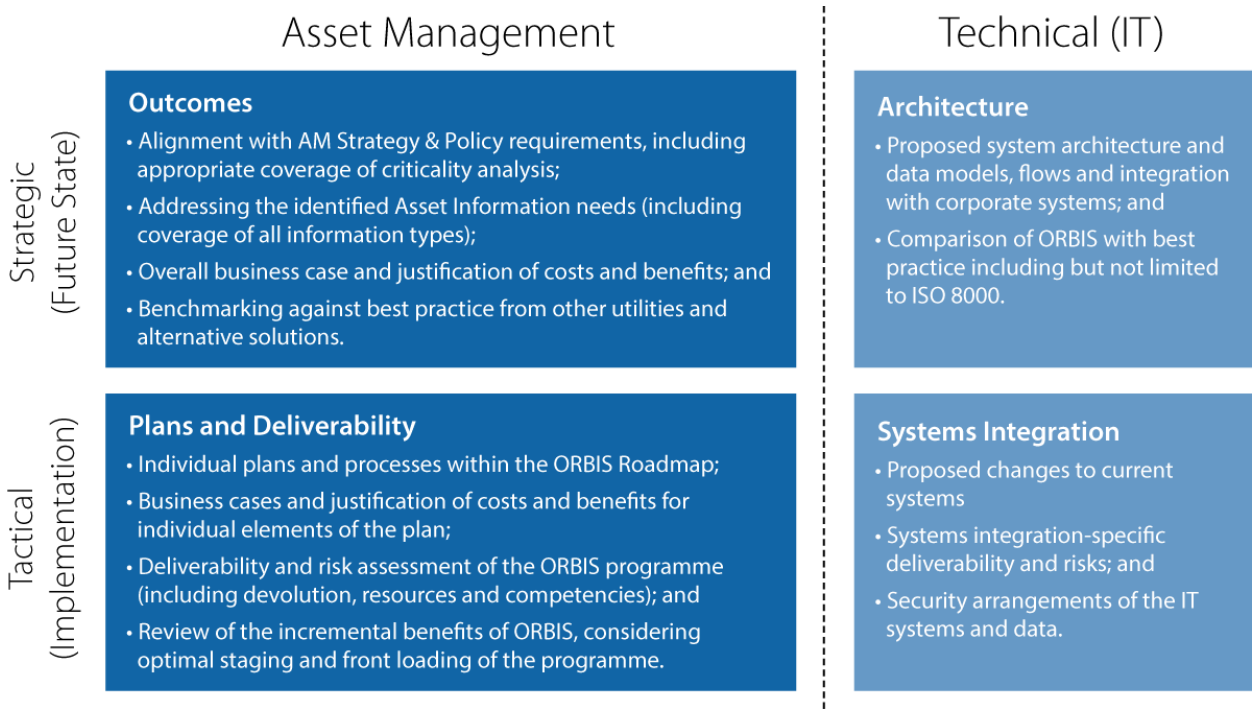


Figure 1 Scope Elements

2.2 Approach

The review was carried out through a combination of document review, stakeholder interviews and supporting analysis. Appropriate stakeholders were identified by Network Rail, ORR and AMCL for the four areas of the review, from the following areas:

- Asset Information Organisation (including ORBIS Programme team);
- Asset Management (as customers of Asset Information, including representatives from each asset type and other Asset Management stakeholders);
- Directors of Route Asset Management (DRAMs);
- Wider Network Rail stakeholders; and
- External stakeholders including ORR.

The methodology presented in Section 2.1 was used as a tool to identify relevant stakeholders and documentation for the different elements of the review. Where there were overlaps between different scope areas these were covered in a single session. Other scope areas needed to be approached from different stakeholder perspectives and so separate sessions were held with these stakeholders.

2.3 Technical Aspects

2.3.1 Technical Resource

To assure appropriate and relevant knowledge and experience was applied to the review with respect to Asset Information IT systems development and integration, AMCL contracted IBM Global Services as an IT resource to complement the review, approved by ORR. IBM provided technical systems definition, development and integration advice to support the overall review of the provision of suitable Asset Information. IBM was a full partner during the review, attending tripartite discussions and relevant meetings.

2.3.2 Technical Methodology

IBM provided two main assessment tools to support the general approach outlined in Section 2.2.The first is a high-level approach used to evaluate the appropriateness of systems, architecture, data and the underpinning business case and is illustrated in Figure 2.

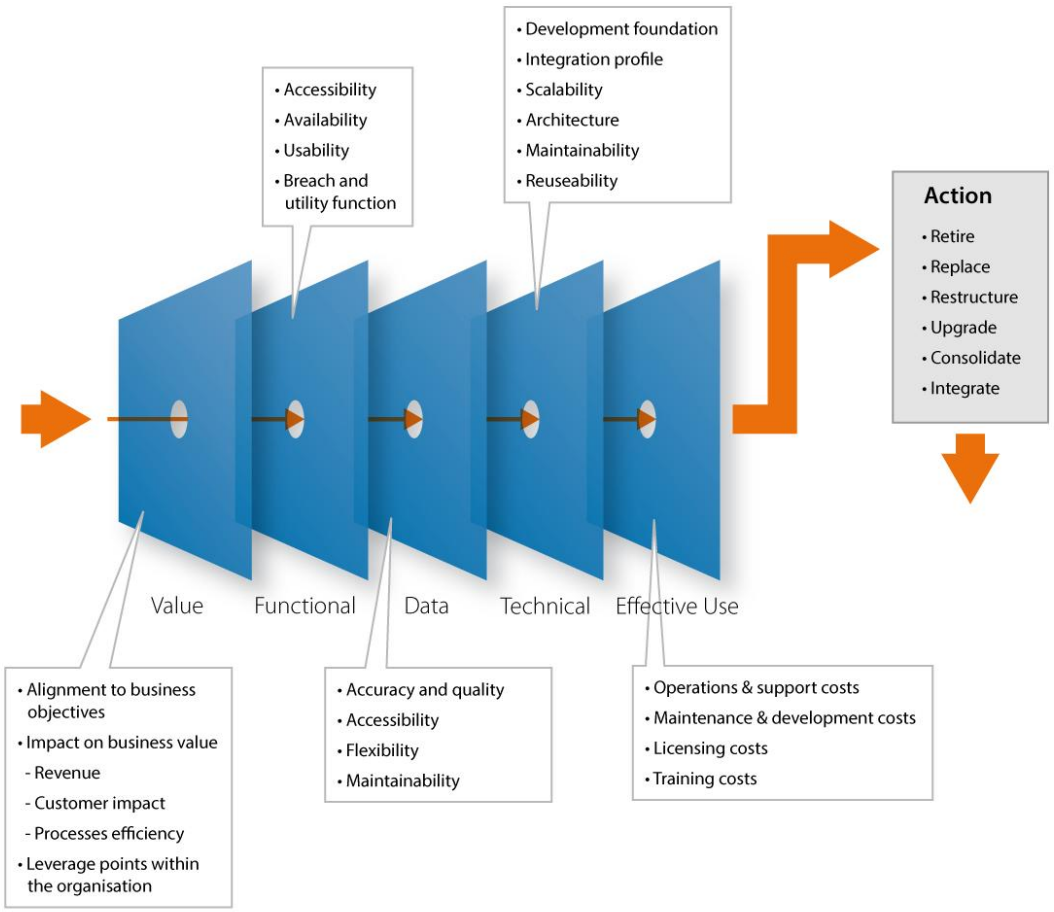


Figure 2 High-Level Technical Review Methodology (Source: IBM)

The second assessment approach concerns project and programme aspects and uses the 7-Keys Method in order to consider deliverability and risk dimensions, illustrated in Figure 3.

Figure 3 7-keys Methodology (source: IBM)

2.3.3 Technical Findings and Recommendations

The majority of the observations from IBM's elements of the project are captured in Section 7. Supporting information from IBM is also provided in the Appendices. IBM's overall feedback and recommendations have been incorporated into the overall findings and recommendations in Section 9.

3 Asset Information in Network Rail

3.1 Overview and Context

This section provides background and context on the role of Asset Information in Network Rail. It includes:

- A brief history of the current Asset Information Organisation and its position in the devolved Network Rail structure;
- The development of the Asset Information Strategy and creation of the Vision & Roadmap;
- A description of the assessments of Asset Management capability carried out using the AMCL Asset Management Excellence Model™ (AMEM) and the Roadmap used to define and monitor capability improvements, including the latest results from the Asset Knowledge Group; and
- An overview of the Vision & Roadmap documentation that have been the main focus of this review.

3.2 Asset Information Organisation

Historically, the role of the Asset Information Organisation was carried out by separate teams split across various functions and asset disciplines, with each unit having semi-independent requirements for the management and use of asset information. The Asset Information organisation was created in February 2010 as part of the PLO workstream within the Transformation Programme, as part of the newly-created Asset Management Directorate. This brought together the teams from various different areas of the company, with a wide remit covering a range of Asset Information activities, from measurement of infrastructure condition to publication of controlled documents.

ORBIS is a business change programme delivering improvements to the Business As Usual (BAU) Asset Information organisation. Devolution to the Routes within Network Rail has seen a shift in responsibility for Asset Management activities to the Routes, so the BAU organisation has had to adapt accordingly. Hence ORBIS includes a re-organisation of the Asset Information organisation to better align the delivery of Asset Information services to Central and Route-based Asset Management teams. The new organisation went live at the end of May 2012 and this element of the ORBIS programme is discussed in more detail in Section 8.

As a large business change programme with a significant IT systems element, ORBIS is dependent on Network Rail's Information Management (IM) team for support and has drawn

some of its resource directly from this department. It is also governed by Network Rail's Investment Framework and Business Change Panel, both of which sit (along with IM) under the Group Finance Director.

The positioning of Asset Information and ORBIS within Network Rail is therefore understood by AMCL to be as illustrated in Figure 4.

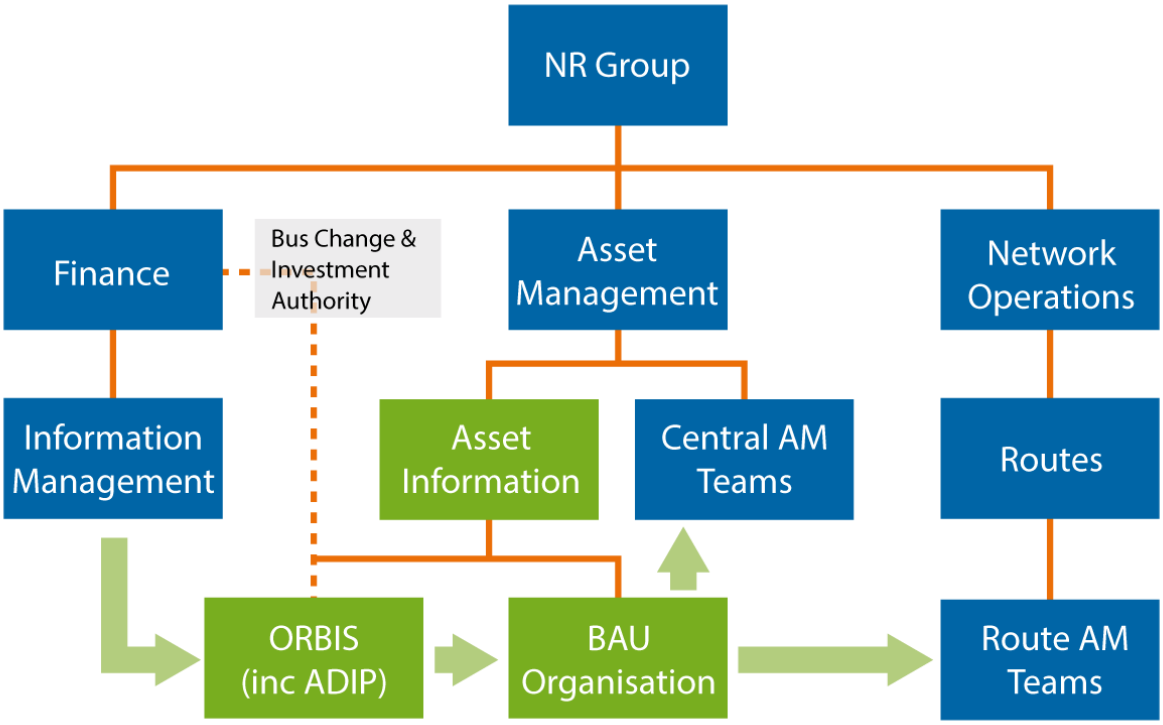


Figure 4 Positioning of Asset Information within Network Rail

3.3 Asset Information Strategy and Implementation

Section 1.1 outlined the background to the development of Network Rail's AIS following the appointment of the new Director of Asset Information in September 2011. Alongside the existing initiatives to improve Asset Information, Network Rail set out to define a forward-looking vision of how Asset Information should support the GB Rail Industry in the future. This was a two phase process. The first phase (to March 2011) defined the Vision and Approach for the future state and consolidated existing data improvement activities in ADIP. The second phase (to September 2011) developed the Roadmap and supporting justification for the Vision set out in the March 2011 document. This formed the basis of the submission for funding of the ORBIS Programme, which officially went live in October 2011.

Since October 2011 ORBIS has mobilised and the Roadmap presented in the September 2011 document has been developed further into the ORBIS Programme. This has included the creation of additional documents for individual projects within the programme and revisiting elements of the September 2011 suite of documents. This approach is summarised in Figure 5.

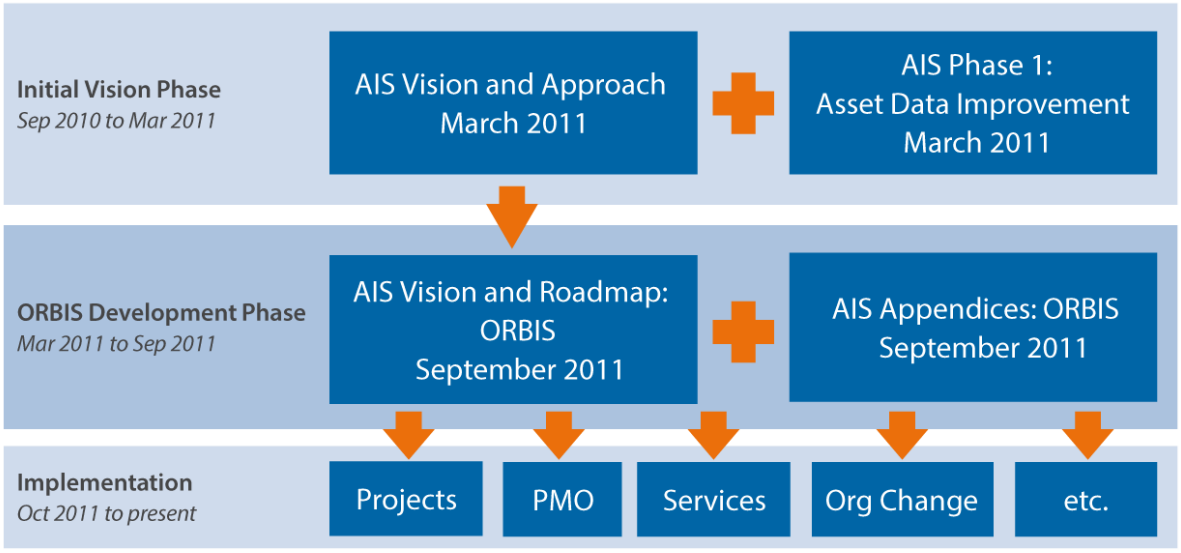


Figure 5 AIS Development

AMCL reported on its review of AIS Phase 1: ADIP and the March 2011 Vision and Approach in December 2011. The focus of this Phase 2 review and report is therefore the September 2011 suite of documents and progress since then.

3.4 Asset Information Capability Assessment and Roadmaps

AMEM is the framework used for the assessment of Network Rail's Asset Management Capability. 'Asset Knowledge' is one of the six groups in the AMEM and covers the following areas of capability:

- Asset Information Strategy & Standards;
- Asset Information Systems; and
- Asset Knowledge & Data.

The following timeline summarises the activities that have shaped the development of Network Rail's Asset Information capability and hence have implications for the current AIS and ORBIS:

- 2009: Full AMEM Assessment (including Asset Knowledge). This provided an assessment of Network Rail's capabilities at the start of CP4.
- 2010: Asset Management Improvement Roadmap (hereafter the 'Roadmap'). This specified Capability Statements for Asset Knowledge, including proposed targets, activities and timescales for delivery.
- 2010: Network Rail Asset Management Improvement Programme (AMIP). This set out Network Rail's plan to deliver improvements to its Asset Management Capability, based on the Roadmap.
- 2011: Full AMEM assessment carried out in mid-2011. This assessed Network Rail's progress against the Roadmap and took into account some evidence from AIS and ORBIS (March 2011 documentation).
- 2011: IIP Update Assessment. This reflected additional documentation provided on AIS and ORBIS progress, including the Vision & Roadmap.
- 2012: Update to Roadmap reflecting progress to date and specifying activities required to address remaining gaps in capability.
- 2012: Asset Management Steering Group (AMSG) Folio Plan. Revision to Network Rail's AMIP to bring together the business change initiatives across Asset Management in Network Rail to improve Asset Management capability.
- 2012: AMIP and Roadmap Validation. Evaluation of Network Rail's proposed AMSG Folio Plan against the Roadmap.

Scores in the recent assessments are summarised in Table 1.

Activity	2009 score	2011 Score	2011 Roadmap Target	2011 Updated Score	Comments
Asset Information Strategy & Standards	61%	63%	70%	69%	Increase due to ORBIS
Asset Information Systems	51%	51%	53%	51%	Marginal increase due to business impact assessment of systems (<1%)
Asset Knowledge & Data	43%	44%	53%	45%	Increase due to Asset Data Confidence Grading and ADIP for SBP

Table 1 Asset Knowledge Activity Scores from 2011 IIP Update

3.5 AIS Vision and Roadmap: ORBIS

3.5.1 Overview

The document at the heart of the AIS is the Vision & Roadmap. Along with its supporting appendices, the Vision & Roadmap is the basis for the bulk of the analysis carried out during this review. It is therefore important to set out the content of the document and understand how this relates to the scope areas under investigation in this review. However, it is recommended that this report is read alongside the Vision & Roadmap as only key content has been reproduced or summarised.

Table 2 presents the chapters in the Vision & Roadmap document and a brief summary of their content. The remainder of this section describes how the Vision & Roadmap was developed from the initial AIS Vision and Approach (March 2011) and in which sections of this report the relevant ORBIS chapters are considered

Chapter	Content
Introduction	Sets business context and outlines need for better Asset Information
Asset Information Vision	Covers what Asset Information is required, how it is managed, the organisation to support this and the services this will provide
Roadmap	Describes the ORBIS Programme, its structure and outcomes
Capturing Hearts & Minds	Outlines the breakthrough projects being undertaken
Org Transformation Roadmap	Outlines the Org Transformation required for the BAU AI Organisation
Data & Systems Management	Describes the impact of the AIS on the management of IT systems & data
Investor Perspective	Presents the business case, costs and benefits for ORBIS
Risks	Outlines the high-level risks for the ORBIS programme
ORBIS Programme Design	Outlines the governance and organisation for ORBIS

Table 2 Vision & Roadmap Content

3.5.2 Business Context (Introduction)

Chapter 2 of the Vision & Roadmap sets out the business context for improvements to Asset Information capability. This is broadly unchanged from the Business Context chapter of the AIS Vision and Approach (March 2011) document, as the long term drivers remain the same. However, a section has been added summarising the findings of the Rail Value for Money (VfM) study and likely impacts of a devolved Network Rail on Asset Information requirements.

The drivers of the requirement for business change are summarised as a set of ten key challenges for Asset Information, which cover the following themes:

- Delivering specific corporate objectives, such as improved safety and efficiency;
- Supporting the devolved, route-centric model of the industry;
- Providing improved Asset Information to support the overall Asset Management Strategy, Asset Policies and Business Planning processes; and
- Internal improvements to the Asset Information organisation in terms of its people, processes and supporting systems to deliver the above.

3.5.3 Asset Information Vision

Chapter 3 of the Vision & Roadmap then sets out the Asset Information Vision. The Vision Statement is clearly articulated as follows:

'To serve Network Rail and the GB rail industry as the trusted source of asset-related information and insight, from which informed decisions can be made to balance risk, performance and funding to best deliver Network Rail's Promise.'

The vision statement is underpinned by three primary objectives which define the end-state outcomes:

- **Business Process Orientation**: providing alignment to business process;
- **National Intelligence Model Orientation**: providing a structured approach for turning data into intelligence; and
- Support for **Five Core Asset Information Types** and their inter-relationships.

These are described further in the Vision & Roadmap, building up to the Asset Information Vision picture (Figure 6) and the supporting Asset Information Organisation Vision (Figure 7). The Asset Information Vision picture was first presented in the AIS Vision & Approach (March 2011) document and remains largely unchanged in the Vision & Roadmap. The Asset Information Organisation Vision was introduced in the Vision & Roadmap document and reflects further thinking on how the Organisation needs to be aligned to the services shown in the Vision.

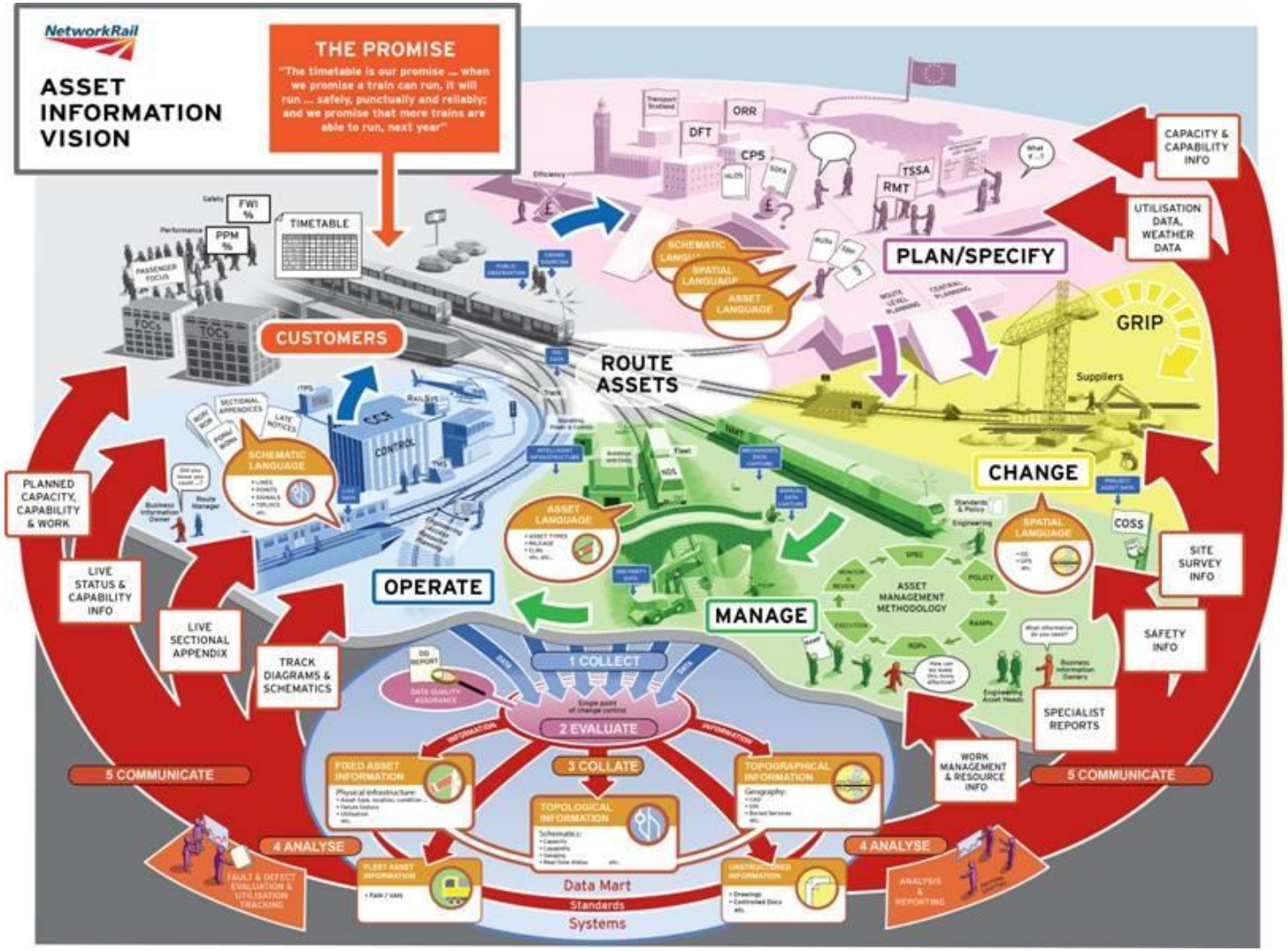


Figure 6 Asset Information Vision

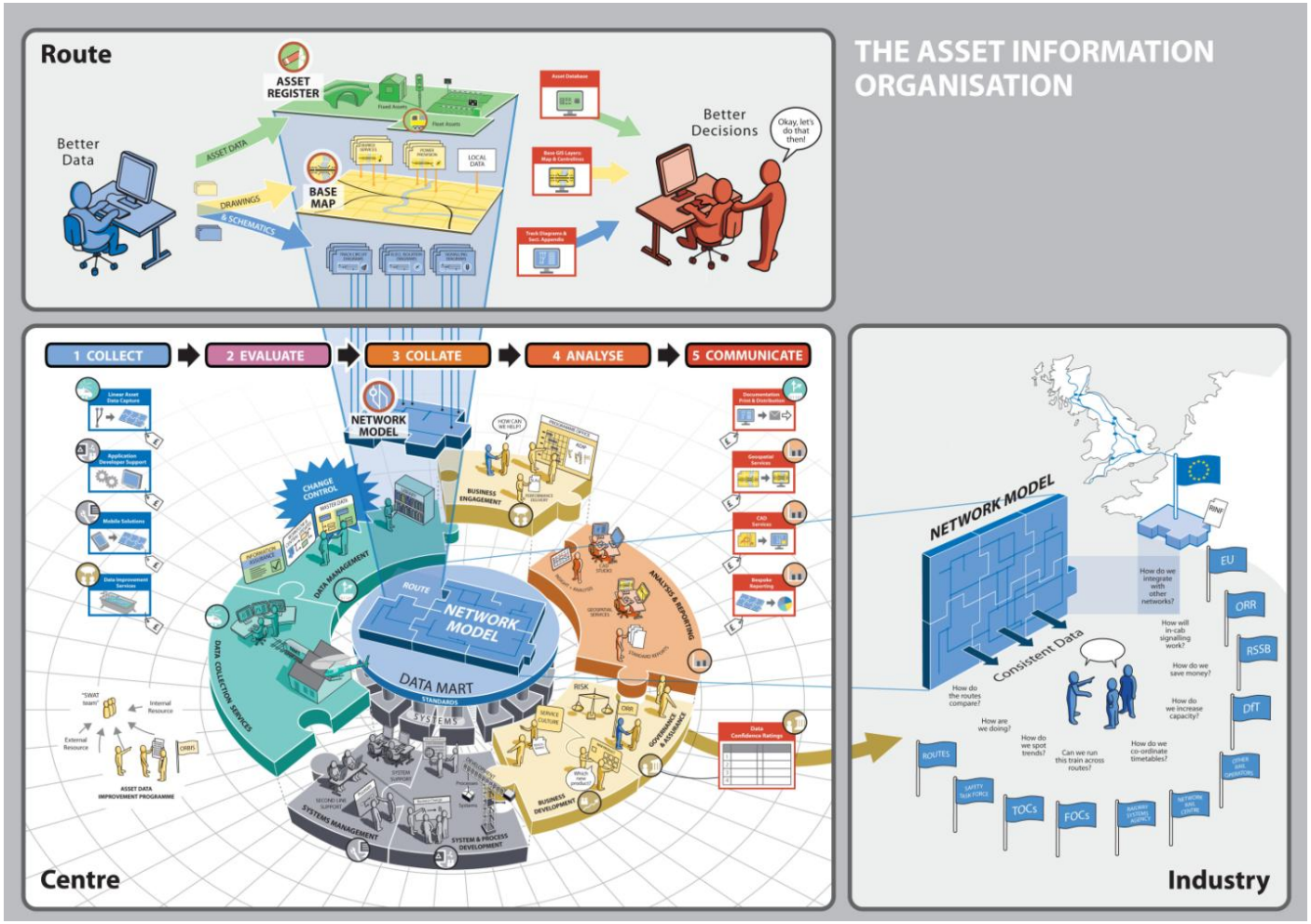


Figure 7 Asset Information Organisation Vision

3.5.4 Asset Information Roadmap

Chapter 4 of the Vision & Roadmap is the major development from the AIS Vision & Approach (March 2011), in that the high-level objectives, goals and broad timeframes have been developed into the following:

1) The ORBIS Programme Architecture identifying the projects required to develop business capabilities, including specific Business Value Propositions, Enablers and Breakthrough projects;
2) A high-level Roadmap for delivering the Vision, linking specific ORBIS outcomes to business processes and timescales; and
3) An overall Programme Plan showing the timeframes for delivering the projects in 1).

This is supported by further definition of Programme Tranches and the Business Value Propositions. There are three Tranches for ORBIS delivery:

- Tranche 1: Information Foundations;
- Tranche 2: Connecting it up; and
- Tranche 3: Making it real-time.

3.5.5 Capturing Hearts and Minds

This is a new chapter included for the first time in the Vision & Roadmap. It outlines the breakthrough projects forming part of Tranche 1. These are projects targeting engagement with a broad base of the frontline workforce:

1) Network Visualisation and Mapping;
2) Master Data Management and Governance; and
3) Handheld Devices.

These projects are the most advanced as they are in Tranche 1 and have been accelerated to establish ORBIS. They are therefore considered from a delivery perspective in Section 6 of this report and in terms of their impact on the culture of Asset Information within Network Rail in Section 8. They are also required to support the realisation of future benefits (see Section 5).

