

# NATIONAL HIGHWAYS & OFFICE OF RAIL AND ROAD

Asset Management Capability & Efficiency  
Review - Final Report

Version: Version 1.0

Date: 20th February 2023



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# Document Control

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## APPROVAL

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## AMENDMENT HISTORY

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| Draft A   | 19 <sup>th</sup> Dec 2022 | All      | First Issue for factual accuracy check |
| Draft B   | 27 <sup>th</sup> Jan 2023 | All      | Second issue for material comments     |
| Version 1 | 20 <sup>th</sup> Feb 2023 | All      | First issue                            |

# Executive Summary

National Highways is responsible for managing the Strategic Road Network (SRN), including developing a draft Strategic Business Plan (SBP), in response to the requirements set out in the Government’s draft Road Investment Strategy (RIS), every 5 years. The Office of Rail and Road (ORR) is responsible for leading the RIS efficiency review, an assessment of the level of efficiency that National Highways proposes to achieve in the SBP.

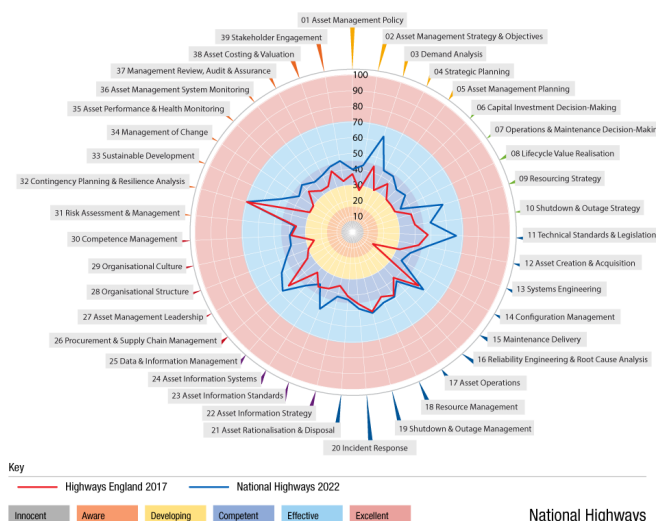
To inform this activity for Road Period 3 (RP3 – April 2025 to March 2030), National Highways and the ORR jointly commissioned ‘RIS3 Capability Reviews’ focused on two key business areas: Asset Management and Procurement & Project Management. AMCL (Asset Management Consulting Limited) was commissioned jointly by National Highways and ORR to undertake the Asset Management Capability review. This document details the scope and findings of that review.

The specific objectives of the Asset Management Capability review were defined by National Highways and the ORR to:

- provide an assessment of National Highways’ current Asset Management capability and maturity mid-way through RP2;
- document National Highways’ improvement plans and assess the Company’s ability to make improvements to its Asset Management capability during the remainder of RP2 and during RP3; and
- determine the scope for efficiencies that could be reasonably expected from improvements in the Company’s Asset Management capability.

Central to this review was the application of AMCL’s Asset Management Excellence Model™ (AMEM). The AMEM enabled us to assess National Highways’ Asset Management capability maturity in a manner comparable to a previous review undertaken in 2017, leading into the current RP2. It also enabled assessment against internationally recognised benchmarks, including the Institute of Asset Management’s (IAM’s) Conceptual Model<sup>1</sup>, the Global Forum for Maintenance and Asset Management’s (GFMAM’s) ‘39 Subjects’<sup>2</sup> and ISO 55001<sup>3</sup>, the international standard on Asset Management.

The 2017 review also established potential improvement trajectories for the organisation’s Asset Management maturity capability (to the end of RP1 and RP2) and estimated the potential scope for efficiencies resulting from those improvements. At the time of this review, with approximately 2 years of RP2 remaining, National Highways was tracking behind those trajectories but had made significant progress since the 2017 assessment.



<sup>1</sup> [IAM - Asset Management - An Anatomy \(theiam.org\)](https://www.theiam.org/)

<sup>2</sup> [GFMAMLandscape\\_SecondEdition\\_English.pdf](https://www.gfmam.com/landscapes/second-edition-english.pdf)

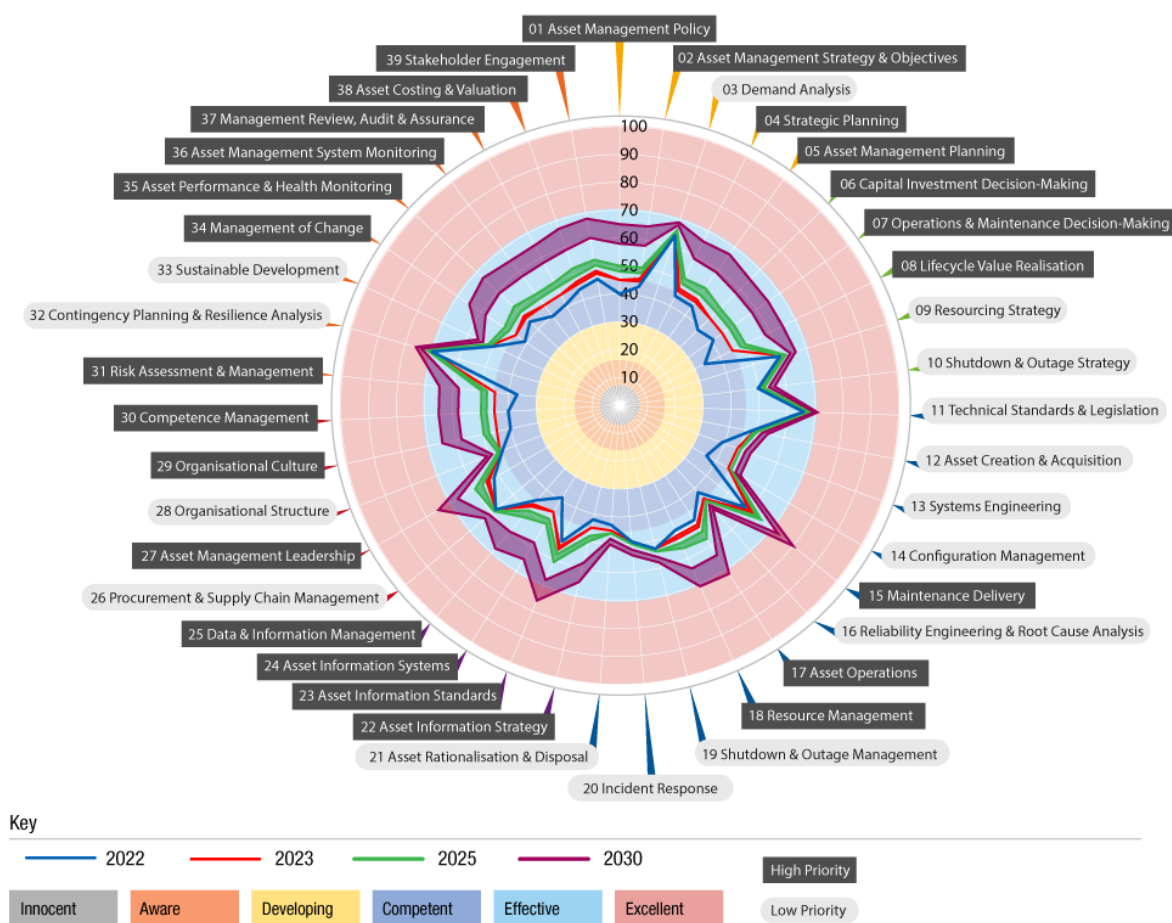
<sup>3</sup> [ISO - ISO 55001:2014 - Asset management — Management systems — Requirements](https://www.iso.org/standard/55001.html)

The 2017 assessment found that Highways England (as National Highways was called at the time) was in the very early stages of adopting an Asset Management approach, with one of the key findings being limited demonstrable senior leadership commitment which is a prerequisite for good Asset Management. This was found to have improved significantly in this latest assessment with effective Asset Management governance and leadership established via the Asset Management Steering Group (AMSG).

In 2017 Highways England had a fundamentally different operational model, which was based on the delivery supply chain having responsibility for key Asset Management decisions about investments and resources within the context of their commercial arrangements. This resulted in some information and skills required to make effective decisions being vested within the supply chain rather than within Highways England. In this latest assessment the ongoing operational approach known as 'Asset Delivery' had effectively brought the supply chain in-house. In our view, this change has had a significant effect on the capability of National Highways to define, implement and control an Asset Management system which will increasingly respond to and fulfil the requirements placed upon it by the government.

The assessment of National Highways' ability to make further improvements to its Asset Management capability during the remainder of RP2 and during RP3 was based on consensus between the ORR and National Highways on which Subjects were highest priority, and establishing trajectory ranges for three milestone dates, as shown in the diagram below:

- Milestone 1 (2023) to achieve ISO 55001 Certification
- Milestone 2 (2025) to complete the AMTP Roadmap and prepare for RP3
- Milestone 3 (2025-30) to deliver prioritised AM Capability Improvements



Forecasting capability trajectories is not an exact science. For any organisation, actual improvement trajectories are heavily impacted by a number of factors, such as the context of the business, stakeholder needs, changing priorities, funding constraints, resources, team and individual capabilities. The longer the forecasting period (in this case approximately 7 years out to the end of RP3) the wider the potential range of actual improvement trajectories in Asset Management maturity capability.

The trajectory ranges identified here are not intended to form specific targets to be met. They are intended to provide guidance to National Highways and the ORR for RP3. They are based on empirical evidence of Asset Management capability growth rates seen in other major infrastructure businesses and provide, in AMCL's view and experience, practical and realistic improvement proposals. They consider both National Highways' current capability and its currently identified improvement plans. However, the final improvement plans for the remainder of RP2 and RP3 are at the discretion of National Highways.

Similarly, the potential scopes for efficiency identified during this review, underpinned by the Asset Management capability improvement trajectories described above, are not intended to form specific targets to be met, or reductions in real-term budgets. They are intended to provide guidance to National Highways and the ORR on the scale of efficiencies that might be expected during RP3, against pre-efficient estimates based on an assessment of need. This assumes the capability improvement trajectories are achieved and other relevant parameters, such as funding arrangements and priorities, remain in a 'steady-state'. They are based on AMCL's experience and published case studies from a range of infrastructure management organisations globally.

The review utilised two related but separate approaches to defining these efficiencies:

- 'Top-down' typical capital and operational efficiencies achievable following the achievement of ISO 55001.
- 'Bottom-up' identification of more specific efficiencies aligned with longer-term improvement actions proposed in this review, through the identification of published case studies comparable to those improvement actions.

These suggested scopes of efficiency can be used to inform the expected efficiencies to be gained from improvement plans that map to the identified improvement actions. Conversely, the suggested scopes of efficiency can be used by National Highways to drive improvement plans where further efficiency is required.

From the end of RP2 to the final year of RP3, it is our opinion that efficiencies in the generalised range of 5%-15%<sup>4</sup> are achievable. This range is supported by the case study evidenced 'bottom-up' efficiencies identified.

As for all efficiency plans, it is essential that these are initiated with an unambiguous understanding of the baseline, or starting point, i.e., 'where are we now', as well as an agreed, documented and systematic approach for how they are going to be measured throughout the time-period.

As a result of completing this review, it is recommended that:

- 1) For the remainder of RP2, National Highways focuses its efforts on closing the management system gaps required to achieve ISO 55001 compliance that have been identified during this assessment. The improvements required to achieve this have been detailed in Appendix C.
- 2) National Highways adopts the three-milestone dates (outlined above) for Asset Management capability improvement planning to ensure clarity on its improvement objectives.

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<sup>4</sup> This proposed efficiency range is a realistic annual efficiency gain between the final year of RP2 and final year of RP3. The efficiency range applies to OMR activities that can be influenced by improvements to National Highways' Asset Management capability over the same period. It may be realised through financial or other gains (e.g. reduction in work volumes or transfer of effort).

- 3) The National Highways Transformation Programme completes its consolidation of National Highways existing plans, and validates the activities identified against the improvement opportunities detailed in Appendix C against each of the 39 Subjects of Asset Management.
- 4) The AMMSG continues to assure that the more focused Asset Management Transformation Programme remains aligned with the consolidated National Highways Transformation Programme (see Recommendation 3) to ensure the capabilities identified to deliver the three milestones are successfully achieved.
- 5) National Highways notes the scope for efficiencies in this report to help establish relevant efficiency targets, baselines and the means for measuring them before the start of RP3.
- 6) A formal efficiencies management framework is established and adopted to manage this process.

AMCL would like to thank the National Highways and ORR participants and to acknowledge the time and commitment from the leadership teams of both National Highways and ORR in supporting this review.

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# 1. Introduction

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## 1.1 Background

National Highways operates, maintains and improves the Strategic Road Network (SRN) – the motorways and major A roads in England. The Office of Rail and Road (ORR) – through its Highways Monitor function – is responsible for holding National Highways to account for its performance and efficiency. This report documents a review that was jointly commissioned, overseen and funded by National Highways and ORR.

The Government sets out its strategic vision for the SRN, objectives for National Highways, and the funding it will make available in periodic road investment strategies. The third Road Investment Strategy (RIS3) will set out the requirements to be delivered by National Highways during Road Period 3 (RP3 – April 2025 to March 2030). The development of RIS3 requires the coordinated efforts of the DfT, National Highways and ORR, with each organisation having responsibility for leading relevant work streams.

National Highways is responsible for developing a draft Strategic Business Plan (SBP) in response to the requirements set out in the Government's draft RIS. The SBP is published following the subsequent publication of the RIS<sup>5</sup>. ORR is responsible for leading the RIS3 efficiency review, an assessment of the level of efficiency that National Highways proposes to achieve in the SBP.

A core part of the work to develop National Highways' draft SBP and ORR's efficiency review is the assessment of National Highways' ability to make efficiency savings from improvements to its core business processes during RP3. To inform this assessment, National Highways and ORR have jointly commissioned 'RIS3 Capability Reviews' focussed on two key business areas: Asset Management and Procurement & Project Management. AMCL (Asset Management Consulting Limited) was jointly commissioned by National Highways and ORR to undertake the Asset Management Capability review. This document details the scope and findings of that review.

Comparable capability reviews were also undertaken as part of the RIS2 process. AMCL also completed the RIS2 Asset Management Capability Review at that time<sup>6</sup>.

## 1.2 Scope & Objectives

The review is intended to provide a resource for both ORR and National Highways as they discharge their responsibilities within the RIS process. The review's specific objectives, as defined by National Highways and the ORR, were to:

- Provide an assessment of National Highways' current Asset Management capability and maturity mid-way through RP2.
- Document National Highways' improvement plans and assess the Company's ability to make improvements to its Asset Management capability during the remainder of RP2 and during RP3.
- Determine the scope for efficiencies that could be reasonably expected from improvements in the Company's Asset Management capability.

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<sup>5</sup> See page 9 of <https://www.orr.gov.uk/sites/default/files/2022-05/Road-Investment-Strategy-3-our-role-and-approach-2022-05-04.pdf> for further detail

<sup>6</sup> [Review of Highways England's ability to improve efficiency from its asset management capability - Final report by AMCL - 18 January 2018 \(orr.gov.uk\)](#)

The Asset Management capability review focused primarily on National Highways' operations, maintenance, and renewals activities. Overlaps between National Highways' approach to enhancements and its ongoing management of the asset base have also been explored via direct interaction with the relevant consultant team reviewing the enhancements approach.

## 2. Approach

### 2.1 The AMCL Asset Management Excellence Model™

Central to this work was AMCL’s Asset Management Excellence Model™ (AMEM). The AMEM enables us to assess an organisation’s Asset Management capability maturity against internationally recognised benchmarks, including the Institute of Asset Management’s (IAM’s) Conceptual Model<sup>7</sup>, the Global Forum for Maintenance and Asset Management’s (GFMAM’s) ‘39 Subjects’<sup>8</sup> and ISO 55001<sup>9</sup>, the international standard on Asset Management. This section provides some more detail on these and the AMEM.

The IAM’s Conceptual Model (or the ‘6-Box Model’) is a high-level framework for understanding the key areas of activity that an organisation needs to be an effective Asset Manager. Each Group of activity supports the main factors that characterise effective Asset Management practice:

- Clear ‘Line of Sight’ (or alignment in ISO 55001 terminology) between the organisation and its key stakeholders and customers.
- The formulation of strategies and plans, underpinned by risk-based decision making, which link the needs and requirements of the organisation’s stakeholders to the lifecycle delivery activities completed on the asset portfolio.
- A focus on three key enablers – the capability of the organisation to do these activities (both internally and through the supply chain), the provision of information which is fit for purpose, and the consistent management of risk and assurance throughout.

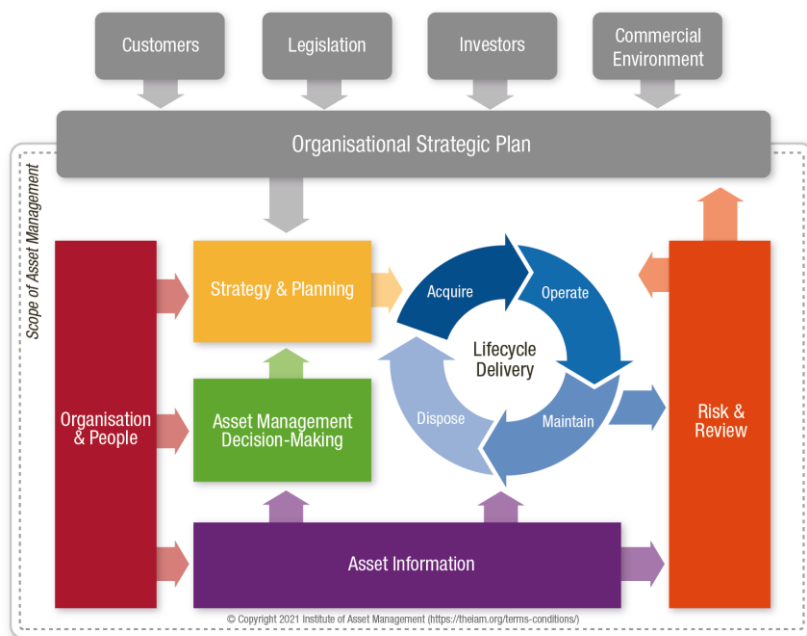


Figure 1 – The IAM’s ‘Conceptual Model’ or the ‘6-Box Model’

<sup>7</sup> [IAM - Asset Management - An Anatomy \(theiam.org\)](https://www.theiam.org/)

<sup>8</sup> [GFMAMLandscape\\_SecondEdition\\_English.pdf](#)

<sup>9</sup> [ISO - ISO 55001:2014 - Asset management — Management systems — Requirements](#)

The IAM’s Conceptual Model further divides into the 39 Subjects of Asset Management which were defined by the Global Forum for Maintenance and Asset Management (GFMAM). Each of these Subjects defines a key area of capability which is essential to supporting the delivery of the Group to which it belongs, and through effective organisational integration, other Subjects and Groups to which it doesn’t belong.

The AMEM, which is shown in Figure 2, enables clients to assess their Asset Management capability maturity and benchmark it against world best practices. It is built around the ‘39 Subjects’ described above which span the range of technical, organisational and human capabilities needed to achieve world-class Asset Management. These subjects are aligned with the second edition of the ‘Asset Management Landscape’ agreed by the GFMAM. The assessment tests the following characteristics for each Subject:

- **Existence** – does something exist – for example is there a policy, strategy or process and is it current?
- **Completeness** – is the scope of the policy, strategy or process consistent with good or best practice?
- **Effectiveness** – is the policy, strategy or process effectively utilised and is it having the desired impact?
- **Integration** – are the organisation’s various capabilities aligned with corporate strategy and orchestrated effectively?

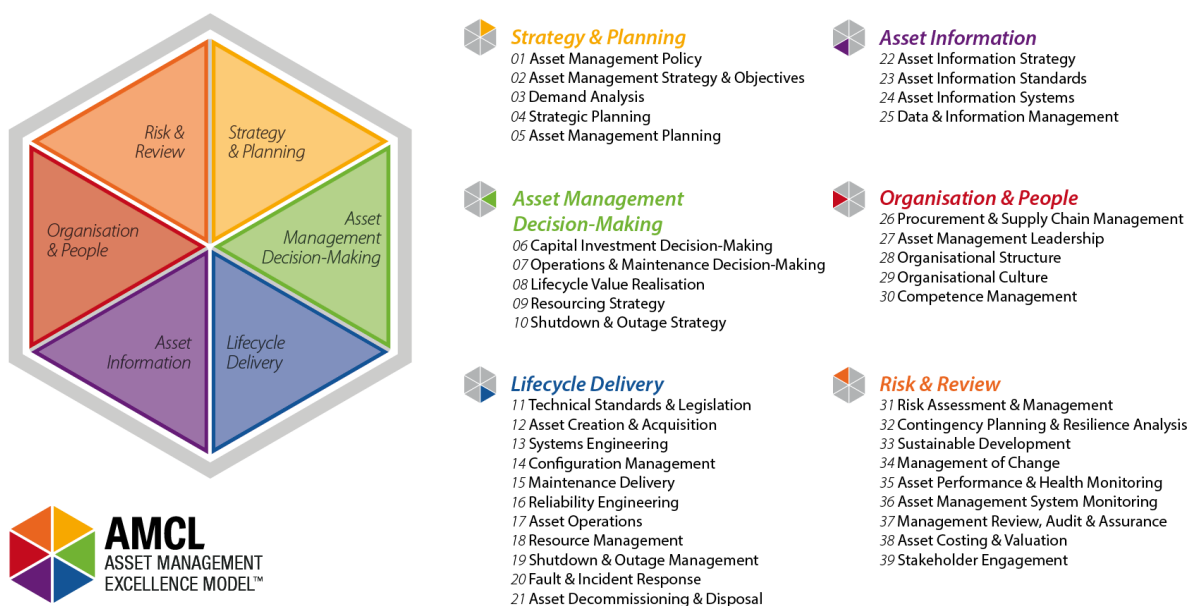


Figure 2 – The AMCL Asset Management Excellence Model™ (AMEM)

Organisations are scored against each of the 39 Subjects using a range of assessment criteria and questions. The scores are presented using the maturity scale shown in Figure 3, which in turn is aligned to the Asset Management maturity scale defined by the IAM<sup>10</sup>. Improvement actions are identified based on the criticality of each subject to the organisation, the current scores for the assessment criteria that make up each subject, and the targets an organisation and its stakeholders wish to set themselves for each

<sup>10</sup> [IAM - Asset Management Maturity Scale and Guidance \(theiam.org\)](http://theiam.org)

subject. AMEM results are used to identify and prioritise improvements based on where an organisation sits relative to world best practices, or defined benchmarks such as ISO 55001.