3.5.6 Organisation Transformation Roadmap

This is a very brief chapter outlining the organisation change programme and shows limited development from the material presented in the March 2011 Vision & Approach. It presents an

overview of the workstreams comprising the Organisation Transformation project and presents an 'Implementation Road Map'. The Organisation Transformation is considered in Section 8 of this report.

3.5.7 Data and Systems Management

While some consideration had been given to data and systems management in the March 2011 Vision & Approach, this chapter has been developed considerably to look at the impacts of ORBIS from Data Management and Systems Management perspectives as follows:

- Data Management:
  - Master Data Management;
  - Network Change (Configuration) Management;
  - Data Governance Framework; and
  - Asset Data Improvement Programme.
- Systems Management:
  - Systems Architecture Principles;
  - IT Reference Architectures; and
  - IT Principles and Systems Rationalisation.

This material is supported by further information on systems in the ORBIS Appendices. The information supplied on Data Management is considered as part of the review of Asset Information Requirements in Section 5, with the Master Data Management project given further consideration in Section 6. The approach to Systems Management has been reviewed by AMCL with IBM and is summarised in Section 7.

3.5.8 Investor Perspective

This chapter is new to the Vision & Roadmap and presents the results of the business case cost-benefit analysis for the ORBIS programme. Bottom-up estimates of the costs of each project in the programme architecture and roadmap are provided, broken down by cost type (Governance, Data, Technology, Business Change, Process). The Opex costs of the Asset Information Organisation changes proposed in ORBIS are also estimated based on staff costs.

High-level financial benefits are provided for each Asset Group, supported by further breakdowns by year and Tranche. Supporting commentary on which projects drive these benefits is also provided, along with estimates of unquantifiable benefits.

The ORBIS business case is reviewed in Section 5.5.

3.5.9 Risks

This chapter is brief, as development of a detailed risk management plan for ORBIS was planned for after the ORBIS launch date. High level risks are summarised, which include:

- Response of the Asset Information Organisation to devolution;
- Resistance to change from within Network Rail; and
- Perception of ORBIS as an 'Asset Management project'.

Risks are considered in Section 6.

3.5.10 ORBIS Programme Design

This chapter sets out the governance framework and programme structure, building upon the high-level structure presented in the March 2011 Vision & Approach (which had formed the basis of the governance structure for the design phase.

The following Critical Success Factors are also identified:

- The capability to deliver large projects (and therefore benefits) within tight timescales;
- The need to win hearts and minds across the business through early and regular benefits delivery; and
- The need to ensure that ORBIS has the right sponsorship and visibility right across the business.

The programme design and governance is considered in Section 6. The Critical Success Factors are considered in Sections 6 and 8.

4 Asset Management System and Asset Knowledge Capability

4.1 Overview - Scope Elements

This section evaluates Network Rail's AIS and ORBIS against the following scope elements set out in Section 1.2:

- Review of alignment with Network Rail's Asset Management Strategy; and
- Benchmarking against best practice from other utilities and alternative solutions.

It considers the development of the Asset Information capability in Network Rail as part of the overall Asset Management capability development.

4.2 Existing Frameworks

4.2.1 Background

While ORBIS is a re-launch for Asset Information improvement in Network Rail with an associated definition phase to secure funding, it builds upon existing work carried out in the Transformation Programme, particularly in the Systems & Data workstream (largely IT-led) and AMIP (largely Asset Management-led).

Hence, the BAU Asset Information Organisation and ORBIS have tried to re-use existing frameworks where possible in defining the programme. The AIS: Appendices refers to several frameworks that have been used as 'scaffolds' for the formulation of the Vision & Roadmap. These are briefly discussed in terms of their impact on the Vision & Roadmap and alignment to the Asset Management System.

4.2.2 Network Rail Frameworks

There are four main frameworks referred to in the Appendices:

- Network Rail's Asset Management Framework;
- Network Rail's 'Governance for Railway Investment Projects' (GRIP) process and the supporting 'GRIP for Change' process for Business Change projects;
- Network Rail's 7-layer Asset Information Architecture Model; and
- Network Rail IM's Asset Management High Level Solution Design (HLSD).

The Asset Management Framework is a visual representation of the cycle of Asset Management decisions and activities. It provides context for the role of Asset Information (particularly the BAU organisation) in the overall Asset Management System.

The GRIP / GRIP for Change process provides a framework for ORBIS as a change programme within Network Rail. This ORBIS Programme Design and Governance is reviewed further in Section 6.

The Asset Information Architecture and HLSD are considered further in Section 7.

4.2.3 External Frameworks

Two main external frameworks are listed in the Appendices:

- BSI PAS55: 2008; and
- National Criminal Intelligence Service (NCIS) National Intelligence Model (NIM).

PAS55 provides guidance on good practice in asset-intensive industries (including Asset Information and Systems) and is aligned to the AMCL AMEM assessments of Network Rail (see Section 4.3.1).

The NCIS NIM is the basis of the Asset Information Organisation. This is a recognised framework that has been applied in other industries and appears to provide a good practice approach to defining the processes for turning raw data into information and communicating this information. It has also helped to clarify the structure of the Asset Information Organisation required to deliver these services (see Section 8).

4.3 ORBIS Alignment to Asset Management

4.3.1 Asset Management Policy

The Network Rail Asset Management Policy[7] was published in February 2011 and is the latest publicly available document. It makes the following statement on Network Rail's aspirations for developing its overall Asset Management Capability:

By the end of the current control period (March 2014) our commitment is to have developed capabilities in asset management that are demonstrably comparable with best practice elsewhere in Britain. Over the following five years we are committed to improving our business

[7] Network Rail: Asset Management Policy (February 2011)

capabilities further, so that we provide the benchmark against which organisations throughout the world assess their own asset management capabilities.

Asset Information is shown in the 'Asset Management Framework' within the Policy, and the Asset Information Strategy is listed in the 'Asset Management Document Hierarchy' presented in the Policy Appendix.

It is considered by AMCL that the Asset Information Strategy and ORBIS programme have been developed to be broadly in line with the overall Asset Management Policy. However, the timescales for delivering ORBIS do not currently align to Network Rail's stated ambition to be 'comparable with best practice elsewhere in Britain' by March 2014. There are currently gaps in some areas to Asset Information best practice (both within the UK and globally) which are to be addressed by ORBIS and are required for overall Asset Management capabilities to reach this level. AMCL has raised this inconsistency with Network Rail in previous reports and assessments.

4.3.2 Asset Management Strategy

The Network Rail Asset Management Strategy was also published in February 2011 and is the latest publicly available document. It is listed in the Business Context section of the Vision & Roadmap (see Section 3.5.2) as a key driver of the requirement to improve Asset Information in Network Rail. Relevant content has been extracted and summarised in Appendix C. This includes high-level statements on Asset Information development.

At a high-level, development of the Asset Information Strategy appears consistent with the content of Network Rail's Asset Management Strategy up to September 2011. The AIS: Vision & Approach (March 2011) and the Vision & Roadmap are the deliverables for Phases 1 and 2 of the AIS specified in the Asset Management Strategy. Note in particular that the initial AIS: Vision & Approach (March 2011) document listed the agreed targets for Capability Measures from the overall Asset Management Capability Roadmap in the main document and promised an output to the detailed ORBIS roadmap development of 'the likely improvement against the regulatory reporter's AMEM model'.

However, it is apparent that the business outcomes listed in the AIS: Appendices document do not fully reflect these agreed Roadmap targets. There are some more specific business outcomes under a heading 'Asset Management Strategy' and a broader outcome under the heading 'External' of "Planning & Development are able to demonstrate that recommendations agreed with (or mandated by) ORR are implemented", but these do not reflect the specific

Roadmap targets. The promised output of the likely improvements against the AMEM model has not been delivered, so it is unclear as to how ORBIS will deliver these improvements.

4.3.3 Asset Management System Development and AMEM Assessments

Network Rail's Asset Management System has and continues to be developed in parallel to the AIS and ORBIS. As set out in Section 3.4, there have been several AMEM assessments during the course of the development of the AIS and ORBIS, along with reviews against the Roadmap targets and Network Rail's own AMIP. Each of these reviews considered alignment of the AIS and ORBIS with the overall Asset Management requirements of the organisation.

The 2011 IIP Update AMEM Assessment recognised the progress made in delivering the AIS and particularly the step forward made through the Vision & Roadmap document. However, it was noted at the time that the required developments to the Asset Management System and Strategy (following the assessment) would need to be reflected in a revision to the Asset Information Strategy. In addition, specific delivery objectives in ORBIS were noted as needing to be delivered to meet targets for other Asset Knowledge related targets in the Roadmap.

It is also recognised that the work done in developing the ORBIS programme has influenced the development of the wider Asset Management business change programme, the AMSG Folio Plan. However, AMCL's review[8] of the AMSG Folio Plan against the specification in the 2012 Roadmap Update found that Network Rail has not yet clearly demonstrated appropriate alignment between Network Rail's on-going Asset Management development activities in AMIP and the subsequent information support requirements in ORBIS. The AMSG Folio Plan relies on ORBIS to deliver the future Asset Knowledge capabilities specified in the Roadmap, but this is not reflected in a clear line of sight defining ORBIS requirements from the on-going AMIP activities.

In particular, while the Vision & Roadmap's existence and ADIP progress on the Data Dictionary together address the 'Asset Information Strategy & Standards' activity, the other two activities ('Asset Data & Knowledge' and 'Asset Information Systems') are reliant on the successful delivery of specific projects within the ORBIS programme. These activities are currently underway but the forecast is that the AMIP and Roadmap target trajectories in these areas will not be met.

[8] AMCL 'AMIP to Roadmap Validation' Draft A (2012)

4.3.4 Current Activities

The ORBIS team is currently developing its use of the ProVision tool (see Section 6.2.3) to map the ORBIS activities to requirements and business benefits to better demonstrate the dependencies and interactions at an individual project and portfolio level. It is considered this may enable a clearer demonstration of delivery of the 2012 Roadmap targets. However, this work was still underway at the time of writing this report.

4.4 Benchmarking and Best Practice

4.4.1 Benchmarking Approach

Following PR08, Network Rail initiated a corporate benchmarking programme in 2009 with the intention of understanding its position relative to its peers and using this to identify areas where there was opportunity for improvement. It is understood that progress updates have been shared with ORR during the PR13 process, in particular as supporting evidence provided for the IIP. This has consisted of specific bi-lateral discussions with other companies in rail and other relevant industries. In addition, the AMEM provides Network Rail with a calibrated benchmark against overall good practice in Asset Management organisations

4.4.2 Bi-lateral Discussions

As part of the overall bi-lateral approach to benchmarking and best practice sharing with other organisations, discussions have covered Asset Information. It was stated that this informed some of the early work on Asset Information as part of the Transformation Programme although evidence was anecdotal with no documentation by Network Rail provided during the review.

However, discussions with the ORBIS team and other stakeholders in the organisation suggested that current benchmarking was more focused on asset or project-specific activities. Information on the levels of discussion held within each Asset Group and an overview of the findings in relevant areas are presented in Appendix D.

For example, the Buildings & Civils team is understood to have had several discussions covering Asset Information with other rail and construction companies. The Signalling team stated that discussions had been held with several international rail organisations, which included the use of Asset Information, both from a systems and data perspective. The Track team had seen specific application of Decision Support Tools (DSTs) from a selection of rail organisations and suppliers to support its evaluation of the proposed Linear Asset Decision Support (LADS) tool.

In addition IM Subject Matter Experts (SMEs) have used a range of studies provided by Gartner to evaluate options for specific systems as part of individual ORBIS projects. These studies will often give guidance on expected Return on Investment (RoI) for these types of projects which can be used to validate benefits assumptions. ORBIS has now established its own Gartner account to give it access to these studies for key projects.

It is not clear that these activities are co-ordinated throughout the ORBIS programme, Asset Management and the wider organisation in general to best maximise use of these and link these to efficiency opportunities. However, the general conclusion in this area from a range of stakeholder perspectives was that the types of system available in other organisations is broadly comparable and that the real opportunities lie in improvements to business processes and data rather than the systems themselves.

4.4.3 Asset Information Capability Benchmarking

AMEM assessments provide industry benchmarks for individual Asset Management capabilities, for both rail-specific and more general utilities organisations. The Asset Management Capability Development process outlined in Section 3.4 and subsequent Roadmap trajectories have been designed with these benchmarks in mind, to enable Network Rail's overall goal (as set out in the Asset Management Strategy) of being recognised as one of the leading Asset Management organisations in its peer group by CP5. Therefore, by using AMEM as a means of targeting and measuring capability, Network Rail has demonstrated benchmarking against best practice to a certain extent. The use of AMEM also enables direct comparisons to BSI PAS55: 2008, the industry standard for Asset Management, which includes guidance on Asset Information and Systems.

In particular, the specific improvements seen in the AMEM scores for 'Asset Information Strategy' have been based on Network Rail adopting good practice. There is no single view of what a 'best practice' strategy looks like as approaches to defining Asset Information Strategy vary between organisations. The most important thing to demonstrate is that all aspects of good practice have been covered somewhere and that these elements are consistent, aligned and appropriate for the organisation's context. The Vision & Roadmap document broadly achieves this for the strategic elements as at September 2011.

For the other activities in the Asset Knowledge group the picture is less clear. There is a lack of demonstrable alignment between ORBIS and the Roadmap (as outlined in Section 4.3). It is not clear which ORBIS activities deliver the specific deliverables (such as an Asset Information Systems Plan) required in the Roadmap and where (and how) Network Rail is learning from its

peer group to deliver these improvements. Discussions with the ORBIS team suggested that while the agreed Roadmap targets were used, these are not being used to identify specific further opportunities for Asset Information best practice sharing.

AMCL has shared its understanding of potential good practice comparator organisations in this area with Network Rail's central Asset Management team as part of the AMEM Assessment and Roadmap development exercises. Details of the comparator organisations and comparator opportunities are given in Appendix C.3.

4.4.4 IT Capability Benchmarking

In 2010, as part of its corporate benchmarking programme, Network Rail commissioned the Hackett Group to benchmarking its large support functions[9]. This included a review of the IT function and services in Network Rail and the results were shared with ORR, who provided these to support this review. The study concluded that Network Rail had opportunities to reduce its technology costs due to large numbers of applications per user and also gave the following observations and comparisons to the peer group and 'world class' comparators in its database on Network Rail's capabilities in application development:

- 90% projects on-budget (86% at World Class);
- 30% projects deliver plan benefits (70% at World Class); and
- 40% of development projects on-time (82% at World Class).

ORBIS is heavily reliant on Network Rail's IM function to support and deliver large elements of its business change projects where these have a large systems component. While the above figures should not be used out of context, they do show the size of the challenge facing large-scale IT and business change projects in Network Rail. For example, these figures can be used to create a 'pessimistic' scenario to test the resilience of the ORBIS Business Case (see Section 5.5.4).

[9] The Hackett Group 'Network Rail 2010 G&A Benchmark - Preliminary Results' (2010)

5 Asset Information Requirements and Business Case

5.1 Overview - Scope Elements

The review scope set out in Section 1.2 included the following specific aspects to be considered for this evaluation:

- Review of the identification of Asset Information needs including coverage of all information types;
- Review of alignment with the Asset Policies including appropriate consideration of criticality analysis;
- Review of the business case and justification of costs and benefits; and
- Review of incremental benefits of ORBIS by considering optimal staging and front-loading of the programme.

5.2 Identification of Asset Information Needs

5.2.1 Approach

The Vision & Roadmap is the output of a year-long process starting from the appointment of the Director of Asset Information, outlined in Appendix A of the Appendices to the Vision & Roadmap. Section 1.1 of the Appendix outlines the development of the Vision itself. The initial phase of this development consisted of meetings held with senior business representatives, visits to maintenance delivery units, workshops and Q&A sessions. This was then developed into a more detailed 'Needs and Frustrations' analysis through more detailed workshops.

This led to the production of the following:

- Vision: statement and picture describing the end-state outcome (see Section 3.5.3);
- Objectives: top-level desired realisable outcomes at the end state (also Section 3.5.3); and
- Goals: specific, measurable milestone outputs aligned to an objective.

Note that the Goals above are explicitly mentioned in the AIS Vision & Approach (March 2011) document but not the Vision & Roadmap. It is understood that these have been replaced by the specific project outcomes.

5.2.2 Capturing Internal (Network Rail) Requirements

The requirements were identified through a 'Needs and Frustrations Analysis', carried out through a series of cross-disciplinary, cross-functional workshops with key stakeholders within Network Rail. Participants were encouraged to be open about weaknesses in the current processes, systems and data.

These workshops captured information requirements and improvement opportunities across all aspects of the Asset Lifecycle, including data quality, process and decision-making requirements. Network Rail shared the 'Visioning Workshops' presentation pack and this showed that the following areas of Network Rail's business processes were considered:

- Route utilisation, output & funding specification;
- Asset Policies;
- Route Asset Management plans;
- Route delivery plans;
- Work execution; and
- Monitoring and review.

The outputs were categorised by the High Level Solution Design (HLSD) produced from the Transformation Programme and structured into a catalogue of requirements by the Business Architect team.

5.2.3 Capturing External Requirements

Network Rail has legal and statutory requirements that it must meet regarding the provision of information on its assets. Some of these are specified in European law (for all railway infrastructure managers) others in UK law (including UK Health and Safety legislation and the Railway Group Standards managed by RSSB). A general condition on the capability to provide adequate information is set out in LC1.

AMCL understands that direct external interfaces of the process were limited. For example, ORR requirements were picked up second-hand through the team involved in the Independent Reporter for Asset Management tripartite discussions. As ORR was not directly involved in the process it is possible that the requirements analysis did not fully reflect ORR's priorities..

The approach taken for Asset Information seems to less formal than for cost information, where ORR has published a Unit Cost data coverage and quality specification, addressed to the

Network Rail Group Finance Director from the ORR's Deputy Director of Markets and Economics[10]. While this is a relatively high-level specification, it does present a benchmark against which cost information can be compared. This is considered further in Section 5.3.

5.2.4 Development of Outcomes and Benefits

The Asset Information requirements were grouped into outcomes and vignettes developed for key needs and frustrations to illustrate the benefits of an improved Asset Information solution. The benefits were also mapped through Investment Logic Maps, which were used to review the estimated benefits of the outcomes with key stakeholders.

From discussion with ORBIS team and key stakeholders from each Asset Group interviewed as part of this process, this was a thorough process in terms of identifying needs and frustrations. However, it is not clear that the external requirements have been captured to the same extent as the internal drivers.

In addition, it is not clear as to whether the high-level information specification developed through the 'Needs and Frustrations Analysis' was further developed into a clear specification of what is needed in terms of 'Fit for Purpose' data for each activity.

5.3 Alignment to Asset Policies

5.3.1 CP4 and CP5 Policy Development, Justification and Delivery

There are three levels at which the alignment of Asset Information and ORBIS to Asset Policies needs to be considered:

1) Asset Information required to deliver CP4 policies;
2) Asset Information required to develop and justify CP5 policies; and
3) Asset Information required to deliver CP5 policies.

This review has focused on 2 and 3, namely the Asset Information required for CP5 policy development and delivery, but it has also considered elements of 1 for these will form the basis of current capability and supporting systems, and the gaps between 1, 2 and 3 will determine the level of uncertainty around CP5 plans and the scale of improvements and challenge for the ORBIS programme to put Network Rail in a position to commence delivery of these plans at the start of CP5.

[10] ORR 'Network Rail's Unit Cost Framework' (Letter to Network Rail, May 2011)

Audits of data quality and coverage are carried out by Arup as part of its Independent Reporter (Part A) role. AMCL therefore held an interview session with Arup to determine the current aspects of this process that should be improved.

In this discussion, Arup stated that its role in assessing data quality is carried out in the absence of a formal agreed specification of the dimensions of the data to be assessed and what is required to meet LC1, other than the broad qualitative statement within LC1. The process for assessing data quality is established, and Arup is able to provide estimates of the confidence and coverage as part of its remit by assessing particular data types. However, there is not a formal understanding of the implications of this output as there is not an official specification against which the comparison can be made.

An official specification should include standards for each data type reflecting its criticality. All data types used in decision-making (i.e. above an appropriate threshold of criticality) would be expected to meet a certain level of quality. High-criticality asset information is likely to include safety-critical information or information with a high impact on expenditure. For example, a current rating of 'B2' in a certain asset information type may be adequate for the delivery of CP4 policies and for CP5 planning purposes, but to safely and cost-effectively implement those policies may require a higher level of data quality (potentially up to 'A1'). The differences between the policy decisions for assets, supporting asset information types and required quality of data will all affect the criticality of the asset information and hence its importance in an overall specification. It is then up to Network Rail and ORR to determine and agree an appropriate level of quality for each data type. Network Rail has stated that this Asset Information Specification will be an output of the Master Data Management (MDM) project.

5.3.2 CP4 Policy Delivery

Network Rail specifies the data quality required for delivery of the CP4 Asset Policies in its current Asset Data Dictionary, against which ADIP is delivering improvements in data coverage and quality. The ADIP approach has already been reviewed by AMCL[11]. Since that report it has delivered improvements in data quality and an interim statement of data quality levels was published in October 2011. At the time of writing, Arup is currently undertaking a Data Quality Assessment and the results of this assessment are due by the end of 2012, which will evaluate further progress in this area.

[11] Review of Phase 1 AIS, 15th December 2011

5.3.3 CP5 Policy Development and Justification

The IIP submissions were based on policies that used 'pre-ORBIS' data, as the Vision & Roadmap was published simultaneously. Therefore, the IIP CP5 policies are based largely on the same data currently being used in delivery of the CP4 policies, with some additional improvements as delivered through ADIP.

The work done in developing the CP5 policies and their justification has identified key asset information types, namely:

- Asset information required to support renewals planning; and
- Asset information required to support maintenance optimisation.

These are required to determine criteria for renewals and maintenance interventions and demonstrate that these provide a lowest whole-lifecycle cost (WLCC) for the asset. Network Rail has put considerable effort into developing its WLCC models for this policy justification, which will also have identified the levels of asset information required to support these models. The '7 layers of asset information' framework used in the ORBIS programme architecture was developed to support policy decision-making and delivery.

An overview of the types of asset information required to support the above decisions in policy development for each asset type are summarised in Appendix D. The following themes were noted:

- For all assets, a basic understanding of the asset inventory ('What and Where') is required, however the requirement for the precision of 'Where' information varies between asset types;
- The asset hierarchy needs to be clearly defined for some asset types as interventions can be carried out on a high level system of assets (or virtual asset, such as an interlocking area) or on individual assets;
- As the CP5 policies generally rely more on risk-based interventions for both maintenance and renewal, improved performance and condition data is required;
- 'Snapshot' condition measures exist for most asset types, but trended information on condition degradation is not as well established in some assets as others;
- For some assets utilisation information is more important than others;
- For some assets the relationships between data types are better understood than for others (e.g. utilisation and degradation, condition and performance); and

- WLCC model development required significant amounts of post-processing of asset information to develop relationships for the assets.

An informal specification of a grading of 'B2' has been discussed between Network Rail and ORR at tripartite meetings for the data quality required by SBP. In the AIS Phase 1: ADIP document, a high level confidence rating for each asset group is presented, but this is caveated with a statement that this is only 'what could be achieved… not necessarily what needs to be delivered'.

The Roadmap states the requirement for an Asset Information Specification to address the current gap in the definition of the data that should be available to support the policy development and justification process. AMCL understands that this is currently under development through the MDM project within ORBIS, and a sample for track data was shown in an interview as evidence. However, a complete version of the specification was not available at the time of writing and it is not clear that the MDM project has a broad enough scope to deliver this for all asset groups (see Section 6.3.2).

It should be noted that a variation in the PR13 settlement as a result of poor Asset Information supporting the CP5 policies has been logged as a risk within ORBIS. While the risk is logged against ADIP, it requires the business owners of the data (Head of Asset Management for each Asset Group) and ADIP to deliver the required improvements together..

5.3.4 CP5 Policy Delivery

The role of Asset Information in supporting CP5 delivery will be twofold:

1) Improve volume efficiency (reduce unnecessary activity levels): provide assurance that volume reductions have been achieved through consistent implementation of policy based on robust condition information (or other criteria) rather than deferral.
2) To enable delivery (unit cost) efficiencies for activities that are undertaken as a result of applying the policy, e.g. locating defects more quickly, access to better fault fixing information, etc.

The information requirements to deliver 1 in practice are likely to be similar to those for the CP5 policy development. However, the level of accuracy will need to be greater for building bottom-up plans.

For example, the Signalling stakeholders interviewed had identified through WLCC modelling based on high-level sampling of network-wide data that an overall 'targeted' approach to

renewals was preferred for CP5 policy. However, to apply this policy to a given interlocking area in the Routes requires a more detailed understanding of the condition of individual assets within the interlocking area.

The information requirements for 2 will depend on the asset type. For some assets, including track, location data is particularly important to delivery efficiency as finding a defect can be a large element of the works delivery. For other assets this may be less of an issue, as the location of the component is well known.

5.3.5 Asset Information Criticality Analysis

The existing assessment of criticality appears to be based on the availability of benefits from ORBIS at an Asset Group level, rather than a cross-asset view of the costs and benefits of capturing information for all asset information types. This means that potential high-criticality asset information types may not be being addressed (or properly integrated with) by the ORBIS scope. A particular example identified through this review is performance (i.e. fault) data for non-track assets (currently stored in FMS). This is essential for development of a Maintenance Requirements Analysis procedure and hence implementing reliability-centred (and/or more sophisticated risk-based) maintenance regimes, so the quality of this data determines the extent to which Network Rail can safely implement these techniques and realise these benefits.

The 7-layer information architecture framework Network Rail has created and used to identify information types and projects should form the basis of this criticality assessment, bringing together the existing analysis already available through the work done in ADIP, developing the WLCC models and CP5 Asset Policies and the MDM programme.

5.4 Business Case Framework

5.4.1 Vision & Roadmap Business Case

The ORBIS business case is presented in the 'Investor Perspective' (Chapter 8) of the Vision & Roadmap (see Section 3.5.8). A single business case for the overall ORBIS programme is provided, evaluated in terms of the benefits in each Asset Group that are enabled through the delivery of improved capabilities in Asset Information services. The structure of the overall business case for Network Rail as understood by AMCL is illustrated in Figure 8. It shows the three-way agreement between Asset Information, the Asset Groups and Network Rail Group that:

- The ORBIS *Outcomes* deliver the Asset Information *Requirements* from the Asset Groups, as signed off by the AMSG;
- These Outcomes enable the delivery of *Future Efficiencies* within the Asset Group, which are an overall benefit to Network Rail (and hence the wider industry); and
- Network Rail Group authorises the *Investment Funding* (costs) for ORBIS based on the benefits outweighing the costs (evaluated through the business case cost-benefit analysis).

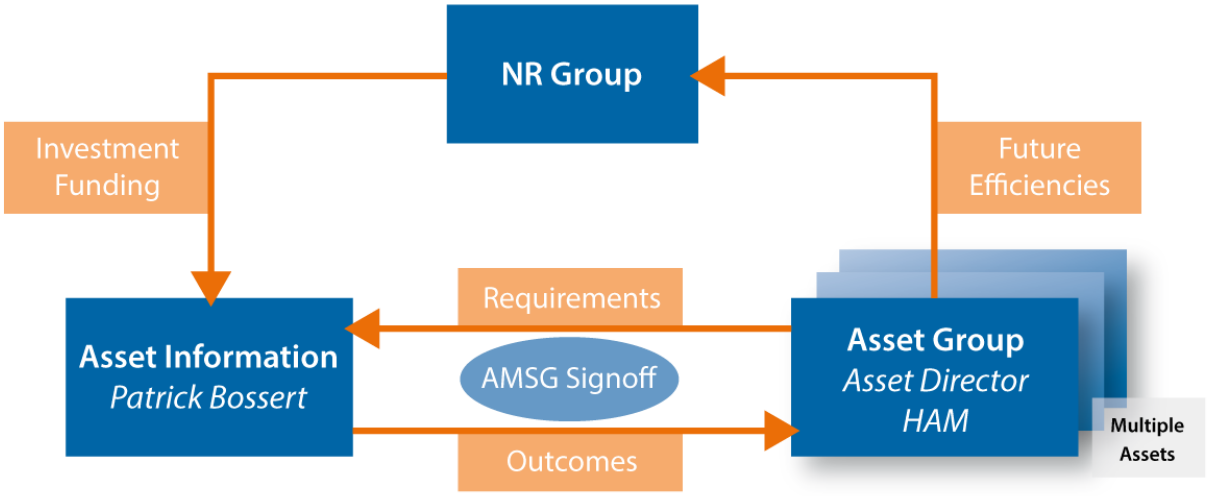


Figure 8 Illustration of Vision & Roadmap High Level Business Case Framework

The business case analysis in the Vision & Roadmap appears to have been carried out on a sound basis for a project at the feasibility stage. The cost breakdown and profile has been created based on bottom-up estimates of the likely project costs, which Network Rail stated was based on estimates of resources required to deliver similar IM and business change projects and standard cost estimates for these resources.

The benefits estimates, while high-level, have been profiled across CP5 for each asset with a brief description of the key initiatives driving these improvements. A major step forward for Network Rail in terms of business case analysis is that these benefits forecasts have been agreed and signed off by the Head of Asset Management for each Asset Group and formally signed off by AMSG. As these benefits will need to be jointly delivered by ORBIS, Asset Information and the Asset Groups, it is important that these elements of the programme are understood and agreed between these parties.

The relationship between costs and benefits is established at a very high-level, comparing total costs to total benefits:

- Costs: Sum of bottom-up project costs, phased by year during project delivery; vs.
- Benefits: Sum of Asset Group benefits, phased by year based on assumed ORBIS outcomes during CP4 and CP5, then constant from 2018/19.