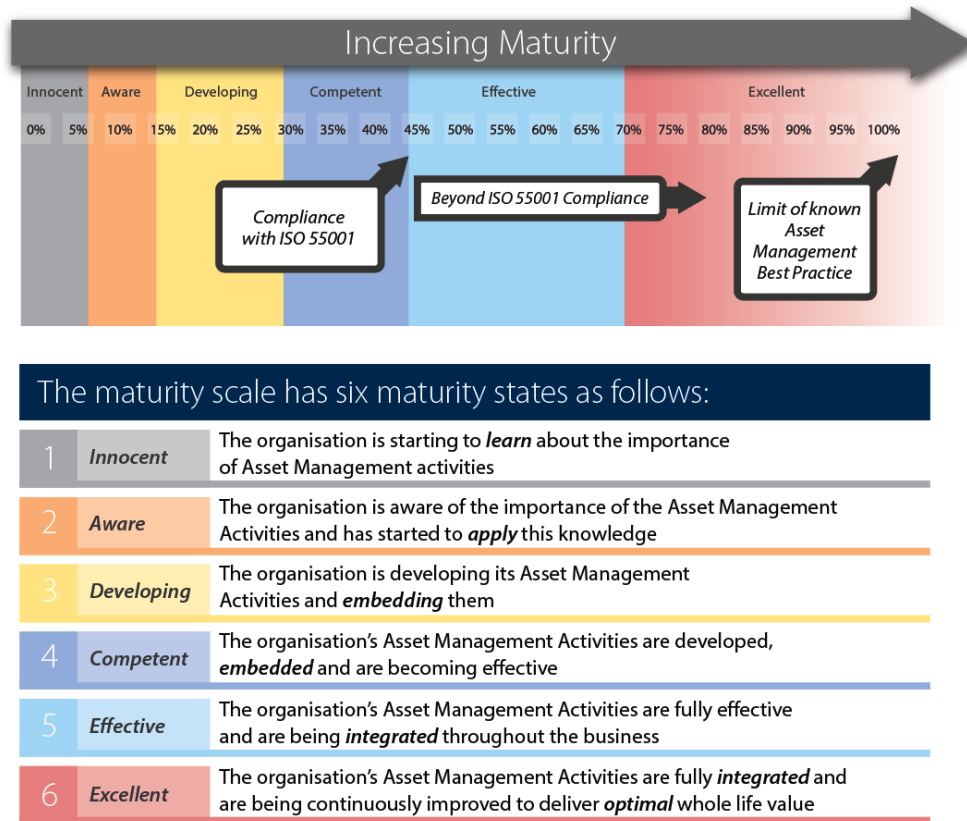


Figure 3 – The AMEM Asset Management Maturity Scale

Improvement actions can then be identified based on the criticality of each activity to the organisation, the current scores for the assessment criteria that make up each activity, and the targets an organisation and its stakeholders wish to set themselves for each subject. The concepts of the existence, completeness, effectiveness and integration of processes ensure the maturity assessment effectively identifies ISO 55001 compliance on the maturity scale already introduced.

Immediate benefits of applying the AMEM include:

- 1) A clear view of strengths and opportunities for improvement in the organisation's Asset Management approaches.
- 2) Identification of internal areas of excellence.
- 3) Identification of applicable external best practices.
- 4) A prioritised list of subjects requiring improvement.
- 5) Tangible evidence to support decisions for enhancing organisational systems, processes and procedures.

AMCL supports a wide range of clients with ongoing assessments including providing access to our extensive database of case studies and best practices. This database is constantly updated with emerging best practices that are used to continuously improve the AMEM assessment process. Finally, the AMEM is periodically recalibrated to ensure the scores required to be 'excellent' are based on the current understanding of world best practices in each of the 39 Subjects.

## 2.2 Main Project Stages

Between July and December 2022, the AMCL project team and personnel from National Highways and the Office of Rail and Road (ORR) stepped through the four main stages shown below.

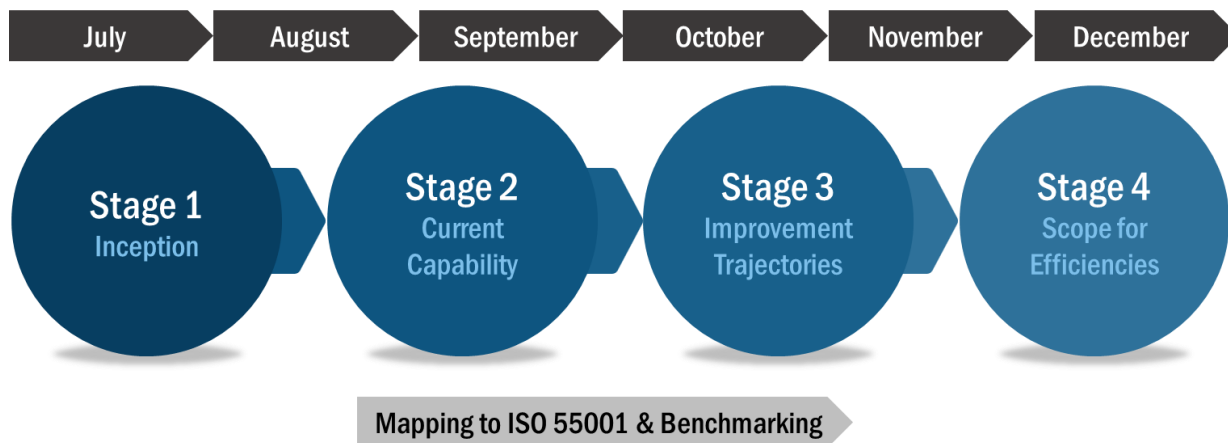


Figure 4 – Main Project Stages

Following Stage 1, the three main project stages have specific objectives, approaches and outputs as shown below. These are described in more detail in the following Sections 2.3 to 2.4.

| Stage 2<br>Current<br>Capability   | Stage 3<br>Improvement<br>Trajectories   | Stage 4<br>Scope for<br>Efficiencies   |
|--|--|--|
| <p><b>Objective:</b><br/>To understand where National Highways is on the internationally recognised Asset Management capability maturity scale.</p> <p><b>Tools &amp; Approach:</b></p> <ul style="list-style-type: none"> <li>Initial review of National Highways' capability in accordance with AMCL's IAM Endorsed Assessment process.</li> <li>Clarification and gap filling with National Highways staff.</li> <li>Benchmarking against other organisations.</li> </ul> <p><b>Output:</b><br/>Score for National Highways' Asset Management capability maturity against the 39 Subject of Asset Management.</p> | <p><b>Objective:</b><br/>To define proposed Asset Management capability improvement trajectories from now until the end of RP3, for consideration by National Highways and the ORR.</p> <p><b>Tools &amp; Approach:</b></p> <ul style="list-style-type: none"> <li>Defining achievable improvement trajectories based on NH and ORR priorities.</li> <li>Review existing improvement plans and identifying further improvement opportunities that will contribute to meeting the proposed improvement trajectories.</li> </ul> <p><b>Output:</b><br/>Proposed improvement trajectories and actions to achieve them based on existing plans and additional opportunities for improvement.</p> | <p><b>Objective:</b><br/>To define the potential areas and associated ranges of efficiency that National Highways could target.</p> <p><b>Tools &amp; Approach:</b></p> <ul style="list-style-type: none"> <li>Reviewing AMCL's Asset Management benefits case study register to identify potential areas and associated ranges of efficiency.</li> <li>Mapping these into the Asset Management capability improvement trajectories defined in Stage 3.</li> </ul> <p><b>Output:</b><br/>Suggested 'scope for efficiencies' deliverable by the end of RP3, assuming the Asset Management capability improvement trajectories are achieved, for consideration by National Highways and ORR in setting RP3 expectations.</p> |

Figure 5 – Summary of objectives, approaches and outputs for the three main project stages

**Stage 2**  
 Current  
 Capability

**Objective:**  
 To understand where National Highways is on the internationally recognised Asset Management capability maturity scale.

**Tools & Approach:**

- Initial review of National Highways' capability in accordance with AMCL's IAM Endorsed Assessment process.
- Clarification and gap filling with National Highways staff.
- Benchmarking against other organisations.

**Output:**  
 Score for National Highways' Asset Management capability maturity against the 39 Subject of Asset Management.

## 2.3 Overview of Approach – Stage 2, Current Capability

To undertake the assessment of current capability, AMCL used the same assessment model used in the previous assessment in 2017/18 – the AMCL Asset Management Excellence Model™ (AMEM – see Section 2.1 for details).

The AMEM has been updated since 2017/18 to keep pace with good practice, but the output provides consistency across the intervening years.

The scope of the assessment was as defined in Section 1.2. AMCL is an Endorsed Assessor under the Institute of Asset Management's (IAM's) Endorsed Assessor Scheme<sup>11</sup>, and used its Endorsed Assessment & Certification Process to complete the assessment, see Figure 6.

The assessment sought evidence of Asset Management good practice within National Highways' documentation and processes and included workshops and interviews with key personnel involved with the Asset Management process.

In total 41 National Highways and ORR personnel were interviewed or took part in validation workshops (see Appendix A) and 125 pieces of documentary evidence were made available for review (see Appendix B).

Once the assessment evidence had been captured in the AMEM, the scores for each of the 39 Subjects, 6 Groups and ISO 55001 clauses were benchmarked against all assessments in the AMEM database.

An interim presentation of the findings of Stage 2 were given to National Highways and the ORR on the 31<sup>st</sup> October 2022.



Figure 6 – AMCL's Endorsed Assessment Process

**The findings of the current capability assessment can be found in Section 3 of this document.**

<sup>11</sup> [IAM - IAM Endorsed Assessors Scheme \(theiam.org\)](http://theiam.org)

## 2.4 Stages 3 & 4 – Overview of Approach

Figure 7 shows an overview of the approach taken to define the improvement trajectories and to identify the scope for efficiencies, defined over three significant milestones through to the end of RP3 in 2030. This approach is expanded on in more detail in Sections 1.1 and 2.6.

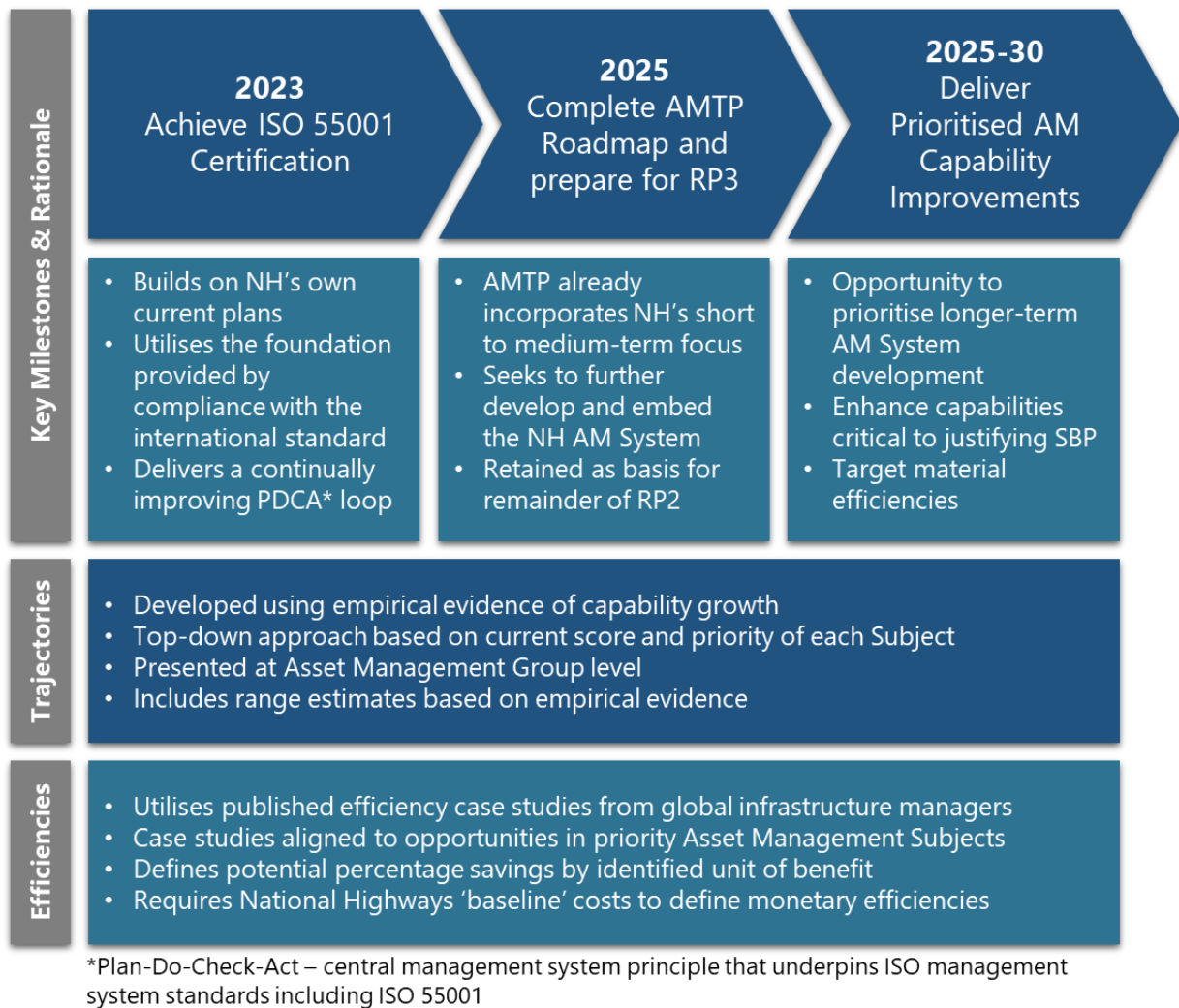


Figure 7 - Approach for defining improvement trajectories and identifying the scope for efficiencies

### Stage 3

Improvement Trajectories

**Objective:**  
 To define proposed Asset Management capability improvement trajectories from now until the end of RP3, for consideration by National Highways and the ORR.

**Tools & Approach:**

- Defining achievable improvement trajectories based on NH and ORR priorities.
- Review existing improvement plans and identifying further improvement opportunities that will contribute to meeting the proposed improvement trajectories.

**Output:**  
 Proposed improvement trajectories and actions to achieve them based on existing plans and additional opportunities for improvement.

## 2.5 Stage 3 Approach – Improvement Trajectories

AMCL has worked extensively with a wide range of organisations over many years, periodically assessing their Asset Management capability maturity and supporting them in prioritising and implementing capability improvements.

This has given us an empirical understanding of how quickly organisations tend to progress when they are focused on developing their Asset Management capabilities.

Figure 8 shows this in a ‘typical’ trajectory against the internationally recognised maturity scale introduced in Section 2.1, and identifies the nominal percentage points achievable per annum. This is based on the findings from all assessments, across all sectors, in the database. As the majority of assessments undertaken have involved organisations in the ‘Developing’ through ‘Effective’ ranges of maturity, the solid line reflects this extensive source of empirical evidence. There is less empirical evidence available for the ‘Aware’ and ‘Excellent’ ranges of maturity. This is reflected in the dotted lines, which have been summarised as ‘Estimated Growth Rates’.

Typically, organisations progress more quickly through the ‘Developing’ and ‘Competent’ bands, as these require the development and integration of largely existing practices, while further optimisation of these capabilities requires more effort and time.

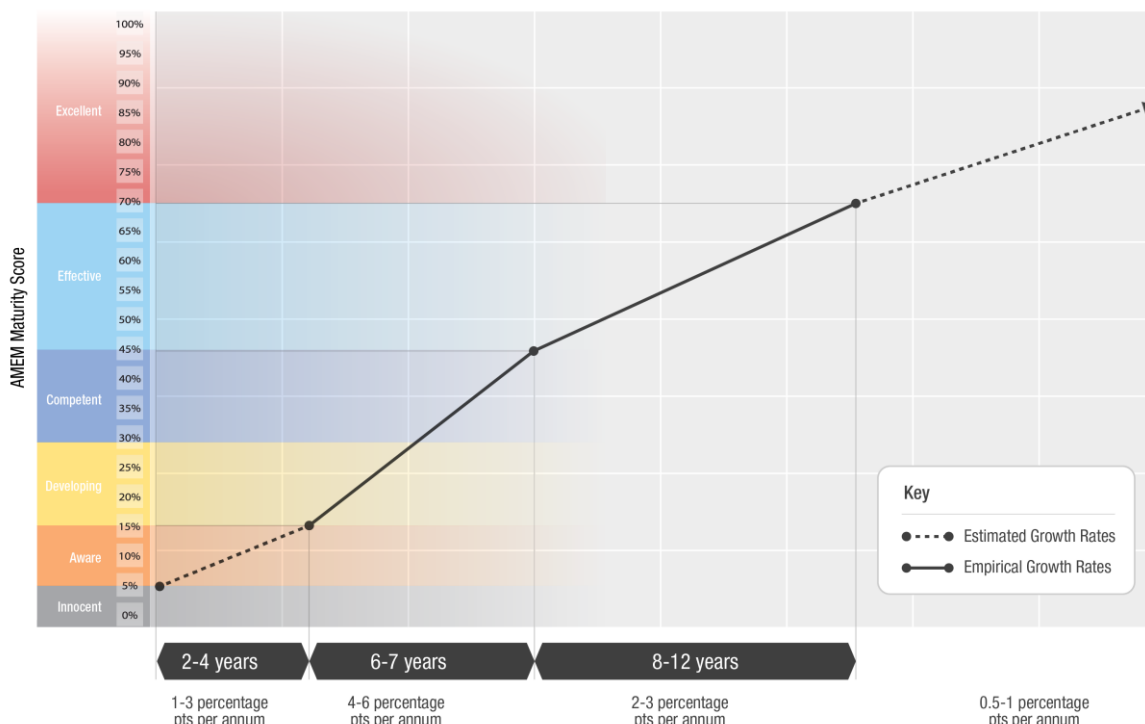


Figure 8 – Typical Asset Management Capability Maturity Growth Rates

This understanding has been used to set trajectories for each of the 39 Subjects for National Highways. The process for developing the trajectories was:

- 1) National Highways and the ORR, as its key stakeholder, were consulted on their priority Subjects for improvement. This resulted in a combined list of 24 of the 39 Subjects being identified as current priorities. 'Priority' means those Subjects that deliver corporate values, priorities or objectives and will be a focus for effort over next 5 years. Although, it should be noted, these priorities may change over that time period.
- 2) The empirical minimum and maximum growth rates shown in Table 1 and Table 2 below, and based on Figure 8 (which is based on all sectors and organisations in the database), were then applied to the priority and non-priority Subjects. These were set at three points in time after the current assessment (2022):
  - **Milestone 1 (2023)** to achieve ISO 55001 Certification  
This assumes that by 2023, National Highways will have achieved a minimum maturity capability score of 45% (the guideline for compliance with ISO 55001) for all 39 Subjects.  
Where National Highways had already scored greater than 45% in the current assessment (2022), that score was taken, along with a one-year increase based on the High or Low priority capability maturity growth rates shown in Table 2.
  - **Milestone 2 (2025)** to complete the AMTP Roadmap and prepare for RP3.  
This assumes that by 2025 National Highways will have increased capability maturity by the 2023 score (see above) plus an 18-month (1.5-year) increase in maturity score based on the High or Low priority capability maturity growth rates shown in Table 2.
  - **Milestone 3 (2025-30)** to deliver prioritised AM Capability Improvements  
This assumes that by 2030 National Highways will have increased capability maturity by the 2025 score (see above) plus a 5-year increase in maturity score based on the High or Low priority capability maturity growth rates shown in Table 2.
- 3) These trajectories were then validated against existing National Highways' plans (primarily the AMTP and broader Transformation Programme) and, where needed, additional proposed activities were identified as required.

**The defined improvement trajectories are summarised in Section 4 of this document, with further detail provided in Appendix D.**

| Subject Priority | Maturity 2022 | Range      | Maturity 2023 (one year)               | Maturity 2025 (18 months) | Maturity 2030 (5 years) |
|------------------|---------------|------------|--|---------------------------|-------------------------|
| High             | Current Score | <b>MIN</b> | Greater of 45% or Current Score +2%    | 2023 +3%                  | 2025 +10%               |
|                  |               | <b>MAX</b> | Greater of 45% or Current Score +3%    | 2023 +4.5%                | 2025 +15%               |
| Low              | Current Score | <b>MIN</b> | Greater of 45% or Current Score +0.5%  | 2023 +0.75%               | 2025 +2.5%              |
|                  |               | <b>MAX</b> | Greater of 45% or Current Score +0.75% | 2023 +1.125%              | 2025 +3.75%             |

Table 1 – Growth Rates Applied

| Subject Priority | Range      | Capability Maturity Growth Rate |
|------------------|------------|---------------------------------|
| High             | <b>MIN</b> | 2% PA                           |
|                  | <b>MAX</b> | 3% PA                           |
| Low              | <b>MIN</b> | 0.5% PA                         |
|                  | <b>MAX</b> | 0.75% PA                        |

Table 2 – Empirical Growth Rate Ranges

## Stage 4 Scope for Efficiencies

### Objective:

To define the potential areas and associated ranges of efficiency that National Highways could target.

### Tools & Approach:

- Reviewing AMCL's Asset Management benefits case study register to identify potential areas and associated ranges of efficiency.
- Mapping these into the Asset Management capability improvement trajectories defined in Stage 3.

### Output:

Suggested 'scope for efficiencies' deliverable by the end of RP3, assuming the Asset Management capability improvement trajectories are achieved, for consideration by National Highways and ORR in setting RP3 expectations.

## 2.6 Stage 4 Approach – Scope for Efficiencies

Scoping the potential efficiencies resulting from improved Asset Management capability maturity is a complex problem. Improvements to one of the 39 Subjects of Asset Management described previously can impact the performance of several areas of the business and correspondingly the overall impact on a particular area of the business can be the sum of the individual impacts caused by various improvements to the 39 Subjects.

The process for identifying the potential scope for efficiencies was split into two parts.

The first part applied a general 'top-down' assessment of typical efficiencies realised.

The second part was a 'bottom-up' assessment of more specific efficiencies associated with longer-term improvement actions aligned with Improvement Trajectory Milestone 3.

The following two sections outline the approach adopted for each part.

**The identified potential efficiencies are summarised in Section 5 of this document, with further detail provided in Appendix E and 0.**

### 2.6.1 'Top-down' Efficiencies

Top-down efficiencies are applied as a general guide for what is possible, based on publicly available case studies (see 0), at two key points on the empirical Asset Management capability maturity growth curve introduced in Section 2.4. These are:

- Typical efficiencies associated with the achievement of ISO 55001 compliance (Improvement Trajectory Milestone 1 – see Section 2.4) – directly relevant to RP2 efficiencies given National Highways ambition to achieve ISO 55001 certification in 2023 and indirectly relevant to RP3 efficiencies as a starting point for what can be achieved.
- Typical capital and operational efficiencies achievable following the achievement of ISO 55001 (Improvement Trajectory Milestone 2 and part of Milestone 3 – see also Section 2.4).

This was the approach used in AMCL's RIS2 Asset Management Capability Review report in 2018 to help understand the target efficiency ranges for RIS2. The efficiencies are summarised in Figure 9 on the following page, with further detail available in Appendix E. They include a focus on risk-based approaches that mean justifying every expenditure against the most pressing need in terms of mitigating and managing risk, effectively tailoring expenditure to your risk profile.

### Achieving ISO 55001 Benefits

- Benefits related to the implementation of an overall Asset Management System (or Framework) are difficult to quantify.
- In general, the benefits are related to consistent decision-making aligned to stakeholder needs, and the ability to systematically continually improve capabilities.
- This benefit is validated through ISO 55001 compliance and / or certification.
- The IAM has estimated that this can lead to overall efficiency benefits in the order of 1% to 8%.