Discussions with the representatives from the Asset Groups suggested that this had been a fair process, although the degree to which they had been involved in determining benefits varied between projects. It is understood that at a relatively early stage the ORBIS team identified that Track had what it believed to be the greatest opportunities, so more effort was focused in this area. Since this initial round of benefits estimation there has been greater involvement for other Asset Groups (see Section 5.4.2).

There also appears to have been relatively low involvement of the Policy Development team in reviewing and evaluating the benefits. This may have missed potential opportunities that had been identified through the WLCC modelling and Policy Development work and also general cross-asset themes on information quality.

5.4.2 Development since Vision & Roadmap

Since securing funding for the initial phases of ORBIS in October 2011, the programme team has been developing the cost and benefits profiles for the programme. Following the devolution of Asset Management responsibilities to the Routes, the ORBIS team has revisited the benefits with both the central Asset Management teams for each Asset Group and Route Asset Management teams.

The structure of the ORBIS programme has also been reviewed to break down the overall programme into:

- Projects: programme elements carried out by ORBIS;
- Capabilities: outcomes of ORBIS projects delivered to the Business As Usual (BAU) Asset Information team; and
- Services: provided by the BAU Asset Information team to the Route and Central teams.

In parallel, the Central Asset Group teams have been reviewing the efficiency profiles for CP5 with the Route teams, as the Routes will be responsible for the delivery of these efficiencies (and hence the overall benefits to Network Rail and the wider industry).

The ORBIS programme has revisited the Outcomes-Requirements sign-off with AMSG and developed this at two levels:

- Revised view of available efficiencies and links to specific ORBIS deliverables with central Asset Group teams (through benefits mapping workshops); and
- Challenge and agreement of proposed ORBIS benefits profiles with individual Routes.

The Route benefits profiles will also depend on the level of Route buy-in to the central team's proposed overall efficiencies.

There are therefore three levels of agreement required for successful delivery of the overall ORBIS business case within the devolved structure:

1) Agreement between Asset Information and the central Asset Groups teams of the overall Asset Group benefits available and attributable to the improved services delivered by ORBIS;
2) Agreement between the central Asset Group teams and the Route-based Asset Management teams on the overall efficiency opportunities available in each Route (taking into account local factors); and
3) Agreement between Asset Information and the individual Routes on the service levels required to support delivery of these efficiencies.

The above developments are illustrated in Figure 9.

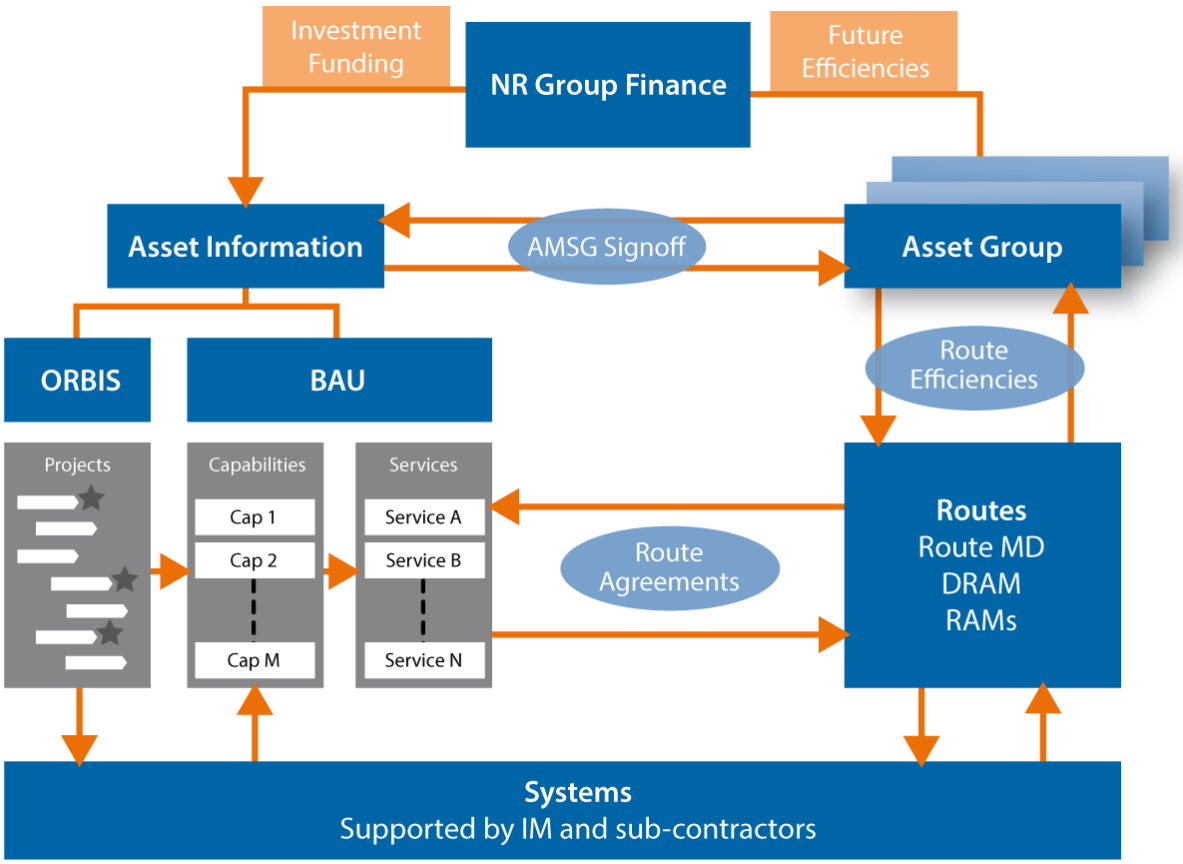


Figure 9 Illustration of Business Case Framework Developments since Vision & Roadmap

The outputs from the benefits mapping were not available at the time of writing this report, as the Route-level validation is expected to be a SBP input and these plans were at the initial stages and not ready to be shared with ORR or the Independent Reporter.

5.5 Business Case Justification

5.5.1 Overall Business Case Approach

The overall approach taken in determining the high-level business case for ORBIS appears robust. Network Rail and ORR have both already approved the overall business cases with their respective appraisal frameworks and challenging these is outside of the scope of this review.

This review has therefore focused on identifying additional evidence information that should be provided from the further work undertaken in developing and challenging the business case since the Vision & Roadmap. There are several observations on the high-level business case:

- A 'single solution' bid approach is presented. For investment appraisal (for example in early feasibility stages of GRIP), a range of options to meet requirements is usually presented.
- It is not clear what alternatives to better Asset Information could enable the delivery of these benefits (e.g. a larger pool of analysts in each Route using existing data sources).
- The bottom-up costing of the ORBIS elements is more detailed and appears more robust than the equivalent top-down estimation of the Asset Group benefits;
- The phasing of costs and benefits and links to outcomes are 'packaged' as part of the single solution with only high-level descriptions of how the outcomes deliver the benefits. The benefits are split by Asset and Tranche, but sensitivity testing of the deliverability of the programme is limited to this overall Tranche level.
- Tranche 1 accounts for nearly two thirds of overall spend, while Tranche 2 is required to really get the benefits of a 'joined up' systems model approach to the network. Breaking down the benefits of these two tranches more clearly would appear appropriate.
- The evaluation period chosen appears arbitrary and includes CP7, whereas the benefits profile is broadly fixed from the end of CP5 (by which time the majority of ORBIS projects have completed). The end of CP6 may be a fairer evaluation period given the length of project and expected benefits timescales.
- ORBIS capex costs are treated as a one-off and ORBIS opex costs appear to be based mainly on staff costs. On-going systems costs are assumed to be broadly the same as the current systems supported by IM, with increases in required capability offset by rationalisation of other systems, although this is not explicitly calculated.
- A total cost of ownership approach for the systems required to deliver Asset Information services (including infrastructure, maintenance, data refreshes, etc.) does not appear to have been undertaken.
- Asset Information (and ORBIS) can only deliver the services and rely on the central Asset Teams and Routes to realise these benefits.

5.5.2 Cost Estimation and Justification

AMCL believes that the bottom-up cost estimates in the Vision & Roadmap have been arrived at through a robust process. Network Rail's standard approach for costing IT and business change projects has been applied to each of the projects in the ORBIS programme, namely:

- Determine the project requirements;
- Estimate the level of internal and external resources required;

- Apply framework rates to determine cost estimate;
- Approach suppliers to validate any key systems costs;
- Apply ranges to the costs to reflect the business complexity and technical complexity of the project; and
- Model overall programme through QRA to determine overall contingency.

This is consistent with standards practice within Network Rail and elsewhere. The information supplied in the AIS: Appendices demonstrated the rationale behind each project's costs and this appeared to have been applied consistently.

There is no standard model for the expected breakdown of overall information-related business change projects across the categories of Data, Business Change, Governance, Process and Technology used in the Vision & Roadmap. These will depend upon the organisation, the complexity of the project and the current levels of capability. However, some research was done into the breakdown of costs for similar projects and these appear reasonable. The cost of large-scale Information Technology projects is considered further in Section 7.

Uncertainty around cost estimates is considered in Section 5.5.4

5.5.3 Benefits Estimation and Justification

To assess the top-down benefits attributed to ORBIS by each Head of Asset Management (HAM), AMCL has used information from the Vision & Roadmap and discussions with relevant stakeholders.

Network Rail did not provide detail supporting the benefits estimation for each asset group as part of this review. It stated that the absolute values of the benefits, CP5 phasing and supporting rationale (as presented in the Vision & Roadmap) should provide sufficient information for evaluating the business case. Therefore AMCL has assessed the 'high-level' logic of the benefits estimation process and based its findings on available information in the Vision & Roadmap and Network Rail 2012 Delivery Plan.

The logic of the benefits estimation appears to AMCL to be:

- Estimate overall control period 'size of the prize' from better Asset Information within the asset, as a % of the total renewals or maintenance spend that could be reduced (i.e. CP6 saving);

- Apply a CP5 5-year profile based on how quickly ORBIS delivers the outcomes required to enable these benefits and how long these would take to be realised; and
- Apply these figures to the baseline CP5 spend for the asset.

However, the 'size of the prize' figures are not presented consistently in the narrative for each asset type. Renewals are generally given as a percentage (but not for Civils), maintenance figures are given as an absolute benefit in £ million, and the CP5 baseline spends are not published in the Vision & Roadmap. AMCL has cross-checked the proposed benefits by applying the published percentage savings to the latest estimates of CP4 spend (from the 2012 Delivery Plan) and these appear reasonable, but for SBP a clearer presentation of how the benefits have been estimated and calculated is required.

There are marked differences between the benefits proposed for each Asset Group. This is important, as these benefits appear to have been used as a proxy for prioritising ORBIS projects in the absence of a full Asset Information Specification based on an Asset Information Criticality Analysis. A summary of the relative position of each Asset Group for each of the factors driving renewals benefits is shown in Table 3. This cannot be used to directly verify the benefits in the Vision & Roadmap (for the reasons given above), but helps to understand the drivers of those benefits estimates.

Asset Group	Relative Size of Prize (%)	Speed of Implementation	CP4 Spend (£m)
Track	High (5%)	High (-,-,50%,100%,100%)	3,615
Signalling	Low (2%)	Slow (-,-,-,50%,100%)	2,156
Civils	Low (<1%)	Instant (100% from Yr 1)	1,748
Buildings (Operational Property)	Low (1%)	Medium (-,-,-,100%,100%)	1,295
Telecoms	None	N/A	1,081
Electrification & Power	High (7.5%)	Medium (-,-,25%, 50%, 100%)	595

Table 3 Asset Group Benefits Estimation

From discussions with the ORBIS team, Network Rail has already internally challenged these differences between assets, with the Director of Asset Management asking the non-Track HAMs to either identify further efficiency opportunities to increase their estimates towards Track, or to justify why these are not achievable for their Asset Group. There has therefore been some internal review of the appropriateness of these estimates and this has been signed off at AMSG as part of the overall ORBIS business case.

AMCL also discussed the benefits estimation process with the individual HAMs. It was acknowledged that the process was relatively high level and the 'size of prize' percentage and speed of implementation estimates were based largely on qualitative factors for the asset group, such as:

- Current systems capability, including analysis and diagnostics;
- Known policy gaps reliant on better Asset Information (e.g. to support risk-based intervention strategies);
- The level of data analysis currently carried out to support policy development and implementation;
- The extent to which the Asset Group has assets that are linear; and
- The extent to which renewals are driven by condition and long-term degradation vs. 'random' failures and/or obsolescence.

The discussions with the HAMs are summarised in Appendix D. These generally support the above benefits estimates as used for the Vision & Roadmap.

Since the Vision & Roadmap, the benefits allocation has been reviewed with further workshops bringing in a wider range of Network Rail stakeholders involved in the CP5 planning process, including HAMs, DRAMs, Asset Group CP5 teams and Maintenance. These are identifying specific activities (such as a Maintenance Unit Cost work item) that would be impacted by improved Asset Information, so that the benefits estimates can be improved.

These detailed benefits projections are being signed off by the DRAMs and Finance Directors in each Route working on a philosophy of: 'If ORBIS delivers this, we will deliver this'. It is important that this logic is presented as supporting evidence to the efficiency projections in the SBP in a clear analysis that is linked to the Asset Information Specification, aligned to the CP5 policy justification and demonstrating the level of reliance on ORBIS.

5.5.4 Sensitivity Testing

The information presented in the Vision & Roadmap is for a single option, with an evaluation period to the end of CP7. No sensitivity analysis is presented in the business case. As information is provided on the yearly costs and benefits of ORBIS, it is relatively straightforward to test the sensitivity of the business case to reducing the evaluation period to show the position at the end of CP5 and CP6.

Evaluation Period	PV Cumulative Costs	PV Cumulative Benefits	NPV	Benefits / Costs
CP5	282	204	-78	0.7
CP6	286	544	258	1.9
CP7	286	819	533	2.8

Table 4 Base Case Financial Evaluation

The bulk of the spend is incurred in CP5 and the bulk of the benefits are realised in CP6 and CP7. It should be noted that the choice of CP7 for the evaluation period in the Vision & Roadmap may not be required to demonstrate the overall positive business case for the programme, as a Benefit-Cost ratio of 1.9 would appear reasonable for a transport-related project that is addressing legislative requirements as well as driving internal efficiencies.

In terms of informing PR13, it is worth noting that ORBIS is similar to a long-term enhancement programme in that it covers multiple control periods and benefits are not always realised in the same control period as the spend. It is therefore important that Network Rail and ORR use similar governance processes to track spend and benefits over the life of the project to make sure that the costs and benefits are reflected appropriately in funding settlements.

An alternative option is to look at the sensitivity around the costs based on the observations from the Hackett report (see Section 4.4.4) in terms of time, cost and benefits realisation.

The Hackett figures show that Network Rail is 'World Class' by their benchmarks in terms of delivering applications projects to budget. However, the realisation of benefits is low (30% vs. 70%) as is the on-time delivery of projects (40% vs. 82%). It can be assumed that some risk is captured in the contingency figures produced by Network Rail (say the level of risk for a world-class organisation). Therefore, to create a plausible but pessimistic downside scenario the following adjustments have been made:

- Costs unchanged (as Network Rail has 'World Class' delivery to cost and any cost over-runs should be picked up in the contingency figures);
- Benefits scaled down to reflect the 30%/70% difference to world class for benefits realisation (i.e. benefits in each year multiplied by 0.43); and
- Benefits delayed so that 40% of current benefits are achieved in the stated year and 60% are carried forward to the next year.

Table 5 shows the effect of applying the above pessimistic assumptions to the business case figures.

Evaluation Period	PV Cumulative Costs	PV Cumulative Benefits	NPV	Benefits / Costs
CP5	282	67	-215	0.2
CP6	286	211	-74	0.7
CP7	286	329	43	1.2

Table 5 Downside Scenario Financial Evaluation

The above analysis is not intended to undermine the business case for the ORBIS programme and it is worth noting that even with this set of pessimistic assumptions, the business case is still positive over the evaluation period to CP7.

Instead, it is intended to illustrate that with Network Rail's previous record of delivering IT programmes, as benchmarked against world class organisations, the risk exists that the programme could under-deliver in terms of on-time, realised benefits. It is therefore essential that ORBIS implements best practice benefits realisation and understands how to flex the programme to accelerate benefits where possible.

5.5.5 Incremental Benefits and Phasing

As stated in Section 5.4.2, the costs and benefits of individual projects are being reviewed and modelled as part of the current ORBIS programme and the outputs from this phase were not available at the time of writing this report. However, observations can be made from the material presented on the Vision & Roadmap business case and discussion of specific projects with the ORBIS team and wider stakeholders.

The overall business case for ORBIS relies on ORBIS 'claiming' benefits that are actually delivered by the Routes. In practice, Asset Information cannot deliver these benefits and the boundary of the ORBIS delivery scope is at the level of Asset Information Services provided.

However, there is a very real 'dis-benefit' that would occur if ORBIS failed to deliver Asset Information that has been promised to Routes to the required specification to enable efficiencies to be realised.

As stated in Section 5.4.2, ORBIS is responsible for delivery of the change programme and improving Asset Information capability. BAU Asset Information is then responsible for delivering improved services to the Routes, who are then in turn responsible for delivering the efficiencies through reduced Capex and Opex spending. Therefore, the challenge is for Network Rail Group to manage these three elements in a fair and equitable way that allows the company to perform most effectively. It is also important for Network Rail to present how these benefits will be identified and tracked so that the progress of the overall programme can be monitored.

As observed in Section 5.2 and 5.3, the existing Asset Information Specification at the time of this review does fully satisfy the agreed Roadmap targets. Asset Information criticality is also still to be fully evaluated. This Asset Information Specification would establish the current and planned levels of Asset Information required for delivery of CP5 activities.

Once this in place, it will be easier to determine the incremental benefits of ORBIS and BAU Asset Information projects. For example, failure to deliver all identified efficiencies could be due to:

- The failure of ORBIS to deliver capability to the agreed time / cost;
- The failure of BAU Asset Information to deliver a service to the required level; or
- The failure of the Route to realise the benefits despite the improved Asset Information being in place.

Conversely, ORBIS and Asset Information could find further benefits within the programme by:

- Delivering the capability requirement ahead of budget / time;
- Delivering a higher level of capability for the same level of budget, enabling further efficiencies for the Route.

The understanding of these opportunities and risks is important for the development of Asset Information as a service organisation within Network Rail. The Director of Asset Information has stated that the proposed operating model for Asset Information is effectively taking data, adding value and selling back, similar to many other information enterprises. As part of the development of its operating model, Asset Information is evaluating the use of transfer pricing to align service costs to the services delivered. Good practice (such as the IT Infrastructure Library

(ITIL)) suggests that the service design should include appropriate measurement methods and metrics, all of which need to be built into the Asset Information Specification. Network Rail is understood to use frameworks like this as part of their overall IT approach (see Section 7.8).

6 Plans, Deliverability and Risks

6.1 Overview - Scope Elements

The review scope set out in Section 1.2 included the following specific aspects to be considered for this evaluation:

- Review of the deliverability of the ORBIS programme and risk assessment (included but not limited to the impact of devolution);
- Review of the proposed method of delivery, the skill-set and competence of the programme team; and
- Review of individual plans, processes within the ORBIS Roadmap.

The first two aspects are considered together through the overall programme delivery and governance approach (with a focus on devolution). Selected projects from within the Roadmap are then used to demonstrate how these overall deliverability risks and opportunities manifest themselves in individual plans.

6.2 ORBIS Programme Delivery and Risks

6.2.1 Overall Deliverability

Common high-level challenges and risks for large-scale IT business change programmes in asset-intensive organisations[12] include:

- Lack of alignment to overall Corporate Strategy (and also AMS in AMCL's experience);
- Lack of engagement at Executive level (Director/Board);
- Lack of commercial, procurement and /or contract management knowledge, judgement and skills;
- Lack of stakeholder management; and
- Lack of project and programme management skills (including capturing risks, plans, requirements)

The risks around alignment to overall Corporate Strategy and the Asset Management Strategy have been discussed in Section 4.3. The Critical Success Factors outlined in Section 3.5.10

[12] Adapted from Cabinet Office: 'What makes for success?

(from Chapter 10 of the Vision & Roadmap) capture the remaining challenges above for the ORBIS programme, namely:

- The capability to deliver large projects (and therefore benefits) within tight timescales;
- The need to win hearts and minds across the business through early and regular benefits delivery; and
- The need to ensure that ORBIS has the right sponsorship and visibility right across the business.

In addition, it is considered that the role of the Director of Asset Information is critical to maintaining board-level engagement, managing key stakeholders, 'winning hearts and minds' and providing the leadership for the ORBIS team and Asset Information to successfully deliver the programme. The impact of the current Director of Asset Information on culture is covered in Section 8.4. Given the difficulties Network Rail has faced historically in recruiting for this role and the delays to progress that have resulted, retention of the current Director of Asset Information over the course of the ORBIS programme or timely and appropriate succession planning, as necessary, are considered to be critical to the achievement of benefits.

Section 5.5.5 considered the difference between the outcomes delivered directly by ORBIS and the benefits of these outcomes that are enabled by ORBIS but not delivered directly.

Therefore there are two main elements that present further deliverability risks to the ORBIS programme and for Network Rail as a whole:

- The ability of the ORBIS team and its suppliers to deliver the projects in the programme; and
- The ability of the wider Network Rail team to realise the benefits.

6.2.2 Programme Delivery

The ORBIS Programme is designed to be delivered largely through 3rd party suppliers and contractors, with internal Network Rail project management resource a relatively small percentage of the total spend. Therefore the success of the programme is dependent on:

- Contracting strategy and supplier management;
- Availability of external resource to support the programme;
- Management of external resource through the PMO.

The ORBIS Programme Director highlighted the lack of a robust contracting strategy as an existing risk that was being addressed during the review. There were considered to be gaps in the resources required to deliver the ORBIS programme as a result of shortfalls in project management expertise. However, it is understood that mitigations were being put in place and ORBIS was being allowed to develop its own contracting strategy within the overall Network Rail framework to enable this resource identification to be accelerated.

The availability of external resource to deliver the programme is not understood to be a great risk to the programme, despite the scale of the programme. From a technical perspective, the underlying projects are generally about business (or process) change, technology change and systems integration, all of which are generic skills that are widely available from a range of suppliers. The majority of the solutions required are likely to already exist and Network Rail already has a large selection of 'building blocks' in terms of systems and capabilities that it can draw on to deliver these solutions (or combinations thereof).

However, the dependence on external suppliers will also mean that the core ORBIS team will have to play an 'intelligent client' role and make sure that knowledge is transferred back into the organisation. In addition, there is a limited pool of people who have sufficient understanding of both the rail industry and the technical solutions, so getting an appropriate balance of these across the project team will be essential.

The ORBIS PMO was set up in March 2011 to deliver the 'Definition' phase to September 2011, and was initially resourced with consultants provided by Qedis. The PMO reported directly to AMSG during this period. Overall delivery was close to the planned timescales with ORBIS launching in October 2011.

Since September 2011 the PMO has been expanding to cover the increased levels of activity in ORBIS. This has included increasing internal resources to complement the Qedis team and form a hybrid team through which external PMO skills and competences can be transferred into Network Rail. The PMO structure and approach appears consistent with good practice and benefits from the use of consultants to bring in external expertise while mentoring existing Network Rail personnel.

The role of the PMO is to provide control, rigour and assurance for the ORBIS Project Managers and check that the overall ORBIS Programme processes are being followed with the right documentation in place for each of the key stages. The PMO covers all aspects of ORBIS, including the ADIP and Organisation Change projects. It also reports in to the Business Change Panel within Network Rail and uses some of the 'GRIP for Change' methodology but tailored to

suit ORBIS objectives. The 'GRIP for Change' process is understood to be under review and lessons learned from the ORBIS PMO will feed into this process to enable the wider organisation to benefit from this.

Areas where the PMO itself has already identified that it needs to improve are around the tracking of benefits associated with projects and identifying critical dependencies and phasing. The biggest current challenge for the PMO is establishing consistency across the earlier projects and Breakthrough projects which have been accelerated as these still need the structure and documentation in place while maintaining the existing momentum.

6.2.3 Design Authority and ProVision

ORBIS has a dedicated Design Authority that looks at the interfaces between elements of the programme, including governance, systems and processes. The Design Authority has been involved with much of the work to date on developing the Architectures and Frameworks used for the programme definition and presented in the Vision & Roadmap.

To support this, Metastorm's ProVision tool has been introduced. This enables several views to be taken on the underlying programme structure and can map programme elements so that benefits can be linked to projects and interdependencies understood. The tool has been introduced since the Vision & Roadmap and is not currently well-resourced. A set of licences have been purchased, but the central team has little resource to support the overall development of the programme model at the moment. It is understood that ProVision is also likely to be deployed across BCAM and the wider Asset Management re-structuring programme.

The implementation of ProVision and its use in modelling the ORBIS programme is a possible solution to the questions raised around the ability of the ORBIS programme to understand the opportunities for rescheduling the programme to accelerate benefits or mitigate risks. It is therefore important for Network Rail and ORBIS to understand how it is going to maximise the value it gets from this tool and build up the required competence to populate and run the tool.

6.2.4 Benefits Realisation and Devolution

As outlined in Section 5.5.5 the outcomes delivered by ORBIS do not directly deliver benefits. Improved Asset Information in itself is not a benefit (unless it is addressing a shortfall to an external requirement), and therefore benefits realisation and tracking will be important to the demonstration of the success of ORBIS and Network Rail as a whole. Following devolution in Network Rail, ORBIS now relies upon the Route Asset Management teams to deliver the benefits identified in the Vision & Roadmap.

There is a significant amount of business change underway in Network Rail as a whole and in particular as a result of the Route devolution and Asset Management restructuring. It is therefore important that ORBIS considered the ability of the business to deliver its side of the benefits realisation and that the Route teams are approached by centrally-led business change projects in a co-ordinated manner.

This review has been limited in scope to ORBIS and is not looking at the impact of devolution as a whole. However, ORBIS needs to identify and manage the opportunities and risks posed by devolution. Good practice[13] suggests that large-scale IT projects should be regularly tested to see if they are robust to scrutiny, for example:

- Trialling solutions to understand how these will work (demonstrations; test beds; pilots)
- Iteratively trading requirements against available funds to determine the criticality of programme elements; and
- Supporting programme decisions with evidence.

This is consistent with the Critical Success Factor identified to 'win hearts and minds through early and regular delivery of benefits'.

A good example of trialling solutions is the current work on the LADS project in Track, where data is being provided for a specific section of route, to see how this would change decision-making for local Route Asset Management team.

The iterative trading of requirements and funding is effectively being carried out through the current round of benefits testing with the Route teams (see Section 5.4.2). The DRAMs will provide a high level of challenge to ORBIS, as they will be held accountable for delivering the efficiencies specified in the overall business case should ORBIS deliver the requirements. This presents both opportunities and risks for the overall benefits realisation. The following observations on these opportunities and risks were taken from discussions with a sample of DRAMs.

Opportunities:

- Routes will provide challenge to the ORBIS Programme in the initial specification of benefits;

[13] Adapted from Ministry of Defence presentation: 'What scrutineers want'

- Routes will want to identify concrete, deliverable opportunities to achieve volume or unit cost efficiencies through the improved Asset Information services, so estimated benefits will be more robust;
- Routes should hold ORBIS to account during the delivery phase; and
- Alliancing provides opportunities for longer-term information sharing between Network Rail and its TOC customers, which may improve understanding of asset interfaces (such as the wheel-rail interface) and encourage innovation in Asset Management of these interfaces.

Risks:

- Failure of ORBIS to deliver the Asset Information Specification may result in Routes 'doing their own thing', damaging the business case for the centralised function or introducing duplication and/or divergence in Asset Information;
- Disaggregation of benefits to specific Asset Information contributions at a Route-level may be not add much value, as individual small efficiency percentages would be hard to track and uncertainty around the benefits may be larger than the benefits themselves;
- Accountability for delivery of benefits could lead to 'buck-passing' in the event of failure; and
- Alliancing may present a further challenge in terms of the potential for conflicting priorities at Route-level.

Work is currently being undertaken using the ProVision tool to map project outcomes to benefits across the programme (see Section 6.2.3). This should help provide supporting evidence for programme decisions. It is important this is built into a robust change control process for the Route level Asset Information Specifications and plans.

ORR has also stated that it would expect Network Rail to share any mandated actions on the Routes (such as compulsory use of Asset Information services or contribution to Asset Information processes such as data collection) as these will provide reassurance on the content of the SBP.

6.3 Individual Plans and Processes

6.3.1 Approach

As part of the detailed investigation of some key projects within the ORBIS programme, AMCL and IBM have looked at the potential issues around deliverability and risks for some individual projects as potential examples of the challenges and risks identified above and how the ORBIS programme is addressing these. The review covered a range of systems and projects, and

details for these are given in Appendix F. Three of these projects are considered below to demonstrate how the high-level findings are reflected in specific projects.

6.3.2 Master Data Management

MDM is an important early implementation project. It was specified in the Vision & Roadmap document, and is building on the work done in ADIP to deliver the Asset Information Specification required to meet the Roadmap target. It also provides a first snapshot of data definitions and master data for a selection of asset types and information types. More details on the project are given in Appendix F.6.

The project builds on existing work on the Asset Data Dictionary (as part of ADIP). The main concern in the project is how much it will deliver by the SBP. The scope of the current MDM work has been specified to focus on Track, and to extend this to other assets and information types will require a contract extension. The timescales for delivery to meet SBP Roadmap targets are limited and this is a challenging piece of work to get right. AMCL considers that Network Rail, Asset Information, ADIP and the ORBIS MDM project all need to work closely and effectively to deliver the project to support definition of the Asset Information Specification.

6.3.3 Asset Management Platform Integration

This Asset Management Platform Integration (AMPI) project refers to the long-term goal of integrating Ellipse and ESRI so that the main Asset Management Platform has GIS capabilities which can bring in the RINM (expand) structure in future as part of Tranche 2: 'Joining things up'.