*Source: IAM 2015 Conference presentation: The impact, value and quantifiable benefits of AM*

### 'Beyond ISO 55001' Benefits

Capex and Opex efficiencies have been achieved through:

- Capex efficiency (including deferral) (2% - 62%)
- Opex Efficiencies (10% - 50%)
- Risk based capital investment (5% - 30%)
- Risk based maintenance (15% - 53%)

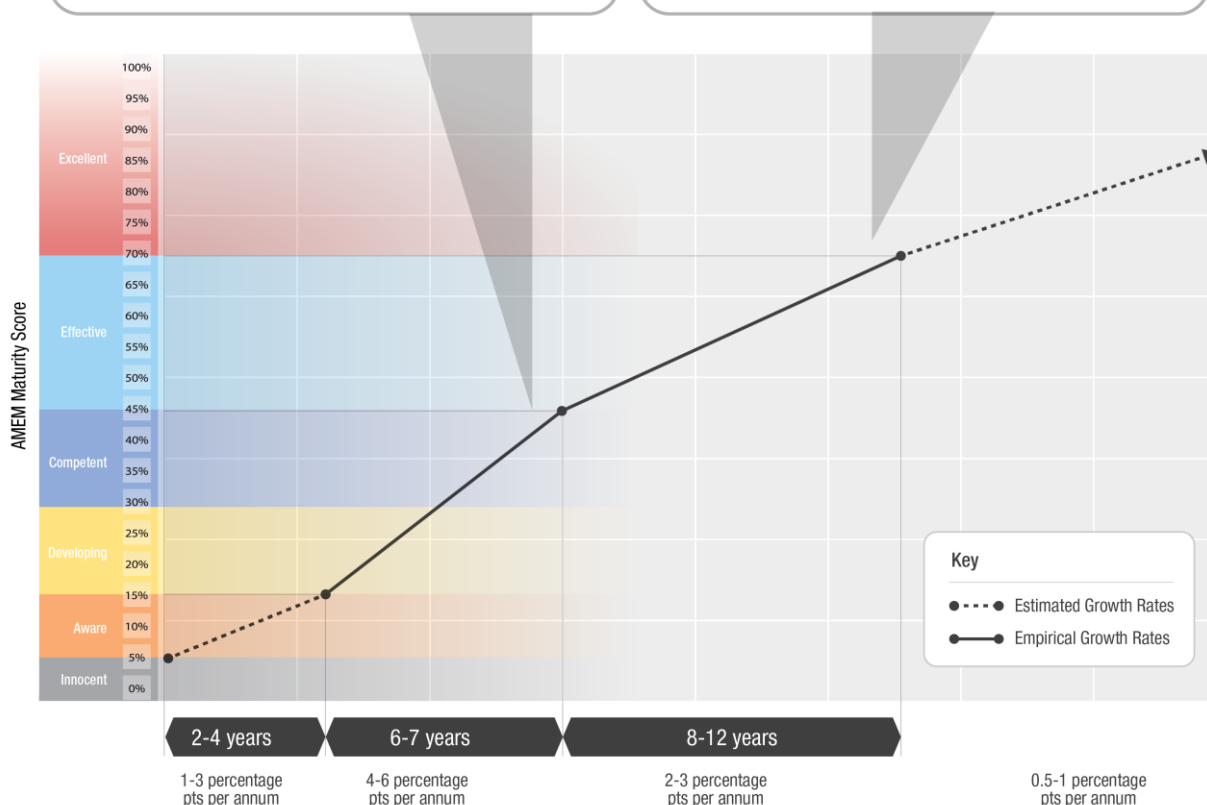


Figure 9 – Top-down Indicative Efficiencies

## 2.6.2 'Bottom-up' Efficiencies

The second part was a 'bottom-up' assessment of more specific efficiencies associated with longer-term improvement actions aligned with Improvement Trajectory Milestone 3. The process to do this was:

- 1) Review AMCL's Asset Management case study database of publicly available information on the potential efficiencies relevant to National Highways. The case studies identified are referenced in 0.<sup>12</sup>
- 2) Group the identified efficiencies case studies into the 12 standard 'Efficiency Areas' we use for this type of work (see Table 3), based on where efficiencies have been gained by other infrastructure management organisations.
- 3) Map these into the six Subject Groups in the IAM's Conceptual Model (the main structure of the assessment, see Section 2.1).
- 4) Validate the potential range for efficiencies against the anticipated improvement actions for RP3 (the third milestone defined in the improvement trajectories).

| Ref. | Efficiency Area  |
|------|--|
| 1    | Improve alignment of objectives to enable better direction of National Highways' business activities |
| 2    | Establish end-to-end planning and efficiencies realisation process                                   |
| 3    | Improve understanding of lifecycle costs and risks for critical assets                               |
| 4    | Improve health and reliability of National Highways' asset portfolio                                 |
| 5    | Tailor maintenance activities to manage costs and risk exposure                                      |
| 6    | Tailor spares procurement and holdings to manage costs and risk exposure                             |
| 7    | Improve alignment of supply chain with National Highways' Asset Management objectives                |
| 8    | Improve alignment of data collation with National Highways' decision making and risk exposure        |
| 9    | Improve efficiency of data access for users  |
| 10   | Improve understanding and use of risk throughout National Highways                                   |
| 11   | Improve how National Highways manages change to minimise risk exposure                               |
| 12   | Improve the sustainability of National Highways as an Asset Management organization                  |

Table 3 – The 12 standard AMCL 'Efficiency Areas'

<sup>12</sup> AMCL's Asset Management case study database includes publicly available, and therefore, self-selecting companies and organisations that claim benefits from adopting an Asset Management approach.

## 3. Current Capability Findings

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### 3.1 Overall Findings

National Highways' Asset Management maturity capability was last assessed by AMCL in 2017 (see Section 1.1), when the organisation was known as Highways England, prior to being renamed in August 2021. As well as a capability assessment, the outputs of that project included potential Asset Management maturity capability improvement trajectories and associated efficiencies through to the end of RP2.

The 2017 assessment found that Highways England was in the very early stages of adopting an Asset Management approach, with one of the key findings being limited demonstrable senior leadership commitment which is a prerequisite for good Asset Management. This was found to have improved significantly in this latest assessment with effective Asset Management governance and leadership established via the Asset Management Steering Group (AMSG), part of National Highways' Executive function.

In 2017 Highways England had a fundamentally different operational model, which was based on the delivery supply chain having responsibility for key Asset Management decisions about investments and resources within the context of their commercial arrangements. This resulted in some information and skills required to make effective decisions being vested within the supply chain rather than within Highways England. In this latest assessment the ongoing operational approach known as 'Asset Delivery' had effectively brought the supply chain in-house. This includes directly managing network maintenance, operations and scheme delivery, as well as insourcing the decision making on asset needs. In our view, this change has had a significant effect on the capability of National Highways to define, implement and control an Asset Management system which will increasingly respond to and fulfil the requirements placed upon it by the government. It enables National Highways to control its activities and get access to information, both of which are essential to achieving its goals more easily, as set out in the Road Investment Strategy (RIS) cycles.

National Highways is currently tracking below the potential Asset Management maturity capability improvement trajectories proposed (as a guide for the end of RP2) during the 2017 assessment. A further review of progress against these can be made if required at the end of the Road Period.

Overall National Highways has made significant progress since AMCL last assessed the organisation's Asset Management maturity capability in 2017. Table 4 summarises the key areas of strength and opportunity identified during this latest assessment.

| Area of Strength  | Area of Opportunity   |
|---|---|
| <p>Effective Asset Management governance and leadership has been established via the Asset Management Steering Group (AMSG). The AMSG is part of National Highways' Executive function which ensures its effectiveness.</p> | <p>The Asset Management System defined in 2017 has been redefined. This is not yet fully completed, and further clarity is required on its scope (which is currently focused on RIS 'Outcome 3'<sup>13</sup> only) and the measurability of its objectives.</p>   |
| <p>Participants in the assessment consistently identified National Highways as an 'Asset Management' organization, which is underpinned by a newly implemented AM Team structure.</p>                                       | <p>National Highways has a new objective to achieve ISO 55001 certification within a relatively short timescale, which will require a shift in improvement focus from the 39 Subjects to an ISO management system.</p>  |
| <p>There has been a recognised need for the implementation of a management system and Target Operating Model (TOM) to align National Highways' objectives, functions and processes.</p>                                     | <p>The broader Transformation Programme and the Enterprise Process Model (EPM) are both early in their development, and the Asset Management part of this (the AMTP) is focused on RIS 'Outcome 3' (one of National Highways' overarching corporate objectives). Although it is noted that the AMSG and developing EPM cover a wider remit.</p> |
| <p>The Asset Delivery approach has strengthened the control, capacity and capability of lifecycle delivery activities, and provided a better foundation for longer-term, strategic Asset Management decision-making.</p>    | <p>Although improvements are being made in how investment decisions are being made, the approach to investment and operational prioritisation and optimisation currently still varies across the Regions as a result of legacy factors.</p>   |
| <p>There has been continual development of Asset Management capabilities since 2017, the latest iteration of which is the Asset Management Transformation Programme (AMTP) and its Roadmap.</p>                             | <p>National Highways will have a limited ability to systematically justify and align investments until the Asset Class Strategies (ACSs) embed and mature and associated Decision Support Tools (DSTs) develop.</p>   |
| <p>There is a recognition that data is a key asset and clear identification of information needs has been established in the Asset Data Management Manual (ADMM).</p>   | <p>Multiple Asset Information and IT Systems Strategies and Roadmaps need to be refined or further developed, aligned and implemented.</p>  |

Table 4 – Main Findings – Strengths and Opportunities

<sup>13</sup> RIS Outcome 3: "A well-maintained and resilient network"

## 3.2 '39 Subjects' Findings

In 2017 AMCL completed a maturity assessment using the AMEM, which was based on a synthesis of assessments undertaken by other organisations. The assessment in 2022 has been more in-depth, with more engagement with National Highways personnel.

As well as establishing potential improvement trajectories for Highways England's Asset Management maturity capability to the end of RP1 and RP2, the assessment in 2017 also estimated the potential scope for efficiencies resulting from those improvements during RP2, relating to:

- Process Efficiencies
- Embedded Efficiencies
- Data & IT System Efficiencies
- Capability Efficiencies

Figure 10 compares Highways England's 2017 scores to the scores for National Highways in 2022. There are notable improvements in the scores for most Subjects. In general, National Highways has improved to be in either the Competent or Effective maturity bands for all Subjects.

The average score has improved from **38%** to **45%**, which is the score representing general compliance with ISO 55001.

As discussed in Section 3.1, improvements have been mainly driven by:

- the introduction of formal Asset Management governance integrated into National Highways' Executive level, and
- the introduction of the Asset Delivery philosophy.

In a few cases, the more in-depth 2022 assessment has enabled improved scores to be identified and justified, due to better engagement, detail and evidence of actual capability maturity, for example the Technical Standards & Legislation Subject.

The basis of the assessment was the interviews and evidence collected and assessed as described in Section 2.3. The assessment scores reflect the objective judgement of the assessment team based on the available evidence. A more detailed set of findings and improvement opportunities can be found in Appendix C of this report.

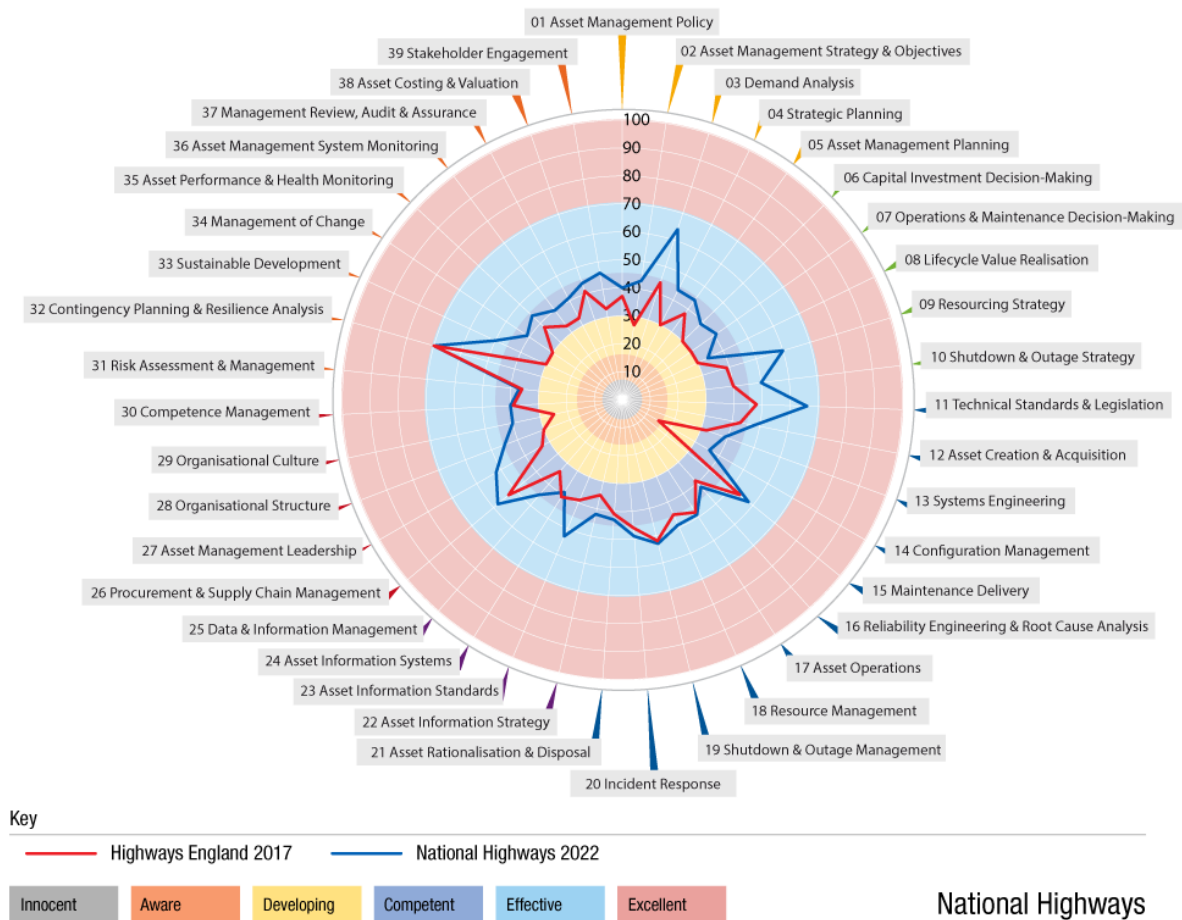


Figure 10 – 39 Subject scores in 2017 versus 2022

### 3.3 ISO 55001 Findings

Figure 11 presents the same Asset Management capability information but from the ISO 55001 management system perspective, as scores for each of the sub-clauses of the International Standard.

This indicates that National Highways is generally close to indicative compliance with ISO 55001 (calibrated on a 45% score).

Some key challenges remain at this stage:

- Scope and definition of the Asset Management system is incomplete (sub-clauses 4.3 and 4.4).
- Clarity of planning and actions to achieve Asset Management objectives, i.e., alignment of activity on the ground to Asset Management and corporate objectives (sub-clauses 6.1 and 6.2).
- Continued development of asset information to meet the minimum requirements (sub-clauses 7.5 and 7.6).
- Systematic management of change at all levels within the Asset Management System (sub-clause 8.2).
- Alignment of performance and evaluation information, internal audits and corrective and preventative actions to the Asset Management System (sub-clauses 9.1, 9.2, 10.1, 10.2).

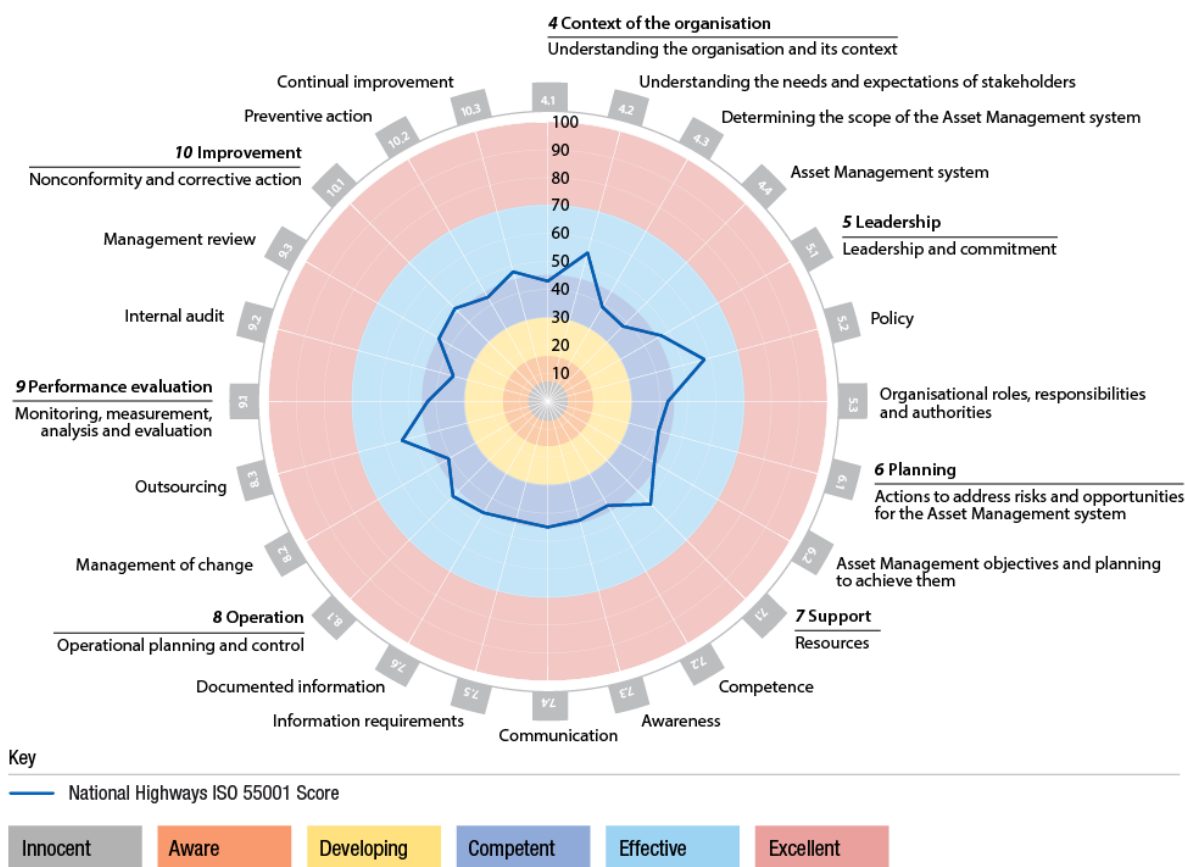


Figure 11 – ISO 55001 sub-clause scores

Figure 12 shows National Highways’ level of compliance against each of the ISO 55001 Main Clauses. The scale used is the IAM’s standard maturity scale (as used in the SAM+ tool), where Maturity Level 3 is equivalent to ISO 55001 compliance<sup>14</sup>. It is our view that:

- National Highways would currently be able to demonstrate compliance for Clauses 5, 8 and 10 with some further work to ensure a focus on the Asset Management system as defined.
- Clauses 4, 6, 7 and 9 still require some work to enable National Highways to be able to demonstrate compliance. This work is focused on ensuring the ‘management system’ view of Asset Management (as defined in ISO 55001) is fully defined and embedded within National Highways.

<sup>14</sup> [IAM - Asset Management Maturity Scale and Guidance \(theiam.org\)](https://www.theiam.org/)

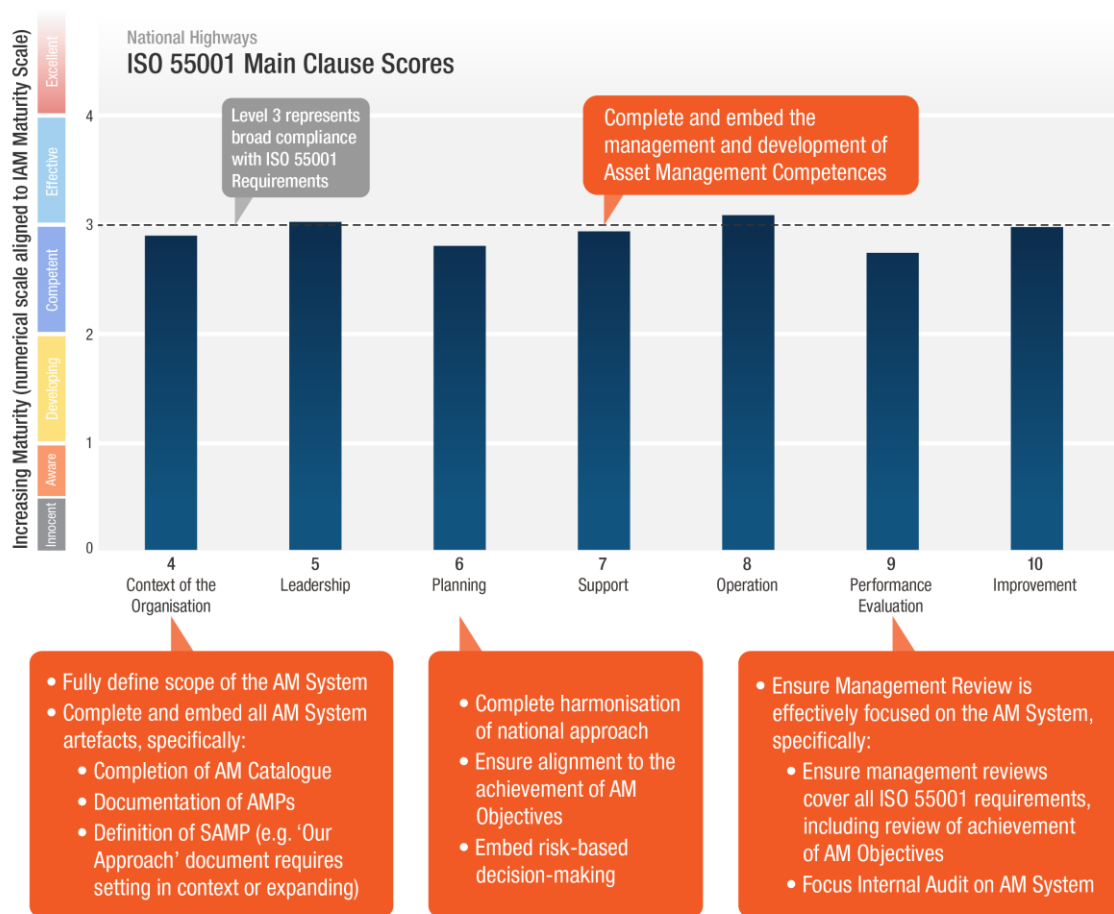


Figure 12 – ISO 55001 main clause scores and key improvement requirements

### 3.4 Benchmarks

The benchmark information presented in this section provides a picture of how National Highways compares, on average, to other organisations AMCL has in its assessment database. Two benchmarks are provided:

- National Highways’ 6-Group average scores against all assessments
- National Highways’ ISO 55001 Main Clause average scores against all assessments

Assessments are archived from the AMEM database when either organisations are re-assessed (the old assessment is removed from the data set), or AMCL judges an assessment to no longer be reliable. The benchmark information presented in this section is based on 215 current assessments.

Figure 13 shows a quartile analysis for all assessments in the sample against which National Highways is compared at the ‘6 Group’ level. All Group scores are relatively mature with respect to the sample, and on this measure show that National Highways is close to being able to demonstrate compliance with ISO 55001 (calibrated to 45% on the scale).