Details on the current Ellipse and ESRI platforms are given in Appendix F.2 and Appendix F.3 respectively, with more information on the specific AMPI project provided in Appendix F.7. A review of these projects has highlighted the following potential risk areas:

- The delivery of AMPI is dependent on the successful delivery of the individual Ellipse and ESRI upgrade projects, which are currently behind schedule;
- It is not clear if the versions of Ellipse and ESRI that are delivered by these upgrade projects will be appropriate for integration and what level of customisation will remain;
- The inclusion to trial the ESRI-Ellipse integrated system through a 'Conference Room' pilot to test the functionality of the system is an excellent opportunity to review the potential benefits; and

- As the MDM and AMPI projects are packaged separately it is important that the interface between the MDM system and the main Asset Management Platform is well understood and any opportunities to rationalise the systems in future is considered at programme level.

6.3.4 Mobile Enterprise Application Platform

The Mobile Enterprise Application Platform (MEAP) is the project that looks into the data management of mobile data and applications as used on the handheld devices. The current programme of deploying the handheld devices puts the capability to develop applications in the hands of frontline staff and the MEAP project provides the infrastructure to support the provision of data for use in these applications, including how data from other systems is shared and updated. More detail is provided in Appendix F.8.

The project is still at feasibility stage so there were not specific risks identified in terms of progress towards implementation. However, as for the MDM and AMPI projects, it is clear that the plans for this system need to be integrated and the data flows understood. For example, it needs to be understood how much Ellipse and ESRI support mobile applications and data as it may be easier to integrate certain types of systems and rationalise the number of systems and supporting infrastructure. An example of a system outside of the current ORBIS scope but essential for wider Network Rail Asset Information requirements is the capture and dissemination of data in FMS (see Appendix F.4). It is not currently understood where this fits into the existing ORBIS programme and how FMS (or its replacement) would be deployed on handheld devices.

An additional challenge for the MEAP is that the total cost of ownership is dependent on the level of activity. Scenarios need to be considered depending on likely take up of the applications as potentially large amounts of data could be moving around the Network Rail telecoms network or external mobile provision.

7 Technology, Systems Architecture and Integration

7.1 Overview - Scope Elements

The review scope set out in Section 1.2 included the following specific aspects to be considered for this evaluation:

- Review of the proposed system architecture and data models, flows and integration with corporate systems;
- Review of security arrangements of the IT systems and data; and
- Comparison of ORBIS with best practice including ISO 8000.

This section also considers some of the technical elements of deliverability, the process and business changes aspects of which were covered in the previous section.

7.2 Technical Review Approach

As outlined in Section 2.3, for the technical review, AMCL worked with IBM to investigate several areas, summarised in Table 6. Findings in each of these areas are considered in turn.

Area	Review Criteria
ORBIS Documentation (Technical Aspects)	▪ Completeness of documentation ▪ Currency of documentation ▪ Level of detail for programme execution ▪ Quality of documentation ▪ Traceability of documentation to IT and Business Requirements
ORBIS Future Systems Architecture Review	▪ Alignment to Strategy ▪ Level of completeness in Business, Data and Application dimensions ▪ Relationship to Enterprise Architecture / Industry Context
Technical Perspective on proposed System Changes	▪ Rationale for System Changes ▪ Evidence of 'to be' component / data model
Current Systems Suitability Review	▪ Evidence of System Review ▪ Evidence of Suitable Product Selection Analysis
Deliverability: Systems Integration Focus	▪ Completeness of IT Deliverables ▪ Completeness of Transition Programme Plan ▪ Completeness of linkage to business requirements ▪ Evidence of information governance ▪ Evidence of KPIs
Business Case Support	▪ Evidence of traceable business case and Total Cost of Ownership

Area	Review Criteria
Comparison of ORBIS with Best Practice	▪ How ORBIS costs compare to Asset-Intensive Enterprise Asset Management (EAM) Programmes ▪ Evidence of Best Practice product Selection Choices
Security (Data Integrity and Business Continuity)	▪ High-level overview of Security measures

Table 6 Technical Review Elements

7.3 Technical Aspects of ORBIS Documentation

The ORBIS documentation generally provides good insight and context around how NR needs to improve Asset Information processes. The Vision & Roadmap provides traceability to business requirements at a high-level, as outlined in Section 3.5.2.

The HLSD and Strategic Logical Reference Architectures documents have been provided which outline the next level of IT design detail, but they are not fully consistent with each other. It is also unclear as to how these documents and architectures fit into the overall delivery method. This review has not seen evidence of a fully documented method which outlines what technical deliverables are required at what point in the overall programme lifecycle. It is understood that this exists to a certain extent through the deliverables for each individual project, which have to pass through stage gate reviews.

At the time of writing this report, ORBIS was currently in the mobilisation phase for some of the larger IT projects so it was not expected that a full suite of IT design documents would be available. However, none of the documents received for the MDM project (the most advanced of the projects) were considered to have a sufficiently developed IT design to meet the levels IBM would expect at this stage of the project.

This review could not establish whether the IT design documentation needed to execute successful delivery is aligned to business requirements. A review of some specific IT design documentation as more projects complete the feasibility stage could form part of follow-up work.

7.4 Systems Architecture

7.4.1 Systems Architecture Good Practice

Systems Architecture is the modelling of the behaviours, interactions & integration of components that constitute a system. A good practice Systems Architecture should provide the following:

- Multiple views of the system;
- Support to describe and design complex systems;
- Encompass Business, Data, Application and Technical Design domain areas; and
- A description of the full end to end solution.

A clearly defined Systems Architecture is essential for complex programmes to identify big dependencies early in the programme definition and design phases.

7.4.2 Systems Architecture Development

Network Rail has illustrated its architecture development through the process shown in Figure 10.

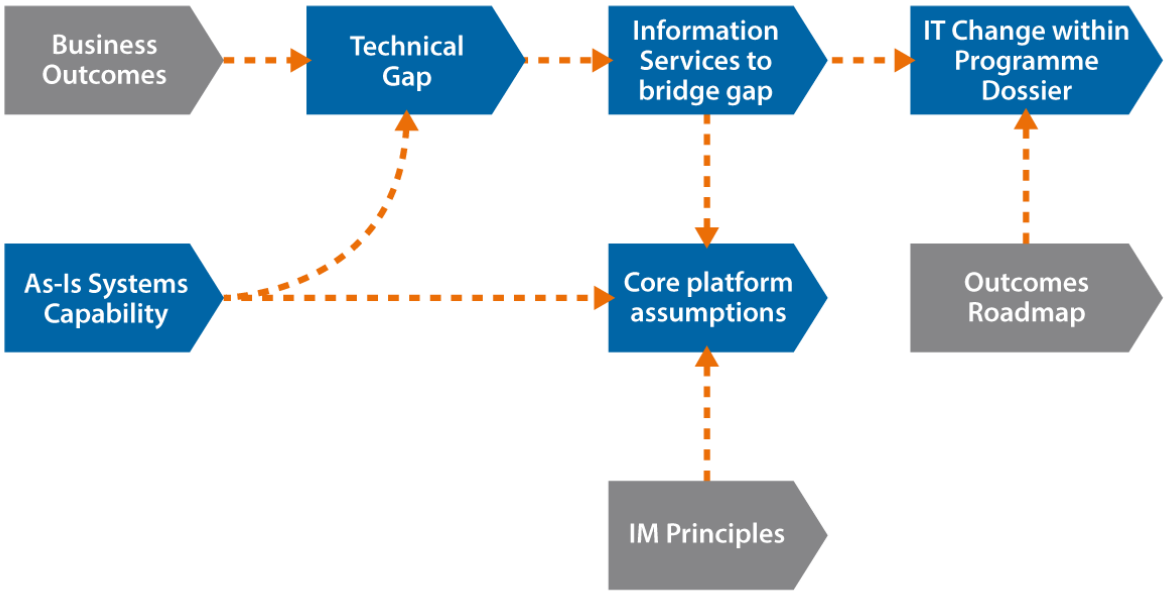


Figure 10 Systems Architecture Development Process

Identifying business needs, as-is system capability and subsequent technical gaps is a suitable approach for defining the scope of what needs to be delivered. This framework should therefore also provide the necessary traceability of functional changes back to requirements.

7.4.3 ORBIS Systems Architecture

The Vision & Roadmap presents an IT Reference Architecture in terms of two diagrams:

- Summary View of IT Building Blocks required to support ORBIS as a business change programme; and

- IT Reference Architecture (IT Building Blocks Decomposition).

Neither of these two diagrams constitutes a clear definition of the Systems Architecture as would be expected for a programme of this scale by IBM. However, supporting documentation referenced in the Vision & Roadmap and provided by Network Rail provides some evidence of Systems Architecture thinking and this is currently being developed further.

The "Asset Management High Level Solution Design.ppt" provides detail pertaining to a System Architecture which outlines the core components of the programme. The conceptual diagram providing a high-level view of the System Architecture is shown in Figure 11.

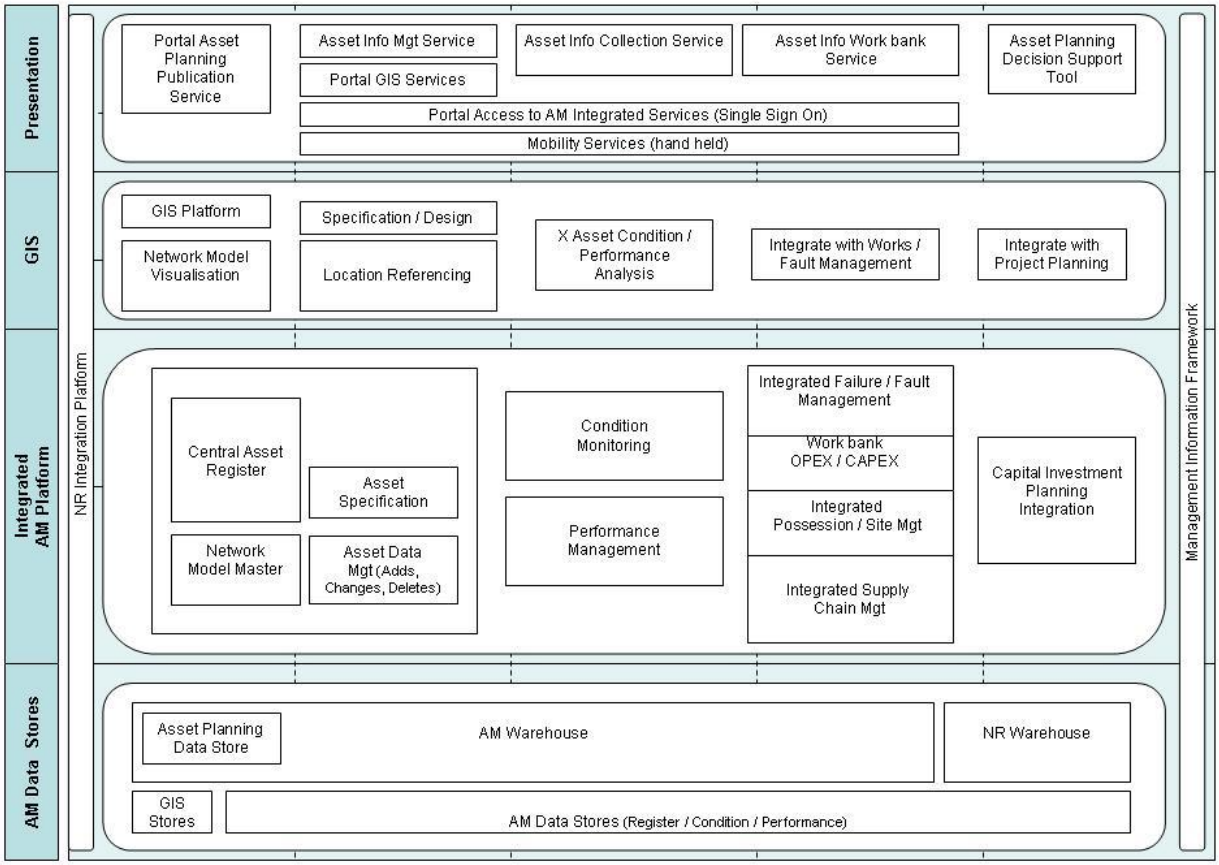


Figure 11 High Level Solution Design (reproduced from Network Rail documentation)

The Asset Management HSLD logical model provides a level of detail below that of the conceptual architecture, shown in Figure 12.

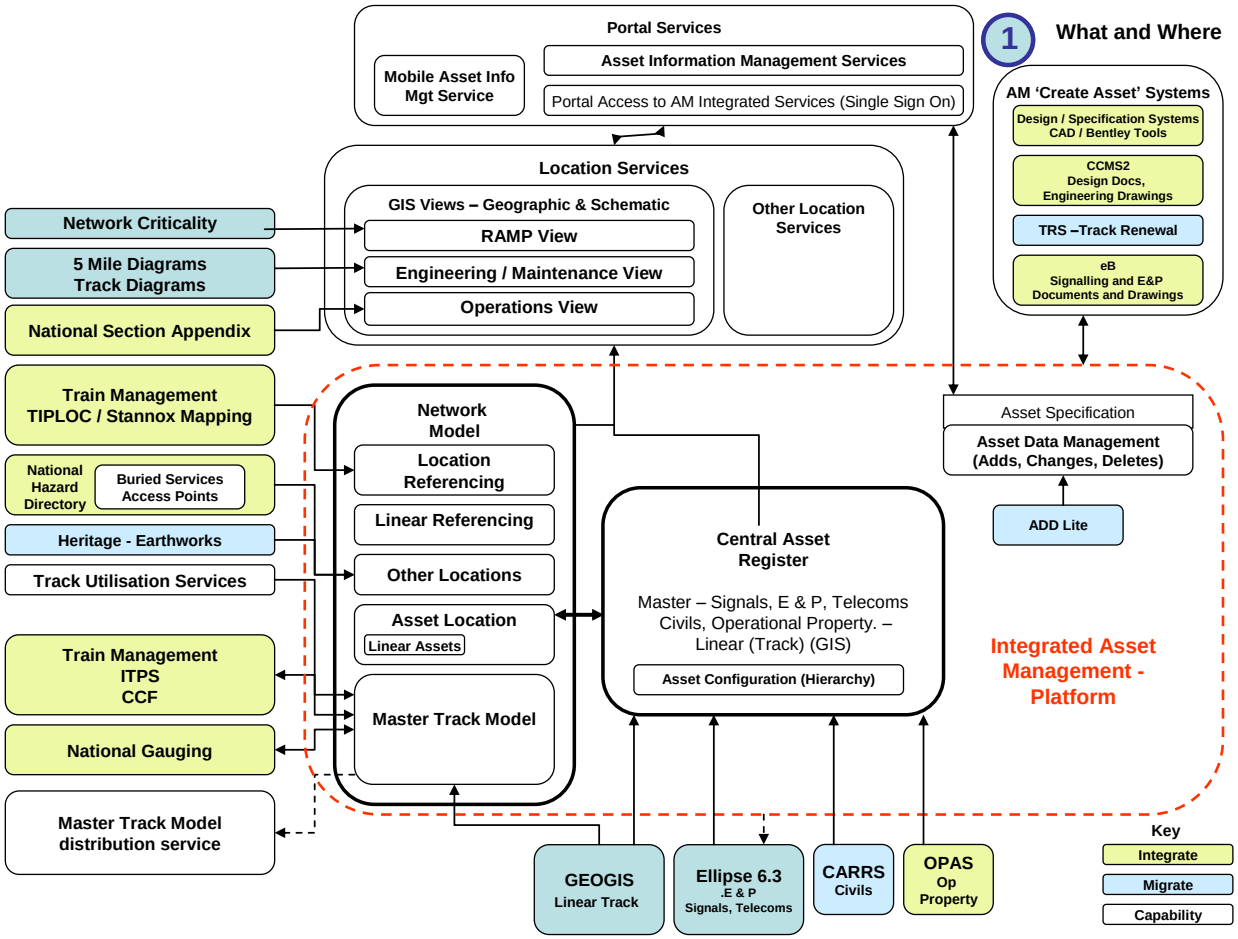


Figure 12 Logical Model (reproduced from Network Rail documentation)

Systems Architecture thinking has also been developed for specific projects as part of the detailed solution design for the project. The "PID - ORBIS WP5 - Integrated AM Platform - v0.91.doc" provides an additional view of the Integrated Asset Management Platform (IAMP) design, shown in Figure 13. Note that this is similar to the approach used in the IT Building Blocks approach in the Vision & Roadmap, but does not appear to be consistent with the HLSD approach.

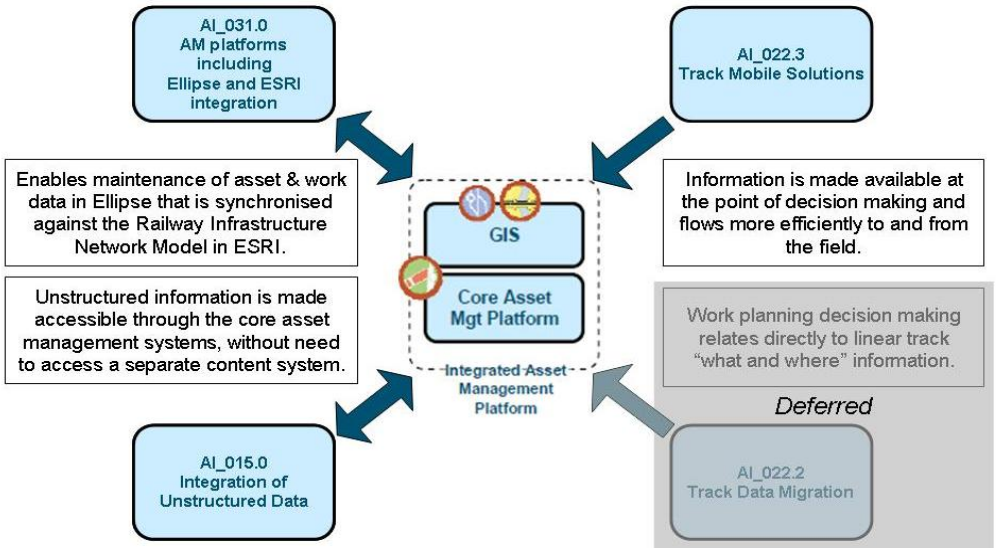


Figure 13 IAMP Architecture (Network Rail Diagram)

In summary, there are elements of a good Systems Architecture approach but this has not been consistently demonstrated in the various deliverables. The underlying architectural principles are sound and therefore need to be applied throughout the 'Solution Design' and 'Build & Test' phases to improve the deliverability of the programme.

Other specific issues observed from reviewing material around Systems Architectures are as follows:

- The role of the GIS needs to be clarified, as it has moved from outside of the IAMP to being part of the IAMP from the initial HLSD to the current IT Reference Architecture.
- The Vehicle Asset Register is presented as part of the IAMP in Section 7.2.4 of the Vision & Roadmap but was understood from interviews to be treated separately in the current architecture.
- Further clarity is required on how the architectures presented relate to a wider range of asset types and potential integration with other business systems outside of the Asset Information and / or Asset Management scope.
- The "Strategic Logical Reference Architectures.ppt" states ORBIS will deliver parts of the HLSD and may also deliver functionality outside of the HLSD, which suggests there is a potential risk of functionality being built without the full view of the requirements, which could impact on deliverability.

7.4.4 Systems Architecture Governance:

A programme as large and complex as ORBIS requires rigorous Systems Architecture Governance to ensure it remains on track. There is potential for discrepancies between different Architectures to result in functionality being added or removed without understanding the wider impact on costs and delivery plans.

Network Rail has provided documentation outlining the scope and processes for the ORBIS Design Authority. These look to be based on good industry practice and should be implemented and resourced in the early stages of the programme, before the mobilisation of the delivery projects.

Generally, it is understood that the integration of the PMO and ORBIS Design Authority is robust and the governance of these elements should not be a cause for concern. In addition, the use of the ProVision tool to manage requirements and dependencies should be integrated with the PMO and Systems Architecture approaches to reinforce the overall understanding of the dependencies from a process, systems and project management perspective.

7.4.5 Observations on Systems Architecture from Project-Specific Reviews

As well as high-level observations, this review considered specific projects and systems from a technical perspective, in terms of architecture, deliverability and risks. For the projects covered in Section 6.3 and Appendix F, some specific observations were made on the Systems Architecture within Network Rail and ORBIS and their implications.

The current Systems Architecture appears to have been developed around the chosen central Asset Management Platform of Ellipse (v6.3) and its corresponding functionality. The future nature and specification of the data to be stored by the systems should influence the longer-term choice of systems to support the capture, manipulation and storage of the data. The chosen future Systems Architecture should be based on a clear understanding of Asset Information requirements, linked to the Asset Information Specification.

It is not clear from the evidence provided which system will provide the master record for the network model after the migration of data from GEOGIS, and it was stated that this decision has yet to be made. It is considered good practice to make this level of architectural decision prior to implementing large-scale system changes, such as the ESRI and Ellipse integration and deployment of the asset data store.

Understanding the single source of the truth for each data entity will be a major challenge, which is understood to be the focus of the MDM project. Detailed information on data flows was not available beyond the high level 'IT Building Blocks' illustrations to determine exactly how data entities will be managed.

Mobile handsets have been deployed but there is no integration to key backend systems and the MEAP is in its infancy. Mobile integration is dependent upon MDM but the MDM project is not delivering any mobile integration capabilities.

MDM has been described as the glue that underpins integration of the various asset information sources and is an enabler project. The project has limited scope. The ability of this review to assess the MDM project was limited due to the MDM project's status at the time but It is something that should be considered going forward.

A FMS replacement has not been articulated and the current system is considered to have a number of issues and is need of improvement. FMS contains asset information critical to Asset Management activities within the organisation and as such AMCL and IBM believe it needs to be appropriately considered.

The ESRI upgrade to v10, the identified Ellipse upgrades and the subsequent integration work are crucial to the success of ORBIS. To support the assessment of this the review team requested references where Ellipse 6.3.3 has been successfully integrated with ESRI 10.0. At the time of writing no references have been provided.

7.5 Technical Perspective on Systems Changes

7.5.1 Proposed Policy for Existing AI Systems

A key function of the AIS is to reduce the complexity in the Asset Management systems estate. Asset Management systems were assessed based on a set of criteria developed from industry standards and outlined in "AIS_Applications_Inventory.xlsx". The approach used was Gartner's TIME methodology which identifies the following options:

- Tolerate: Keep existing system in its current state;
- Invest: Keep the existing system but improve its capabilities through investment;
- Migrate: Transfer the existing data and or functionality from the current system to an alternative system (either an existing system or a system to be developed); or
- Eliminate: Remove the system and data as these are no longer required.

The underlying principles, assessment methodology and criteria were provided by Network Rail and were found to be in line with good practice.

7.5.2 Policy Implementation

The next step was to review the implementation of the application assessment process outlined above. Based on the evidence provided the following areas highlight potential issues, in our opinion, with how the process has been implemented:

- Functionality comparison appears to have been excluded from the final outcome. It is not fully understood how the IT system selection process can exclude functionality comparison
- The selection process only considered systems Network Rail already owned and by definition excludes any other products in the marketplace. Network Rail did confirm a review of other products only applied to the core asset management platform systems and will not be used for other systems selection.
- The evidence provided doesn't show whether Network Rail considered using alternative Asset Management systems from within the estate with similar functionality, other than for the core asset management platforms as above.
- The core Asset Management system selection was driven by the requirements that Ellipse could fulfil, as defined by Network Rail. This, aligned to the functionality comparison exclusion, was considered by Network Rail to avoid the need for a full selection process.
- The scoring process has not been consistently applied which affected the outcomes in some cases. For example, FMS Central had an average score of 2.0 ("some fit") but 8 out of the 13 criteria were not scored which impacted the average calculation as it was based on 5 areas as opposed to the full 13 criteria. This was not a one-off, the spreadsheet contained many instances of incomplete assessment which could produce inconsistent results.
- The TIME assessment doesn't appear to have been consistently applied and it's not clear what relationship the scoring has to the final assessment. Some applications with low score (marked as red) have a 'Tolerate' assessment, whereas an application with a medium score (marked as yellow) has a 'Migrate' assessment.

7.6 Current Systems Suitability Review

The project and systems reviews are presented in more detail in Appendix F.

It should be noted that the current systems are unlikely to have changed greatly by the time of SBP submission. The main systems projects in the ORBIS programme are currently being

mobilised or in feasibility phases, with only MDM likely to make significant progress by SBP. ADIP will have delivered further improvements alongside MDM by SBP, but the majority of Tranche 1 projects will not deliver until the start of CP5. It is therefore important to understand the strengths and weaknesses of the current applications and systems to support the SBP process.

Summary observations on systems suitability from the individual systems and project reviews are as follows:

- Ellipse and ESRI are core to the Asset Management Strategy and are well-established systems in the Asset Management domain.
- Ellipse 6.3.3 goes out of support during the ORBIS timeline and the brief project outline provided for the 'Ellipse and ESRI upgrades' project (AI_031.1) is not clear as to what this means in terms of impacts on the other elements of the programme or the opportunity to migrate to an alternative system.
- GEOGIS is an ageing platform which is to be migrated to the RINM and whose data is understood to have some quality issues.
- FMS is listed as 'Tolerate' in ORBIS, pending a review of Fault Management in Network Rail.
- FMS has known limitations and issues and does not have a dedicated team providing 3rd line support (including the capability to develop the underlying code). The strategy for FMS is currently unclear but it appears to be a possible candidate for migration to another platform.
- Not enough evidence has been provided to fully assess Informatica as an MDM system but this is understood to be an industry standard and hence 'fit for purpose'.

7.7 Deliverability: Systems Integration Focus

ORBIS IT delivery has significant integration points and as such contains significant delivery risk for an organisation whose core business isn't complex system integration. Network Rail has appreciated this and will use various third party companies to implement many of the complex integration projects. However, ORBIS will still need an over-arching System Integrator role to govern all sub-projects to ensure they deliver to the desired architecture.

The System Integration plans, dependency matrices, RAID systems, and other supporting documentation have not been established for all projects and therefore were not available for this review. Systems Integrators appear to be introduced on a project-by-project basis (with

some degree of packaging to achieve contracting efficiencies). For example, Capgemini has been appointed as the Systems Integrator for the MDM solution.

As noted in Section 6.3, a key concern is the late delivery of external IM projects that are delivering the individual ESRI & Ellipse upgrades, along with the ease by which the Ellipse v6.3.3 to ESRI v10.0 integration can be achieved.

There is also a risk that Network Rail does not have the necessary GEOGIS skills to support the migration to the proposed replacement. The systems super user interviewed for this review is retiring and it is understood there is a limited pool of expertise remaining in Network Rail.

7.8 Comparison of ORBIS with Best Practice

7.8.1 EAM Programme Comparisons

It can be difficult and potentially misleading to directly compare Enterprise Asset Management (EAM) programmes because each project has its unique organisational context and constraints.

However, IBM provided a summary of current activity in this area in terms of its findings from discussion with a sample of client references and industry bodies. An attempt has been made to benchmark the key cost drivers for large EAM transformation programmes. Appendix E compares a selection of projects from asset intensive industries, from which some high level observations can be made.

IBM's investigations identified the following common key cost levers for large asset intensive EAM programmes:

- Complexity of change / geographic locations;
- Extent of technology customisations and integrations;
- Process change required;
- Data quality and availability;
- Timescale;
- Stakeholder commitment, dedication and effort from client;
- Change management effort;
- Users and training effort; and
- Clarity and detail of requirements, roadmap and ‘To Be’ state.

The largest comparator EAM programme in the sample investigated was for the implementation of a global work management system for a major global oil company. Commencing in 2007, this five year programme consolidated 45 legacy systems across 16 countries with approximately 1.35 million assets and 4,600 users. This was a successful project which now provides the backbone technology solution across the enterprise. The capital expenditure on this project was £120 million, roughly 40% of what is proposed to be spent on ORBIS.

A large UK utilities provider with 26,600 km of linear assets is currently scoping an EAM/ERP transformation programme. They are currently using an Ellipse platform. The company has budgeted £75 million for the project, a quarter of the budget proposed to be spent on ORBIS.

EAM is a growth market; driven by technology advancements such as mobile, analytics, geospatial mapping and data visualisation. One aspect of EAM that is coming to the fore in the UK, is the extent to which business models are being transformed by new approaches such as outsourcing ‘as-a-service’ and 'power by the hour'. The latest EAM solutions can now accommodate changing organisational / industry structures and the associated complexities involved in sustaining asset integrity amongst its multiple stakeholders (e.g. owners, operators, maintainers, contractors, regulators, etc.). For example, GS Hall, Keir, Balfour Beatty, Atkins all manage other firms’ assets within their own EAM, including complex SLAs, billings and contracts. This shift from traditional in-house maintenance to complex outsourcing and partnering means the EAM needs a robust security model that is multi-tenant, web-accessible and configurable.

It is therefore considered by IBM from its research that the size and scale of the ORBIS programme compared to those taking place in similar peers is ambitious and therefore reflects the complexity and challenge of the project. For the most complicated of the peer group projects (spanning a global business and all asset types) the cost is still significantly lower than ORBIS. IBM was not given access to individual projects within ORBIS to test the costs of these as Network Rail was not prepared to share cost data. This is considered an area that could be reviewed further for key projects within ORBIS if required.

7.8.2 ISO Comparisons

Consideration of Network Rail's compliance with relevant ISO standards such as ISO 8000 was requested as part of the scope for this project. While a full review and assessment would need to be carried out by an authorised body, AMCL and IBM have discussed the use of such standards with Network Rail.

Network Rail stated that it has considered the principles of the ISO 8000 standard for Data Quality and Management in the operating model for Asset Information and in specific ORBIS capabilities such as MDM. In particular it is claimed that the data specific aspects of ISO 8000 (e.g. data modelling, data attribute interdependency) will inform the Business Data Definitions aspect of the MDM project. The Asset Information Specification produced by the MDM project could be assessed to determine whether it meets the ISO 8000 standard.

In addition, the Asset Information Organisation is currently further developing the services that it will offer (including data management and assurance) and the processes required to deliver those services. As more details of the standard emerge it is anticipated that the Asset Information Organisation will adopt these where applicable and appropriate and consider formal ISO accreditation.

The Information Services standard, ISO 20000 (and its relationship to ITIL v3) is said to be a key consideration for the wider Information Management function within Network Rail and its relationship with Asset Information. This includes the planning of new services and the implementation of those services as a partnership between IM, Asset Information and the ORBIS programme.

For example, from an IM perspective, through “service management” all changes are controlled, tracked and represented in the configuration management database and processed through the following process:

- Management and planning;
- Configuration identification;
- Configuration control;
- Status accounting and reporting; and
- Verification and audits.

It was stated that IM recognises the necessity of managing the inventory of IT assets and changes to them in a disciplined manner to ensure the integrity and availability of these assets to support Network Rail's business vision. This follows the best practices used by the industry. Network Rail IM has tailored the ITIL v3 framework to meet the specific needs of the company. This IT framework provides a foundation and supporting structure to aid the successful planning, designing, implementation, maintenance, management and governance of IT investments and system life cycle projects. Policies, processes, procedures, artefacts, reviews, and standards associated with configuration management are inherent in the framework.

7.8.3 Use of Handhelds

Following completion of the core review, AMCL was asked to further comment on the choice of iOS devices for frontline staff in Network Rail as part of ORBIS. Through a document review of studies carried out in this area and supplementary evidence provided by Network Rail and IBM, it is clear that there is no single 'best practice' solution for all Asset Management organisations (see Appendix F.9). The rationale behind choosing the iOS devices as set out in the Vision & Roadmap is consistent with the goals of the programme, and the devices do not have any limitations that would restrict the short-term goals of the programme. However, Network Rail will need to demonstrate that it has identified appropriate decision points in the ORBIS programme for reviewing the continued suitability of these devices and integrating them further into the overall systems portfolio.

7.9 Security

The security arrangements for IT systems and data were reviewed through the documentation provided for the technical elements of the review and through the systems-specific reviews, particularly around current arrangements.

The scope of the term 'security' was specified by ORR and Network Rail to focus on disaster and business continuity recovery processes, rather than general IT security (encryption, etc.). The more general IT security issues are considered to form part of Network Rail's wider IM estate and IT policies and are therefore outside of the scope of this review.

The design phase of a system normally includes the specification of the system availability, which would include specifications for disaster recovery. Network Rail provided an example of an IM 'Business Impact Assessment', which is undertaken at the 'initiate' stage of each project. This evaluates the relative impact on business performance of system failures (such as availability, information loss, disclosure and accuracy) and is used to inform the required specification of availability at the 'define' stage in the ORBIS project methodology.

For the existing systems reviewed there was no clear documented evidence to provide a view on systems' current availability service levels and whether these met the above criteria. Similarly, while it was understood that disaster recovery tests are occasionally carried out, it was unclear how often these are conducted and whether this is built in to some kind of systems specification. Anecdotal evidence suggests GEOGIS has an annual disaster recovery test plan but it was not clear how other systems are handled.

In addition, examples were given of potential damage being done to data and systems through user error, such as changes being made to fields in databases, or data from one system being used to over-ride another. In all cases it was understood that there were sufficient recovery measures in place to mitigate this, but it does appear to be a potential risk area for the ORBIS programme which will be making substantial changes to systems, interfaces and data. Network Rail has put data management processes in place to mitigate this risk.

The choice of Apple's iOS devices for the initial implementation of handheld technology is understood to have been taken as a joint decision between ORBIS and Network Rail IM (see Appendix F.9). Security was a driving factor of this decision as the application development is understood to be robust and prevents (or at least limits) unauthorised access and viruses.

8 Organisation, People and Culture

8.1 Overview - Scope Elements

The review scope set out in Section 1.2 included the following specific aspects to be considered for this evaluation:

- Review of the competence and skill-set requirements of the 'to be' organisation.

This has been extended to a wider review of all people elements of the programme, including the impact on organisational culture.

8.2 Organisation Design

8.2.1 Background

As set out in the context section of the Vision & Roadmap, the Asset Information Organisation was created in 2010 as part of the PLO element of the Transformation Programme. It brought together approximately 200 people from systems and data teams from across the organisation into a single Asset Information team within Asset Management, although the structure, make-up and roles of individual teams were left largely unchanged. This meant a broad remit covering a range of activities including multiple points of customer interface.

The Director of Asset Information was not appointed until September 2010, so it is understood that the Asset Information teams continued their existing roles following the initial move. A review of the existing organisation and design of the future organisation was therefore seen as a high priority by the new Director of Asset Information and is reflected in the emphasis that is placed on the Asset Information Organisation Vision in both the initial AIS (March 2011) and subsequent Vision & Roadmap.

8.2.2 Vision & Roadmap - 'To be' Organisation

Chapter 3 of the Vision & Roadmap sets out the Asset Information Organisation Vision (see Section 3.5.3). This is a significant development from the original AIS (March 2011), based upon the Asset Information Vision developed for that AIS. It is based around the NCIS NIM (see Section 4.2.3) and resulted in the creation of following teams:

- Governance & Assurance;
- Business Development;
- Business Engagement;

- Data Collection Services;
- Data Management;
- Systems Management;
- Systems & Process Development; and
- Analysis & Reporting.

Descriptions of the teams and an illustration of how this works under a devolved structure is also provided, along with a list of which services were thought likely to be offered:

- Done 'To' the Routes (funded by the Centre) such as assurance, reporting and ownership of the RINM;
- Run 'For' the Routes (funded by Routes via Asset Information Industry Service Charge) such as Train-borne and helicopter borne condition and surveillance data; and
- Run 'For' the Routes (funded directly by the Routes) such as optional services and ad hoc reports.

Supporting information on the development of the proposed organisation structure was provided in the Appendices and in the Organisation Design document[14] and through discussion with the team involved in the initial Organisation Design. The process followed has been iterative and interactive and has involved many members of the Asset Information team. It has considered both the positive aspects of the existing organisation that needed to be reinforced and the negative aspects that needed to be addressed. Feedback has been captured directly through well-attended 'Town Hall' sessions, and indirectly through a website which allowed people to feedback anonymously. Network Rail stated that the relevant Trade Union recognised the level of interaction as one of the best they've seen in Network Rail organisation restructures.

It is clear that the shape and structure of the organisation has been designed to align to the overall Asset Information Vision and the customers of Asset Information (both internal and external). It has also looked at opportunities to move roles to the most appropriate team, including relocation of sites where appropriate. Anomalies in pay levels for broadly similar roles in different teams have been addressed.

In AMCL's experience through applying the AMEM, there is no single 'optimal' design for an Asset Information organisation, which is supported by the Network Rail's findings from its

[14] Network Rail: Asset Information Strategy Organisational Design Appendices v0.1 September 2011

external benchmarking to date. It is possible to deliver best practice in Asset Information maturity with no specific Asset Information function provided the strategy, capabilities, processes and competences are clearly defined and captured in the accountabilities of other areas of the organisation.

However, the approach taken in Network Rail of designing the organisation around the services provided appears robust, and has included the management and minimising of the existing multiple interfaces with each route. The proposed Organisation Design looks capable of delivering good Asset Information practice and represents a significant step forward in Network Rail's approach to defining the role of Asset Information in Network Rail.

8.2.3 Implementation of New Organisation

The Vision & Roadmap also sets out a roadmap for implementing the Asset Information Organisation Vision, in Chapter 6 (see Section 3.5.6), although this is brief and the actual Implementation Road Map diagram is considered relatively ambiguous by AMCL.

However, this was developed into a full project following the launch of the ORBIS programme and was one of the key initial projects. The project was delivered to schedule alongside the parallel move to Milton Keynes and the new organisation went live during the review (end of May 2012). As such, AMCL was not able to determine the effectiveness of the new organisation. It was understood that there were still short-term resource issues but a recovery plan was in place to fill these by September 2012. It is understood that continuity plans were put in place by Network Rail to mitigate the impacts of this move and business-as-usual Asset Information services were not affected during the transition period.

In addition, an Asset Information Services Pack has been developed to explain the new organisation and the services it offers to the Routes. This pack and the general ORBIS branding are helping to establish the current AIS and Asset Information Organisation but the success of this will only be validated with effective delivery of the outcomes, which will require development of appropriate KPIs to monitor this, reflected in appropriate service level agreements.

8.2.4 Implications of Devolution on Future Organisation Structure

The Asset Information Organisation was initially designed before devolution was announced, but the actual implementation was carried out against the backdrop of devolution. The Organisation Design was reviewed and the Business Engagement team strengthened to accommodate the increased number of interfaces with the Routes.

The implemented current Asset Information Organisation is therefore aligned to the devolved Network Rail organisation structure so further devolution and alliancing is unlikely to have a material impact on the structure of the organisation. However, the responsiveness of the organisation to adapt to changes in the levels of demand for services from the Routes will be essential to the efficient and effective delivery of these services.

Asset Information may need to relatively quickly scale-up to meet demand for popular services that are seen to drive business benefits or cut down (and/or eliminate) services that are either considered low value or more effectively delivered within the Route. There is not an immediate urgency to model or implement this as the current rules for devolution mandate the use of central Asset Information services for the first two years (i.e. to the end of CP4). However, this is something that will need to be monitored to demonstrate value for money in future Control Periods.

In terms of the existing organisation and potential future developments, AMCL has not been requested to review the size of the Asset Information Organisation as part of this review, but did discuss this with the Head of Strategic Planning. AMCL's understanding is that the proposed Asset Information organisation will be treated as efficient by Network Rail as it has been designed from the 'bottom-up' based on the specified services. Network Rail also stated that the teams within Asset Information would be developing metrics to demonstrate the levels of service delivered and hence the efficiency of their processes. The Director of Asset Information's Strategic Objectives were shared and it is expected that these will be cascaded down to individual objectives and metrics for the teams within the Asset Information Organisation and ORBIS.

However, there may be future opportunities to achieve efficiencies by combining Route-facing services with those of other central Asset Management teams. It is not clear why Asset Information services would be any different to general Asset Management services from the perspective of a Route user.

In addition, the current focus of the Asset Information Organisation is to fill current vacancies to get back to the staffing levels in place before the re-organisation and move to Milton Keynes. There is a long-term estimated resource requirement of 327 people, but the introduction of these additional staff is being carried out incrementally so the organisation size can be reviewed for its appropriateness in the devolved organisation as the new processes and services are developed. The first 'Post Implementation Review' is scheduled for September and so should inform the SBP in January 2013. This will be carried out by the heads of the Asset Information

teams as a group, so that collective shortfalls and/or overlaps can be identified, along with any opportunities to move roles within teams. This will then become a quarterly review process.

Due to the amount of Asset Information recruitment required, the recent recruitment drive in Milton Keynes has been a pilot for large scale recruitment in Network Rail. This programme recently won the 'Most Effective Recruitment and Retention' category at the HR Excellence Awards, which demonstrates industry recognition of good practice.

8.3 Competence and Skill-Set

8.3.1 Background

The Asset Information Organisation created as part of the PLO was combined from systems and data teams across the organisation. It therefore contained a mix of skill-sets depending on the originating function of the team. However, the nature of the teams meant the majority of people had a general skill-set focused on analytical, systems and data capabilities.

There was therefore recognition during Organisation Design that the 'To be' organisation would need to have stronger customer -facing skills as Asset Information restructured itself to deliver services to customers in central Asset Management teams and the Routes. At the same time, the organisation sought to reinforce its existing reputation for data processing and analysis.

8.3.2 Current Status and Future Development

Consideration of the general skill-set and specific competences required to deliver the Asset Information Vision is presented in the AIS Appendices and general statements are made in the main Vision & Roadmap document. These reflect the 'town hall' workshop sessions that were used to define the Organisation Design. Activities have been built into job descriptions, which specify tasks and skill-sets for each role.

However, a specific set of competences has yet to be defined for the Asset Information Organisation. The Human Resources Project Lead for Asset Information and ORBIS has been tasked with developing this during the 2012/13 Financial Year and it is seen as a priority. There are several 'People Initiatives' underway, and these have been built into a People Plan for Asset Information. This includes development of:

- Recruitment (see Section 8.2.4);
- Induction process for new starters;

- Competency Framework - based on the Investment Projects framework but with 'People Management' and 'Handling Information' additional competencies to be developed;
- Role Profiles (to support the existing Job Descriptions): Add clarity to what is expected of personnel in Asset Information, including opportunities and limitations of role;
- Training Needs Analysis (following development of Competence Framework) to address current gaps; and
- Talent Management and Succession Planning (for long-term development of Asset Information and wider Asset Management teams).

The above elements are being developed to provide the current and future suite of Asset Information services and the competence framework is to be designed to map to the AMEM. Then levels of competence can be observed and any gaps addressed through the Training Needs Analysis. This work was still underway at the time of the review.

8.4 ORBIS Impacts on Culture

8.4.1 Vision & Roadmap

The Director of Asset Information adopted a different approach to previous attempts to improve Asset Information by running the AIS development and ORBIS definition phases as a bid. This included justifying the proposal as an external supplier would, and also including 'sales and communication' to key stakeholders as part of this bid. Previous attempts at improving Network Rail's Asset Information hadn't valued the proposition in terms of how much it would cost and what it would deliver so it was seen as important to demonstrate this in the Vision & Roadmap.

The involvement of key stakeholders in the development of the Vision & Roadmap was apparent from the discussions held with the HAMs and other key stakeholders. From the interview sessions held with stakeholders from the core Asset Information and ORBIS teams, it is clear that the appointment of the Director of Asset Information has generated renewed enthusiasm, focus and a common sense of purpose for Asset Information improvement in Network Rail.

In addition, the wider strategic communication with external stakeholders such as ORR and Department for Transport (DfT) has also built support for the overall programme and the role of Asset Information in the industry as a whole.

8.4.2 Progress Since September 2011

Since the publication of the Vision & Roadmap and mobilisation of the ORBIS programme, the team has continued to push its message across the organisation, particularly through the Breakthrough Projects.

From stakeholder interviews it is clear that historically, centrally driven programmes (especially those relating to IT) have not succeeded due to lack of local buy-in. As outlined in Section 6.2, Route-level buy-in is essential as ORBIS itself cannot directly deliver benefits within the Routes.

ORBIS has responded to the challenges of working in the devolved organisation by further strengthening its Business Engagement and Communications teams to accelerate this engagement with the Routes. A Head of Communications was appointed in March 2012 and a Communications Strategy developed following this. This has culminated in the recent pilot workshops in the Routes to present the ORBIS programme and capture feedback.

Network Rail provided the information shown in Table 7 on feedback from the pilot sessions, which highlight particular successes and challenges for the ORBIS programme from the perspective of engaging the Routes.

5 observations – things working well
This was acknowledged as the best thing Network Rail have done for a long time – attendees observed that the new technologies present an exciting development for the railway and a great step forward for their teams
Frontline teams recognise that the technologies will help them to work smarter – early adopters are already seeing benefits to the way they work every day, e.g. saving time, saving paper, clearer communication
There is strong demand for the iphones and apps – those with iPhones are really benefitting from the GPS locator, the 'Where Am I?' app and the ability to send photos via email; those who don't have their iPhones yet are eager to know when / if they will be getting them; all are excited about the apps and other tools in development and are keen to have them as soon as possible
People see great benefit in having a comprehensive view of asset locations and layers in future
Frontline teams would like more communication and involvement going forwards – attendees were very forthcoming with feedback and ideas, and told us they appreciated the opportunity to give their opinions (their perception was that this isn't always the case). Many expressed an interest in being involved in future too, e.g. as part of user design groups

5 observations – things to be improved
Uncertainty around rollout plans – “Am I getting one? If so, when?”
More training required – for many users, iPhones are being used predominantly for calls and texts, indicating that practical training is required in order to reap the full benefits (how to access app store; how to use apps; scenarios / examples of times they could use them). iPhone literacy levels vary widely, so training needs to be tailored to different user needs
Need to understand and overcome other barriers to using the technologies – to encourage usage, we need to address concerns voiced, e.g. “great in theory but how will it work in practice?”, “how am I going to recognise my iPhone when there are 5 next to one another in the van?”, “the battery life isn’t long enough” and understand if there are any others
Need to demonstrate how the more visible elements of Breakthrough (e.g. iPhones) fit in with the wider ORBIS programme and long-term plans
Impact to roles and processes – people realise that by ‘working smarter’ (increasing automation, reducing paperwork, etc.) there are implications for roles, and there is some concern about the impact for admin staff, track inspections etc.

Table 7 Asset Information Roadshow Feedback

Capturing feedback from the Routes and the central Asset Management teams will be essential to the success of ORBIS. This is a long-term programme that needs to continuously engage the business to be successful and needs to adapt to changes in the business environment. ORBIS needs to facilitate innovation in the Routes but then make sure this is captured and disseminated across the wider Network Rail organisation.

8.5 Asset Management Re-organisation

Asset Management is being restructured around a central organisation that delivers Asset Management Services to the Routes. This programme is known as Project Olympus and started after ORBIS was developed. It is running approximately one year behind ORBIS. It is anticipated that Asset Information Services will eventually become a subset of the wider Asset Management services. While this does not directly influence the current state of ORBIS, it may potentially mean that there are future opportunities to combine Asset Information service lines with other Asset Management service lines (such as the provision of DSTs). There may also be an opportunity to combine some of support and business engagement activities to minimise the number of interfaces with the Routes.

9 Summary of Findings, Challenges and Recommendations

9.1 Findings

9.1.1 Overview

This review further validates the findings of the most recent AMEM Assessment, namely that the Vision & Roadmap represents a major step forward in terms of Network Rail's approach to Asset Information. It is considered to contain all of the elements required for a good practice AIS and provides a solid foundation on which to develop the Asset Information capability within Network Rail and the wider industry.

It also validates further that while Asset Information and ORBIS have made a lot of progress since September 2010, the initial delay in mobilising the Asset Information Directorate and developing the AIS prior to that point have left a challenging trajectory to recover to the agreed Roadmap targets by the publication of the SBP in January 2013 and the end of CP4.

In terms of the mandated themes for investigation, the following is a summary of high-level findings:

- **Capabilities**: The proposed improvements in the Vision & Roadmap present a long-term solution that AMCL considers addresses the existing shortfall between Network Rail's Asset Information capability and current best practice. A significant increase in Asset Information capability is required to deliver the CP5 policies and further evidence will be required by the SBP to demonstrate that this improvement trajectory will be met.
- **Fitness for purpose**: The majority of the current systems appear to be fit-for-purpose for delivering the current Asset Information requirements, but will need substantial development and integration to deliver the proposed future capabilities. The majority of ORBIS deliverables are planned for CP5 and CP6 and are therefore not intended to impact on the SBP or influence the data supporting in the PR13 process. ORBIS has challenging timescales to deliver a fit-for-purpose Asset Information Specification supported by fit-for-purpose Asset Information Systems and Architectures in time for policy implementation and benefits realisation during CP5.
- **Efficiency**: A strong initial business case for ORBIS is presented in the Vision & Roadmap, which is based on sound evaluation for a programme in its early definition phase. The robustness of this business case was tested through modelling a pessimistic scenario based

on an existing assessment[15] of the capability of Network Rail's Information Management (IM) team in realising project benefits. The results emphasise the importance of fully delivering the identified benefits to achieve a positive business case. A benefits realisation and tracking process is therefore required to support delivery of efficiencies by ORBIS, Asset Information and the Central and Route Asset Management Teams. This needs to be supported by clear definitions of roles and responsibilities for delivering ORBIS benefits in the devolved organisation.

- **Comparison with Best Practice**: Elements of the current Asset Information organisation and ORBIS programme are considered to be current good or best practice (including the Vision & Roadmap, Organisation Structure and Programme Design). The proposed future capability set out in the Vision & Roadmap is likely to be comparable with contemporary best practice, but this is some way off. Other individual elements of the current Asset Information approach and ORBIS programme need further development to address gaps to best practice, particularly the Asset Information Specification and detailed System Architecture. High-level benchmarking suggests the ambition of ORBIS is high, due to the scale and complexity of the changes proposed.

The findings of this review have therefore been cross-checked against Network Rail's plans for improving Asset Management Capability to determine where further specific actions or evidence are required within ORBIS to demonstrate that the agreed Roadmap targets will be delivered.

Since the publication of the Vision & Roadmap and subsequent mobilisation of the ORBIS programme, significant progress has been made in a number of key areas. ORBIS and Asset Information have also adapted well to the challenges of devolution: moving to a Route-centric operating model and engaging directly with the Routes to build their relationship and improve understanding of the benefits of Asset Information services and ORBIS.

Therefore the focus of this review has been on identifying any areas of AIS and ORBIS where:

- There appear to be gaps or misalignment to Network Rail's overall Asset Management Strategy and subsequent Asset Information Requirements; or

  Further evidence is required from Network Rail to demonstrate it has a clear understanding of the Asset Information it needs to deliver CP5 (and beyond) in a way that is cost-effective and demonstrates value for money.

[15] The Hackett Group: Network Rail 2010 G&A Benchmark - Preliminary Results, 16th September 2010

9.1.2 Asset Management System and Asset Knowledge Capability

Network Rail's overall approach to Asset Information is consistent with that set out in its Asset Management Policy as that of a key enabler in the Asset Management Framework, with the Asset Information Strategy clearly present in the Asset Management Documentation Hierarchy. However, as observed in an earlier AMCL report[16], the Asset Management Policy sets a target for being best practice in Britain by the end of CP4, whereas the majority of ORBIS improvements are delivered over CP5.

The AIS has been developed in line with the two-phase approach set out in Network Rail's AMS. The Phase 1 AIS outputs clearly referenced agreed Roadmap targets. However, the Phase 2 AIS Vision & Roadmap that defines ORBIS has yet to be shown to fully align to the Asset Management Strategy and Roadmap targets. This inconsistency means there is a risk that even with the successful delivery of ORBIS, Network Rail may not achieve the identified trajectory and targets associated with Asset Information. In particular, Network Rail's latest forecasts suggest that while some elements of good practice are currently in place, the AMCL Roadmap targets for two of the three activities in Asset Knowledge will be missed, namely 'Asset Information Systems' and 'Asset Knowledge and Data'.

There are only a limited number of projects in the ORBIS scope that are intended to deliver improvements in time to influence the PR13 evaluation, with the majority being delivered in CP5 and CP6. These include the on-going ADIP that was in place for AIS Phase 1 and some early ORBIS projects (including the deployment of handhelds and MDM).

The Asset Information Strategy has been built on existing good practice frameworks for managing information and some benchmarking and best practice sharing has been carried out during the development of the ORBIS programme and individual projects. However, this appears to have been on a case-by-case basis to date. There is therefore an opportunity to co-ordinate benchmarking activities across Asset Information, Asset Management and Network Rail as a whole to exploit the opportunities for best practice sharing with comparator organisations and demonstrate continuous improvement.

9.1.3 Asset Information Requirements and Business Case

The 'Needs and Frustrations' process for identifying asset information requirements appears robust and has captured options across all asset types that reflect likely improvement

[16] AMCL 'Review of Phase 1 AIS' (2011)

opportunities. These have been developed into business value propositions against the '7 layers of asset information' framework.

The ADIP element of the Phase 1 work has delivered improvements in the quality of the asset information available for defining and justifying Network Rail's CP5 Asset Policies. However, further evidence will be required to demonstrate that the information supporting the policies is sufficiently robust by SBP. The process for demonstrating and evaluating this has now been established through ADIP and the relevant Arup (Independent Reporter: Part A) Data Quality audits.

A clear Asset Information Specification supported by Asset Knowledge Standards does not currently exist for the information required to deliver Network Rail's CP5 Asset Policies and establishing this should be a priority for Network Rail. It is not clear that the current scope of the MDM element of ORBIS addresses this for all assets and information types within appropriate timescales.

The overall business case for ORBIS (at September 2011), including the proposed benefits for each Asset Group[17] level, appears to have been based on a sound evaluation process for a programme in an early 'definition' phase trying to secure initial funding.

The differences between the benefits estimated for each Asset Group appear to result from realistic assumptions, based on the differences between discrete and continuous assets, the predictability of degradation and the capabilities of the existing systems. The opportunity to test and challenge assumptions between Asset Groups is currently being explored further.

A breakdown of these benefits to specific Route-based initiatives and Asset Information services (and hence underlying capabilities and ORBIS projects) is under development. The business case is dependent on Routes signing up to deliver the allocated efficiencies and therefore is currently theoretical until a firm plan for benefits realisation is in place for each Route. This exercise is currently underway, however it is understood that this is a complex task and the resource is constrained. It is therefore not clear if this will be delivered in sufficient time to support the SBP.

The single option 'package' presented in the Vision & Roadmap means that only limited analysis of the robustness of the business case is possible. Investment appraisals usually present a range of alternative options that meet the requirements to provide justification for the preferred

[17] i.e. Track, Signalling, Electrical Power, etc.

course of action. Similarly, while the underlying assumptions for organisation size indicate that some activities and services can be scaled to meet demand from the Routes, it has not been shown how this could work in practice for 'low demand' or 'high demand' scenarios.

In addition, plans are still being developed for ORBIS projects and benefits realisation, so there a relatively high degree of uncertainty which is not reflected in the current business case. The base case is strongly positive and delivers a good benefit-cost ratio, even over a shorter evaluation period than that presented in the Vision & Roadmap (CP6 vs. CP7). However, sensitivity testing suggests that under a set of alternative pessimistic assumptions, the business case may not be positive until CP7. This shows the importance of implementing best practice benefits realisation and understanding how to flex the programme to accelerate these benefits where possible so the base case trajectory can be met or outperformed.

Service Level Agreements for the services provided by the Asset Information Organisation to the Routes are still in development so it is not clear what levels of coverage, quality and confidence are required to support delivery at Route level and the impacts of over / under-performance on efficiency forecasts.

9.1.4 Plans, Deliverability and Risks

The programme appears to have been well-managed since its initiation and it is important that ORBIS maintains this momentum, with appropriate governance and project management processes.

The overall ORBIS Programme has an eight-year timeframe over which significant industry change is expected, so it will need to be supported by a robust and flexible change control process that enables it to adapt and respond to this challenging business environment.

The dedicated ORBIS PMO and governance structure provide assurance that these systems of control are in place and it has been recognised internally as a step forward for planning and managing change in Network Rail which will be applied more widely across the portfolio of change projects.

Devolution presents both an opportunity and a potential challenge to Network Rail and Asset Information in particular. The challenge will be to get the Routes to create or sign up to benefits realisation plans based on better Asset Information services. As outlined above in 'Asset Information Requirements and Business Case', the potential downside risk to benefits delivery is significant and needs to be mitigated. Therefore the benefits realisation plans need to track, whether Asset Information has over / under-performed in delivering its services and whether the

Routes have successfully realised the expected benefits / efficiencies. ORR expects to see any mandated activities in the Routes reflected in the SBP.

The wider Asset Management business change programme, including the current restructuring as a service organisation may present further challenges to Asset Information, in that key roles defined for the Asset Information Organisation (such as Business Engagement and Communications) may need to be integrated with the wider team.

The interfaces between individual plans and projects for specific systems need to be better understood, particularly where there are systems that were not initially in the scope of ORBIS but are required for the delivery of the overall Asset Management capability improvement, such as FMS and Netraff.

The approach taken with the LADS project to prototype early and test benefits assumptions would appear to be good practice and should be considered for other key projects.

9.1.5 Technology, Systems Architecture and Integration

The use of existing IM resource including the Information Systems Strategy team within ORBIS demonstrates good alignment with the wider Network Rail IT strategy.

Clear principles and concepts for the Systems approach are set out in the documentation, although from reviewing specific examples it does not appear that these have always been applied consistently across the portfolio.

The Systems Architecture presented in the Vision & Roadmap is at a relatively high level and needs to be developed further to demonstrate a working, robust data model. Data flows and interfaces between specific systems are not clear in the current documentation and are required to provide assurance that the proposed systems will support these.

A detailed review of the MDM and AMPI projects identified that decisions made early in the ORBIS programme may have repercussions in terms of future systems integration and upgrades. These considerations do not currently appear to be reflected in an overall Systems Plan which includes these decision points.

Sessions with representatives from Asset Groups, systems users and ORBIS representatives highlighted system-specific considerations in terms of capability and whether these are 'fit for purpose', Ellipse and ESRI, the core systems identified for the Asset Management Platform, are well established in the Asset Management domain. Historic issues have been more about the

management of data using these systems, which is linked more to people and process rather than system functionality and this is being addressed by ADIP. However, Ellipse 6.3.3 goes out of support during the ORBIS timeline. While the 'Ellipse and ESRI upgrades' project should address this, it is not clear what the impacts of these upgrades will be on other elements of the programme, or the opportunity to migrate to another system. These are additional key decision points that need to be identified in the Systems Plan.

There were two key systems covered in the review that are bespoke to Network Rail and have either limited or no support. GEOGIS is an ageing platform which is to be migrated to the RINM and whose data is understood to have some quality issues. The strategy for FMS is unclear as despite its known limitations and lack of a dedicated team to provide 3rd line and development support, it is listed as 'Tolerate' in ORBIS pending a review of Fault Management in Network Rail. This is understood to be in part due to ownership issues which were only recently addressed through transferring ownership of FMS into Asset Information.

In terms of upcoming capability, an in-depth review of Informatica's capabilities as an MDM system was not carried out, but it is understood that this is an established system and is likely to be fit for purpose. Decisions regarding other key future systems (such as RINM) are still being made and so were not assessed.