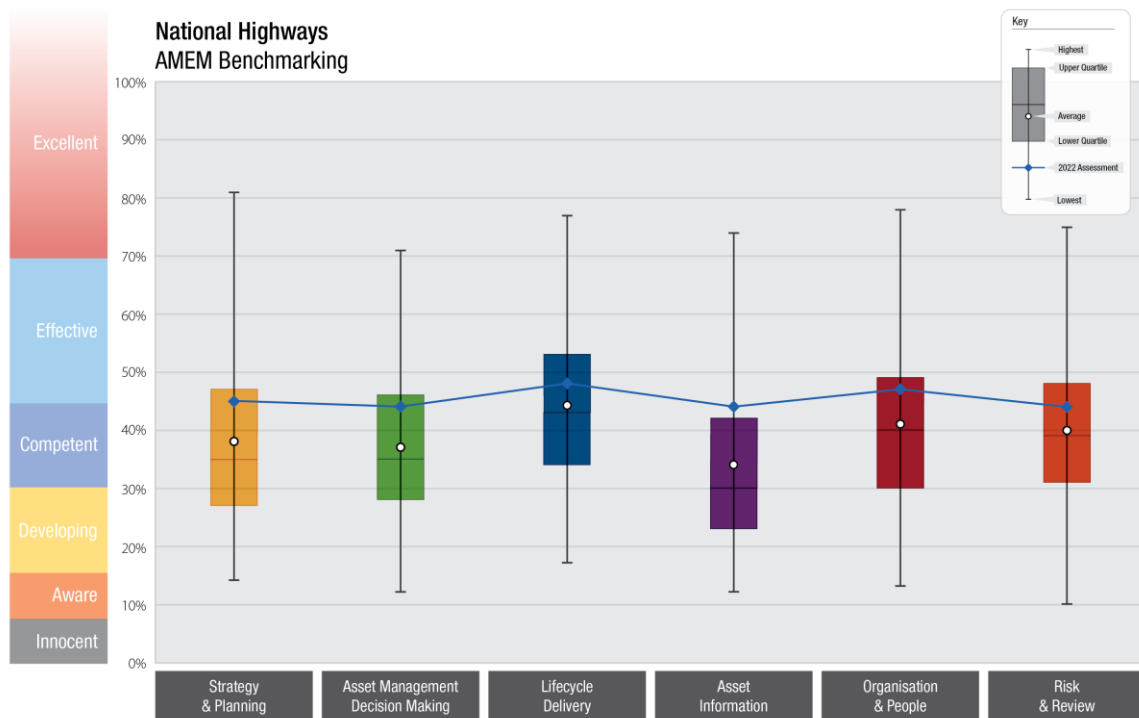


Figure 13 – National Highways’ 6-Group average scores against all assessments (215 total)

Figure 14 shows a quartile analysis for all assessments in the sample against which National Highways is compared at the ISO 55001 ‘Main Clause’ level. As with the 6 Group benchmark it shows that National Highways scores relatively well with respect to the benchmark sample.

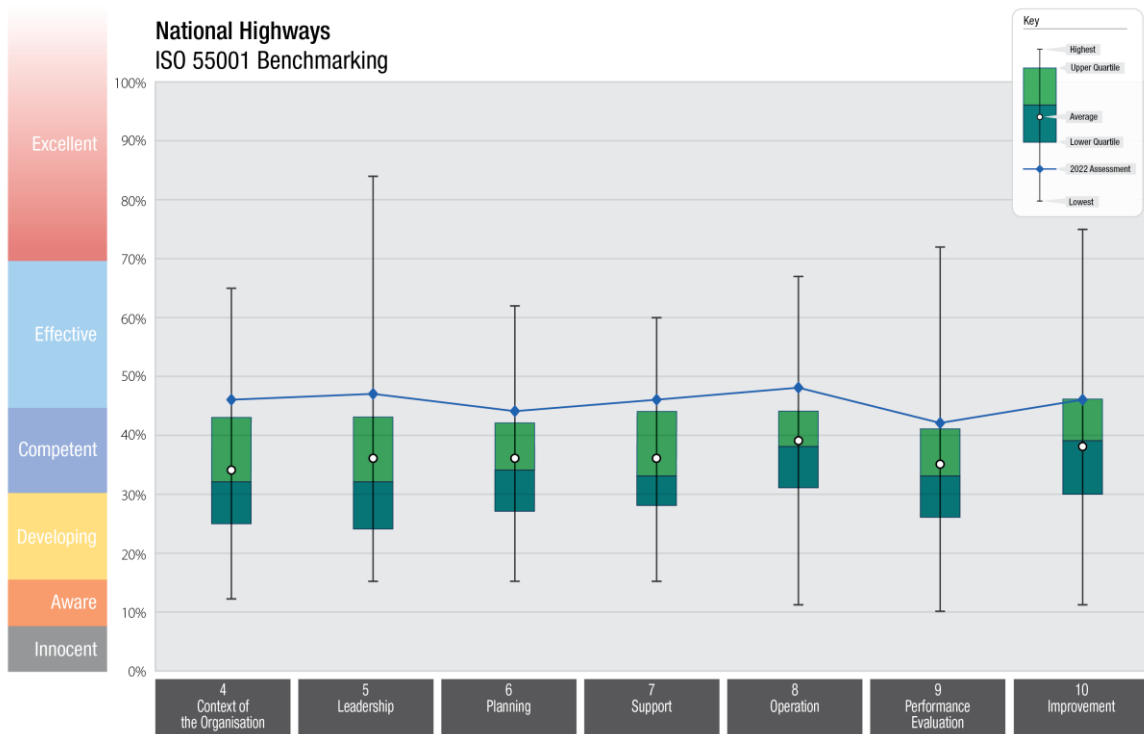


Figure 14 – National Highways’ ISO 55001 Main Clause average scores against all assessments (215 total)

## 4. Improvement Trajectory Ranges

### 4.1 Introduction

This section describes prioritised and practical ranges of increased Asset Management maturity capability ('trajectories') through to the end of RP3, for consideration by National Highways and the ORR. Details of the key areas of improvement required to meet the proposed trajectories summarised in this section are included in Appendix D.

Forecasting capability trajectories is not an exact science. For any organisation, actual improvement trajectories are heavily impacted by a number of factors, such as the context of the business, stakeholder needs, changing priorities, funding constraints, resources, team and individual capabilities. The longer the forecasting period (in this case approximately 7 years out to the end of RP3) the wider the potential range of actual improvement trajectories in Asset Management maturity capability.

The trajectory ranges identified here are not intended to form specific targets to be met. They are intended to provide guidance to National Highways and the ORR for RP3. They are based on empirical evidence of Asset Management capability growth rates seen in other major infrastructure businesses and provide, in AMCL's view and experience, practical and realistic improvement proposals. They consider both National Highways' current capability and its currently identified improvement plans.

The final improvement plans for the remainder of RP2 and RP3 are at the discretion of National Highways and may or may not reflect the experience and empirical evidence provided in this report.

### 4.2 Overview

Figure 15 shows the priority Subjects identified by National Highways and the ORR and the three trajectory ranges defined using the approach described in Section 2.4. After good initial alignment and further discussion, there was consensus between the ORR and National Highways on which Subjects were high priority, as shown in Figure 15.

As described in Section 2.4 the three trajectory range milestones are:

- Milestone 1 (2023) to achieve ISO 55001 Certification
- Milestone 2 (2025) to complete the AMTP Roadmap and prepare for RP3
- Milestone 3 (2025-30) to deliver prioritised AM Capability Improvements

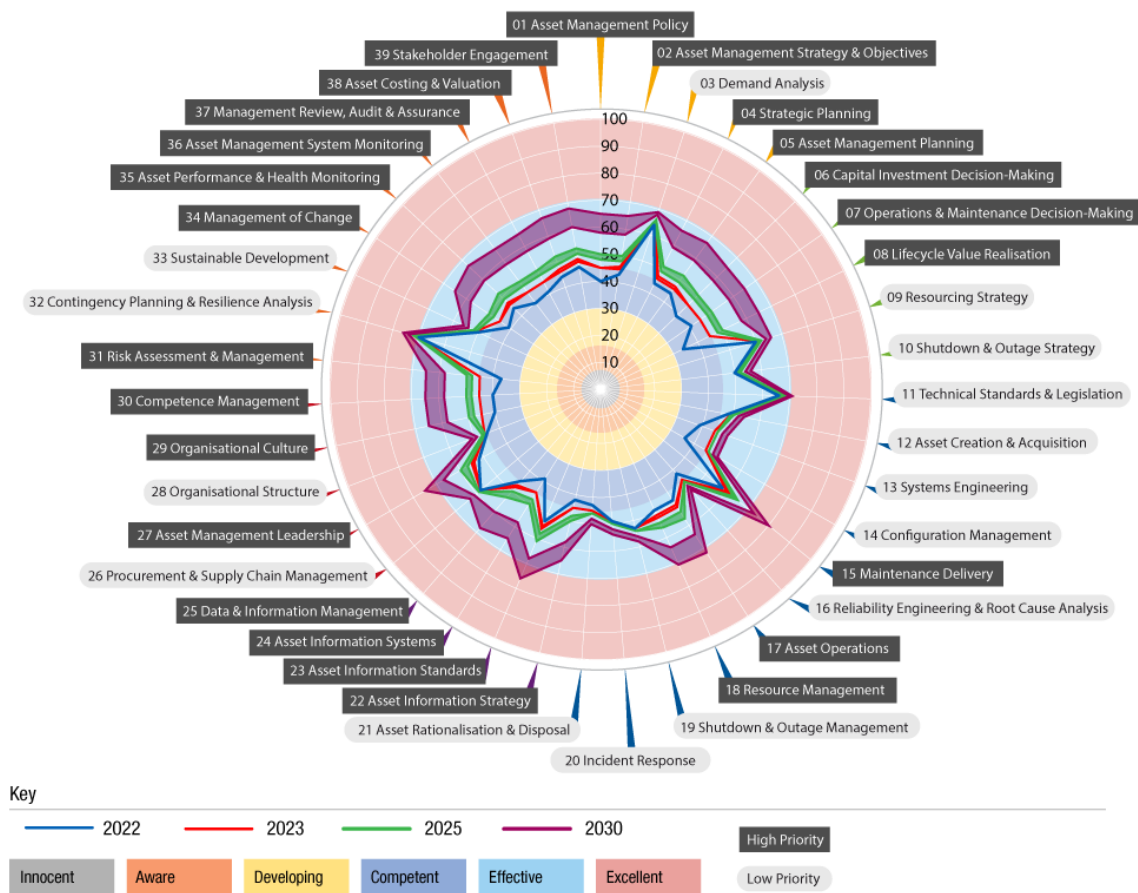


Figure 15 – Three trajectory milestones

Six individual Subject Group improvement trajectory ranges, and the key actions required to achieve the three milestones in each of these Groups, can be found in Appendix D of this report.

The trajectories summarised above and explained in more detail in Appendix D, define National Highways’ starting position, as assessed, in terms of its Asset Management capability, and realistically achievable capability improvements over RP3. Section 5 (following) uses empirical case study evidence, adjusted for this starting position, to define proposed efficiency ranges associated with the capability improvements contained in these trajectories.

## 5. Scope for Efficiencies

### 5.1 Introduction

As with the improvement trajectory ranges discussed in Section 4, the potential scopes for efficiency identified during this review are not intended to form specific targets to be met, or reductions in real-term budgets. They are intended to provide guidance to National Highways and the ORR on the scale of efficiencies that might be expected during RP3, against pre-efficient estimates based on an assessment of need.

They are based on AMCL's experience and published empirical case studies from a range of infrastructure management organisations globally, to provide a guide of the 'art of the possible' in terms of efficiencies. To achieve these potential efficiencies would require a coherent and focused improvement plan which incorporates all the elements laid out in Appendix D and the successful delivery of that plan over the time-period identified. It would also require other parameters that could negatively impact efficiencies even if the capability improvement trajectories are achieved, such as funding arrangements and priorities, to remain in a 'steady-state' throughout the time-period.

It should also be noted that it is unlikely that any organisation would have the capacity and capability to achieve all the efficiencies identified, but they provide a guide for practicable realisation of efficiencies depending on the final plans established by National Highways for RP3.

The final improvement plans and efficiency targets for the remainder of RP2 and RP3 will be set by the Department for Transport, taking into account National Highways' proposals and ORR advice, and may or may not reflect the experience and case study evidence provided in this report.

### 5.2 'Top-down' Efficiencies

As described in Section 2.4 the process for identifying the potential scope for efficiencies was split into two parts. The first part applied a general 'top-down' assessment of typical efficiencies realised. This included:

- Typical efficiencies associated with the achievement of ISO 55001 compliance (Improvement Trajectory Milestone 1 – see Section 2.4) – directly relevant to RP2 efficiencies given National Highways ambition to achieve ISO 55001 certification in 2023 and indirectly relevant to RP3 efficiencies as a starting point for what can be achieved.
- Typical capital and operational efficiencies achievable following the achievement of ISO 55001 (Improvement Trajectory Milestone 2 and part of Milestone 3 – also see Section 2.4).

Based on the top-down efficiencies identified (see Appendix E), it is our opinion that efficiencies in the generalised range of 5%-15% are realistically achievable between the final year of RP2 and final year of RP3, assuming ISO 55001 compliance is achieved by the end of RP2. This efficiency range applies to OMR activities that can be influenced by improvements to National Highways' Asset Management capability over the same period. It may be realised through financial or other gains (e.g. reduction in work volumes or transfer of effort). This range is also supported by the case study evidenced 'bottom-up' efficiencies identified.

In forming this opinion, AMCL utilised its professional knowledge and experience to consider the following factors:

- The range of efficiencies evidenced by the case studies against each Efficiency Area were, when taken in aggregate, relatively large ranges in some cases. A relatively pessimistic view, based on the lower quartiles of the identified ranges and the removal of outliers was therefore adopted.
- The activities that underpin the proposed Improvement Trajectories, which are defined in Appendix D and include National Highways' existing plans for further capability improvement, were aligned to the case studies, where possible.

### 5.3 'Bottom-up' Efficiencies

The second part was a 'bottom-up' assessment of more specific efficiencies aligned with longer-term improvement actions associated with Improvement Trajectory Milestone 3. The result from this assessment is shown in Table 5, which shows the 12 'Efficiency Areas' (i.e. standard areas of capability improvement which have been demonstrated to deliver efficiencies for asset intensive organisations) and a suggested scope for efficiency based on the relevant case study evidence identified and reviewed.

It should be noted that:

- The scope for efficiencies is based on the Efficiency Areas and Case Study Ranges reviewed.
- Suggested Scope (as shown in the third column of Table 5) is the lower quartile Case Study range for each Efficiency Area, as we believe this is achievable within the relevant timescales.
- This provides a more realistic and practicable target efficiency range, as not all Case Studies provide details of timescales to implement and realise efficiencies.

These suggested scopes of efficiency can be used to inform the expected efficiencies to be gained from improvement plans that map to the identified Efficiency Areas. Conversely, the suggested scopes of efficiency can be used by National Highways to drive improvement plans where further efficiency is required.

More detail on this and the case studies reviewed can be found in 0, which contains the following information:

- Appendix F.1 shows the mapping of the 12 Efficiency Areas listed in Table 5 into the six Subject Groups of the IAM's Conceptual Model.
- Appendix F.2 shows the case study detail for each Efficiency Area, broken down into 26 sub-areas and mapped into the RIS2 Outcomes and National Highways' '7 Ways' (equivalent to Asset Management Objectives).

These potential scopes of efficiency and associated empirical evidence are intended to help inform relevant discussions relating to RP3 targets and plans. However, our experience and best practice suggests that to be successful they must be **baselined** (i.e. the starting position against which the efficiencies are to be measured from) and measures agreed and documented before monitoring starts at the beginning of RP3.

Table 5 – 12 Efficiency Areas

| Ref. | Efficiency Area  | Suggested Scope                       | Units of Benefit Identified in Relevant Case Studies                        |
|------|--|---------------------------------------|---|
| 1    | Improve alignment of objectives to enable better direction of National Highways' business activities | 0% to 5%                              | Customer Satisfaction Score   |
| 2    | Establish end-to-end planning and efficiencies realisation process                                   | 2% to 17%<br>3% to 6%                 | Capex Cost per Annum<br>Average Rate of Return                              |
| 3    | Improve understanding of lifecycle costs and risks for critical assets                               | 5% to 11%                             | Annualised Lifecycle Cost   |
| 4    | Improve condition and reliability of National Highways' asset portfolio                              | 5% to 24%                             | Downtime reduction  |
| 5    | Tailor maintenance activities to manage costs and risk exposure                                      | 3% to 9%<br>15% to 19%                | Corrective Maintenance Cost per Annum<br>Maintenance Cost per Annum         |
| 6    | Tailor spares procurement and holdings to manage costs and risk exposure                             | 10% to 20%<br>10% to 15%              | Inventory Procurement Costs<br>Inventory Holding Costs                      |
| 7    | Improve alignment of supply chain with National Highways' Asset Management objectives                | 0% to 12%<br>10% to 20%               | Maintenance Cost per Annum<br>Under-Warranty Work Cost                      |
| 8    | Improve alignment of data collation with National Highways' decision making and risk exposure        | 1% to 2%                              | Annualised Lifecycle Cost   |
| 9    | Improve efficiency of data access for users  | 7% to 14%<br>3% to 15%                | Maintenance Cost per Annum<br>IT Opex Costs                                 |
| 10   | Improve understanding and use of risk throughout National Highways                                   | 14% to 23%<br>7% to 13%<br>42% to 45% | Normalized Risk Value<br>Capex Cost per Annum<br>No. of Capex Cost Overruns |
| 11   | Improve how National Highways manages change to minimise risk exposure                               | Qualitative                           | None  |
| 12   | Improve the sustainability of National Highways as an Asset Management organization                  | Qualitative                           | None  |

## 6. Conclusions & Recommendations

### 6.1 Overview

The conclusions and recommendations for this review are detailed in the following three sections, split by the original review objectives:

- 1) Provide an assessment of National Highways' current Asset Management capability and maturity mid-way through RP2.
- 2) Document National Highways' improvement plans and assess the Company's ability to make improvements to its Asset Management capability during the remainder of RP2 and during RP3.
- 3) Determine the scope for efficiencies that could be reasonably expected from improvements in the Company's Asset Management capability.

### 6.2 Objective 1 – Current Capability (mid-RP2) Conclusions

Overall National Highways has made significant progress since AMCL last assessed Highways England's (as National Highways was then called) Asset Management maturity capability in 2017-18.

In our view, introduction of the Asset Delivery model has had a significant effect on the capability of National Highways to define, implement and control an Asset Management system which will increasingly respond to and fulfil the requirements placed upon it by the government. It enables National Highways to control its activities and get access to information which are essential to achieving its goals, targets or outcomes more easily, as set out in the Road Investment Strategy (RIS) cycles.

Effective Asset Management governance and leadership has been established via the Asset Management Steering Group (AMSG). The AMSG is part of National Highways' Executive function which ensures its effectiveness. However, the Asset Management System that was developing in 2017 has been redefined and is not yet fully complete. Further clarity is required on its scope (which is currently focused on RIS 'Outcome 3') and the measurability of its objectives.

National Highways has an ambition to achieve ISO 55001 certification within a relatively short timescale, which will require a shift in improvement focus from the 39 Subjects to management system implementation and embedment. Although National Highways benchmarks favourably against the sample of assessments in AMCL's assessment database, its capabilities against the ISO 55001 'Plan-Do-Check-Act' (PDCA) management system requirements are not yet sufficient to guarantee certification. The main areas that require improvement are:

- **Clause 4: Context of the Organization** – Fully define the scope of the AM System and complete and embed all AM System artefacts, specifically completion of the AM Catalogue, documentation of the AMPs, and definition of the SAMP (i.e., the 'Our Approach' document requires setting in context or expanding).
- **Clause 6: Planning** - Complete harmonisation of the national planning approach, ensuring alignment to the achievement of the 7 'Ways' (equivalent to AM Objectives), embedding risk-based decision-making.
- **Clause 9: Performance Evaluation** – Ensure management review is effectively focused on the 'Business as Usual' review of the AM System, rather than the implementation project itself, specifically ensure coverage of all ISO 55001 requirements, including the review of risks, performance, internal audits and corrective actions.

These are the management system 'bookends' of National Highways AM System and once in place will enable the PDCA approach to be embedded. The intention is for this to be completed by the end of RP2.

**It is recommended that:**

1. For the remainder of RP2, National Highways focuses its efforts on closing the management system gaps required to achieve ISO 55001 compliance that have been identified during this assessment. The improvements required to achieve this have been detailed in Appendix C.

## 6.3 Objective 2 – Improvement Planning Conclusions

Participants in the assessment consistently identified National Highways as an 'Asset Management' organization, which is underpinned by a newly implemented AM Team structure, and has a focus on improving its Asset Management capabilities to deliver the requirements of the SRN.

There has been continual development of Asset Management capabilities since 2017, the latest iteration of which is the Asset Management Transformation Programme (AMTP) and its Roadmap, which is focused on RIS 'Outcome 3'. In other parts of the organisation other improvement plans exist, for example the 'Operational Excellence' programme. There are clear dependencies between these improvement programmes, but they are not currently fully coordinated. The AMTP itself is not yet fully defined or controlled. The version that was made available to the assessment team was out of date, and it was not clear what the latest version was.

The broader Transformation Programme is designed to bring these various improvement programmes together under one coordinated programme, but this initiative has only just started. The Enterprise Process Model (EPM) is also early in its development.

Our overall conclusion of National Highways' improvement plans is that they include important and potentially effective activities and initiatives, but they are not effectively coordinated and because of this may not deliver as much value as they potentially could.

This review has drawn on the current capability findings and National Highways current improvement plans (primarily the AMTP) to define three horizons for improvement planning:

- **Milestone 1 (2023):** activities to achieve ISO 55001 Certification
- **Milestone 2 (2025):** activities to complete the AMTP Roadmap and prepare for RP3
- **Milestone 3 (2025-30):** activities to deliver prioritised AM Capability Improvements

**It is recommended that:**

2. National Highways adopts the three-milestone dates (outlined above) for Asset Management capability improvement planning to ensure clarity on its improvement objectives.

3. The National Highways Transformation Programme completes its consolidation of National Highways existing plans, and validates the activities identified against the improvement opportunities detailed in Appendix C against each of the 39 Subjects.

4. The AMSG continues to assure that the more focused Asset Management Transformation Programme remains aligned with the consolidated National Highways Transformation Programme (see Recommendation 3) to ensure the capabilities identified to deliver the three milestones are successfully achieved.

## 6.4 Objective 3 – Scope for Efficiencies

The potential scope for efficiencies has been identified to provide a guide to National Highways and the ORR on what has been achieved by other organisations as they have implemented Asset Management maturity capability improvement programmes, using published case studies. The review utilised two related but separate approaches to defining this potential scope:

- 'Top-down' typical efficiencies associated with the achievement of ISO 55001 compliance and typical capital and operational efficiencies achievable following the achievement of ISO 55001.
- 'Bottom-up' identification of more specific efficiencies aligned with longer-term improvement actions proposed in this review, through the study of published case studies comparable to those improvement actions.

These approaches have enabled the identification of a potential range of generalised efficiencies (5%-15%<sup>15</sup>) that could, in AMCL's opinion, be achieved by the final year of RP3 if the capability improvement trajectories defined are achieved over the time-period and other relevant parameters remain 'steady-state'. This should act as a guide to what is achievable, in terms of efficiencies, pending a final decision on improvement plans and the alignment of the scope of efficiencies identified to those plans.

As for all efficiency plans, it is essential that these are initiated with an unambiguous understanding of the baseline, or starting point, i.e., 'where are we now', as well as an agreed, documented and systematic approach for how they are going to be measured throughout the time-period.

Recommendation 1 above effectively strengthens National Highways' ability to do this by formalising the management system 'bookends' of National Highways AM System which, once in place, will enable the PDCA approach to be embedded.

### **It is recommended that:**

5. National Highways notes the scope for efficiencies in this report to help establish relevant efficiency targets, baselines and the means for measuring them before the start of RP3.
6. A formal efficiencies management framework is established and adopted to manage this process.

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<sup>15</sup> This proposed efficiency range is a realistic annual efficiency gain between the final year of RP2 and final year of RP3. The efficiency range applies to OMR activities that can be influenced by improvements to National Highways' Asset Management capability over the same period. It may be realised through financial or other gains (e.g. reduction in work volumes or transfer of effort).

# APPENDICES

# Appendix A Personnel Interviewed

## A.1 INTERACTIONS

| Interaction Detail and Attendees                 |   |
|--|---|
| <b>5th Sept Organisation and People Workshop</b> |   |
| Attendee Name                                    | Title   |
| Jason Glasson                                    | Head of Asset Management Development              |
| Steve Evatt                                      | Principal Enterprise Architect Digital Services   |
| Janine Thorp                                     | Head of Business Design Transformation            |
| Simon Came                                       | Head of Planning and Development (Midlands)       |
| Sarah Bull                                       | Asset Management Portfolio Delivery Manager       |
| Alexandra Shipulina                              | Transformation Delivery Director                  |
| Lila Tachtsi                                     | Asset Management Director                         |
| Frances Stanley                                  | Regulatory Project Manager                        |
| Jane Kelsey                                      | Organisational Development and Change Partner     |
| Liz Herridge                                     | Director of Network Claims and Transformation FBS |
| Janvi Shah                                       | Head of Asset Management Strategy                 |
| Davin Crowley-Sweet                              | Chief Data Officer, Digital Services              |
| <b>6th September Lifecycle Delivery Workshop</b> |   |
| Attendee Name                                    | Title   |
| Jason Glasson                                    | Head of Asset Management Development              |
| Amy Williams                                     | Project Director (OE2025)                         |
| Kieran Dodds                                     | Head of Operational Engineering                   |
| Marie O'Reilly                                   | Head Of Performance and Governance                |
| Colin George                                     | Principal Adv & Team Leader                       |
| Louise Jackson                                   | Head of Strategic Asset Investment Planning       |
| Jordan Phillip                                   | Senior Project Manager OD Performance Team        |
| Janvi Shah                                       | Head of Asset Management Strategy                 |
| Lila Tachtsi                                     | Asset Management Director                         |
| Simon Came                                       | Head of Planning and Development (Midlands)       |
| Dennis Sakufiwa                                  | Head of Specialism Geotechnics SES                |
| Bruce Parker                                     | Head of Planning and Development (NW)             |
| Frances Stanley                                  | Regulatory Project Manager                        |
| Stephen Charlton                                 | Engineering Team Manager                          |
| Serge Mikhaylov                                  | Senior Advisor Asset Management Development       |

| <b>Interaction Detail and Attendees</b>                     |   |
|---|---|
| Craig Bedson  | Head of Geotechnics, Drainage & Pavements             |
| <b>7th October Asset Information Workshop</b>               |   |
| <b>Attendee Name</b>  | <b>Title</b>  |
| Jason Glasson   | Head of Asset Management Development                  |
| Ibrar Ajaz  | IT Business Partner Digital services                  |
| <b>8th September Strategy and Planning Workshop</b>         |   |
| <b>Attendee Name</b>  | <b>Title</b>  |
| Louise Jackson  | Head of Strategic Asset Investment Planning           |
| Jason Glasson   | Head of Asset Management Development                  |
| Jodie Inman   | Graduate Project Manager                              |
| Christina Chinnian  | Head of Regulatory Monitoring                         |
| Janvi Shah  | Head of Asset Management Strategy                     |
| Mark Clements   | Chief Analyst   |
| Chris Jackson   | Project Manager Asset Management Development          |
| Lila Tachtsi  | Asset Management Director,                            |
| Chris Regan   | Business Transformation and Performance Director      |
| <b>13th September Workshop Follow Up Workshop</b>           |   |
| <b>Attendee Name</b>  | <b>Title</b>  |
| Frances Stanley   | Regulatory Project Manager                            |
| Janvi Shah  | Head of Asset Management Strategy                     |
| Chris Jackson   | Project Manager Asset Management Development          |
| <b>15th September Decision Making and Risk &amp; Review</b> |   |
| <b>Attendee Name</b>  | <b>Title</b>  |
| David Bray  | Director Smart Motorways Programme                    |
| Simon Came  | Head of Planning and Development (Midlands)           |
| Christina Chinnian  | Head of Regulatory Monitoring                         |
| Jason Glasson   | Head of Asset Management Development                  |
| Peter Hill  | Group Manager Asset Management Development Structures |
| Chris Jackson   | Project Manager Asset Management Development          |
| Leonie Mackenzie  | Monitoring and RIS Compliance Director                |
| Sharon McCarthy   | Corporate Assurance Director                          |
| Janvi Shah  | Head of Asset Management Strategy                     |
| Frances Stanley   | Regulatory Project Manager                            |
| Lila Tachtsi  | Asset Management Director                             |
| Amy Williams  | Project Director (OE2025)                             |

| <b>Interaction Detail and Attendees</b>  |  |
|--|--|
| Tod Wood                                 | Head of Internal Audit                           |
| <b>20th September Workshop Follow Up</b> |  |
| Attendee Name                            | Title  |
| Lila Tachtsi                             | Asset Management Director                        |
| Janvi Shah                               | Head of Asset Management Strategy                |
| Jason Glasson                            | Head of Asset Management Development             |
| <b>23rd September Workshop Follow Up</b> |  |
| Attendee Name                            | Title  |
| Bruce Parker                             | Head of Planning and Development (NW)            |
| Simon Came                               | Head of Planning and Development (Midlands)      |
| <b>23rd September Workshop Follow Up</b> |  |
| Attendee Name                            | Title  |
| Marie O'Reilly                           | Head Of Performance and Governance               |
| <b>28th September Workshop Follow Up</b> |  |
| Attendee Name                            | Title  |
| Mike Wilson                              | Chief Highways Engineer                          |
| Lila Tachtsi                             | Asset Management Director                        |
| <b>3rd October Workshop Follow Up</b>    |  |
| Attendee Name                            | Title  |
| Alexandra Shipulina                      | Transformation Delivery Director                 |
| <b>3rd October Workshop Follow Up</b>    |  |
| Attendee Name                            | Title  |
| Amy Williams                             | Project Director (OE2025)                        |
| <b>3rd October Workshop Follow Up</b>    |  |
| Attendee Name                            | Title  |
| Steve Davy                               | Head of Technical Standards                      |
| <b>5th October Workshop Follow Up</b>    |  |
| Attendee Name                            | Title  |
| Jessica Corfield                         | Director Business Transformation                 |
| David Bray                               | Director Smart Motorways Programme               |
| <b>5th October Workshop Follow Up</b>    |  |
| Attendee Name                            | Title  |
| Alan Couzens                             | Capital Portfolio Management Divisional Director |
| <b>7th October Workshop Follow Up</b>    |  |
| Attendee Name                            | Title  |

| <b>Interaction Detail and Attendees</b>                      |   |
|--|---|
| Liz Herridge   | Director of Network Claims and Transformation FBS |
| <b>18th October Interim Report Presentation</b>              |   |
| <b>Attendee Name</b>   | <b>Title</b>                                      |
| Lila Tachtsi   | Asset Management Director,                        |
| Janvi Shah   | Head of Asset Management Strategy                 |
| Christina Chinnian   | Head of Regulatory Monitoring                     |
| Jason Glasson  | Head of Asset Management Development              |
| Frances Stanley  | Regulatory Project Manager                        |
| Chris Jackson  | Project Manager Asset Management Development      |
| Stephen Bussell  | Principle Economist                               |
| Danny Jennings   | Principle Highways Engineer                       |
| <b>9th November AM Capability Subject Priorities Session</b> |   |
| <b>Attendee Name</b>   | <b>Title</b>                                      |
| Janvi Shah   | Head of Asset Management Strategy                 |
| Christina Chinnian   | Head of Regulatory Monitoring                     |
| Jason Glasson  | Head of Asset Management Development              |
| Frances Stanley  | Regulatory Project Manager                        |
| <b>29th November Final Report Presentation</b>               |   |
| <b>Attendee Name</b>   | <b>Title</b>                                      |
| Janvi Shah   | Head of Asset Management Strategy                 |
| Christina Chinnian   | Head of Regulatory Monitoring                     |
| Jason Glasson  | Head of Asset Management Development              |
| Frances Stanley  | Regulatory Project Manager                        |
| Rachel Gittens   | Head of Future Road Investment Strategy           |
| Stephen Bussell  | Principle Economist                               |
| Danny Jennings   | Principle Highways Engineer                       |

# Appendix B Documents Reviewed

## B.1 DOCUMENTS

| Item                            | Document Name   |
|---------------------------------|---|
| <b>AMCL Assessment Category</b> | <b>Competence</b>   |
| 1                               | Skills Matrix Final Feedback for 2021 2022                          |
| 2                               | Skills Matrix   |
| 3                               | Skills Matrix for Structures Tunnels and Vehicle Restraints         |
| 4                               | Post Tensioned Training Webinars                                    |
| 5                               | AMSG 23 August Slides V2  |
| 6                               | AMSG Minutes August V1.1  |
| 7                               | Asset Mgt People Capabilities Deep Dive Outputs for Board Sept 2022 |
| <b>AMCL Assessment Category</b> | <b>Asset Information</b>  |
| 8                               | [DRAFT] Asset Management Digital Governance Part A                  |
| 9                               | AMSS Roadmap Part A Update  |
| 10                              | Asset Data Group TOR Rev1   |
| 11                              | Asset Management Digital Programme Board Tor                        |
| 12                              | Data Architecture Standards   |
| 13                              | Data Pain Points Summary  |
| 14                              | Our Accountabilities and Responsibilities                           |
| 15                              | Our Information Vision and Strategy                                 |
| 16                              | PD 08 01 Manage Asset Data Procedure                                |
| 17                              | PD08 Manage Asset Data  |

| Item                            | Document Name                                    |
|---------------------------------|--|
| <b>AMCL Assessment Category</b> | <b>Audit &amp; Assurance</b>                     |
| 18                              | Management Actions Guidance                      |
| 19                              | SES Assurance Mapping Sep 2022                   |
| <b>AMCL Assessment Category</b> | <b>Governance &amp; Change</b>                   |
| 20                              | 220818 AM Sep Dec 22 Comms Plan                  |
| 21                              | AMSG Minutes July                                |
| 22                              | AMSG Tor Updated 2022                            |
| 23                              | NH Change Approach                               |
| 24                              | 220804 Change Engagement Strategy ACS V0.4       |
| 25                              | 220815 ACS Implementation Plan V0.2              |
| 26                              | 220916 AM Comms AMCL slides                      |
| 27                              | AM RACI AMSG Slides V0.19 Inc Draft Systems View |
| 28                              | AMSG 07 July Slides Issue V2                     |
| 29                              | AMSG Agenda 7 July Issue V2                      |
| 30                              | P&D National Meeting Structure                   |
| 31                              | Pavement Group TOR                               |
| <b>AMCL Assessment Category</b> | <b>Organisation Structure</b>                    |
| 32                              | Operations Target Structure 2022 FINAL           |
| <b>AMCL Assessment Category</b> | <b>ACS &amp; Process Books</b>                   |
| 33                              | ACS Structures Publication                       |
| 34                              | ACS VRS Publication                              |
| 35                              | ACS Objectives All Assets 090222                 |

| Item                            | Document Name  |
|---------------------------------|--|
| 36                              | Asset Class Handbook 20 July   |
| 37                              | Drainage Process Book  |
| 38                              | Geotechnical Process Book  |
| 39                              | Heads Of PD ACS ACH 270722 V1.0                                      |
| 40                              | Lighting Process Book  |
| 41                              | Pavements Process Book   |
| 42                              | Structures Process Book  |
| 43                              | VRS Process Book   |
| 44                              | ACS Drainage Publication   |
| 45                              | ACS Geotechnical Publication   |
| 46                              | ACS Lighting Publication   |
| 47                              | ACS Pavement Publication   |
| <b>AMCL Assessment Category</b> | <b>ADMM</b>  |
| 48                              | Admmv13 Part 2 Requirements and Additional Information FINAL         |
| 49                              | Admmv13 Part 4 Asset Reference Catalogue FINAL                       |
| 50                              | Asset Management Capability Review ADMM and Configuration Management |
| 51                              | Of Admmv13 Part 3 Data Dictionary FINAL                              |
| 52                              | Admmv13 Part 1 Data Principles and Governance FINAL                  |
| <b>AMCL Assessment Category</b> | <b>Investment Decision Making</b>                                    |
| 53                              | Investment Decision Matrix   |
| <b>AMCL Assessment Category</b> | <b>Standards</b>   |

| Item                            | Document Name  |
|---------------------------------|--|
| 54                              | Manual for Development of Documents V6.2 February 2022 Parts 1, 2 and 3 Combined |
| <b>AMCL Assessment Category</b> | <b>Performance &amp; Reports</b>   |
| 55                              | NH Efficiency Report 2022  |
| 56                              | RIS2 OMM Final Shared for Publication 14 July                                    |
| 57                              | RIS2 OMM Published 14 July 2022  |
| 58                              | National Highways Annual Report 22   |
| <b>AMCL Assessment Category</b> | <b>Projects</b>  |
| 59                              | OD PCF V2.0 FINAL 300418   |
| 60                              | Project Control Framework The Handbook Version 5.0                               |
| 61                              | 3D User Guide for Scheme Management  |
| <b>AMCL Assessment Category</b> | <b>Area 3 AMOR</b>   |
| 62                              | 190618 Area 3 PAD DOV AMOR Appendix 3 Incident Response Performance V2.0         |
| 63                              | 190618 Area 3 PAD DOV AMOR V2.0  |
| 64                              | 190618 Area 3 PAD AMOR Appendix 4 Severe Weather V2.0                            |
| 65                              | 190618 Area 3 PAD DOV AMOR Appendix 2 Network Occupancy Requirements             |
| <b>AMCL Assessment Category</b> | <b>Sustainability</b>  |
| 66                              | Net Zero Highways Data Methods Statement   |
| 67                              | People Places and Processes a Guide to Good Design at National                   |
| 68                              | 003 Social Value Strategy Report Final   |
| 69                              | Climate Change and The Strategic Road Network                                    |

| Item                            | Document Name  |
|---------------------------------|--|
| 70                              | National Highways Carbon Tool Guidance Document V2 5                 |
| <b>AMCL Assessment Category</b> | <b>AM Transformation</b>   |
| 71                              | AMTP TMO Handbook V2.0   |
| 72                              | 20220324 Charter 6 As Is Process Mapping Summary V0.4                |
| 73                              | AMTP Roadmap   |
| 74                              | Process Workstream Asset Mgt Update                                  |
| 75                              | What Is Asset Management Transformation                              |
| 76                              | What S Changing  |
| 77                              | Charter Pack Master Feb 2021   |
| <b>AMCL Assessment Category</b> | <b>Maintenance</b>   |
| 78                              | GS 801 Revision 1 Asset Delivery Asset Inspection Requirements Adair |
| 79                              | NW 22 23 IRP Final   |
| 80                              | NW 22 23 IRP GG104 Risk Assessments                                  |
| 81                              | TMMM Version 2 1 Final   |
| 82                              | A10 Asset Series 0500 GG104 Risk Assessment                          |
| 83                              | A13 Asset Series 0500 GG104 Risk Assessment                          |
| 84                              | AD10 Maintenance Requirements Plan 2022 23                           |
| 85                              | AD13 Maintenance Requirements Plan 2022 23                           |
| 86                              | GM 701 Revision 1 Asset Delivery Asset Maintenance Requirements Web  |
| <b>AMCL Assessment Category</b> | <b>AM Policy &amp; Strategy</b>                                      |
| 88                              | Asset Management Policy V Final                                      |
| 89                              | Heads Of P&D ACS & ACH 270722 V1.0                                   |

| Item                            | Document Name   |
|---------------------------------|---|
| 90                              | ACS AM Objective Mapping V7   |
| 91                              | AM Framework Diagram Version 1  |
| 92                              | Approach To Asset Management V Final  |
| <b>AMCL Assessment Category</b> | <b>Decision Support Tool</b>  |
| 93                              | DST Capability Slides for AMCL  |
| <b>AMCL Assessment Category</b> | <b>Digital Vision &amp; Systems Strategy</b>                                      |
| 94                              | Digital Roads 2025 Interactive Roadmap Final                                      |
| 95                              | Introducing Digital Roads   |
| 96                              | BED22 0003 Asset Management Systems Strategy Published                            |
| 97                              | Digital Delivery Enabling Outcomes with Digital Data and Technology Final         |
| <b>AMCL Assessment Category</b> | <b>Delivery Plan 2025</b>   |
| 98                              | 5 Year Delivery Plan 2020 2025 Final  |
| <b>AMCL Assessment Category</b> | <b>External Reviews</b>   |
| 99                              | Review Of Highways England's Asset Management of Road Technology                  |
| 100                             | Review Of Highways England's Engagement Approach with Local and Regional Partners |
| 101                             | Review Of Highways England's Supply Chain Management Framework                    |
| 102                             | Ris3 Renewals Planning Effectiveness Review Task 2 Eam Report                     |
| 103                             | Ris3 Renewals Planning Task 1 Eam Report  |
| 104                             | (Highlighted) Ris3 Renewals Planning Task 1 Eam Report                            |
| 105                             | 06 Hyperion Routes to Market Review March 2021                                    |
| 106                             | 07 Hyperion Life Extension Renewals April 2021                                    |

| Item                            | Document Name   |
|---------------------------------|---|
| 107                             | Highways England Portfolio and Programme Management Capability 2017                           |
| 108                             | Highways England Procurement and Contract Management Capability 2017                          |
| 109                             | Review Of Highways England Ability to Improve Efficiency from Its Asset Management Capability |
| <b>AMCL Assessment Category</b> | <b>ORR Annual Assessments</b>   |
| 110                             | Annual Assessment of National Highways Performance 2022 Web 0                                 |
| 111                             | (Highlighted) Annual Assessment of National Highways Performance 2022 Web 0                   |
| 112                             | Annual Assessment of Highways England's Performance 2021 Web                                  |
| <b>AMCL Assessment Category</b> | <b>RIS 2</b>  |
| 113                             | Road Investment Strategy 2 2020 2025  |
| <b>AMCL Assessment Category</b> | <b>Strategic BP 2025</b>  |
| 114                             | Net Zero Highways Our 2030 2040 2050 Plan   |
| 115                             | Strategic Business Plan 2020 25   |
| <b>AMCL Assessment Category</b> | <b>Strategic Planning (Route Strategies)</b>  |
| 116                             | Highways England Strategic Road Network Initial Report WEB                                    |
| 117                             | London To Scotland East Final   |
| 118                             | London To Scotland West Final   |
| 119                             | Manchester Northwest Quadrant Strategic Study Stage 3 Report                                  |
| 120                             | N160005 Route Strategies Approach2  |
| 121                             | Northern Trans Pennine Strategic Study Stage 3 Report   |
| 122                             | Vision for Route Strategies   |

| Item | Document Name  |
|------|--|
| 123  | Connecting The Country Planning for The Long Term            |
| 124  | Delivery Plan 2022 23 July 8                                 |
| 125  | Highways England S Analytical Methods to Inform Our Proposal |

# Appendix C Group Level Findings & Improvement Opportunities

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This appendix details the findings of the assessment by the six AMEM Groups and their constituent 39 Subjects. Each section is structured as follows:

- Overview of Group – an overview of the Group, introducing the purpose of the Group and the primary Subjects that make up the Group.
- Summary of Asset Management capability scores.
- Current Position – a description of the current position of National Highways with respect to the Group by Subject.
- Improvement Opportunities – a list of tactical improvement opportunities identified.

## C.1 STRATEGY & PLANNING

### Overview of Group

The Asset Management Strategy & Planning Group contains the core Asset Management Activities required to develop, implement and improve Asset Management within an organisation, taking into account business and organisational objectives and the effects of changing demand over time on the asset portfolio. The effective output of this Group is a fully justified, long-term Asset Management Plan which clearly explains what the organisation plans to do with its assets with respect to creation, maintenance and operation, and disposal. The Group is split into five **Subjects** which are:

- 1) **Asset Management Policy** - the principles and requirements derived from and consistent with the organisational strategic plan that the organisation will use to manage its physical assets. Includes the definition of the overall Asset Management System.
- 2) **Asset Management Strategy & Objectives** - the strategic approach for the management of the physical assets of the business that will be used to achieve the organisational strategic plan, including the definition of specific Asset Management objectives.
- 3) **Demand Analysis** - the processes an organisation uses to both assess and influence the demand for, and level of service from, an organisation's assets.
- 4) **Strategic Planning** - the process an organisation uses to undertake strategic Asset Management planning.
- 5) **Asset Management Planning** - the processes and plans that specify the activities and resources, responsibilities, timescales and risks for the achievement of the Asset Management objectives.