While most asset-specific systems requirements were in the Vision & Roadmap scope, improvement plans to address shortfalls in BCAM systems were dependent on the BCAM improvement programme. These have been held up by the initial focus on process within BCAM, but are now being aligned to ORBIS. This alignment still needs to be demonstrated to show that these systems issues will be addressed.

High-level benchmarking, carried out by IBM, of the total cost and timescales for ORBIS against other EAM programmes suggests that ORBIS is ambitious and of a greater scale and complexity than its peers. The most comparable programme identified was delivered for less cost and within shorter timescales. As an initial study, this indicates there is potentially a high risk in the programme due to its size and Network Rail should explore further opportunities with this peer group to understand what lessons can be learned to mitigate these risks.

Data Governance and security & continuity arrangements are in place through Asset Information and standard IM practices. However, there have been historic occurrences of Asset Information data being lost or damaged due to user actions and sufficient measures will need to be in place to assure that this is not a future risk.

Future governance of Systems Architecture and Data Integrity will be essential, especially with the introduction of the planned MEAP and future integration of systems and data flows. The current deployment of iOS devices appears to be successful and supporting Network Rail's short-term goals. Network Rail needs to build on this to define the future role of smart devices in supporting improved Asset Management and include appropriate decision points for implementing its device strategy in its plans.

9.1.6 Organisation, People and Culture

An enthusiasm and common sense of purpose was observed across the stakeholders interviewed from the core Asset Information and ORBIS teams.

The new organisation structure has been developed and delivered in line with planned timescales, including the move to Milton Keynes. Current resource levels are behind target but it is understood this is being addressed through a recruitment plan and BAU Asset Information services have not been affected.

Engagement with the Routes has been accelerated and a Communications Strategy has been developed since the Vision & Roadmap, with pilot sessions to explain ORBIS and Asset Information to frontline staff.

The Breakthrough projects appear to be making good progress and changing working practices and this needs to be reinforced through the above Communications Strategy and capturing learning from the frontline staff.

A competence framework for Asset Information is being created and this will be used to identify competence gaps and address these through training and recruitment as required.

The Asset Information Services Pack and general ORBIS branding are helping to establish the current AIS and Asset Information Organisation but this will only be validated with delivery of the identified outcomes.

9.2 Recommendations

AMCL has already proposed the 2012 Improvement Specification for Asset Knowledge activities as part of the 2012 AMCL Roadmap Update. The following recommendations are therefore provided within this context to address specific issues identified during this review.

Asset Management System and Asset Knowledge Capability

1) The existing AIS and ORBIS documentation (including supporting justification and appendices) should be reviewed, refreshed as appropriate and demonstrably mapped to the deliverables for Asset Knowledge specified in the 2012 AMCL Roadmap Update. Any gaps against the specifications in the Roadmap need to be addressed. The following deliverables will need to be covered in the evidence provided as part of the SBP submission in January 2013, with the mapping identifying where each deliverable is covered:
    a. Asset Information Strategy;
    b. Asset Information Specification;
    c. Data Dictionary;
    d. Asset Information Plan;
    e. Data Confidence Assessment;
    f. Data Management Processes; and
    g. Asset Information Systems Plan (covering the 'Asset Systems and Architectures' requirements in the 2012 AMCL Roadmap Update').
2) The revised AIS should formally demonstrate alignment with the Asset Management Improvement Plan and explicitly reflect the deliverables in 2012 AMCL Roadmap Update by January 2013.
3) Each Asset Information deliverable supplied for the SBP should include a section on continuous improvement, aligned to the Asset Management Improvement Plan and outlining how and when the content will be reviewed for fitness-for-purpose and updated as appropriate, including any planned improvements before the end of CP4.

Asset Information Requirements and Business Case

4) The Asset Information Specification and Data Dictionary that is being supplied for the SBP in January 2013 should build on the existing Asset Information Services Pack, Asset Information Architecture and Data Dictionary. These should set out Network Rail's business requirements for Asset Information to deliver its obligations under its Network Licence for

the remainder of CP4 and to safely and effectively implement its new Asset Policies from the start of CP5.

5) The Asset Information Specification that is being supplied for the SBP in January 2013 requires an information criticality analysis, which should utilise the detailed benefits analysis work undertaken by ORBIS since September 2011. Within it the costs of obtaining data and maintaining systems should be evaluated against the improved decision-making capability and/or efficient delivery of works and the consequences of the data not being available.

6) Improvements to the Data Dictionary supplied for the SBP in January 2013 should include targets for coverage, quality and confidence, including any allowed variability in these standards by Route.

7) Benefits attributed to ORBIS but delivered by the Routes should be supported with a benefits realisation plan and tracking process that is consistent with the Route-level submissions for the SBP in January 2013.

Plans, Deliverability and Risks

8) The Asset Information Plan supplied for SBP in January 2013 should be based on the existing ORBIS Programme Plan and augmented to meet the specification in the 2012 AMCL Roadmap Update. It should provide an appropriate level of detail for a programme plan, covering how Asset Information activities will be delivered and how these will be developed. It should also include a schedule for regular updates to ORR on ORBIS progress with key milestones and deliverables identified to demonstrate delivery of the plan and highlight any risks.

9) The suite of Asset Information documents should be added to the scope of the existing change control processes in the PMO by October 2012 to enable benefits to be accelerated and mitigate risks where possible.

10) The dependencies, outcomes and benefits of the ORBIS Programme should be modelled to a suitable level of granularity using an appropriate tool. This will enable robust modelling of any change impacts. This process should be specified as part of improvements to the change control process by October 2012 and the tool should be populated by SBP in January 2013.

11) The SBP in January 2013 should be clear on any Asset Information services or activities that will be mandated on the Routes.

12) Network Rail should formalise its approach for continuous improvement within ORBIS and Asset Information over the course of the programme, including benchmarking its services

and learning from the experiences of comparator organisations to mitigate risks and drive efficiencies. These should be included as a chapter on Continuous Improvement in each of the SBP deliverables (by January 2013).

Technology, Systems Architecture and Integration

13) High-criticality Asset Information Systems should be identified by the SBP in January 2013, based on total cost of ownership and the importance of the data held within them (as defined in the Asset Information Specification).

14) High-criticality Asset Information Systems not within the ORBIS scope should be clearly identified in the Asset Information Systems Plan by SBP in January 2013, along with a RACI approach to ownership and development of the system.

15) The Asset Information Systems Plan supplied for the SBP in January 2013 should demonstrate that high-criticality Asset Information Systems either are or will be 'fit for purpose' to deliver the Asset Information Specification, particularly for systems with known issues such as GEOGIS, FMS and those in the BCAM improvement programme.

16) The Asset Information Systems Plan supplied by SBP in January 2013 should build on existing Systems Plans and Architectures to provide a better understanding of interdependencies and data flows and how these support the Asset Information Specification for CP5 and beyond.

Organisation, People and Culture

17) Roles and accountabilities for Asset Information should be clearly identified in the suite of Asset Information documents provided for SBP in January 2013, with particular emphasis on Data Management and Assurance processes in the devolved structure.

18) By March 2013 Communications and Business Engagement activities should be integrated with wider Asset Management System business change projects to reduce overloading on Route-based teams and optimise feedback from the Routes to identify improvements.

19) By March 2013 the Competence Framework should be aligned to the wider Asset Management Competence Framework and also support the roles and accountabilities for managing Asset Information.

AMCL would like to take this opportunity to thank all those who contributed to this review.

Appendix A Documentation Reviewed

A.1 ORBIS Documentation

Key ORBIS Documentation

- Asset Information Strategy Vision and Roadmap v1.0 September 2011
- Asset Information Strategy Appendices v1.0 September 2011

Other ORBIS Supporting Evidence

- Asset Information Strategy Organisational Design Appendices v0.1 September 2011
- Asset Management High Level Solution Design.ppt
- PID - ORBIS WP5 - Integrated AM Platform - v0.91.doc
- Strategic Logical Reference Architectures.ppt
- AIS_Applications_Inventory.xlsx

A.2 Other Documentation and Supporting Evidence

Network Rail

- Asset Management Policy, February 2011
- Asset Management Strategy, February 2011.

ORR

- Network Rail 2010 G&A Benchmark - Preliminary Results, 16th September 2010 (The Hackett Group)
- Network Rail's Unit Cost Framework (Letter to Network Rail, May 2011)
- Mandate AO/015: Network Rail Bottom-Up Benchmarking Programme Review, November 2011 (Arup)

AMCL

- Asset Management Improvement Roadmap ,4th May 2010
- Review of Phase 1 AIS, 15th December 2011
- AMEM Assessment IIP Update, 2nd May 2012
- AMIP to Roadmap Validation (Draft A), 16th July 2012
- Review of Asset Failure Management (Version 1.0), 6th September 2012

External

- Jim Norton (BCS - Chartered Institute for IT) 'IT change or business change?' (Presentation)
- Nicholas Gleich, (Cabinet Office - Major Projects Authority) 'What makes for Success?' (Presentation)
- Stuart Combes (Ministry of Defence) 'What scrutineers want' (Presentation)

Appendix B Stakeholder Interviews

B.1 Asset Information & ORBIS

Name	Position
Patrick Bossert	Director of Asset Information
Peter Tapp	Programme Architect & Design Authority
Steve Hobden	Programme Manager, ADIP
Rajinder Pryor	Strategic Analyst
Mike Howard	Enterprise Architect (Information)
Nick Fitch	Business Change Workstream Lead
Craig Higton	Benefits Manager (Atos)
Paul Rixon	Business Architect
Giles Tottem	Programme Manager, Tranche 1
David Blount	LADS Project Manager (Atos)
Ian Tankard	Head of AI Governance and Assurance
Mary Jordan	Interim Head of AI Analysis and Reporting
Kiran Grewal	ORBIS Programme Director
Amisha Lakhani	PMO [Qedis]
Samantha Sheldon	PMO [Qedis]
Jeremy Axe	Enterprise Architect (Technology)
Charles Wiles	Business Change Manager
Ian Hopper	MDM Project Manager
Santosh Dubey	Enterprise Architect (BCAM)
Charlotte Housden	Communications Manager
Helen Cole	Communications [Qedis]
Colleen Blyth	Strategic Analyst

B.2 Other Network Rail

B.2.1 Asset Group Sessions

Asset Group	Name	Position
Track	Sue Coverdale	Head of Asset Management [Track]
Signalling	Steve Slater	Special Projects Manager
	Rob Ireland	CP5 Signalling Programme Manager
	John Alexander	Signalling Engineering Design Manager

Asset Group	Name	Position
Electrification & Power	Richard Stainton	Professional Head - Electrical Power
	Phil Collins	Head of Asset Management [E&P]
Buildings	John Chappell	Head of Asset Management [Buildings]
Civils	Tony Wilcock	Head of Asset Management [Geotechnical]
Telecoms	Fraser Allan	Principal Technology Engineer
	Richard Lawes	Acting Head of Telecoms

B.2.2 Current Systems Users

System	Name	Position
Ellipse	Paul South	Systems & Applications Support Manager
ESRI	Chris Barber	Geospatial Data Analyst
GEOGIS	Rodney Hunt	GEOGIS Data Specialist
FMS	Duncan Riddle	Support Analyst - Application Services

B.2.3 Other

Function	Name	Position
Asset Management	Tim Kersley	Head of Asset Management Support
Asset Management	Andy Kirwan	National Route Support Engineer
Finance	Anit Chandarana	Finance Director, Asset Management
Planning & Regulation	Eliane Algaard	Head of Strategic Planning
Human Resources	Matt Duffy	HR Projects Lead
Routes	Alan Ross	Director of Route Asset Management (Scotland)
	Simon Gates	Director of Route Asset Management (Sussex)
	Stuart Kistruck	Director of Route Asset Management (Wessex)
Information Management	Simon Goodman	Head of Information Systems Strategy

B.3 External

Company	Name	Position
ORR	Richard Coates	Engineer, Asset Management
	Marius Sultan	Principal, Asset Management
Arup	Ian Hood	Associate
	Peter Whittlestone	Associate Director
Network Rail (High Speed) Ltd	Paul Hawthorne	Head of Track Engineering

Appendix C Asset Management Strategy Content

C.1 AMCL Roadmap Capability Statements

The following Capability Statements were specified in the Roadmap for the Activities in the Asset Knowledge Group:

- An Asset Information Strategy is in place that defines Network Rail's approach to the definition, collection, management, reporting and overall governance of asset information necessary to support the implementation of Network Rail's Asset Management Strategy.
- An Asset Information Specification is in place that defines the information requirements necessary to deliver the Asset Information Strategy and external stakeholder needs, and is aligned with the Business Architecture.
- Asset Knowledge Standards are in place that define the required attributes and data quality requirements for capture of Network Rail's Asset Information requirements.
- An Asset Information Plan is in place that defines the key activities and timescales necessary to deliver the Asset Information defined in the Asset Information Specification.
- Data Collection & Validation has been undertaken to establish the confidence level of different sets of Asset information based on the requirements defined in the Asset Knowledge Standards and categorised into Red, Amber and Green.
- Data management and assurance processes are in place to ensure the ongoing governance of Asset Information is undertaken in accordance with the Asset Information Specification and Asset Knowledge Standards.
- A Business Architecture is in place that links to the asset management framework, process, and decisions defined in Network Rail's Asset Management Strategy.
- A Systems Architecture is in place that will deliver the objectives and requirements defined in the Asset Information Strategy and takes accounts of emerging best practice from the ISO 8000 initiative.
- Appropriate Asset Information Systems are in place that provide the Asset Information to the Network Rail and external users in accordance with the Asset Information Plan.

C.2 Asset Management Strategy (Feb 2011)

This Section extracts content relating to Asset Information from Network Rail's Asset Management Strategy.

The Asset Management Strategy includes the following high-level statement on the requirement to improve Network Rail's Asset Information capability:

Asset information: Improving the quality, integration, accessibility, and where appropriate, extending the scope of the asset information needed to support strategic, planning and delivery processes.

The Asset Management Strategy goes on to describe Network Rail's Asset Management Capability as assessed by AMCL's Asset Management Excellence Model™ (AMEM). In the general overview of progress between the assessments carried out in 2006 and 2009, Asset Information is highlighted as being an area in which 'weaknesses persisted'.

Asset Information (along with analysis tools, competences and processes) is presented as an enabler within Network Rail's Asset Management Framework, supporting the core Asset Management activities. The Strategy goes on to recognise the historic issues with the management of asset information:

The effective management of asset information has proved a difficult area for Network Rail over many years. A major programme of work was undertaken between 2004 and 2006 which delivered improvements in our primary asset information and systems and enabled us to demonstrate compliance with a licence condition pertaining to the Asset Register (LC 24). We have not been able to sustain that rate of improvement and are now in a position where the strategy on asset information needs to be refreshed and implemented.

The Asset Management Strategy then goes on to set the context for Asset Information within the Asset Management Improvement Programme (AMIP), defining the two Phases of the Asset Information Strategy (as presented in Section 3.3).

The AMIP section of the Asset Management Strategy also specifies Asset Information as one of the priority areas for benchmarking.

Specific targets for improvement in Asset Information are also set out in the Asset Management Strategy. High-level objectives for key milestones in the planning and delivery of CP5 activities are shown in Table 8.

Workstream	IIP September 2011	SBP January 2013	CP5 Delivery Plan April 2014
Asset Information	Fit for purpose asset information by December 2010 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.

Table 8 Asset Management Strategy High Level Objectives

The corresponding AMEM targets are shown in Table 9.

Group	Ref	Activity	Mar 2009	Jun 2011	Dec 2012	Mar 2014
Asset Knowledge	4.01	Asset Knowledge Standards	61%	70%	74%	78%
	4.02	Asset Information Systems	51%	53%	60%	63%
	4.03	Asset Data & Knowledge	43%	53%	56%	61%

Table 9 Asset Knowledge Roadmap Targets (in Asset Management Strategy)

C.3 Sample Asset Knowledge Good Practice Organisations

Organisation	Best Practice Area
MTR (Hong Kong)	Integration of Asset & Financial information
Singapore Mass Rapid Transit Ltd (SMRT)	Asset Knowledge using SAP
Severn Trent Water	Operation of range of Asset Information Systems
Bentley Motors	Traceability of Assets
Gatwick Airport Ltd	Asset Knowledge
Ausgrid (Australia)	Integration of Asset Management information systems
SP Ausnet	Condition monitoring

Appendix D Asset Group Detail

D.1 General

D.1.1 Overview

This Appendix covers the output of the detailed discussions with the Heads of Asset Management (or other representative asset stakeholders) from the Asset Groups. The following assets were covered to meet the requirements specified in the mandate:

- Track;
- Signalling;
- Electrical Power;
- Civils (including Geotechnical and Structures);
- Buildings (Operational Property); and
- Telecoms.

The sessions covered the asset-specific elements of the review, with particular focus on the identification of Asset Information Requirements and the benefits estimates in the Business Case (see Section 5). The following sections outline the information presented.

D.1.2 Information Requirements

A brief summary of sources of key information required to manage the asset.

D.1.3 Policy Requirements

Further information that has been identified as important to the development of the CP5 policies and/or their delivery.

D.1.4 ORBIS

The involvement of the Asset Group in ORBIS to date and scale of benefits from expected Asset Information improvements driven by ORBIS.

D.1.5 Benchmarking and Best Practice

Any activity in asset-specific benchmarking that has supported the Asset Information Strategy, including system choices.

D.1.6 Risks and Devolution

Any risks identified by the Asset Group relating to ORBIS delivery or its impacts on the Asset Group.

D.2 Track

D.2.1 Overview

The session was held with the Head of Asset Management for Track.

Track is linear asset and has predictable degradation based on mechanical wear, so it should be possible to predict and prevent and reduce re-work. Underwritten Track benefits come mostly from reductions in work volumes in CP5 following implementation of the policy and better planning:

- Avoids early renewals;
- Avoids wrong treatment; and
- Temporal planning.

Track spend is ~£600m per year.

There is currently a lot of track data is captured across the various systems, but this is difficult to access and manipulate.

D.2.2 Information Requirements

GEOGIS (see Section F.5) has historically been the Asset Register ('What and Where') for Track. Following Lambrigg, S&C data is now stored in Ellipse (see Section F.2) and Ellipse and GEOGIS mirror certain information types.

Condition and faulting data is captured through the Rail Defect Management System (RDMS), with additional information captured through Track Geometry Recording (TGR) devices. Failures are captured through FMS (see Section F.4) with the failure impacts captured in TRUST.

Workbank information for plain line is captured in the Track Renewal System (TRS).

Utilisation data is captured through Netraff.

D.2.3 Policy Requirements

The CP5 IIP submission is reliant on better asset information to deliver the work volumes reductions sustainably. Previously (pre-2009) all work was renewal (triggered by condition). Now Asset Managers need to have sufficient information to differentiate between three levels of renewal / refurbishment:

- Complete system renewal;
- Heavy refurbishment - 50% service life extension (including ballast treatment); and
- Medium refurbishment - 20% service life extension (including strategic re-padding).

Therefore Track savings have been 'pledged' to ORBIS.

D.2.4 ORBIS

Track involvement in ORBIS to date has been significant with the Head of Track Asset Management now spending approximately 2 days per week focusing on ORBIS activities.

The main benefit of improved Asset Information is removing the 'wrong work' through better route-based prioritisation, reflected in the reduction in renewals. Improved systems remove the need for engineering judgement, with degradation broadly understood so the tools can predict and prevent, rather than reacting and responding. This also directly helps reduce the reactive budget and the Schedule 4 and Schedule 8 costs resulting from late notice possessions for reactive work.

The £150 million for CP5 is based on an exit rate of £60 million savings per year with only 50% available in year 3 and then 100% from year 4. Other quantified examples were given of issues associated with current ways of working, such as lack of root cause identification resulting in repeat failures for 33% of L2 defects. Similarly, it was stated that 35% of tamping is ineffective, with wasted shifts amounting to £22m per Control Period

In terms of successes to date, ADIP has been focusing on improvements to last 5 years of data (identifying jointed track, etc. using geometry data). This has made some improvements. The mobile application introduced through the Breakthrough projects was stated to be very popular with trackside staff. The S&C inspection application is proving useful for the 'where is it' and 'what is it' aspects of verification required as a result of Lambrigg.

The key step change will be introduction of the Linear Asset Decision Support (LADS) tool. Network Rail is committed to £1.3 million of funding for a pilot to investigate this further. This appears to be a good opportunity to test the estimated benefits as well as the tool itself.

In terms of ORBIS delivery it was stated that for Track, a modular approach is important so that elements of functionality can be built in as these become available.

The majority of the core Track Systems (GEOGIS, RDMS, TRS, etc.) have been assessed to require 'Migration' as part of the TIME assessment for ORBIS. Data will be migrated from the existing systems to new platforms.

D.2.5 Benchmarking and Best Practice

Part of Track's investigation into the possibilities for LADS tool has been to look at alternative tools in other rail infrastructure companies:

- RAMSYS;
- Erdman IRIS (as used on High Speed 1); and
- Balfour Beatty's model.

A full evaluation of appropriate systems is planned as part of the LADS project.

D.2.6 Risks and Devolution

It was stated that there has been confusion in some projects as to who is the 'owner' of the solution. For example, in the MDM project, anecdotal evidence was given of the MDM team trying to enforce a rule that Track hadn't actually specified, although further details were not given as to the extent or impact of the issue and how it was resolved. However, it was commented that these issues were generally minor and that the involvement in ORBIS of Track representatives was good. For details of the MDM project see Section F.6.

It was stated that devolution presents opportunities to improve data, with the example being given of the Anglia Route team deciding to spend 3 months sorting out its GEOGIS data as it had the authority and autonomy to do so.

D.3 Signalling

D.3.1 Overview

Two Signalling sessions were held. The first covered Asset Information in Maintenance strategy and implementation and was held with the Special Projects Manager. The second covered asset information in renewals and policy decision-making and was held with the CP5 Signalling Programme Manager and Signalling Engineering Design Manager.

Signalling assets are largely discrete, although they are grouped in terms of 'interlocking areas', the collection of assets controlled by an interlocking. As for most Asset Groups, the important decisions for Signalling relate to determining maintenance and renewal frequencies and demonstrating that these are optimal strategies for cost and risk.

D.3.2 Information Requirements

Ellipse (see Section F.2) is the master Asset Register ('what and where') for Signalling Assets. It also contains the standardised job 'norms' for works management purposes. There is also a Relay Database (not in the ORBIS systems list) which is used for tracking safety critical relays.

Condition information is collected through SICA inspections and stored in SSADS. SSADS also captures unstructured data collected during SICA inspections (such as photos and supporting reports). A lot of relevant condition data is still stored on local record cards, which needs to be integrated with central Asset Data Stores.

Fault data is managed in FMS / SINCS (see Section F.4) with performance impact data from TRUST.

D.3.3 Policy Requirements

Key decisions for the Signalling Policy are Renewal Frequency and Maintenance Frequency, determined by understanding asset populations and asset histories, including:

- Installation dates (Ellipse);
- Maintenance history (Ellipse), failure history (FMS), interventions (Various);
- Work arising and repeat failures (Ellipse / FMS).

Several aspects of the CP5 Policy require improvements to asset information, including criticality analysis of signalling assets to further implement ROSE.

The Signalling representatives had also identified that the new policies required an improved understanding of condition, as the move to targeted renewal relies on a good understanding of an individual asset's condition, rather than just sampling for a site or interlocking area and replacing when the overall sample reached a poor condition. Local record card information needs to be accessible to central planners.

For Maintenance, the quality of FMS data definitions and Ellipse job norms needs to be improved to successfully implement ROSE as the impact of maintenance activities on fault rates needs to be understood and supported by root cause analysis.

For certain types of Signalling equipment obsolescence is a driver of renewal requirements but obsolescence information isn't routinely captured. Utilisation is also a driver of some points-related assets which is also not routinely captured across the network.

D.3.4 ORBIS

It was stated that the benefits profile in the Vision & Roadmap had been developed by Signalling with support from the ORBIS team. High-level benefits for Signalling Maintenance assume 3% improvement in exit rate through ROSE, assumed to be dependent on delivery of ORBIS. Renewals activities are expected to be lower (2%).

The initial benefits put forward in the Vision & Roadmap are currently being reviewed (at the time of writing) and it is understood that the underlying assumptions have changed.

It was stated that lots of benefits can be achieved by building the Asset Information requirements into processes and standards, e.g. when inspecting an asset capture the required data via handhelds. This will then automatically transfer data that is currently stored on local record cards into data stores. Similarly, tools like SICA can be deployed on handhelds and improved to target known data for trending purposes.

There are also opportunities to improve the existing DSTs, with SICA already identified as a possible candidate for improvement, although this isn't currently in the ORBIS list of systems. It was felt that the initial ORBIS questions were around the data that is currently collected (and supporting systems) rather than what is needed to better manage assets in future. The more recent work has been about moving DSTs to the left in the programme plan, and it was stated that Signalling are keen to mock up a prototype DST as soon as possible.

ORBIS is viewed as creating the library of data to support existing processes, with Asset Information as the data owners. Improvements to these data libraries, like the digitisation of

signalling plans which can then be accessed more easily is seen as another opportunity for benefits.

D.3.5 Benchmarking and Best Practice

Signalling have been carrying out a large number of bi-lateral benchmarking studies, particularly focused on Policies and Asset Management. It was stated that several central Asset Information Systems have been observed in visits to other rail comparators including comparator systems to Ellipse (Maximo in Jernbaneverket (Norway) and SAP in DB Netze (Germany)). Prorail (Netherlands) and RFF (France) also have specific Asset Management tools, and WLCC models were discussed with SBB.

Its understanding from discussions with systems users in the comparator organisations was that:

- The systems themselves offer similar functionality to the likes of Ellipse;
- The data in the systems can be of variable quality and is more likely to limit the level and accuracy of automation available in decision making;
- Most comparators do not have a condition assessment tool that is as developed as SICA; and
- Other DSTs and WLCC are similarly in early stages of development or have met some resistance within the comparator organisations.

It was stated that that the improvements made to Ellipse data quality through previous work and ADIP have addressed many of the perceived shortfalls between Network Rail and its peers. For example, interlockings have now been added as Virtual Assets through ADIP which enables easier collection and manipulation of data for asset planning.

Internal benchmarking and best practice sharing in Maintenance delivery units has also led to an improvement in data quality outside of ADIP and ORBIS.

D.3.6 Risks and Devolution

As part of the devolution and restructuring of Asset Management, the allocation of analytical capability across Asset Information, Maintenance and Asset Management will have to reflect the best place for this to be located. There will need to be some capability in all areas but to realise benefits will require consolidating teams which are duplicating work.

It was stated that in practice introducing ROSE (and Risk-Based Maintenance in general) will actually increase some activity on critical assets on critical routes. Also, ROSE should be introduced gradually to test the impact of the new regimes on assets of different Route and Asset criticalities. Once these are understood the policies can be rolled out further.

Keeping data up to date is seen as the major challenge. ADIP focuses on getting data, not keeping it up to date. It is perceived that there could be push-back from people on the ground who don't immediately get to see the benefits of the data collection, so it was suggested that the tools that deliver the benefits need to be the same tools that are used for data collection to achieve this culture change and get ownership of Data Quality.

Concerns were raised about the current handheld and how consistently it was being used in the Routes. For example, in some Routes the operatives were said to be doing the work on paper and then getting someone else to input into the system, in another Route they were keen to use the handheld but struggled to find one with sufficient battery. However, once it had loaded they were using it proactively. In a final example, it was stated that in one delivery unit they weren't even using the systems.

It was felt that as part of devolution, HQ needs to provide quality mock-ups of DSTs working on real data to ask the question: ‘If we put these on your desk – would it be useful?’. Then the Routes can challenge this. Therefore it is hard to demonstrate that the estimated benefits are achievable until the DST is in place.

D.3.7 Additional: Level Crossings

Level Crossings are now managed separately from Signalling assets and have a separate CP5 Policy. These were not in the scope for this review but were discussed briefly with the Signalling representatives. Most data is held in the same data stores as for other Signalling assets (Ellipse, FMS, etc.). The key additional tool is the All Level Crossings Risk Model (ALCRM), which feeds back into signalling workbanks. The management of level crossing assets is still the responsibility of the Signalling RAM in the Route.

ALCRM is to be 'Tolerated' under the TIME assessment.

D.4 Electrical Power

D.4.1 Overview

The Electrical Power (EP) session was held with the Head of Asset Management for EP and the Professional Head - Electrical Power. The HAM joined Network Rail in January 2012 from UKPNS (and previously National Grid and the telecoms industry) so was not involved in development of the Vision & Roadmap and hence brings an external perspective and level of challenge to the programme and efficiencies it has promised.

EP has Traction assets and non-Traction assets, current assets are split across approximately 30 asset groups. A lot of work has been done in the Traction assets area but it was stated that there is an opportunity to further develop the models for non-traction assets and the supporting information required for policy decision-making and implementation. Signalling Power Cables were highlighted as a particular area of concern where the high-level workbank reflects a limited amount of information being available.

In addition, EP has several challenges when compared to other assets, namely that:

- External policy changes on energy generation and distribution need to be reflected in EP policy;
- Asset capability requirements are very closely linked to changes in utilisation (e.g. new rolling stock, additional trains, etc.); and
- Network Configuration needs to be carefully managed as there are a lot of dependencies between the assets, so an individual project in a particular location can have knock-on effects to power requirements elsewhere.

Configuration management (linked to 'capability and 'utilisation' data types) is seen as a key issue for EP assets, to understand what level of service can be (and is) provided and whether this meets the specified requirements. This is currently carried out through measurements at certain locations and intervals, whereas this will need to be developed to move to real-time capture at substations which can be built into SCADA. This would then be used for degradation modelling, along with other elements of configuration and usage, such as metering data provided by EDF for billing and configuration elements. An £80 million project is underway to upgrade the existing SCADA systems.

D.4.2 Information Requirements

Asset Criticality is given consideration and is based on the criticality of the asset supported. For example, signalling power supplies will be categorised based on the criticality of the signalling assets supported.