### Summary

| No. | Subject                                | Maturity Score |
|-----|--|----------------|
| 1   | Asset Management Policy                | 40%            |
| 2   | Asset Management Strategy & Objectives | 43%            |
| 3   | Demand Analysis                        | 64%            |
| 4   | Strategic Planning                     | 44%            |
| 5   | Asset Management Planning              | 44%            |

Table 6 – Strategy & Planning Maturity Scores

Table 7 – Strategy &amp; Planning Findings and Improvement Opportunities

| Subject  | Priority | Score | Findings  | Improvement Opportunities   |
|--|----------|-------|---|---|
| 1 – Asset Management Policy (inc. Asset Management System) | H        | 40%   | <ul style="list-style-type: none"> <li>AM Policy has been reviewed and updated since 2017, but AM System has also been redefined since that time and is still developing and embedding</li> <li>AM System scope is defined primarily against geography and assets – definition with respect to process and organisation is not clearly defined</li> <li>Alignment of AM System is primarily to RIS2 'Outcome 3' only – a draft AM Framework exists but has not been implemented</li> <li>Many AM processes and artefacts are still in development (e.g., EPM and AM Catalogue)</li> </ul>   | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Define AM System scope to meet ISO 55001 requirements</li> <li>Enhance AM Framework to integrate and articulate new and existing AM System artefacts (e.g., SAMP and strategic plans – see Subjects 2 and 4)</li> <li>Complete implementation of the AM System (primarily AM Catalogue and associated processes)</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Update AM Policy and AM System as part of ongoing management review and continual improvement</li> <li>Ensure continued ownership by top management (AMSG)</li> <li>Ensure demonstrable fitness to set, deliver and monitor achievement of AM Objectives</li> </ul>  |
| 2 – Asset Management Strategy & Objectives                 | H        | 43%   | <ul style="list-style-type: none"> <li>'Our Approach' document was presented as the AM Strategy (SAMP) and the '7 Ways' as National Highways' AM Objectives, however: <ul style="list-style-type: none"> <li>'Our Approach' is primarily a defined approach to AM capability development and does not include the asset portfolio strategic plan</li> <li>'7 Ways' are aspirational statements rather than SMART objectives</li> </ul> </li> <li>Other elements of the strategy (such as the ACSs) are under development</li> <li>Innovation &amp; Research strategy is well established</li> <li>In general AM Strategy is relatively new and mostly still developing and embedding</li> </ul> | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Define SAMP in accordance with ISO 55001 requirements and in relation to existing artefacts (see Subjects 1 and 4) – this could be a collection of documents but must include: <ul style="list-style-type: none"> <li>Measurable (SMART) AM Objectives for AM capability development and the asset portfolio</li> <li>Strategic plans to deliver the AM Objectives for AM capability development and the asset portfolio (see Subject 4)</li> </ul> </li> </ul> <p><i>*Note – the strategic plan for capability development is effectively the AMTP Roadmap (and elements of the broader TP Roadmap including Operational Excellence – see Subject 17)</i></p> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Fully embed AM Strategy and AM Objectives ('Our Approach' and 'Ways')</li> <li>Fully embed ACS approach including underpinning lifecycle modelling (costs and risks)</li> </ul> |

| Subject                       | Priority | Score | Findings   | Improvement Opportunities   |
|-------------------------------|----------|-------|--|---|
| 3 – Demand Analysis           | L        | 64%   | <ul style="list-style-type: none"> <li>Defined demand analysis approach driven by RIS cycle</li> <li>Complete set of documentation (e.g., Route Strategies, Strategic Studies, SRNIR) support and being iterated for RIS3</li> <li>Potential future scenarios are defined, and Route Strategies and Strategic Studies define service level requirements</li> </ul>   | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>No specific actions required beyond being able to demonstrate full systematic control of this Subject in relation to the AM System</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>This is a low priority subject area. No specific improvement opportunities have been identified beyond ISO 55001 compliance – continual improvement only</li> </ul>  |
| 4 – Strategic Planning        | H        | 44%   | <ul style="list-style-type: none"> <li>Strategic planning is driven by the RIS cycle (Research, Decision, Mobilisation, Delivery)</li> <li>The EPM (16 Step Process) includes required elements of a strategic planning process but is early in its development</li> <li>The SBP 2020-25 contains an Annex which includes strategic funding, however risks and liabilities are not quantified</li> </ul>   | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Identify existing strategic plans which constitute the relevant part of the SAMP – utilise AM Framework to articulate this (see Subjects 1 and 2).</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Fully embed end-to-end strategic planning process</li> <li>Ensure the process is underpinned by lifecycle modelling and understanding of risks and liabilities</li> </ul>  |
| 5 – Asset Management Planning | H        | 44%   | <ul style="list-style-type: none"> <li>Each Region has its own process for planning and unconstrained AMPs are held at the Regional level</li> <li>The constrained strategic AMP is produced as part of RIS setting process</li> <li>Regional approaches to optimisation and prioritisation are currently being harmonised into agreed national approach</li> <li>There is limited evidence of alignment of Regional plans to the achievement of AM Objectives (the '7 Ways')</li> </ul> | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Identify existing Regional plans within the AM System, and make explicit their alignment to the SAMP and the AM Objectives – utilise AM Framework to articulate this (see Subjects 1 and 2)</li> <li>Complete the harmonisation of Regional approaches, and ensure the Regional AMPs can demonstrate how they deliver the AM Objectives</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Fully integrate AM planning processes through embedded end-to-end process</li> <li>Demonstrate full alignment between strategic and Regional plans</li> <li>Implement virtual planning process and plans</li> </ul> |

## C.2 ASSET MANAGEMENT DECISION MAKING

### Overview of Group

The Asset Management Decision-Making Group contains the Asset Management Activities required to enable the development of whole-life cost justified and optimised Asset Management Plans. The outputs from this Group are a set of asset policies (or asset class strategies) which present optimised Asset Management lifecycle decisions for all the organisation’s assets, and guidance on how these should be applied or modified. The Group is split into five Subjects which are:

- 6) **Capital Investment Decision-Making** - the activities undertaken by an organisation to determine the capital expenditure requirements necessary to deliver the strategic plan.
- 7) **Operations & Maintenance Decision-Making** - the processes and activities undertaken to define appropriate maintenance requirements.
- 8) **Lifecycle Value Realisation** - the activities undertaken by an organisation to trade-off the costs and benefits of different renewal and maintenance interventions over the life of the assets, systems and asset portfolio with respect to value.
- 9) **Resourcing Strategy** - the activities undertaken by an organisation to optimise the use of people, plant, tools and materials to deliver the required Asset Management activities.
- 10) **Shutdowns & Outage Strategy** - the activities undertaken by an organisation to develop an optimised strategy for shutdowns or outages.

### Summary

| No. | Subject                                  | Maturity Score |
|-----|--|----------------|
| 6   | Capital Investment Decision-Making       | 39%            |
| 7   | Operations & Maintenance Decision-Making | 41%            |
| 8   | Lifecycle Value Realisation              | 34%            |
| 9   | Resourcing Strategy                      | 60%            |
| 10  | Shutdown & Outage Strategy               | 50%            |

Table 8 – Asset Management Decision Making Maturity Scores

Table 9 – Asset Management Decision Making Findings and Improvement Opportunities

| Subject                                      | Priority | Score | Findings  | Improvement Opportunities   |
|--|----------|-------|---|---|
| 6 – Capital Investment Decision-Making       | H        | 39%   | <ul style="list-style-type: none"> <li>• ACSs outline the narrative for investment decisions – for both renewals and enhancements – but this is qualitative only and they are not yet completed</li> <li>• Processes to identify capital items are defined at a Regional level, these are then constrained, and their strategic alignment approved at a national level</li> <li>• Limited evidence of risk being used to prioritise and optimise plans</li> </ul> | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>• Complete ACS documentation and embed their use</li> <li>• Ensure the use of risk to prioritise plans is explicit and consistent (between Regions and to the Corporate RMF – see Subject 31)</li> <li>• Ensure Regional processes are consistently applied</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>• Fully integrate AM planning processes through embedded end-to-end process</li> <li>• Demonstrate full alignment between strategic and Regional plans</li> <li>• Implement virtual planning process and plans</li> </ul> |
| 7 – Operations & Maintenance Decision-Making | H        | 41%   | <ul style="list-style-type: none"> <li>• ILM / ADAMr / ADAIr appear to define a Maintenance Strategy and define key maintenance standards / procedures</li> <li>• Regional MRPs will begin to implement a more risk-based maintenance strategy and maintenance requirements approach</li> <li>• The 'Operational Strategy' and the 'SRN concept of operations' fulfil the requirements of an operations strategy</li> </ul>                                       | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>• Complete MRP roll-out and embed</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>• Implement more sophisticated approaches to O&amp;M optimisation (for example, cost-risk optimisation of intervals)</li> <li>• Fully integrate O&amp;M optimisation into lifecycle modelling (see Subject 8)</li> </ul>  |
| 8 – Lifecycle Value Realisation              | H        | 34%   | <ul style="list-style-type: none"> <li>• DSTs exist for Pavements and Structures – which are the most critical asset classes – but these are of limited sophistication</li> <li>• Other asset groups do not have DSTs at present</li> <li>• AMPT 3.20 defines the following for the 22/23 timeframe – "Asset DST requirements developed" – so plans to develop this capability but not compete yet</li> </ul>   | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>• Complete ACS documentation and embed – ensure full lifecycle is 'considered' within planning</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>• Full risk-based lifecycle modelling for critical assets provides clear understanding of lifecycle value</li> <li>• Validation and improvement of lifecycle models ongoing</li> <li>• ACSs updated periodically to reflect lifecycle model validation and ongoing performance</li> </ul>  |
| 9 – Resourcing Strategy                      | L        | 60%   | <ul style="list-style-type: none"> <li>• Specific contracting models have been established</li> <li>• Asset Delivery is the core approach and has brought more control to resourcing and delivery capability (including through TUPE)</li> <li>• The Network Occupancy Process defines road access</li> <li>• First-cut for resources and access for RIS3 will be defined by February 2023</li> </ul>   | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>• No specific actions required beyond being able to demonstrate full systematic control of this Subject in relation to the AM System</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>• This is a low priority subject area. No specific improvement opportunities have been identified beyond ISO 55001 compliance – continual improvement only</li> </ul>  |

| Subject                         | Priority | Score | Findings  | Improvement Opportunities  |
|---------------------------------|----------|-------|---|--|
| 10 – Shutdown & Outage Strategy | L        | 50%   | <ul style="list-style-type: none"> <li>Efficient delivery and customer impact are a key tenet of the SBP and Delivery Plan documents</li> <li>Strategic Studies and Route Strategies help to define the long-term access requirements</li> <li>The Network Occupancy Process defines road access</li> <li>First-cut for resources and access for RIS3 will be defined by February 2023</li> </ul> | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>No specific actions required beyond being able to demonstrate full systematic control of this Subject in relation to the AM System</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>This is a low priority subject area. No specific improvement opportunities have been identified beyond ISO 55001 compliance – continual improvement only</li> </ul> |

## C.3 LIFECYCLE DELIVERY

### Overview of Group

The Lifecycle Delivery Group contains all the Asset Management Activities required to implement the Asset Management Plans created in the Asset Management Strategy & Planning Group (see Appendix Section C.1). The Group is split into eleven Subjects which are:

- 11) **Technical Standards & Legislation** - the processes used by the organisation to ensure its Asset Management activities are compliant with the relevant technical standards and legislation.
- 12) **Asset Creation & Acquisition** - the organisation's processes for the acquisition, installation and commissioning of assets.
- 13) **Systems Engineering** - a robust approach to the design, creation and operation of systems.
- 14) **Configuration Management** - a management process for establishing and maintaining consistency of a product's physical and functional attributes with its design and operational information throughout its life.
- 15) **Maintenance Delivery** - the management of maintenance activities including both preventive and corrective maintenance management methodologies.
- 16) **Reliability Engineering** - the processes for ensuring that an item shall operate to a defined standard for a defined period of time in a defined environment.
- 17) **Asset Operations** - the processes used by an organisation to operate its assets to achieve the business goals.
- 18) **Resource Management** - the processes used by an organisation to manage its resources in support of its Asset Management plans.
- 19) **Shutdown & Outage Management** - the processes used by an organisation to optimally deliver the shutdown and outage strategy.
- 20) **Fault & Incident Response** - the processes used by an organisation to predict and respond to failures and incidents.
- 21) **Asset Decommissioning & Disposal** - the processes used by an organisation to decommission and dispose of their assets.

## Summary

| No. | Subject                           | Maturity Score |
|-----|-----------------------------------|----------------|
| 11  | Technical Standards & Legislation | 66%            |
| 12  | Asset Creation & Acquisition      | 48%            |
| 13  | Systems Engineering               | 39%            |
| 14  | Configuration Management          | 36%            |
| 15  | Maintenance Delivery              | 58%            |
| 16  | Reliability Engineering           | 42%            |
| 17  | Asset Operations                  | 49%            |
| 18  | Resource Management               | 49%            |
| 19  | Shutdown & Outage Management      | 53%            |
| 20  | Fault & Incident Response         | 49%            |
| 21  | Asset Decommissioning & Disposal  | 43%            |

Table 10 – Lifecycle Delivery Maturity Scores

Table 11 – Lifecycle Delivery Findings and Improvement Opportunities

| Subject                                | Priority | Score | Findings   | Improvement Opportunities  |
|--|----------|-------|--|--|
| 11 – Technical Standards & Legislation | L        | 66%   | <ul style="list-style-type: none"> <li>National Highways runs the governance process related to highways standards on behalf of the UK highways industry</li> <li>All relevant standards are available via the 'Standards for Highways' portal and are controlled by Technical Standards Committees</li> <li>Product acceptance is clearly defined and implemented in accordance with EU requirements</li> </ul>   | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>No specific actions required beyond being able to demonstrate full systematic control of this Subject in relation to the AM System</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>This is a low priority subject area. No specific improvement opportunities have been identified beyond ISO 55001 compliance – continual improvement only</li> </ul>   |
| 12 – Asset Creation & Acquisition      | L        | 48%   | <ul style="list-style-type: none"> <li>PCF is in place which provides a project management Gateway process that is followed</li> <li>Reported that effective Project Management processes are in place backed up by Project Management competence framework</li> <li>No programme management methodology is in place, but Programme Boards exist which provide a systematic approach</li> <li>PCF is being refined and integrated with the '3D Process' via the Integrated PM Framework</li> </ul> | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Complete '3D Process' implementation and embed</li> <li>No further specific actions required beyond being able to demonstrate full systematic control of this Subject in relation to the AM System</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>This is a low priority subject area. No specific improvement opportunities have been identified beyond ISO 55001 compliance – continual improvement only</li> </ul>   |
| 13 – Systems Engineering               | L        | 39%   | <ul style="list-style-type: none"> <li>Traditional requirements management is in place and delivered through the PCF, based on standard specifications and project engineering assurance</li> <li>Project engineering assurance is provided through PCF Gateways which are also independently assured (by Corporate Assurance)</li> <li>There is a developing V-model approach for managing requirements through more complex technology projects, but this is not yet in place</li> </ul>         | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Ensure developing V-model approach is not presented as BAU</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>This is a low priority subject area. No specific improvement opportunities have been identified beyond ISO 55001 compliance – continual improvement only</li> </ul>   |
| 14 – Configuration Management          | L        | 36%   | <ul style="list-style-type: none"> <li>New ADMM and PD08 define configuration baseline and process for keeping this up to date through capital interventions</li> <li>However, there is no complete configuration management system which controls all changes</li> <li>Understanding of national network configuration is limited by regional variations and non-standardised designs</li> </ul>  | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Ensure ADMM and PD08 are consistently applied and where possible harmonise Regional approaches</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>This is a low priority subject area. No specific improvement opportunities have been identified beyond ISO 55001 compliance – continual improvement only. <i>However, see also Subject 34 which is a high priority Subject with an opportunity to automate as far as possible asset change utilising a configuration management approach that ensures critical asset configuration is maintained</i></li> </ul> |

| Subject                      | Priority | Score | Findings   | Improvement Opportunities   |
|------------------------------|----------|-------|--|---|
| 15 – Maintenance Delivery    | H        | 58%   | <ul style="list-style-type: none"> <li>Asset Delivery structure brings improved clarity and control to the execution of maintenance and inspection activities</li> <li>Maintenance requirements are baselined by SES and refined and applied regionally (through the new MRP process)</li> <li>IP5 reporting is underpinned by common information (for example the Confirm system) and improving collation</li> </ul>                                | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Complete MRP roll-out and embed</li> <li>No further specific actions required beyond being able to demonstrate full systematic control of this Subject in relation to the AM System</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Continue to improve intelligent planning and access to the asset through innovation, data and analysis</li> <li>Better integrate all maintenance, renewal and operational activity</li> </ul>                       |
| 16 – Reliability Engineering | L        | 42%   | <ul style="list-style-type: none"> <li>Reliability is the focus of RIS Outcome 2 – ‘Providing Fast &amp; Reliable Journeys’</li> <li>This is primarily being enabled through National Highways’ major schemes through modelling, enhancement work and improved incident response</li> <li>There is no detailed and systematic process for root cause analysis or OMR level reliability growth planning</li> </ul>                                    | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Implement a systematic process for root cause analysis and OMR level reliability growth planning</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>This is a low priority subject area. No specific improvement opportunities have been identified beyond ISO 55001 compliance – continual improvement only</li> </ul>  |
| 17 – Asset Operations        | H        | 49%   | <ul style="list-style-type: none"> <li>Asset related operational processes are defined in the AMOR and in various standards in the 'Standards for Highways' online portal</li> <li>Requirements for managing degraded mode operations are set out in the DMRB (GM703 and 704) and in the AMOR Appendices 3 and 4</li> <li>The Operational Excellence initiative is integral to improvement, but its link to the AMTP was not demonstrated</li> </ul> | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Ensure the scope of the AM System (see Subject 1) includes Operational Excellence and develop and / or integrate an improvement roadmap which covers the full scope of the AM System (see also Subject 2)</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Continue to improve intelligent planning and access to the asset through innovation, data and analysis</li> <li>Better integrate all maintenance, renewal and operational activity</li> </ul> |
| 18 – Resource Management     | H        | 49%   | <ul style="list-style-type: none"> <li>Asset Delivery has improved the control and management of delivery resources to deliver National Highways’ needs</li> <li>Asset Delivery and other frameworks demonstrate that there is no significant shortage of delivery resource</li> <li>Internal teams have been inherited - not planned. There is a target operating structure, but this is not yet fully implemented</li> </ul>                       | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>No specific actions required beyond being able to demonstrate full systematic control of this Subject in relation to the AM System</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Implement new target operating structure – ensure full alignment of resources to current future needs as articulated in SAMP and AMP documentation</li> </ul>  |

| Subject                               | Priority | Score | Findings  | Improvement Opportunities  |
|---------------------------------------|----------|-------|---|--|
| 19 – Shutdown & Outage Management     | L        | 53%   | <ul style="list-style-type: none"> <li>The well-established Network Occupancy Process manages this systematically, and no significant change evidenced since 2017</li> <li>Reported that the Network Occupancy Team know the programme of work and bundle it effectively</li> <li>Overall, National Highways' Delivery Plan and the detailed planned against actual performance is actively monitored</li> </ul>        | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>No specific actions required beyond being able to demonstrate full systematic control of this Subject in relation to the AM System</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>This is a low priority subject area. No specific improvement opportunities have been identified beyond ISO 55001 compliance – continual improvement only</li> </ul> |
| 20 – Fault & Incident Response        | L        | 49%   | <ul style="list-style-type: none"> <li>Fault Reporting Incident Response Operational Requirement defined in Part 3 of the AMOR</li> <li>AMOR identifies contingency plan requirements - including the 'Tactical Incident Response Plan'</li> <li>Control centre is the first point of contact, Traffic Officers provide first response, with asset engineering second line response from Regional teams</li> </ul>      | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>No specific actions required beyond being able to demonstrate full systematic control of this Subject in relation to the AM System</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>This is a low priority subject area. No specific improvement opportunities have been identified beyond ISO 55001 compliance – continual improvement only</li> </ul> |
| 21 – Asset Decommissioning & Disposal | L        | 43%   | <ul style="list-style-type: none"> <li>Decommissioning and disposal of assets is completed in accordance with all required legislation and regulation</li> <li>PCF covers land rehabilitation and the ADMM covers more general strategy and processes for disposal</li> <li>Detailed disposal processes are in the DMRB / MCWH but need to be made more explicit in the 'Our Approach' and ACS documentation</li> </ul> | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Make disposal processes detailed in the DMRB / MCWH more explicit in the 'Our Approach' and ACS documentation</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>This is a low priority subject area. No specific improvement opportunities have been identified beyond ISO 55001 compliance – continual improvement only</li> </ul>                      |

## C.4 ASSET INFORMATION

### Overview of Group

The Asset Information Group contains all the Asset Management Activities required to specify, collect, maintain and dispose of asset information in a way that fully supports all aspects of an organisation's Asset Management System. The Group is split into four Subjects which are:

- 22) **Asset Information Strategy** - the approach to the definition, collection, management, reporting and overall governance of asset information necessary to support the implementation of the organisation's Asset Management strategy.
- 23) **Asset Information Standards** - the specification of a consistent structure and format for collecting and storing asset knowledge.
- 24) **Asset Information Systems** - the asset information systems the organisation has in place to support the Asset Management activities and decision-making processes in accordance with the asset information strategy.
- 25) **Data & Information Management** - the data and knowledge held within the organisation's asset information system.

### Summary

| No. | Subject                       | Maturity Score |
|-----|-------------------------------|----------------|
| 22  | Asset Information Strategy    | 42%            |
| 23  | Asset Information Standards   | 53%            |
| 24  | Asset Information Systems     | 39%            |
| 25  | Data & Information Management | 45%            |

Table 12 – Asset Information Maturity Scores

Table 13 – Asset Information Findings and Improvement Opportunities

| Subject                          | Priority | Score | Findings   | Improvement Opportunities  |
|----------------------------------|----------|-------|--|--|
| 22 – Asset Information Strategy  | H        | 42%   | <ul style="list-style-type: none"> <li>‘Our Information Vision &amp; Strategy’ (Highways England document from 2020) exists online but has not been referenced in the workshops or by interviewees</li> <li>Overall roadmap is set out in the AMTP Charter 4 ‘sunburst’ diagram, but multiple strategies are in place, including the AMSS and Digital Strategy</li> <li>ADMM Part 2 details the requirements for asset data which have been defined to fulfil National Highways’ strategic objectives</li> </ul> | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Ensure clarity and alignment of the various asset information and digital strategies (including Our Information Vision &amp; Strategy, AMSS and Digital Strategy)</li> <li>Ensure alignment of information strategies and approaches to the scope and requirements of the AM System (see Subject 1)</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Update AI Strategy as part of ongoing management review and continual improvement</li> <li>Ensure focus on systems integration and information coverage for all AM activities</li> <li>Continue to improve intelligent planning and access to the asset through innovation, data and analysis</li> </ul> |
| 23 – Asset Information Standards | H        | 53%   | <ul style="list-style-type: none"> <li>PD08 manages handover of data from work, supported by PCF and the ‘3D Process’</li> <li>ADMM Part 2 includes National Highways’ requirements for asset data management and provides supporting guidance for each asset class</li> <li>ADMM Part 3 (Data Dictionary) defines the asset data requirements, hierarchy, and rules for individual assets and attributes</li> </ul>   | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>No specific actions required beyond being able to demonstrate full systematic control of this Subject in relation to the AM System</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>AI Standards are updated to support integrated systems</li> <li>Effective feedback loop between information usage and AI Standards is in place</li> </ul>   |
| 24 – Asset Information Systems   | H        | 39%   | <ul style="list-style-type: none"> <li>Current AM Systems landscape documented in Section 3 of AMSS shows numerous systems in place and operational</li> <li>AMSS identifies siloed AI systems, potential duplication, overlapping capabilities and limited interoperability</li> <li>Roadmap for AMSS implementation is not anticipated to be in place until 2023</li> </ul>  | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Ensure existing information systems provide accessible and controlled information in accordance with clause 7.6 (of ISO 55001)</li> <li>Ensure any discrepancies or issues are identified and rectification plans are defined and being implemented and monitored</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Information systems are fully integrated</li> <li>Full alignment between financial and asset registers</li> </ul>  |

| Subject                            | Priority | Score | Findings  | Improvement Opportunities  |
|------------------------------------|----------|-------|---|--|
| 25 – Data & Information Management | H        | 45%   | <ul style="list-style-type: none"> <li>ADMM Part 1 sets out the data principles, categories and governance for information</li> <li>Online 'information management system' defines information governance roles for the governance and continual improvement of information</li> <li>Developing 'Data as a service' corporate approach appears good practice but there was limited evidence of this provided</li> </ul> | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Ensure existing information is accessible and controlled in accordance with clause 7.6 (of ISO 55001)</li> <li>Ensure any discrepancies or issues are identified and rectification plans are defined and being implemented and monitored</li> <li>No further specific actions required beyond being able to demonstrate full systematic control of this Subject in relation to the AM System</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Fully embed 'Data as a service' ensuring this is aligned to the needs of the AM System</li> <li>Ensure available information supports all aspects of the AM System, including: <ul style="list-style-type: none"> <li>lifecycle modelling (see Subjects 6,7,8)</li> <li>Understanding asset costs and risks</li> <li>Understanding unit costs (see Subject 38)</li> </ul> </li> </ul> |

## C.5 ORGANISATION & PEOPLE ENABLERS

### Overview of Group

The Organisation and People Enablers Group is focused on assessing the capability of an organisation, its people and its supply chain to effectively implement all aspects of Asset Management. The Group is split into five Subjects which are:

- 26) **Procurement & Supply Chain Management** - the management and development of supply organisations.
- 27) **Asset Management Leadership** - the leadership of the organisation in promoting a whole-life Asset Management approach to the stewardship of the organisation's assets.
- 28) **Organisational Structure** - the structure of the organisation in terms of its ability to deliver effective Asset Management.
- 29) **Organisational Culture** - the culture of the organisation in terms of its ability to deliver effective Asset Management.
- 30) **Competence Management** - the processes used by the organisation to systematically develop and maintain an adequate supply of competent and motivated people to fulfil its Asset Management objectives.