Ellipse is the main asset register for EP assets, providing 'what and where' information.

As for most other Asset Groups, FMS is the source of fault information, with performance impacts taken from TRUST.

EP has several supporting systems used to capture asset condition and utilisation (including loads and supply). It is understood that overall condition information (as used as inputs to the WLCC models) is currently stored on a spreadsheet. This is due to underlying condition information coming from a range of sources, captured through various inspection methods, with the source varying by asset type. For example, Conductor Rail condition is captured both manually and through the Conductor Rail Measurement System (CRMS), whereas HV Switchgear is captured through inspections carried out in line with Network Rail's Asset Reporting Manual Procedure NR/ARM/M13PR.

D.4.3 Policy Requirements

The Whole Life Cost Model for electrification is considered to be the main tool supporting Asset Management decision-making and is the basis of the CP5 policy.

The main improvement to asset information required to support the CP5 policy is a better understanding of condition to support the use of condition-based policies rather than age-based policies. The condition data required for each asset type has been identified and procedures will be updated so that this data is captured through routine inspections.

The CP4 volumes delivered are considered low and it is expected these will increase in CP5, which needs to be reflected in the efficiency profiles (see Section D.4.4).

In addition, the current approach is to apply the network-wide policies to create individual projects that are then combined into a Network Asset Management Plan. However, once the projects are in this plan it is harder to re-prioritise these based on the policies driving the works. It is therefore expected that this will need to evolve during CP5 to capture the drivers of the projects so that it is understood which network-wide issues are driving creation of the projects

and how policies can be reviewed to prioritise these on a risk basis. This will require capture of the information to support this understanding of risks and condition (and other) drivers.

D.4.4 ORBIS

The IIP benefits and supporting work in the Vision & Roadmap was carried out by Spencer Thompson, before Phil Collins joined. This estimated about 7% of efficiencies due to new Asset Information from ORBIS. These have been reviewed by the new HAM and it is still thought that moving from age to condition-led policies should drive 5-10% of efficiency. However, there are concerns that this may have been a double-counting from both the policy and ORBIS benefits perspectives. Also, better understanding of condition information may bring-forward some activities.

Network Rail expects the value of benefits for EP assets to vary by asset type, with some assets (such as batteries) that require regular replacement seeing little benefit from additional condition data. This is particularly the case for assets where to collect the additional condition data would require manual inspection.

The current CP5 policy and resulting plans were under review at the time of the session. This included a review of the baseline for the efficiencies presented in the CP5 plans (including any linked to delivery of better information through ORBIS). For example, applying the CP4 policy to the assets at the start of CP5 would give an initial baseline. New energy-related activity drivers add in additional costs and then application of the CP5 policy gives the benefits.

It was recognised that the ORBIS team is reviewing the high-level benefits and trying to map these to specific ORBIS deliverables.

EP expects to deliver additional benefits through sharing the CP5 plan with delivery contractors to enable better longer-term planning. This will be dependent on the policies identifying the right levels of work, and hence the supporting information identified in Section D.4.3.

There was some concern that as Track had put forward the most benefits in the initial round of development (for the Vision & Roadmap) that the focus of ORBIS had shifted too much in favour of Track, while opportunities may exist in other assets. As an example, the linear nature of the traction assets may mean that there are further benefits available if a Linear Asset Decision Support tool could be developed for electrification alongside that for Track.

Devolution is expected to drive improvements in enhancement projects from an EP perspective as the Route will take responsibility for any 'inter-asset' conflict over funding additional power supply requirements.

D.4.5 Benchmarking and Best Practice

Benchmarking has been undertaken with work practices compared to those in other organisations. EP has opportunities to discuss with other distribution organisations as well as other rail comparators. It was considered that from these discussions there could be opportunities to improve efficiency by targeting the planning and design phases. The existing interfaces between Asset Management, Engineering and Investment Projects and the current policies and standards (including sign-off and derogation) were considered to be a barrier to efficiency.

D.4.6 Risks and Devolution

The competence in Configuration Management within the central team and Routes was seen as a short-term risk due to the current team being under-resourced and the importance of configuration management in EP. It was felt that the central EP model would need to sit in this configuration team (within the central Asset Management team), but this is still under consideration.

It was stated that overall Asset Management capability maturity in the Routes needs to improve but this does not need to focus on Asset Information in particular. The role of the central team will then be to provide guidance on what comprises good practice (such as for an investment case) and then to challenge and propose changes to Route-based plans as an assurance function on behalf of the central Network Rail organisation. The central team would also monitor the overall progress of the network-wide policy application (as in Section D.4.3) to determine whether these are delivering the required levels of improvement.

It is expected that as the capability maturity in the Routes develops the central team's role will evolve to best meet the demand. However, there is a potential risk that responsibilities for key activities are not clearly defined.

Successful delivery of ORBIS and Asset Information services in general will be reflected in the commonality of the Asset Management, Engineering and Route-based reports, as any dashboards and reports should be specified to best meet the needs of all of these stakeholders.

Too much customisation in individual Routes would mean different views on what is required to best manage assets.

It was considered that Routes may be better at sharing funds between asset groups to accelerate projects that deliver the most benefit.

D.5 Civils (Geotech and Structures)

D.5.1 Overview

Civils assets were covered in two separate sessions, one with the ORBIS representative from the BCAM programme (to cover the interface) and one with the Head of Asset Management for Geotechnical Assets.

BCAM is the main improvement programme for Civils assets and addresses certain elements of Asset Information provision. The interface between BCAM and ORBIS is managed by the Director of Asset Information participating on the Steering Group for BCAM and through shared BCAM/ORBIS resource in Asset Information-specific projects. ADIP is also being applied in Civils.

The Civils function has seen a recent restructuring, with local teams moved centrally and creation of a Geotechnical Assets central role. This team is accountable for development of policy and standards. There is also a small mining team that manages risk from deep mining on rail infrastructure, including quarrying and shallow mines.

There are a range of assets covered by Civils assets and the focus of this session was on Geotechnical assets. These are normally linear assets although Drainage assets have discrete components.

Earthworks are a linear asset but are treated as a collection of discrete assets by being separated into lengths of 110 yards. They vary in height and can have quite a big height or slope length meaning that defects are harder to locate, however these are photographed and registered and determine the condition score (poor / marginal / serviceable). Historically this data has been subjective although it was stated that this was becoming more objective.

D.5.2 Information Requirements

Drainage and Earthworks system is the 065 Database (from NR standard on examination of earthworks) providing Asset Register (Inventory, 'What and Where') and condition data.

The main Asset Register for Structures is CARRS, with structures condition information stored in SCMI and tunnels through TCMI. These are supported by tactical tools.

A lot of current information is stored on local spreadsheets, which is seen as an issue for the BCAM programme (and ORBIS supporting this).

Unit Cost information for renewals works is stored in the Cost Allocation Framework (CAF).

D.5.3 Policy Requirements

As for other assets, the main building blocks to determine the CP5 policy are the asset inventory, condition information, degradation rates and historic performance (failure rates and impacts) for building forecasting models. Degradation rates are currently calculated manually using condition data from the existing systems.

Evidence and measurability are the new challenges for supporting the CP5 policy and its implementation, along with the need to make sure that this is mechanistic, systematised and automated where possible. There was also an observation that several important systems are currently hosted externally and these should be moved internally through ORBIS.

D.5.4 ORBIS

Tony was involved in the initial development of the Geotech benefits for the Vision & Roadmap. These are relatively small compared to those for other assets. The bulk of the efficiency savings are reductions in the volumes of activity in the workbank, with a small percentage coming from reductions to examinations required as data handling is improved.

It was recognised that the Routes will be responsible for delivering these efficiencies, not ORBIS itself. The benefits had been determined through a national workshop, looking at opportunities. These have informed individual Route discussions, with the ORBIS team managing this Route interface.

It was stated that the initial view on efficiencies would be likely to be conservative as this was carried out an early stage in the process and as the plans matured a better understanding of what was possible would be available.

The main benefit of ORBIS is seen to be the accessibility of information, with ORBIS providing a wider range of information 'at your fingertips', including a better picture of assets which have been remediated and the resulting performance improvements. Defects would also be better understood, in terms of the volume of defects and cost of solutions.

The existing databases do not allow for a bottom-up calculation of the workbank and multi-functional, cross-asset information (e.g. on capability requirements, tonnage utilisation, track quality, etc.) would be easier to share, especially for embankments. This would enable the

development of models that can better look at whole-life costs and determine whether maintenance interventions are effective and worth continuing.

Better information would support moving towards a risk-based examination schedule, but this would only be able to realise significant savings if several sites in nearby locations could be grouped, due to the economies of scale in going to the same patch. The existing examination regime already works off condition so benefits are expected to be smaller than for some asset types.

It was stated that Structures would experience similar relative levels of benefits and the figures in the Vision & Roadmap reflect this. However, structures have more information spread across different systems.

It was noted in the session that the cost of pulling together the CP5 plan has been significant for Network Rail, and that one of the benefits of ORBIS would be automation of elements of this process, bringing efficiency to central processes as well as Route-level delivery, perhaps as much as a 50% reduction for PR18 and the CP6 plan, although this wasn't a formal estimate. It was also stated that PR13 had made a substantial step from PR08 in terms of the level of data and analysis supporting the plans.

D.5.4.1 BCAM Programme

The benefits available through ORBIS for Civils (and Buildings) assets are also subject to the interface with the BCAM programme. This is developing a more appropriate policy for CP5 which is sufficiently prescriptive and directive without restricting too many options. It is intended to give a firm steer in this policy of what should be done to get alignment across the 10 Routes. BCAM has a higher focus on the process change required in the central team and Routes to support the changes in policy and delivery, rather than ORBIS which is limited to delivery of improved information services.

BCAM priorities include:

- CP5 policy (and hence plans);
- CSAMS – Asset data store (in BCAM programme, but ORBIS provides the system);
- Understanding of asset risk; and
- People and resources (particularly for Route teams), including the recent re-organisation re-sizing based on asset count and activity.

ORBIS provides the overall strategy and logic for Asset Information and BCAM has some special needs within this. Elements of ORBIS have direct interfaces with BCAM, such as improvements in data quality for Earthworks, Structures and Buildings through ADIP.

The BCAM elements were originally left out of ORBIS as they were considered to be part of separate scope. Buildings & Civils were focusing on the initial process change and restructuring. This has now been revisited to include Asset Information functionality gaps in ORBIS.

ADIP is viewed by Civils as being less open than other elements of ORBIS as it has specific target requirements to meet. BCAM provides support to the Master Data Management elements of ORBIS for Buildings and Civils data types.

Note that the BCAM programme is monitored separately by Arup and so does not form part of this scope. However, the above interfaces have been considered in terms of their impact on the ORBIS programme and the organisation's wider Asset Management and Asset Information capability.

D.5.5 Benchmarking and Best Practice

Benchmarking has been carried out in Buildings and Civils and has been recognised by the recent Arup review[18] as being one of the most developed streams. This has included looking at Asset Information in comparator organisations as part of the overall, end to end process, including Bentley's 'InspectTech'

Drainage and Earthworks decision support tools have been peer-reviewed with other asset groups and the Network Rail team has worked with the Highways Agency (and Mott MacDonald) to bring in external expertise and test these.

In addition, bi-lateral benchmarking work has been carried out with SNCF, where end-to-end benchmarking has been considered by taking case studies from each organisations and applying the organisation's policies and processes to see how this would be handled.

System-specific benchmarking hasn't been carried out but it was not considered that any of the comparators involved to date had systems that were ahead of Network Rail. The level of granularity available for earthworks data is understood to be greatest in Network Rail.

[18] Mandate AO/015: Network Rail Bottom-Up Benchmarking Programme Review, November 2011 (Arup)

D.5.6 Risks and Devolution

Some degree of restructuring and re-organisation had already been carried out in Civils disciplines, with Civils moving from 5 territories to 10 Routes. It was recognised that this required co-ordination from the centre, through the initiatives in the BCAM programme. To a certain extent, the existence of the BCAM programme and overlap with ORBIS provides an opportunity to align the Route-based business process improvements to the Asset Information requirements and deliver the overall programme, although this requires careful integration and management of the two programmes.

D.6 Buildings

D.6.1 Overview

The session on Buildings (Operational Property) was held with the Head of Asset Management for Buildings Assets. There are interfaces and overlaps with other assets, usually based on the assets in the station lease (with some exceptions). Track, Signalling and Telecoms assets are managed outside of the Buildings portfolio.

The main boundary issue is the power interface, with High Voltage (HV) assets managed by EP and Low Voltage (LV) managed by Buildings.

D.6.2 Information Requirements

OPAS is the main system (since 2007) and holds Asset Register, condition, risk profile, defect and fault information. It can store this information against a wide range of assets.

E&P assets are stored in Ellipse (as for E&P).

The range and quality of M&E asset data in OPAS is not considered to be as good as that for structural elements such as the building fabric.

D.6.3 Policy Requirements

Under the current policy, RAMs for Buildings are responsible and accountable for the data. These are collected by Amey during regular inspections (CEFA). Checks are made as the data enters the system through data validation by Amey, the RAM and an additional 5% of sites are surveyed further to check these.

Faults are logged in the 'Operational Property Help Desk' (OPHD) system within OPAS. The progress of close-out can then be tracked by the operator. Network Rail Maintenance provides the initial fault response team, but this is limited to fault fixing. Capturing information on defects will be improved by moving to the new system (see Section D.6.4), however this is not seen as that significant for the long-term strategic asset management for buildings as the bulk of the expenditure is in planned maintenance, repair and renewal.

OPAS feeds the WLCC models used to support policy decision-making and determine the lowest WLCC for buildings. The ICM then carries out the overall portfolio modelling applying these policies. This has been designed to be implementable by the Asset Manager

As for other Civils assets, the degradation profiles were calculated outside of the main systems as part of specific work for PR13 and the SBP. This was a 12 month project leading to the plans provided in the IIP and will be used for SBP. This is also supported by a 5 year study into degradation that is currently underway.

ADIP is tactical and supports the SBP, but is expected to have a relatively small impact, looking at data on MDUs and Lineside Buildings (<15% of portfolio). 70% of portfolio is stations, the data of which is considered by Network Rail to be of sufficient quality for the SBP.

D.6.4 ORBIS

The ORBIS scope does not cover the existing planned improvements to the OPAS system, however longer-term improvements are in scope. ADIP provides an opportunity to deliver some benefits.

The HAM was involved in the work that led to the Vision & Roadmap. The first benefits workshop was primarily based on assessing CP5 benefits due to ADIP and additional benefits were considered jointly with Civils through the more detailed follow-up workshops. These produced investment logic maps (as for the other assets). These are still at an initial outcomes level and are currently being developed. It was commented that over the course of the workshops, participants went from being sceptical of the merits of the session to being enthused by the end. However, further evaluation of the outputs was required before the impact on the overall benefits could be estimated.

The HAM was impressed by the progress to date of the Asset Information and ORBIS teams, particularly given the challenge of devolution and changing landscape along the way. It was also stated that many of the new recruits to the teams were from outside of the rail industry but had adapted to the industry well.

However, the HAM was less clear on the visibility of timelines, particularly for the longer-term deliverables and hadn't been closely working with them other than in the initial benefits workshop and follow-up.

D.6.5 OPAS Enhancement Programme

It was stated that the OPAS Enhancement Programme is separate from ORBIS and BCAM and being supported by the Asset Information team (not ORBIS), with Atrium and ATOS providing the system enhancements. The core OPAS system is considered ‘fit for purpose’ so it is being

developed in parallel to ORBIS to improve general efficiencies in business delivery rather than support the PR13 process.

Buildings has learned from the development of OPAS, which took 5 years and struggled due to the absence of a dedicated Asset Information function to manage the interface between the Asset and IM teams. The Asset teams were not able to fully specify the requirements and the IM team was not able to determine an appropriate solution. For this project, the client brief has been given to Asset Information who then acts as client's agent for the project.

D.6.6 Benchmarking and Best Practice

System-specific benchmarking has been carried out for OPAS by the 'Building Research Establishment' to reflect the challenges set out in the McNulty report. This review has said that OPAS provides good practice and that compared to the challenges in the McNulty report it was relatively robust.

In addition, further benchmarking evidence is being compiled for the SBP, looking at comparators from other countries (including New Zealand, Australia, Sweden and France) and UK industries (LUL, BAA) as part of the wider Buildings and Civils benchmarking programme (covered in Section D.5.5).

While the programme is still underway it was claimed that Network Rail appeared to be in advance of its peer group in many of these comparisons, consistent with the findings from the BRE research.

D.6.7 Risks and Devolution

Devolution has moved Asset Management resource from the centre to the Routes, which means that some of the short-term support for ORBIS is harder to mobilise. However, it was recognised that the RAMs are still involved and this has come on a long way. It was stated that generally the central buildings policy had been well received by the Routes.

Stations assets face an additional challenge to other assets as part of devolution as on some Routes these are subject to transfer to TOC control as part of the lease arrangements in the re-franchising process. This may have an impact on the future specification of data.

OPAS is understood to be well -populated with existing data and easy to disaggregate to asset points. However, the SSM KPI is understood to be sensitive to movements in scores for

individual station assets at a lower level of disaggregation so there may be changes to these KPIs at TOC/Route level as part of the franchise specification.

The underlying core data requirements are understood to stay the same and are what is required for good Asset Management, however, how much of the specification for Asset Information that could be written in to franchises in future would depend on the franchise structures in place.

D.7 Telecoms

D.7.1 Overview

The interview session was held with the Head of Asset Design and Delivery and Principal Technology Engineer who are part of Network Rail Telecoms (NRT). NRT was created in August 2011 and has been kept as a single central function as part of the devolution and restructuring of Asset Management, with a central Director. Its services and organisation structure are based on the eTOM model, a recognised process framework for Telecoms companies.

NRT provides Telecoms Service Delivery to Network Rail and will potentially expand this to the wider rail industry in future. Frontline maintenance is provided by Route S&T teams, supported by Field Teams split into four regions aligned to the Routes (Scotland & LNW; LNE & East Midlands; Anglia, Kent & Sussex; Wessex, Wales & Western). A central Telecoms Asset Management function provides both technical support (from Stoke and Doncaster) and the main Asset Management responsibilities.

The main source of Telecoms Asset Information is the Network Management System which is based on network technology and automatically captures much of the data required for Asset Management and Asset Information purposes. This is similar to newer Signalling assets which use network technology and are supported by telecoms-based communications, and EP control assets when the new SCADA systems are introduced.

D.7.2 Information Requirements

Telecoms data was initially stored in Clarify (from Thales) which was migrated to Ellipse and FMS when Telecoms was brought in-house in 2009. Other systems are also used (through leases) from firms such as Global Crossing Limited.

Other asset register systems include:

- CAMS (Cable allocation database)
- Cramer (for FTN assets)

D.7.3 Policy Requirements

In CP4 Telecoms has been using the Telecoms Decision Support Tool (DST) which uses a simplified asset base to forecast the renewals workbank. This was designed within Telecoms as

it was originally considered for development by IM but considered cheaper to deliver in-house. The tool has been used to support CP4 policy development and the CP5 policy development to date.

To improve the policies requires a better understanding of degradation and the root causes and fixes of failures. This requires improved reporting and it was recognised that the current quality of FMS data is an issue, with free text fields seen as 'hit and miss'.

It is also important to understand the accuracy of the availability figures for Telecoms assets as these are key to the overall service level provided by NRT to other parts of the business (such as communications channels for Signalling equipment).

While the Network Management System tools capture some info on the problems (e.g. duration), not everything is captured automatically, and even the second level support doesn't always carry out full root cause analysis and fix information.

Other information improvements for delivery of the CP5 policy include availability of spares, suggestions for fault fixing and local information to the technicians.

D.7.4 ORBIS

The initial benefits estimation was led largely by the Head of Asset Management for S&T as Telecoms hadn't undergone restructuring. This was focused mainly on updating Ellipse data through site surveys.

It was initially expected that ORBIS benefits would be low for several reasons:

- A high level of Asset Information available through the existing systems;
- The Telecoms asset base is small relative to the other assets; and
- Network Management tools allow inventory-style reports.

So in terms of capturing basic Asset Information, automating 'asset surveys' is seen to be the main benefit of ORBIS, to minimise the need to manually go out and capture these.

However, since the initial workshops for the Vision & Roadmap, Telecoms has been involved in the follow-up sessions and has therefore considered further opportunities from better information in both Renewals (through Fraser Allan) and Maintenance (through Nigel Beecroft). Telecoms is also part of ADIP (through Richard Cundy). One initiative under consideration is the

use of handheld technology in terms of opportunities for improvements to inputting fault data. It is estimated that this would reduce reactive maintenance costs by 10% (~£800k value).

It was also stated that there may be opportunities for learning from progress in other assets, such as through LADS for Track. It was considered that the current Telecoms DST was excel-based and reaching its limits as the asset base has increased so it is currently split across several spreadsheets. The introduction of FTN and GSM-R adds new asset types and volumes which will increase the pressures on the existing DST further.

Hence the core functionality of the existing DST needs to remain but in a more supportable place. For example, it was stated that the condition module in Ellipse could be 'turned on' and used to store condition information.

In terms of the overall approach to ORBIS since the Vision & Roadmap it was considered that the process followed was sensible and the findings of the investment logic map sessions were sound. However, it was clear as to how ORBIS was going to deliver these improvements and timescales and to what degree Telecoms was expected to take responsibility for delivering the benefits resulting from these improvements.

D.7.5 Benchmarking and Best Practice

Internal benchmarking is currently carried out in NRT but is focused more on renewals unit costs. International benchmarking has been more general with rail companies from Sweden and Switzerland as comparators. There is a Railway Telecoms Cost Benchmarking Group that looks at larger networked assets, although this is in its early stages. Telecoms Asset Information systems have not yet been covered specifically in this group. The wider implementation of telecoms solutions in Network Operations Centres has been considered, but once again less from an Asset Information perspective.

In addition there is an agreement in place with Siemens to look at how the GB railway introduces cost on 'off-the-shelf' telecoms products, through adding safety requirements. LUL has been approached to discuss the use of station telecoms assets. Once again, DSTs and other Asset Information systems have not really been considered to date in benchmarking.

D.7.6 Risks and Devolution

The role of devolution for Telecoms activities is slightly different to that for other assets as NRT remains a central organisation, with limited Asset Management activity devolved to the Routes.

Hence some Asset Information systems for Telecoms assets will be managed within NRT and the boundaries between the Asset Information team, ORBIS programmes and Telecoms own improvement initiatives have been considered. For example, the Cramer module for cable management is intended to sit with NRT, while DST and FMS data would be 'bought' from Asset Information.

Telecoms faulting data capture is based in the Routes via Network Operations and it is therefore hard to spot major telecoms failures due to the redundancy in the system. The initial failure doesn't cause an operational impact (and hence is not picked up by Operations staff but the redundancy has been lost so further failures will have a more pronounced impact. Hence improvements to this operational understanding will be important to minimise Telecoms failures.

It was stated that Telecoms staff are in general more technologically aware due to the nature of the assets and the technologies used to monitor and repair them. However, local S&T maintenance still need to use the handhelds to capture faults and root causes.

Another consideration for Telecoms is the additional bandwidth needed to support all of the Asset Information communications requirements. Currently ORBIS will request this from IM, IM will build the profile and NRT will support this profile. While from an external perspective this could just be seen as an internal money-go-round, this is still a potential risk to programme delivery which assumes that the infrastructure will be in place to support the information flows.

There is also an internal debate between IM and NRT over wi-fi access points, as Telecoms has brought in LAN/WAN assets from IM. It is currently defined as Telecoms assets up to the router, and IM assets from the router, but this boundary is still being decided between IM and Telecoms.

Appendix E Large-Scale System Change in Asset & Infrastructure Organisations

E.1 Peer Group Comparison

The following table summarises a number of programme comparators considered. All programmes are understood to cover the full transformation programme including systems, data and business change. However, as IBM was not given full access to the underlying detailed project information for these programmes or ORBIS it has not been able to determine which elements of each programme are most directly comparable.

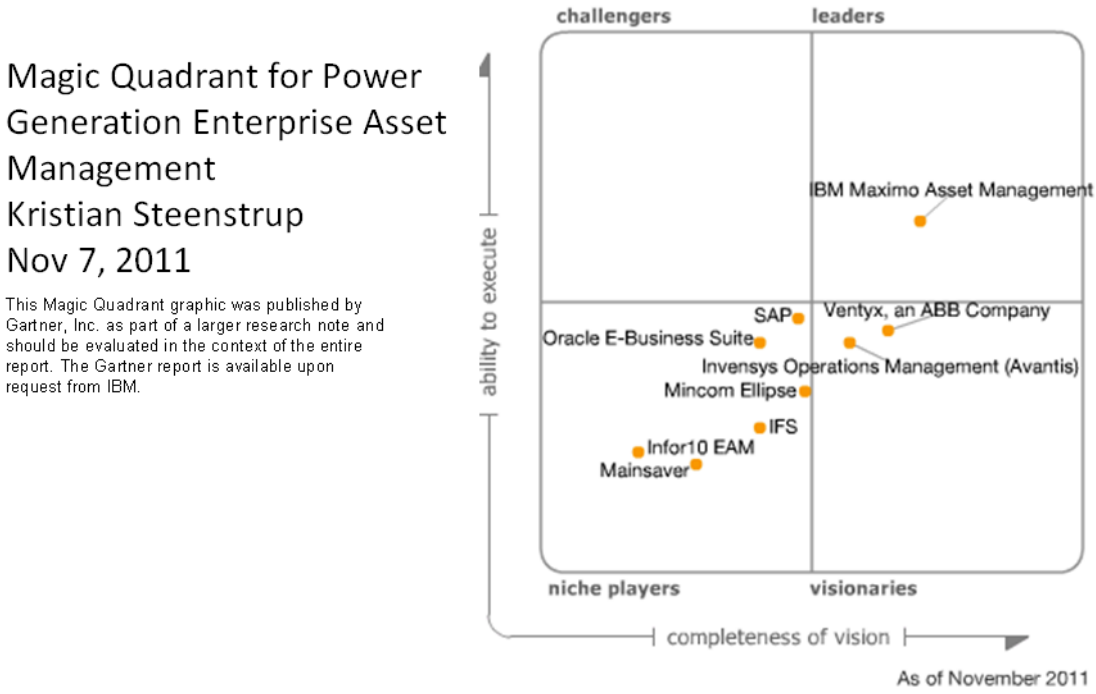
Company	Description	Duration	Approx Cost	Scope/Magnitude
Network Rail (FAMS)	Transportation Rolling-Stock and Road Fleet	9 months	£3M	1,200 rail vehicles 100 users
Australasian National Rail Company	EAM implementation for National rail infrastructure and rolling-stock	10 months	£5M	4,000km track 1,650 bridges 4,250 wagons 175 locomotives
Nordic National Rail Company	EAM implementation for National Rail infrastructure	18 months	£5M	All infrastructure assets
European Oil & Gas (new develop phases)	EAM implementation, and integration	10 months	£10M	1,500 users 320K assets/locations 22 sites
Major European Oil and Gas (upstream)	EAM implementation, and integration	12 months	£20M	2,200 users 450K assets/locations 11 sites
UK Water Company	EAM transformation, extending SAP and Integration to ESRI ArcGIS, CRM and BI	2 years	£55M	100 treatment works
UK National Power Provider	Upgrade from Ellipse to SAP platform		£75M	26,600km linear asset 181 power stations
Major Global Oil Company (Exploration & Production)	Global standard EAM implementation	5 years	£120M	4,600 users, 1.35M assets/location 45 legacy instances 16 major sites
Network Rail (ORBIS)	Large-scale EAM transformation. Implementing, integrating and rationalising numerous systems	8 years	£300M	40,000 civil assets 20,000km linear asset

Industry analysts do not segment transport as a sub-sector of the EAM market. However, rail does encompass common features with other regulated asset intensive industries so some broad comparison can be made (i.e. fleet management, health & safety and linear assets). The following figures provide alternative views on the leading EAM providers.

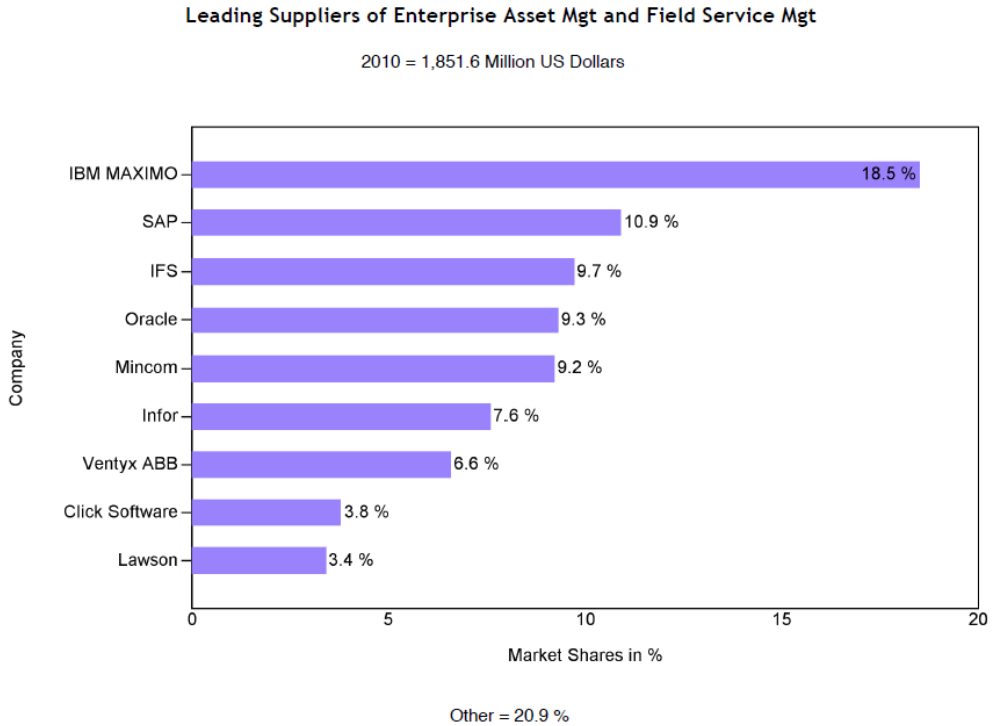
Pos'	Supplier	2010	Share (%)	Growth (%)
1	IBM	199.1	12.9	15.0
2	SAP	129.2	8.4	11.0
3	Oracle	104.3	6.7	11.0
4	ABB Ltd.	68.2	4.4	4.4
5	Infor	60.0	3.9	-13.1
6	Mincom Ltd	49.0	3.2	2.4
7	IFS	27.7	1.8	14.6
8	Lawson Software	27.3	1.8	-16.6
9	Brooks Automation	25.0	1.6	3.9
10	Invensys	20.5	1.3	57.7

Source: IDC Manufacturing Insights, 2011

A mix of traditional IT service providers and specialist firms are providing a wide range of EAM services to asset-intensive industries today, but SAP and IBM Maximo implementations dominate the landscape.