### Summary

| No. | Subject                               | Maturity Score |
|-----|---------------------------------------|----------------|
| 26  | Procurement & Supply Chain Management | 58%            |
| 27  | Asset Management Leadership           | 52%            |
| 28  | Organisational Structure              | 45%            |
| 29  | Organisational Culture                | 40%            |
| 30  | Competence Management                 | 40%            |

Table 14 – Organisation & People Maturity Scores

Table 15 – Organisation & People Enablers Findings and Improvement Opportunities

| Subject                                    | Priority | Score | Findings   | Improvement Opportunities  |
|--|----------|-------|--|--|
| 26 – Procurement & Supply Chain Management | L        | 58%   | <ul style="list-style-type: none"> <li>Move to Asset Delivery contractual arrangement is the most significant improvement since 2017 which has enabled National Highways to better define, implement and control its AM System</li> <li>Beyond this general evidence of iterative improvements</li> <li>Categorisation through tiers of contractors include PFI, Route to Market and Asset Delivery categories</li> <li>No evidence provided of a written procurement or supply chain policy and / or strategy in place</li> </ul> | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>No specific actions required beyond being able to demonstrate full systematic control of this Subject in relation to the AM System</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>This is a low priority subject area. No specific improvement opportunities have been identified beyond ISO 55001 compliance – continual improvement only</li> </ul>   |
| 27 – Asset Management Leadership           | H        | 52%   | <ul style="list-style-type: none"> <li>Effective AM governance and leadership has been established via the Asset Management Steering Group (AMSG)</li> <li>AMSG is part of National Highways' Executive function which assures its effectiveness, with revised AM Policy endorsed by 'Top Management'</li> <li>Established AMTP which is monitored by AMSG and AMTC</li> <li>National Highways' AM culture has developed significantly since the last assessment and continues to develop positively</li> </ul>                    | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>No specific actions required beyond being able to demonstrate full systematic control of this Subject in relation to the AM System</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Top management (AMSG) effectively owns and directs the AM System as BAU</li> <li>AMSG is able to demonstrate it can agree and deliver on clearly defined AM Objectives (see Subject 2) including continually improving the AM culture (see Subject 29)</li> </ul>               |
| 28 – Organisational Structure              | L        | 45%   | <ul style="list-style-type: none"> <li>When running then interviews and workshops National Highways identifies as an 'Asset Management' organisation</li> <li>A new AM Team structure has been implemented</li> <li>Asset Management roles and responsibilities have been defined</li> <li>Internal teams have been inherited - not planned. There is a target operating structure, but this is not yet fully implemented</li> </ul>   | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>No specific actions required beyond being able to demonstrate full systematic control of this Subject in relation to the AM System</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>This is a low priority subject area. No specific improvement opportunities have been identified beyond ISO 55001 compliance – continual improvement only. <i>However, implementing the new target operating structure supports Subject 18 which is High priority</i></li> </ul> |

| Subject                     | Priority | Score | Findings   | Improvement Opportunities   |
|-----------------------------|----------|-------|--|---|
| 29 – Organisational Culture | H        | 40%   | <ul style="list-style-type: none"> <li>• Culture is a significant part of the wider Transformation programme and 'Embedding asset management' (which is the 7th 'Way' / AM Objective)</li> <li>• There is a level of understanding of the 'as is' and 'to be' cultures but no specific plan identified to move from one to the other</li> <li>• AMTP and associated communications and change strategies are supporting positive AM culture development</li> </ul> | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>• Ensure the specific requirements of ISO 55001 clauses 7.3 (Awareness) and 7.4 (Communication) are addressed</li> <li>• This will mean ensuring AM communications are in place and effective (both internally and externally) and people working within the AM System are fully aware of their role in relation to it</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>• AM culture is pro-actively planned for and pursued – current and target states and plans to change are in place</li> <li>• AMMSG takes a leading role in ensuring this is achieved (see Subject 27)</li> </ul> |
| 30 – Competence Management  | H        | 40%   | <ul style="list-style-type: none"> <li>• The AMTP identifies actions to implement a training needs and skills framework during 2022-23</li> <li>• An AM Capability Model and skills matrices are in development and awaiting AMMSG approval</li> <li>• It was reported that existing HR processes for technical competences (e.g., annual review) and succession planning are in place</li> </ul>  | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>• Ensure the specific requirements of ISO 55001 clause 7.2 (Competence) is addressed</li> <li>• This will mean completing and embedding the AM Capability Model and skills matrices and ensuring full systematic control of this Subject in relation to the AM System can be demonstrated</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>• Organisational / team structure, and individual roles / competences, are continually and appropriately refined and updated</li> </ul>   |

## C.6 RISK & REVIEW

### Overview of Group

The Risk & Review Group contains all the Asset Management Activities associated with risk assessment, risk management, review and audit of the organisation's Asset Management System, ensuring that the continuous improvement loop is closed. There are nine Subjects in this Group which are:

- 31) **Risk Assessment & Management** - the policies and processes for identifying, quantifying and mitigating risk and enhancing opportunities.
- 32) **Contingency Planning & Resilience Analysis** - the processes and systems put in place by the organisation to ensure it is able to continue to operate its assets to deliver the required level of service in the event of an adverse impact such as a major weather incident, act of terrorism or major power failure.
- 33) **Sustainable Development** - an enduring, balanced approach to economic activity, environmental responsibility and social progress to ensure all Asset Management activities are sustainable in perpetuity.
- 34) **Management of Change** - the organisations processes for reviewing the impact on its Asset Management system of any major change.
- 35) **Asset Performance & Health Monitoring** - the processes and measures used by the organisation to assess the performance and health of its assets using performance indicators.
- 36) **Asset Management System Monitoring** – the processes used by the organisation to review the overall effectiveness of its Asset Management System in delivering its Asset Management Strategy and Objectives.
- 37) **Management Review, Audit & Assurance** – the organisation's processes for closing the 'plan-do-check-act' cycle and assuring that the organisation is achieving and continually improving its activities.
- 38) **Asset Costing & Evaluation** - the organisation's processes for defining and capturing maintenance and renewal unit costs and the methods used by the organisation for the valuation and depreciation of its assets.
- 39) **Stakeholder Engagement** - the methods an organisation uses to engage with stakeholders to articulate different scenarios within its strategic plans.

## Summary

| No. | Subject                                    | Maturity Score |
|-----|--|----------------|
| 31  | Risk Assessment & Management               | 37%            |
| 32  | Contingency Planning & Resilience Analysis | 70%            |
| 33  | Sustainable Development                    | 50%            |
| 34  | Management of Change                       | 41%            |
| 35  | Asset Performance & Health Monitoring      | 44%            |
| 36  | Asset Management System Monitoring         | 40%            |
| 37  | Management Review, Audit & Assurance       | 41%            |
| 38  | Asset Costing & Evaluation                 | 44%            |
| 39  | Stakeholder Engagement                     | 46%            |

Table 16 – Risk & Review Maturity Scores

Table 17 – Risk &amp; Review Findings and Improvement Opportunities

| Subject   | Priority | Score | Findings  | Improvement Opportunities   |
|---|----------|-------|---|---|
| 31 – Risk Assessment & Management               | H        | 37%   | <ul style="list-style-type: none"> <li>National Highways has a corporate Risk Management Framework (RMF) in place which is aligned to ISO 31000</li> <li>This appears to be good practice, but is not yet fully embedded beyond the 'Secondary Risk' level</li> <li>National Highways' risk appetite is defined but not fully rolled out, embedded, or communicated to the organisation</li> <li>In general, risk assessment occurs within defined risk registers, however, it is acknowledged that these are not yet fully aligned</li> <li>Reported that risk is reasonably effectively managed within project and programmes managed by Major Projects</li> <li>The asset RMF is being defined but no AM System level risk assessment, or asset-level and lifecycle risk approaches, are yet in place</li> </ul> | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Implement and embed the asset RMF, ensuring alignment to the corporate RMF – ensure this is applied consistently across the full scope of the AM System (see Subject 1)</li> </ul> <p><i>*Note – ISO 55001 references risk assessment in several places and it is recommended that each of these is explicitly investigated</i></p> <ul style="list-style-type: none"> <li>Ensure the use of risk to prioritise plans is explicit and consistent (between Regions and to the Corporate RMF – see Subject 5)</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Asset RMF is fully implemented and enables risk-based decision-making (see Subjects in the Strategy &amp; Planning, Decision Making and Lifecycle Delivery Groups)</li> <li>Performance and condition indicators and metrics are fully aligned to improved risk management and decision-making approaches (see Subject 35)</li> </ul> |
| 32 – Contingency Planning & Resilience Analysis | L        | 70%   | <ul style="list-style-type: none"> <li>AMOR Appendices 3 and 4 (Incident Response and Severe Weather) provide clear and complete requirements</li> <li>It was reported that AMOR requirements are effectively implemented, including planning, testing and updating emergency plans</li> <li>Resilience appears to be systematically considered within National Highways' plans</li> </ul>  | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>No specific actions required beyond being able to demonstrate full systematic control of this Subject in relation to the AM System</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>This is a low priority subject area. No specific improvement opportunities have been identified beyond ISO 55001 compliance – continual improvement only</li> </ul>  |
| 33 – Sustainable Development                    | L        | 50%   | <ul style="list-style-type: none"> <li>The 'Sustainability Report' (in Annual Report) presents a well-established and comprehensive Sustainability Strategy</li> <li>'Good Design' Sustainability and Climate Change National Highways websites resources, 'Supply Chain Sustainability School'</li> <li>Evidence that the Sustainability Strategy is effectively implemented and embedded in plans but not yet fully aligned to the 'Our Approach' document (SAMP equivalent)</li> </ul>   | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Align Sustainability Strategy and 'Our Approach' document (SAMP equivalent)</li> <li>No further specific actions required beyond being able to demonstrate full systematic control of this Subject in relation to the AM System</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>This is a low priority subject area. No specific improvement opportunities have been identified beyond ISO 55001 compliance – continual improvement only</li> </ul>   |

| Subject                                    | Priority | Score | Findings   | Improvement Opportunities   |
|--|----------|-------|--|---|
| 34 – Management of Change                  | H        | 41%   | <ul style="list-style-type: none"> <li>Management of Change is subject to a development workstream in the AMTP Roadmap</li> <li>A National Highways wide Change Framework appears to exist with a specific AM variant, e.g., ACS rollout has a specific change strategy</li> <li>Management of asset change is governed by processes traditionally carried out by the supply chain under the Asset Delivery contract, the '3D Process' and the Capital Delivery Management Tool (CDMT) now has this asset level change process embedded</li> </ul>   | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Formalise the National Highways wide Change Framework and incorporate / align to the AM System scope and definition (see Subject 1)</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Change to the AM System is effectively controlled, risks are managed, and opportunities effectively and safely pursued</li> <li>AMSG takes a leading role in overseeing this process</li> <li>Management of asset change is automated as far as possible and utilise a configuration management approach that ensures critical asset configuration is maintained (see Subject 14)</li> </ul>  |
| 35 – Asset Performance & Health Monitoring | H        | 44%   | <ul style="list-style-type: none"> <li>There is a defined and clear structure in the way National Highways measures and reports its performance to ORR and the Government</li> <li>Metrics are defined against each of the Outcome Areas within the OMM (top level KPIs and supporting PIs), although detailed processes were not evidenced</li> <li>ORR monitors and publishes annually – this is a backward look and there does not appear to be a forecast of any duration</li> <li>National Highways' ability to forecast performance and condition indicators through lifecycle modelling is limited</li> </ul> | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Ensure all performance and condition indicators are aligned to the needs of the defined AM System (see Subject 1) and are routinely reviewed by AMSG (see Subjects 36 and 37)</li> <li>Ensure compliance to the requirements of ISO 55001 clause 9.1</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Performance and condition indicators and metrics fully aligned to improved risk management and decision-making approaches (see Subject 31 and Subjects in the Strategy &amp; Planning, Decision Making and Lifecycle Delivery Groups)</li> <li>This includes the ability to forecast performance and condition indicators using lifecycle models (see Subject 8) to help justify planned strategic and annual work volumes (see Subjects 4 and 5)</li> </ul> |
| 36 – Asset Management System Monitoring    | H        | 40%   | <ul style="list-style-type: none"> <li>AMSG has been set up and is monitoring implementation of the AM System</li> <li>The processes that underpin the preparation of information for AMSG are developing and not yet focused on the AM System (specifically, AM System risk assessment, performance and condition indicators and internal audit of the AM System)</li> <li>The AMTP includes a goal to have an 'AM Technical assurance and governance approach implemented for all asset types by 2021/22 (item 6.8)</li> </ul>   | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Develop, implement and embed processes that underpin the preparation of information for AMSG, specifically: <ul style="list-style-type: none"> <li>AM System risk assessment (see Subject 31)</li> <li>performance and condition indicators (see Subject 35)</li> <li>internal audit of the AM System (see Subject 37)</li> </ul> </li> <li>Ensure compliance to the requirements of ISO 55001 clauses 9.1 and 9.2</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Management review of the AM System is fully integrated into the National Highways corporate approach</li> </ul>  |

| Subject                                   | Priority | Score | Findings   | Improvement Opportunities  |
|---|----------|-------|--|--|
| 37 – Management Review, Audit & Assurance | H        | 41%   | <ul style="list-style-type: none"> <li>The National Highways Annual Report describes a '4 Lines of Assurance' model based on good practice</li> <li>The 'Our Approach' document and AMTP Roadmap acknowledge that a full risk-based asset assurance approach is not yet in place</li> <li>AMSG has been set up and is monitoring implementation of the AM System, but has not yet switched to BAU monitoring (specifically AM System risk assessment, performance and condition indicators and internal audit of the AM System)</li> <li>Corrective &amp; Preventive Action (CAPA) management is in place but only for specific, defined activities (such as audit)</li> </ul> | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Focus AMSG on 'BAU monitoring' of the AM System, specifically: <ul style="list-style-type: none"> <li>AM System risk assessment (see Subject 31)</li> <li>performance and condition indicators (see Subject 35)</li> <li>internal audit of the AM System (this Subject)</li> </ul> </li> <li>Ensure compliance to the requirements of ISO 55001 clause 9.3 – create a management review annual calendar</li> <li>Define, implement and embed a CAPA management framework for the AM System which builds on existing approaches and is compliant with ISO 55001 clauses 10.1 and 10.2</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Management review of the AM System is fully integrated into the National Highways corporate approach</li> </ul> |
| 38 – Asset Costing & Evaluation           | H        | 44%   | <ul style="list-style-type: none"> <li>There does not appear to be an overall Unit Cost Framework</li> <li>Capital costs appear to be fairly well understood (Annual Report contains 'Standard Costing rates' for strategic cost elements)</li> <li>Maintenance costs are captured in the 'Statement of Comprehensive Net Expenditure' but not clear how these are generated</li> </ul>  | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Ensure the ability to demonstrate where unit costs for capital and maintenance activities are held and how they are developed and refined</li> <li>No further specific actions required beyond being able to demonstrate full systematic control of this Subject in relation to the AM System</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>Formalise the approach for capital and maintenance unit costs based on existing approaches and the requirements of the AM System (in particular of Subjects in the Strategy &amp; Planning and Decision-Making Groups)</li> <li>Utilise and continually improve the accuracy and effectiveness of unit cost information in optimising decision-making</li> </ul>                                       |

| Subject                     | Priority | Score | Findings  | Improvement Opportunities  |
|-----------------------------|----------|-------|---|--|
| 39 – Stakeholder Engagement | H        | 46%   | <ul style="list-style-type: none"> <li>• Delivery Plan is a key framework for stakeholders - identifies intent to work with, engage and consult more with stakeholders</li> <li>• The Delivery Plan identifies intent to refresh Stakeholder Engagement Plan by the end of 2022-23</li> <li>• EAM review identifies that "The stakeholders that we consulted think that Highways England's engagement is on the whole positive but can be inconsistent"</li> <li>• Communications plans are reported to be in place for internal but not for external communications</li> </ul> | <p><b>ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>• Ensure the specific requirements of ISO 55001 clauses 7.3 (Awareness) and 7.4 (Communication) are addressed</li> <li>• This will mean ensuring AM communications are in place and effective (both internally and externally) and people working within the AM System are fully aware of their role in relation to it (see also Subject 29)</li> </ul> <p><b>Beyond ISO 55001 Compliance:</b></p> <ul style="list-style-type: none"> <li>• Formalise stakeholder engagement approach to ensure continued alignment to National Highways' decision-making criteria and the setting of AM Objectives</li> <li>• AMSG takes a leading role in ensuring this is achieved (see Subject 27)</li> </ul> |

# Appendix D Group Level Improvement Trajectories

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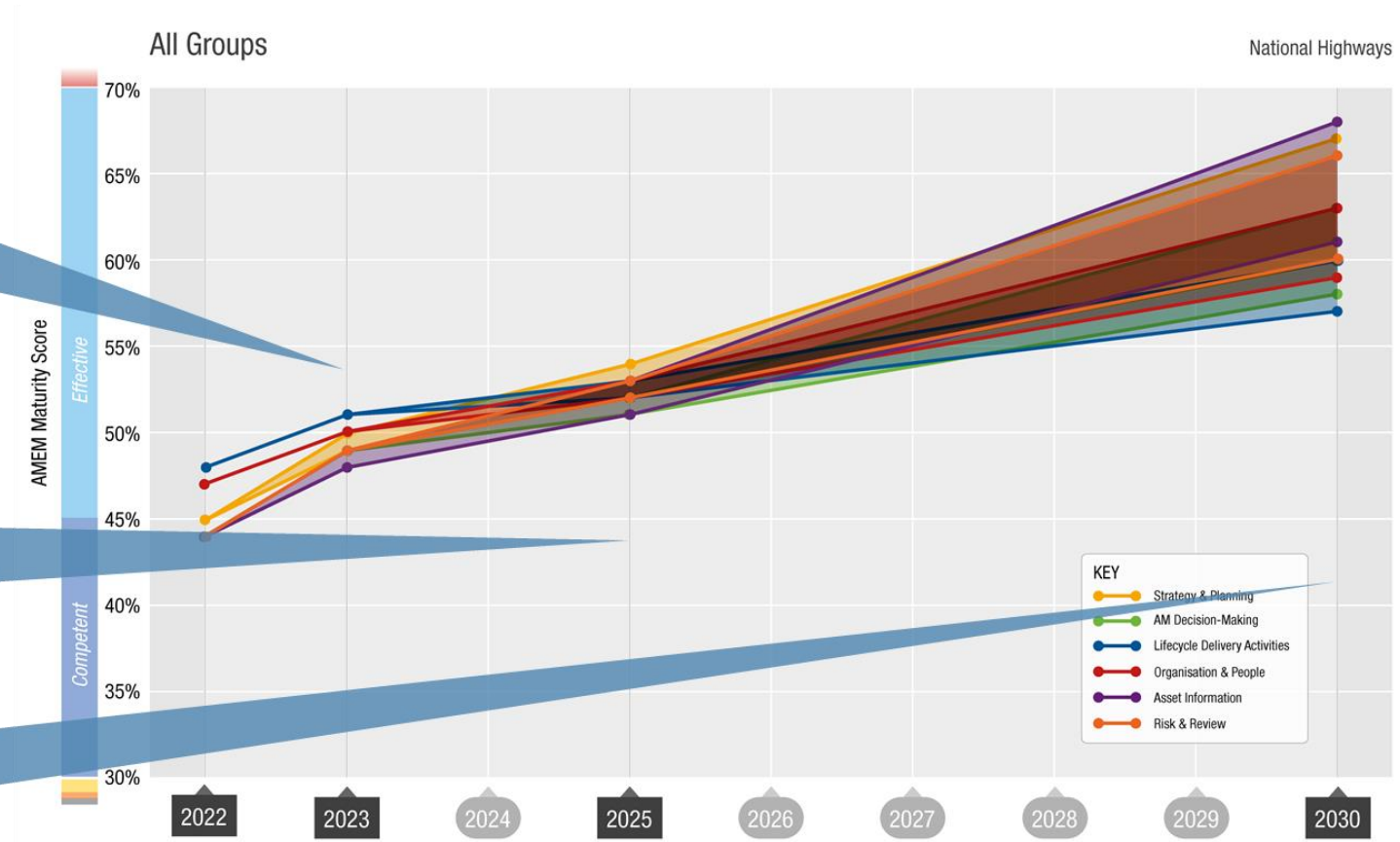
This appendix details the improvement trajectories introduced in Section 4, presented by the six AMEM Groups, including a summary of the recommended actions needs to achieve each milestone in the trajectory.