Source: Gartner.2011



Source: ARC Advisory Group,2011

EAM in Rail Findings

The following provides an indication of product-selection choices made by metro/rail companies based on evidence we have been able to find in the public domain:

Product	Representative Companies
SAP	Canadian National, BNSF, Union Pacific, DB, Italian Railways, Banedanmark
Mincom	Westnet Rail, Finnish Rail, Network Rail, Metronet (TfL), Railcorp
Maximo	DB, SNCF, Renfe, Russian Railways, Amtrak, Jernbaneverkert, Dutch Rail, KiwiRail, Taiwan HSR, Network Rail, Tubelines (TfL), Nexus, Connex, WMATA, MMTA

Appendix F Systems and Project-Specific Detail

F.1 Asset Information Services - Key Systems

The following key systems are identified in the Asset Information Systems & Technology Matrix in the Asset Information Services Pack:

- Ellipse;
- Ellipse Handhelds (Symbol);
- iPad & iPhones;
- Rail Defect Management System (RDMS);
- Fault Management System (FMS Local & Central);
- GEOGIS;
- Operational Property Asset System (OPAS);
- Civils Asset Register (CARRS);
- Civils Tactical Solutions:
  - Hidden Critical Elements;
  - Compliance Management System; and
  - Scour Database.
- Rail Stress Register;
- Critical Rail Temperature Register;
- Calibration Register;
- Sidewear Register;
- Weak Embankments Register;
- Netraff;
- Hazard Directory;
- Possession Works Management (Possman);
- SSOWPS;
- Track Geometry Reporting (TGR);
- Rail Vehicle Asset Register;
- Asbestos Risk Management System (ARMS);
- Route Asset Management Plans (RAMPS); and
- System and Projects Reviews.

F.2 Ellipse

F.2.1 Current Position

Ellipse is the central asset register and work scheduling tool for Maintenance and is now the master data source for several assets (see Appendix D). Ellipse forms one of the core asset management platform systems going forward as outlined in high level documents.

NR assessed the Ellipse functionality against the business requirements and it has been stated that Ellipse v6.3.3 will meet the majority of the functional requirements. It was stated by NR that the requirements were derived from known Ellipse v6.3.3 functionality; therefore there should be no gaps.

F.2.2 Proposed Changes

Currently NR run Ellipse 5.x which heavily customised is out of support. A project external to ORBIS is currently upgrading Ellipse to v6.3.3 which a supported version that is nearest to v5. It has been stated that most of the v5 customisations will be removed in the v6.3.3 delivery. Customisation percentage figure prior to and post upgrade was requested but NR couldn't provide any useful number to assess the customisation impact.

This project is late which could impact on ORBIS timelines.

ORBIS is dependent upon Ellipse v6.3.3 being in place, which will enable the ESRI integration project.

There is currently unused functionality within Ellipse which may address some of the other Asset Information requirements and aid rationalisation of systems. For example, London Underground is understood to use some of the additional modules and it would be worth Network Rail using its benchmarking and best practice connections with LUL to test the appropriateness of these for Network Rail. An evaluation of this functionality has yet to be carried out but is understood to be under consideration for the AMPI project.

F.2.3 Deliverability and Risks

Ellipse v6.3.3 vendor support ends Q4 2012 with AMT Sybex support continuing until 2014. The ORBIS upgrade strategy for Ellipse is covered in the 'AI_031.1 'Ellipse and ESRI upgrades', however it is not clear from this brief project outline what the impact is on other elements of the

programme or whether this could be used as a decision point to migrate to an alternative system.

Ellipse v8.0 is a fundamental change to how application is designed, it will no longer be CICS based and as such any upgrade may have significant risk. No documentation that has been provided outlines how ORBIS will handle this scenario.

Harmonising the various data models of the systems that will be migrated to that of Ellipse will pose a quite a challenge and needs to started as soon as possible.

Ellipse 6.3.3 integration to ESRI v10.0 may prove to be difficult. References where this has been accomplished before were not available during the main review but Network Rail has since stated that Western Power in Brisbane (Australia) has been provided as a reference by AMT Sybex. Network Rail is following this up as part of the AMPI project.

F.2.4 Security and Business Continuity

Ellipse is a standard product which is supported internally within Network Rail by 1st and 2nd line support teams (in Asset Information), Application Services (in IM, for more complex configuration changes) and AMT (externally). This arrangement provides sufficient internal stability, security and resilience. A 'Sandpit' tool allows for solutions to be tested in a live but safe environment before this is rolled out to the full system.

It is understood that the contract for the existing level of support runs out in September 2014.

F.2.5 Summary

The existing Ellipse v6.3.3 upgrade should be assessed in more detail as it carries significant risk for the entire ORBIS programme if it delivery continues to slip. In addition the level of remaining customisation should also be fully documented and available for review as this has a direct knock on to future upgrade complexity and costs.

According to the Ellipse product roadmap provided to this review by NR, Ellipse 6.3.x will run out of support during the ORBIS timeline (Q4 2014) and no further upgrade has been outlined.

F.3 ESRI

F.3.1 Current System

ESRI ArcGIS software is utilised by a number of teams within Asset Information as a Geographical Information Systems application to support the use and analysis of geospatial data. The Geospatial Model Stabilisation (GMS) project involves the updating of the existing Corporate Network Model (CNM), and the provision of data to form the Railway Infrastructure Network Model (RINM). The team to support this process is the Geospatial Network Team which has been newly created in the Asset Information organisation.

GEOGIS is a mainframe register for rail infrastructure assets (see Section F.5). The Infrastructure Database (IDB) contains the network link-node model. The network model is represented at both route (ELR – measure line) and track (track centre line) level. This data set is currently managed using a bespoke application called the IDB Toolset developed by Omnicom Engineering. This application is used to provide an up-to-date track map and associated set of route files for operating the Real Time Positioning System (RTPS) on the Track Recording Vehicles (TRVs). ESRI ArcGIS is used to provide quality assurance of network related datasets.

Network Rail currently uses ESRI 9.1, which is approximately 8 years old. The system is not integrated to the other core asset management systems. This version of ArcGIS has been customised by ESRI to include tools that provide functionality for linear referencing. It is used to cross-check other datasets and is used to maintain the CNM Spatial Data Enterprise (SDE).

F.3.2 Proposed Changes

ESRI software will form the core of the Geographical Information System in the Asset Management Platform and will be used for:

- Quality Assurance of Geospatial Data;
- Data Maintenance ;
- Geospatial Analysis;
- Network Analysis;
- Schematic Generation;
- Map Production; and
- Reporting.

ORBIS supports the existing GMS work to update the network model and to develop a BAU process for its maintenance in the future. In addition, an Information Management (IM) project (external to ORBIS) is delivering an upgrade to the existing ESRI system to version 10.0. The project is understood to be late and delivery is now being estimated as October 2012.

ESRI is a widely used GIS tool in the asset management domain so there are no concerns with this system.

F.3.3 Deliverability and Risks

The current delay to the existing upgrade has implications for the deliverability of future upgrades. This is an example of the dependency of ORBIS on external schemes, which still affect Asset Information capability while not being under the direct control of the Asset Information Director.

The planned ESRI 10.0 & Ellipse 6.3.3 integration may introduce many issues as IBM was unaware of this particular combination having been implemented at any organisation as large as Network Rail. Vendors for both systems may be able to provide documentation or reassurance that this integration is feasible and this has been considered in the recommendations.

F.3.4 Security and Business Continuity

The current ESRI instance is not business critical so the main data security issues relate to keeping IDB, CNM and GEOGIS aligned. IDB is considered the master.

As ESRI becomes the default GIS system this will need to be considered further.

F.3.5 Summary

ESRI is a standard package and there are no specific concerns about its use as the main GIS for Network Rail. However, the current instance is out of date and may potentially raise issues around integration with Ellipse. Therefore, as for Ellipse, the existing ESRI upgrade carries significant risk for the entire ORBIS programme if it delivery continues to slip.

F.4 FMS

F.4.1 Current Position

The Fault Management System (FMS) implementation at Network Rail consists of two different applications: FMS Central and FMS Local.

FMS Central was designed by Logica to replace the SINCS mainframe incident investigation system. Logica no longer supports FMS Central and Network Rail owns the application intellectual property rights. However, no updates have been produced for a few years. The original Logica FMS development and support team was brought into Network Rail but many of its members have subsequently left, so Network Rail does not have a dedicated team providing 3rd line support and development for the application.

FMS Central and FMS Local operate in a 'hub and spoke' configuration where central data is synched with each local partner via a batch-type process. Asset Register Data is taken into FMS Central from Ellipse and failure data is output to the Performance Strategy System (PSS). This is illustrated in Figure 14.

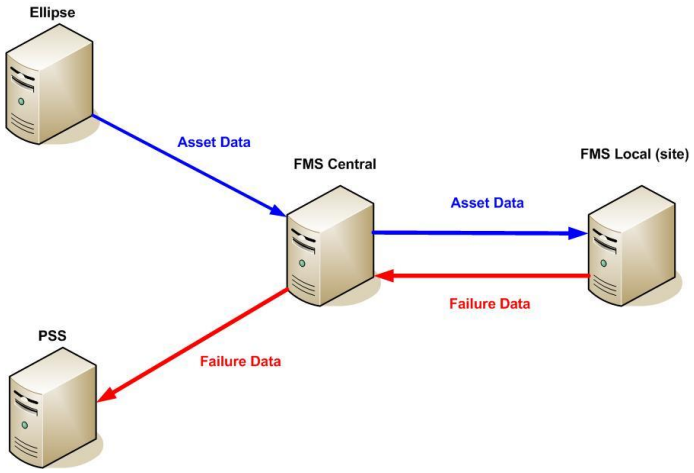


Figure 14 FMS Hub and Spoke Illustration

FMs Local was developed to replace the FRAME mainframe system which handled rail infrastructure faults. It was originally based on Signalling assets only but has been expanded to take in fault management for most asset types. There are nine standalone instances of FMS Local which were aligned to the nine Infrastructure Maintenance Companies (IMCs) under Railtrack's ownership of the network. Each FMS Local instance only interfaces with FMS

Central, with none of the FMS systems having an interface to each other. Each instance is identical in terms of application structure, but only the local assets and supporting information are duplicated from FMS Central. FMS Local is owned and supported by a company called RailTech Solution (RTS) and is based in SQL Server 2000.

The Local-Central set-up is expensive to maintain as each instance of FMS local requires three servers. It is also not aligned to the new Route structure as it is based on the historic IMC.

If an incident occurs, the FMS Local User will manually enter the TRUST incident number and delay minutes into fields on the FMS Local failure record. As this is a manual process, the delay value held on FMS Local cannot be relied on to be accurate, and there is the possibility of having incorrectly keyed values input. This means that any delay values on FMS Local are indicative only. PSS, on the other hand, takes feeds from both FMS and TRUST and links the two data sets together, and hence is the most reliable source of delay/failure information (rather than FMS)..

F.4.2 Proposed Changes

The last major changes in FMS Central were understood to have taken place in 2008 for Maintenance Phase 2a to address geography and process changes.. There have been a number of minor enhancements and bug-fixes to FMS Local in the last 5 years. The Failure Modes underwent a rationalisation after Phase 2a, and have been adjusted and expanded on an as-required basis.

FMS no longer fits with current business process and has been the subject of a more detailed review by AMCL[19] It is likely the system will need to be changed or replaced as part of these improvements, but ORBIS currently has FMS as a 'Tolerate' option pending the wider business review of Fault Management.

FMS will need to develop to support automatic generation of fault information from Intelligent Infrastructure and the 'RCM Flight Engineer'-type role that is starting to be introduced in some Routes. Following the interview carried out during the review, Network Rail has followed up with the suppliers of FMS Local (RTS Solutions). They indicated that there is a "plug-in" that would allow automatic generation from Intelligent Infrastructure into FMS Local. However, this has not been investigated or demonstrated.

[19] Review of Asset Failure Management (Version 1.0), September 2012

F.4.3 Deliverability and Risks

FMS was originally outside of the ORBIS programme but the data it provides is likely to be critical to Network Rail's understanding of some of its non-Track assets. The issues raised around the system's potential for integration, development and support suggest an alternative is required and this could potentially be a high risk system in delivering the overall improvements to Asset Information capability.

However, it was stated that FMS itself is not considered very complex or complicated, so it should be straightforward to integrate the philosophy behind FMS and Fault Management processes into an overall systems solution. The environment in which FMS is used may drive the requirement for a bespoke solution, although this has yet to be evaluated by the ORBIS programme.

F.4.4 Security and Business Continuity

Problems can be caused by the data server going down. There is little resilience particularly in the Local instances, although these were being considered for migration to CSC data centres at the time of the interview and it is understood that this has since taken place. The web server can be more easily re-routed to access the underlying data server. Transactional and full back-ups are carried out at regular intervals, and data can be captured manually while the system is not available. It was not clear if the business kept logs or assessments of outage frequency and impacts.

The automatic updating from Ellipse to FMS Central was raised as a greater concern as the asset change and housekeeping processes in FMS have the potential for data to be lost if sufficient governance checks aren't carried out on the proposed changes. An example was given where the ADIP team simplified the number of equipment group IDs for Points Operating Equipment, which led to new FMS records being created for assets that lacked a useful attribute. These then needed to be updated again to add this attribute back into FMS. While this did not result in any data being lost, it shows the importance of the systems governance to managing asset information.

F.4.5 Summary

The current 'wait and see' approach for FMS presents a high risk as this is potentially one of the main sources of information for non-Track fault data and hence one of the key systems influencing the choice of Asset Data Stores. Therefore ORBIS needs to consider what system

will provide fault management functionality going forward if FMS isn't going to be used in the medium term. This should be determined as soon as possible and reflected in the overall architecture.

F.5 GEOGIS

F.5.1 Current Position

GEOGIS is the primary track network model (in terms of ELR and Track IDs) and asset register for track assets. GEOGIS was custom built for British Rail and is based on a mainframe system and supported by ATOS. The system itself is understood to reliably provide the functionality as initially specified for the system.

Data quality is an issue as over the years track data has not been kept fully up to date for various reasons (see Section D.2), particularly prior to 2004. Considerable improvements have been made since 2004 with clearer definition of responsibilities, and more recently the introduction of a centralised team. Changes to GEOGIS are captured from a variety of sources, which range from more automated analysis of standard jobs to manual scans of the 'Weekly Operating Notices'' to spot any changes to track. There are considered to be opportunities to improve this further to minimise the amount of manual assurance required

GEOGIS is the master for Plain Line Track and Adjustment Switches. It also contains S&C but Ellipse has recently become the master source for this asset type.

Some bridge and station data is held in the background of GEOGIS but it is not visible as a data record to any user other than an administrator. The records are retained in GEOGIS so that when viewing track data in Track Diagrams a view of some geographical reference points are visible to help the user. This data set is checked on an ad-hoc basis only as the records for these assets are mastered in CARRS and OPAS respectively.

.S&C data is mastered in Ellipse following the Grayrigg recommendation. These changes are mirrored in GEOGIS for Network Modelling purposes.

It was stated the GEOGIS & Ellipse maintain data on the same asset (not certain what percentage that is of overall data) with changes having to be manually applied to both system which is timely and could introduces more data quality issues.

Track Diagrams is an application that provides visual representation of the track estate based on GEOGIS data. It is the only application external to GEOGIS that has read/write access to GEOGIS data. Users can update GEOGIS data in real-time via Track Diagrams. Users have to request access from IM and it is only granted to those with a responsibility for updating data who have obtained the required level of competency.

F.5.2 Proposed Changes

The functionality of GEOGIS has been broadly the same since its introduction and is understood to be robust. However, the system has been classed as 'Migrate' and is seen as a burning platform due to its age and inherent data quality issues and the desire to move towards an integrated RINM.

F.5.3 Deliverability and Risks

The main contact provided by Network Rail for this review for GEOGIS (Rodney Hunt) had over 30 years' experience with the system and is retiring in summer 2012. It is understood that there is a central team with GEOGIS experience that should mitigate the loss of this knowledge. However, retaining corporate knowledge of legacy systems is a potential challenge which could pose a risk to the migration project.

Even though GEOGIS is very old it has been stated that it's very reliable and highly responsive which is understandable based on its mainframe core.

F.5.4 Security and Business Continuity

Atos support GEOGIS and the system is seen as reliable with no unplanned outages. The maintenance window is night / weekends and its immediate criticality to the business is relatively low. Regular full back-ups of data are taken, so in the event of a data loss this would be easily recoverable with only recent entries to update.

The Network Rail representative suggested anecdotally that there are occasionally minor glitches but that these are based more on the integration of the system with overall Network Rail IT infrastructure than any fundamental flaws in the GEOGIS system itself.

F.5.5 Summary

While the GEOGIS system itself appears fit for its current purposes, the introduction of the RINM (based on ESRI) and its integration with Ellipse present an opportunity to migrate GEOGIS across to a more modern, supported system. However, there is a lot of learning that has gone into the existing system and its use in the business, and ORBIS needs to be careful that this knowledge is carried through as part of the planned migration.

F.6 Master Data Management - Live Project

F.6.1 Current Position

Network Rail does not currently have a Master Data Management (MDM) system. Data mastering is currently managed on an asset-by-asset basis (and also by information type), with systems identified as the 'master ' system. This project was considered as part of the review as it is an example of Network Rail introducing a new system to address a perceived shortfall in Asset Information capability, namely the specification and management of master data and its configuration in Network Rail.

The current Asset Knowledge standards are held in the Asset Data Dictionary developed through ADIP, which does not directly interface with the asset registers and other asset data sources themselves.

In the absence of an MDM system, data is currently pulled together from a variety of sources and lots of post-processing is required to correct data and address quality issues, not all of which is then fed back into systems. In addition, many data from different systems does not align due to the differences in references and configurations used by different systems. This is what the project is setting out to address.

MDM is seen as a key enabler of ORBIS and is a critical project required to support the production of an overall Asset Information Specification, as it develops the list of information types required to be captured over the life of an asset to support lifecycle tools and policy development.

F.6.2 Proposed Changes

At the time of writing the MDM project was live and Informatica had been selected as the chosen MDM tool. ADIP was creating the Asset Data Dictionary, with Capgemini providing the Systems Integrator role for Informatica.

The MDM project delivers:

- Business Data Definitions for Track (and eventually other assets), similar to the current Asset Data Dictionary;
- Master Record (for agreed most essential data within wider suite); and
- Supporting software solution.

The initial focus of the project is on Track (for all data types) and then Phase 2 will include Signalling data. The project is being considered for acceleration so that the MDM specification will be in place for all assets and information types by SBP.

F.6.3 Deliverability and Risks

It is understood that as for most core data the existing systems provide most of the required functionality and ADIP has addressed many data quality issues, the majority of data definitions are likely to be similar to the current systems (say ~90%).

The main concern is that the scope of the current MDM work has been specified to focus on Track, and to extend this to other assets and information types will require a contract extension. The timescales for delivery to meet SBP roadmap targets are limited and this is a challenging piece of work to get right. Network Rail, Asset Information, ADIP and the ORBIS MDM project all need to work closely to deliver the project to support definition of the Asset Information Specification.

The positioning of MDM within the overall Systems Architecture needs to be considered further. It was stated that the MDM end state architecture will have MDM interfacing with various core asset management systems. It is therefore essential that this functionality is taken into consideration in the Ellipse & ESRI integration project.

The link between MDM and FMS also needs to be considered further as it is not clear that FMS is in the long-term Systems Architecture for ORBIS whereas this will be an essential source of fault information during asset lifecycles.

F.6.4 Security and Business Continuity

This was not covered in this review as Informatica was not in place. The successful implementation of Informatica will address the issues seen with current systems where data is not being properly mastered and one system can overwrite another.

F.6.5 Summary

The MDM project is a foundation for ORBIS which needs to build on the existing work done in ADIP and policy development to enable delivery of an initial Asset Information Specification in time for the SBP that can then be improved to position Network Rail to start capturing appropriate data against this by the start of CP5. The solution needs to be fully integrated with the other solutions proposed for the core Asset Management Platforms.

F.7 Asset Management Platform Integration (AMPI) - Ellipse & ESRI Integration - Feasibility

F.7.1 Current Position

This project covers two streams from in the original Vision & Roadmap for feasibility:

- AM Platforms including Ellipse and ESRI Integration (AI_031.0); and
- Integration of unstructured data sources with core asset systems (AI_015.0).

It brings together two of the core systems identified in the Asset Information Strategy - Ellipse (see Section F.2) and ESRI (see Section F.3).

F.7.2 Proposed Changes

The aim is to bring together information in the two key systems to visualise assets and information for planning and delivery purposes. The programme is currently at the beginning of feasibility and is being taken through to solution design.

The aim is to build around the existing packages. It was stated by Network Rail that the Ellipse-ESRI interface is now standard and that they have had AMT-Sybex (Ellipse) and ESRI to demonstrate that this is achievable. However, IBM have been unable to find examples to support that this has taken place elsewhere, whereas interfaces between ESRI and Asset Management Platforms are more widely known.

The AMPI will take the layout from GEOGIS as this is the current formal definition of the network, which in turn takes its definitions from IDB. The RINM will then become the core network model underpinning the Ellipse-ESRI data with the 'gold copy' of the RINM in ESRI.

The AMPI will need to interface with the Asset Data Stores project to capture data from other sources (such as condition monitoring equipment), i.e. big data that doesn't need to be regularly accessed through Ellipse.

F.7.3 Deliverability and Risks

The proposed functionality will be tested through 'Conference Room' pilots, an established approach for trialling systems solutions. A sample of users is taken and a configured package set up so that the data can be trialled and process / data / system issues can be captured and fed back into the programme.

The ORBIS project takes as its starting point existing upgrades to ESRI and Ellipse which are currently behind schedule. This has potential implications for the delivery of this project if these are delayed further. There are also potential risks that the level of customisation on the existing / upgraded versions of ESRI/Ellipse will influence the ease with which the two systems can be integrated.

Note that devolution could potentially introduce further issues for access to data stores if Routes are in competition with each other and need different levels of access. The creation and uploading of data should be specified in the Route Devolution Handbook or Asset Information Service Level agreements but visibility of other Routes data may put further challenges on the underlying system.

F.7.4 Security and Business Continuity

It is assumed that this will form part of the standard systems integration process.

F.7.5 Summary

This project is in early feasibility so assessment of this project has been limited. As it is a core ORBIS project it should be closely monitored. Key things to note are:

- The Ellipse-ESRI integration is non-standard, especially with the versions of Ellipse and ESRI that are currently planned;
- Existing customisations may also influence the compatibility;
- The 'Conference Room Pilot' is an important step in identifying the right solution and may also provide an opportunity to test likely benefits;
- It is critical to understand the interfaces and data flows with other systems in the architecture as these develop, especially the RINM and MDM tools; and
- It will also be important to think what additional functionality may be required to support a fully devolved Route structure with limited cross-network visibility in the Routes.

F.8 Mobile Enterprise Application Platform - Feasibility

F.8.1 Current Position

The current mobile application services are delivered by O2, with data interfacing done through Oracle Service Oriented Architecture (SOA), which gives access to other systems. This project is focused on the Mobile data services rather than the technology used to access them (such as handhelds, which are a Breakthrough project). The handling of mobile data is seen as an opportunity to improve the way Network Rail collects and shares its information for use on mobile devices.

F.8.2 Proposed Changes

The MEAP will be a system to support the sharing of data across frontline staff to enable more improved delivery of frontline services. It needs to support the design and delivery of applications that can 'mash up' data to facilitate local process improvement while maintaining the integrity of the data that gets fed back into the main Asset Information systems.

The system therefore needs to be as open as possible to allow for creation of these application ideas, with Software Development Kits (SDKs) that provide the opportunity for frontline staff to submit ideas that can be industrialised and shared across Network Rail.

F.8.3 Deliverability and Risks

The project is still at feasibility stage so there were not specific risks identified in terms of progress towards implementation. However, it is clear that the plans for this system need to be integrated with those for the other Asset Management Platforms so that the data flows are understood. It will also depend on which systems are planning to build mobile capability into future upgrades as this could provide an opportunity for rationalisation. For bespoke applications data may need to be made available through an SOA.

An additional challenge for the MEAP is that the total cost of ownership is dependent on the level of activity. Scenarios need to be considered depending on likely take up of the applications as potentially large amounts of data could be moving around the Network Rail telecoms network or external mobile provision.

F.8.4 Security and Business Continuity

The system needs to be developed so it can support the likely level of activity and balance the need to provide data across the organisation while maintaining data integrity. Sufficient consideration needs to be given to how critical data is backed up to mobile devices in the event of a loss of service, and how this is transmitted back to the central stores when service is resumed.

F.8.5 Summary

The MEAP provides an exciting opportunity for Network Rail to promote innovation in the use of asset information across the business, by the users themselves. However, it will require an appropriate level of systems governance and assurance being in place.

F.9 Handheld Devices

This section was added after the core review had been completed, following a request from ORR for more information on the use of iOS devices in Network Rail and its peers. This section was compiled based on further information provided by Network Rail and IBM as a result of this request.

F.9.1 Current Position

Network Rail is currently introducing a range of iOS-enabled smart devices for its frontline staff as part of the 'Breakthrough' projects. These are not currently directly interfaced with 'back office' systems but are being rolled out to increase frontline user familiarity with smart devices and prepare for deployment of Network Rail applications from the MEAP. Network Rail also has a range of existing non-iOS handheld devices that have been introduced over a number of years to automate various aspects of field data collection and equipment testing.

F.9.2 Proposed Changes

The initial deployment of handheld devices has been through the 'Breakthrough' project as part of the 'Capturing Hearts and Minds' element of ORBIS. There are plans to further integrate the handheld devices with the 'back office' systems as the capabilities develop, through the MEAP.

F.9.3 Deliverability and Risks

The choice of iPhones and iPads for this initiative was based on criteria set out in the Vision & Roadmap. The use of handheld devices in Asset Management organisations is the subject of debate in several organisations and from evidence provided by Network Rail there is no 'one size fits all' solution. Examples were given of BT, who had deployed commercial mobile devices for their OpenReach staff, and BP, who had chosen a bespoke solution due to the nature of their operational environment. Network Rail held discussions with both of these organisations to learn from their experiences and help shape its own strategy.

In addition, information was provided by Network Rail taken from a Gartner study[20] that evaluated the role of iOS devices in the enterprise. IBM was also able to provide a 'Point of View' on the use of iOS devices over dedicated handheld equipment.

Key findings from the Gartner study for the enterprise were:

[20] Gartner: "Vendor Focus for Apple" (March 2012)

- Review your business requirements and risks to determine if you are exerting too little or too much control over Apple devices; and
- Understand where Apple products can provide value and ensure those users have proper access.

Observations on pros and cons of iOS versus alternative solutions are summarised from the IBM 'Point of View' in Table 10.

Pros	Cons
▪ iOS provides the full range of application functionality required; ▪ Usability and cost effectiveness of iOS is generally better than Windows mobile and traditional PDA peers; ▪ Mobile EAM applications are available that are generally well received; ▪ Applications are simple and intuitive; ▪ Users treat devices with care as it carries personal value; and ▪ Trend towards 'Bring Your Own Device' in enterprises suggests that future significant hardware cost savings may be available (providing sufficient security measures are in place).	▪ Device architecture is closed and proprietary to Apple, so integration with other hardware devices such as RFID is difficult; ▪ Can get 'locked in' to device specific applications and it is considered better to utilise browser-based applications where possible; ▪ Delivery of data or other content often has to use Apple's proprietary iTunes / iCloud services; ▪ iOS is designed for 'always on' environment, not for storing large quantities of data when a network connection is not available; ▪ Not fully ruggedised (to the extent that dedicated products would be); and ▪ Limited access to Microsoft Office products, although some apps provide this.

Table 10 Summary of Key Pros and Cons on iOS Devices

In summary, for general use in the enterprise iOS devices provide sufficient functionality and an ease of use that makes them a cost-effective alternative to traditional, dedicated devices. However, for certain niche applications requiring long periods of disconnection or use in hostile / hazardous environments, dedicated devices are preferred.

As this is a changing marketplace and other devices including those based on Windows mobile and Google's Android are also making developments in this area, it is important that Network Rail's plans for its systems include plans for integrating and deploying smart devices to support the delivery of Asset Management activities.

F.9.4 Security and Business Continuity

The choice of iOS devices was based on a joint decision between the ORBIS team and Network Rail IM to choose a device that had a level of intrinsic security, through Apple's product controls on applications.

F.9.5 Summary

The choice of iOS devices and deployment to date is consistent with the approach taken in other enterprises and provides a cost-effective alternative to traditional handheld devices. Network Rail needs to review and develop its plans for integrating the current handhelds with its back office systems to demonstrate that the short-term solution in place is consistent with its longer-term aspirations for using handheld devices to improve the way Asset Management activities are delivered.