## Generic Activity Areas

**2023 (ISO 55001 compliance)**  
 Key activities to achieve ISO 55001 certification

**2025 (end of RP2) – Completion of AMTP Roadmap**  
 Key activities to complete the AMTP Roadmap and prepare for RP3

**2030 (end of RP3)**  
 Key activities to deliver focused AM Capability Improvements (i.e., against the priority Subjects)



# Strategy & Planning

**2023 (ISO 55001 compliance)**  
 Fully define scope of the AM System  
 Complete and embed all AM System artefacts, specifically:

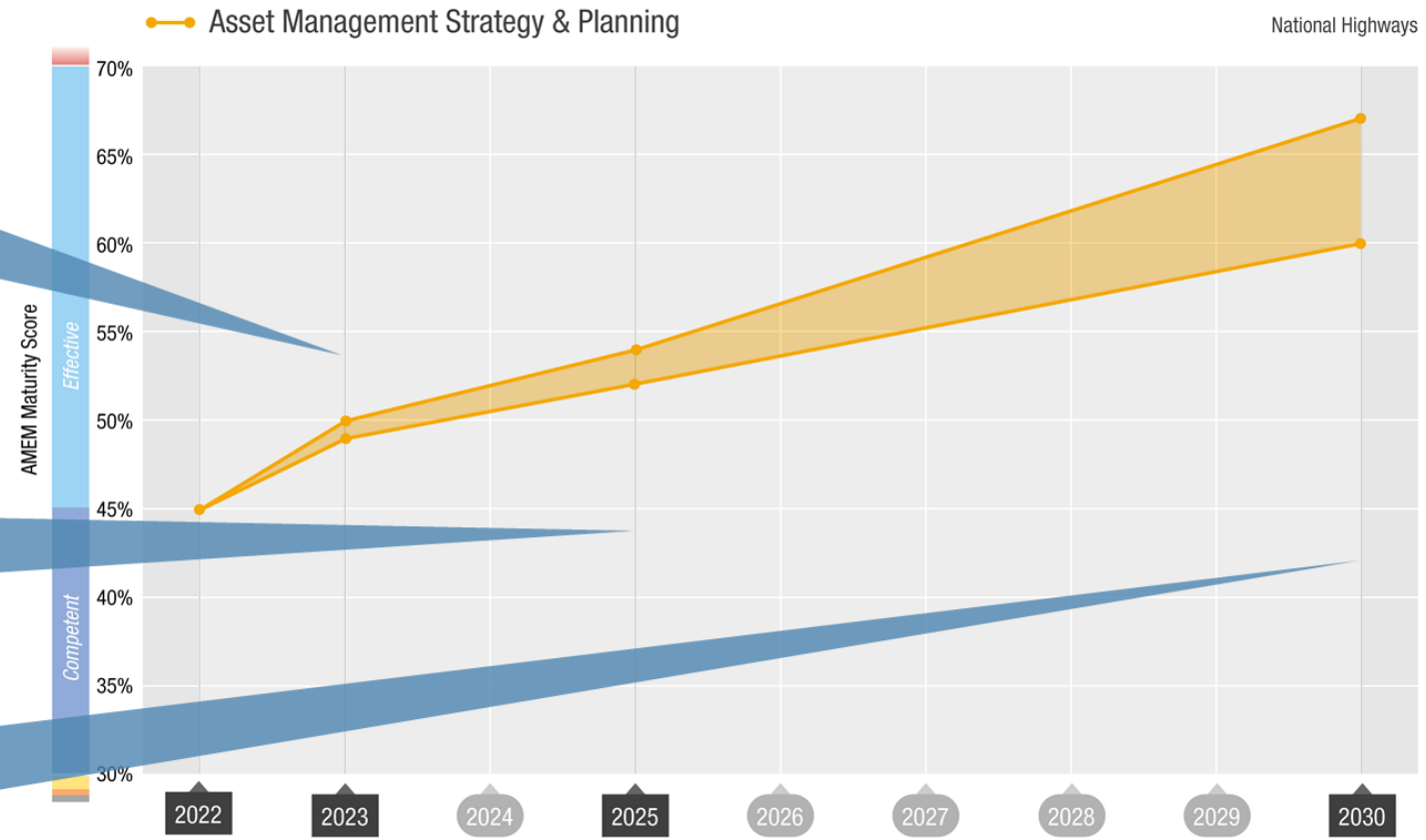
- Completion of AM Catalogue
- Documentation of AMPs
- Definition of SAMP (e.g. 'Our Approach' document requires setting in context or expanding)

**2025 (end of RP2) – Completion of AMTP Roadmap**

- RP3 approach communicated to external stakeholders and regulators **(1.7)**
- Review and update AM Strategy and Policy **(1.8)**
- Structured programme of cross-directorate knowledge and skills sharing **(1.11)**
- AMTP change impact assessment **(1.12)**
- Produce the final Strategic Business Plan **(2.11)**

**2030 (end of RP3)**

- Demonstrate delivery of AM Objectives ('Ways') and appropriateness of AM Policy and Strategy ('Our Approach') to deliver these
- Fully integrate AM planning processes through embedded end-to-end process – demonstrate full alignment between strategic and Regional plans
- Implement quantified risk-based process and plans
- Continued, iterative, improvement of AM Catalogue



# AM Decision Making

**2023 (ISO 55001 compliance)**

- Complete harmonisation of national approach
- Ensure alignment to the achievement of AM Objectives
- Embed risk-based decision-making

**2025 (end of RP2) – Completion of AMTP Roadmap**

- Renewals prioritisation process implemented and technical assurance reviewed (3.17)
- Asset class lifecycle plans embedded (3.21)
- ACS embedded in the business (3.22)
- Renewals prioritisation process embedded (3.23)
- AM processes embedded for RP3 and integrated across the business (3.24)

**2030 (end of RP3)**

- Full risk-based lifecycle modelling for critical assets provides clear understanding of lifecycle value
- O&M optimisation fully integrated into lifecycle modelling
- Validation of lifecycle models in progress
- ACSs updated periodically to reflect lifecycle model validation and ongoing performance



# Lifecycle Delivery

**2023 (ISO 55001 compliance)**  
 Maintain existing capabilities and raise delivery team and contractor awareness of the AM System  
 Specifically:

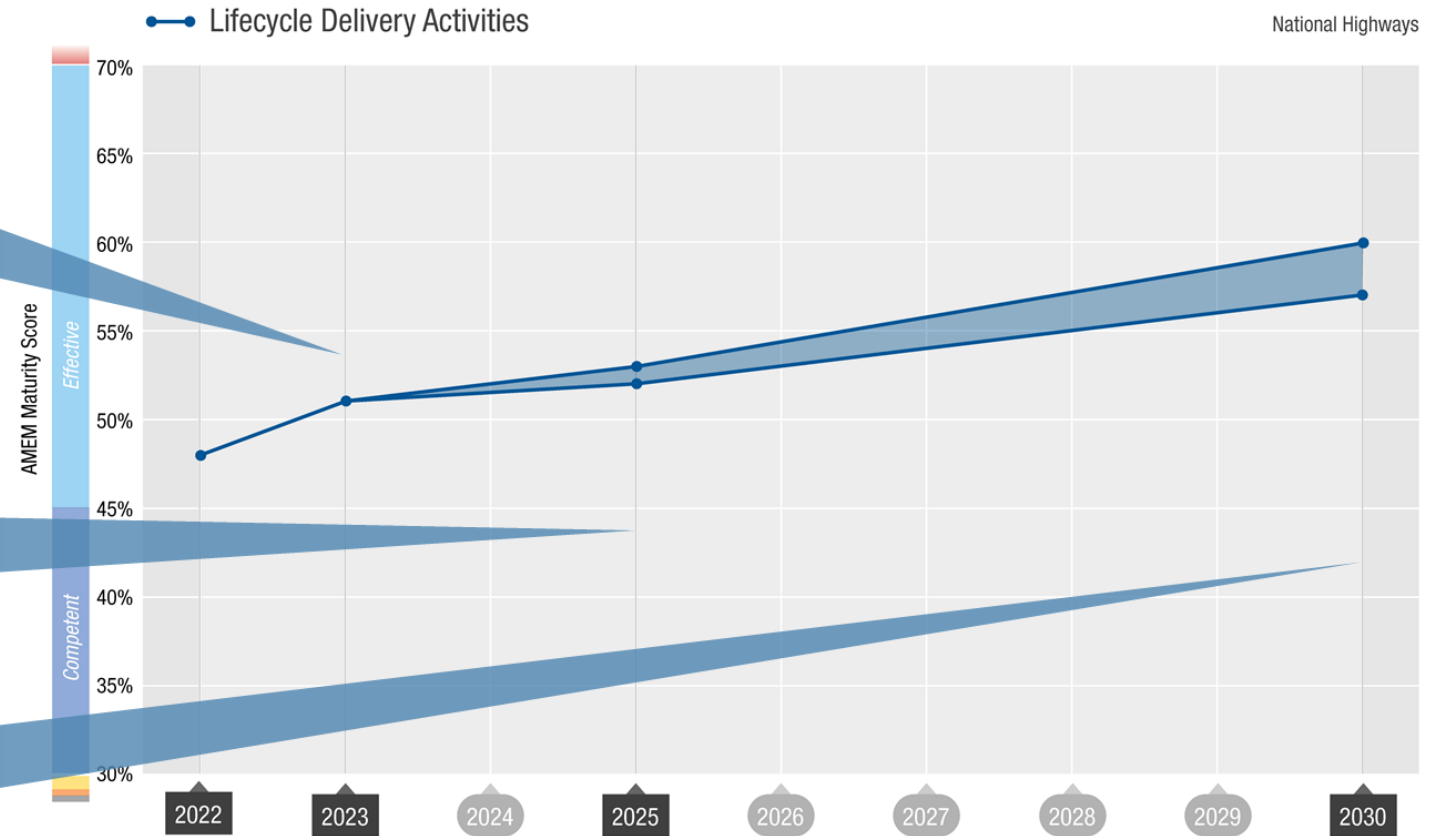
- Improve understanding of system configuration
- Improve RCA and OMR level reliability growth planning
- Effectively implement Operational Excellence

**2025 (end of RP2) – Completion of AMTP Roadmap**

- Leverage innovation within operational models (5.11)
- Develop maintenance intervention reduction tools with innovation and Intelligence, improving planning and delivery (5.15)
- Greater asset management efficiency captured through processes (5.16)

**2030 (end of RP3)**

- Continue to improve intelligent planning and access to the asset through innovation, data and analysis
- Strategic resource planning approach is developed and implemented
- An effective and fully controlled Configuration Management System is in place for relevant assets
- Technical and delivery resources are appropriately balanced across the Regions and the Supply Chain

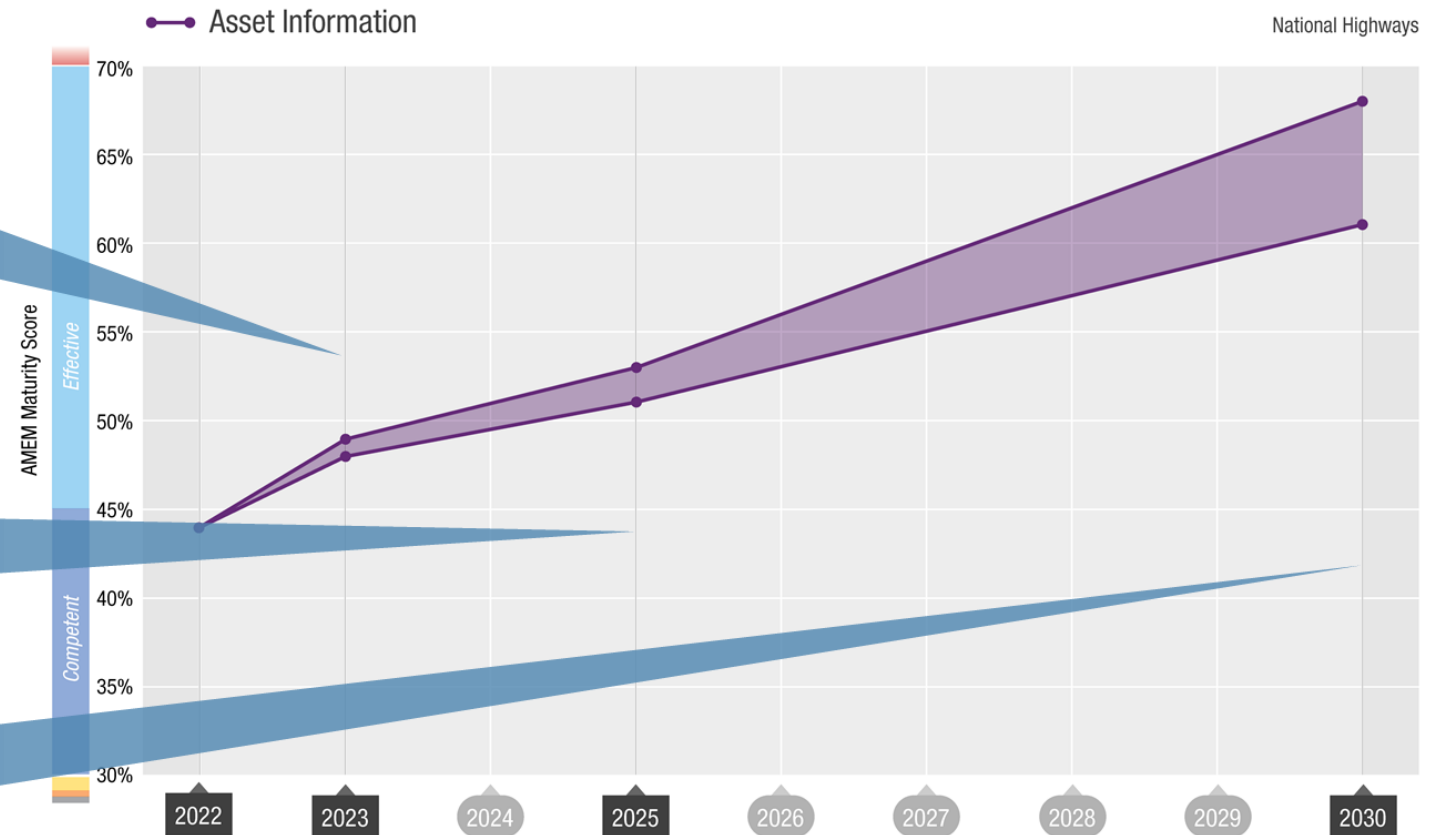


## Asset Information

- 2023 (ISO 55001 compliance)**
- Align multiple information strategies and ensure coherence of information requirements and alignment to AM System needs
  - Manage AMSS identified risk of siloed AI systems, potential duplication, overlapping capabilities and limited interoperability
  - Ensure AMSS Roadmap is in place by Certification

- 2025 (end of RP2) – Completion of AMTP Roadmap**
- Asset Systems Strategy implemented and embedded (4.16 & 4.19)
  - Asset Data Strategy implemented and embedded (4.17 & 4.20)
  - Data Improvement Plan implementation (4.18)
  - Systems, tools and data fully support NH asset management strategy (4.21)

- 2030 (end of RP3)**
- Information systems are fully integrated
  - Full alignment between financial and asset registers
  - Information supports all aspects of the AM System, including lifecycle modelling and delivery, and asset costs and risks
  - Continue to improve intelligent planning and safe and efficient access to the asset through innovation, data and analysis

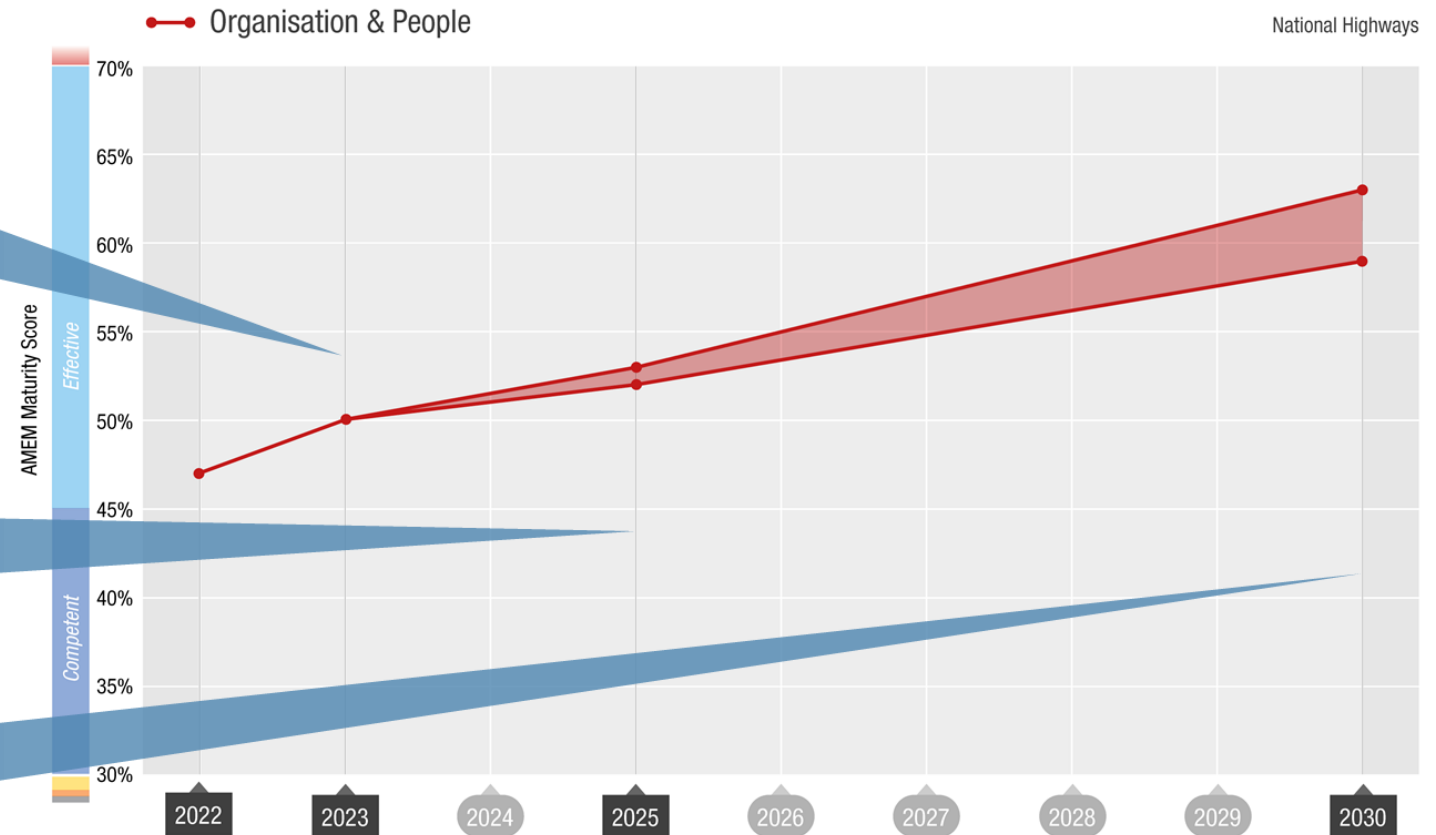


## Organisation & People

- 2023 (ISO 55001 compliance)**
- Ensure AMSG fulfills full BAU 'Management Review' in accordance with ISO 55001 requirements
  - Complete and embed the development and management of Asset Management competences (AM Capability Model and skills matrices)
  - Ensure existing processes for technical competences (e.g. annual review) and succession planning in place

- 2025 (end of RP2) – Completion of AMTP Roadmap**
- Structured programme of cross-directorate knowledge and skills sharing (1.11)
  - Embed and continually improve competence management approach
  - Complete and implement Asset Management training needs and skills framework (1.6)
  - Development of culture management approach

- 2030 (end of RP3)**
- Top management (AMSG) effectively owns and directs the AM System as BAU
  - Organisational / team structure, and individual roles / competences, are continually and appropriately refined and updated
  - AM culture is pro-actively planned for – current and target states and plan to change are in place

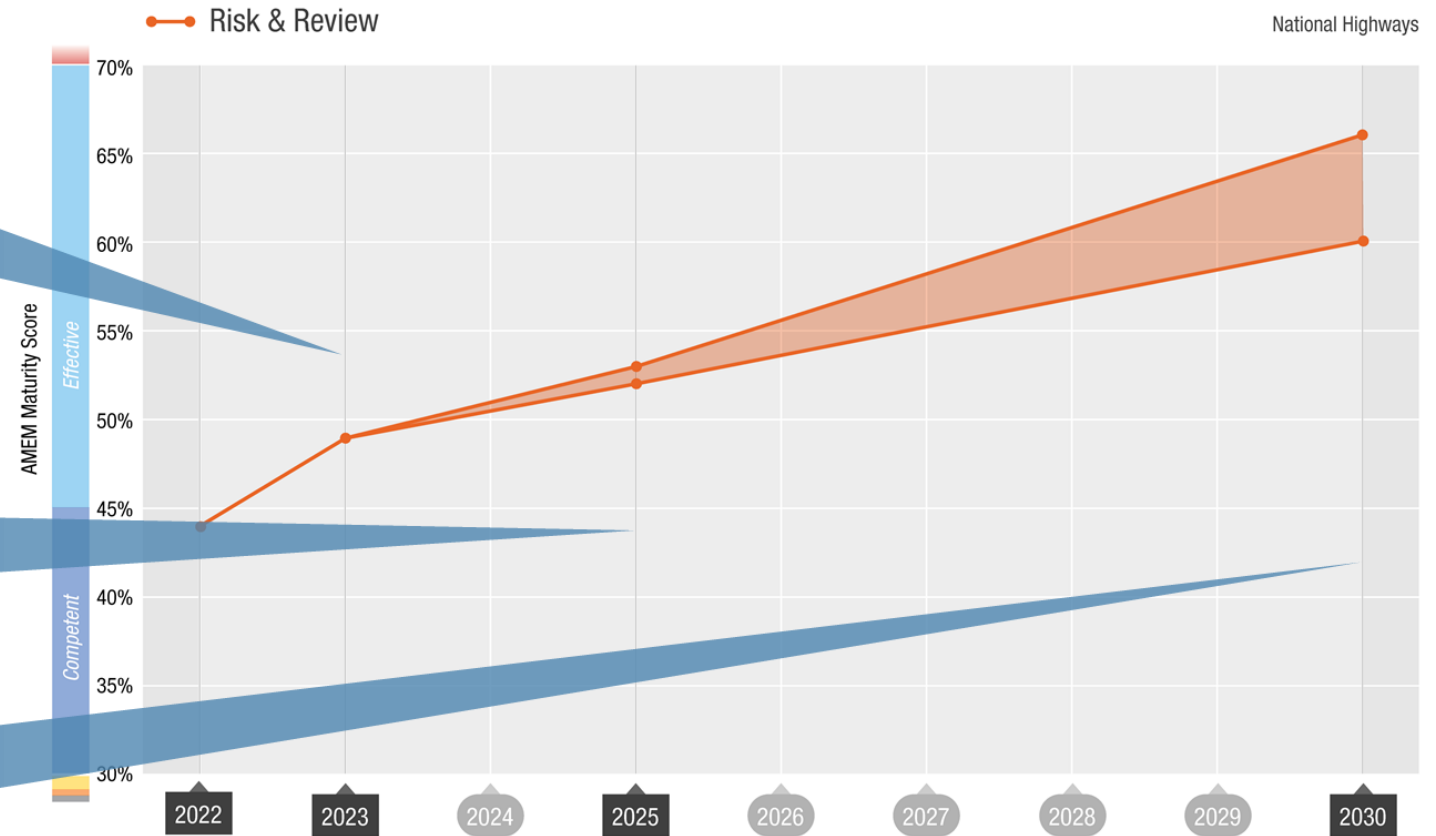


## Risk & Review

- 2023 (ISO 55001 compliance)**
- Implement Asset RMF and complete AM System level risk assessment
  - Utilise Asset RMF for maintenance and investment planning
  - Focus management review on ISO 55001, including review of achievement of AM Objectives
  - Focus Internal Audit on AM System

- 2025 (end of RP2) – Completion of AMTP Roadmap**
- Risk appetite fully implemented (6.10)
  - Technical governance and assurance process embedded and refined for RP3 (6.17 and 6.18)
  - Improved structures metric, alternative indicator for technology assets and flooding resilience metric agreed for RP3 (new)
  - Customer led levels of service agreed for RP3 (new)

- 2030 (end of RP3)**
- Management review of the AM System is fully integrated into the NH corporate approach
  - Performance and condition indicators and metrics are fully aligned to improved risk management and decision making approaches
  - Change to the AM System is effectively controlled and risk and opportunities are demonstrably managed



# Appendix E 'Top-down' Efficiencies

## E.1 OVERVIEW OF ASSET MANAGEMENT EFFICIENCIES

### Categories of Efficiencies

There are many different types of efficiency that occur from effective Asset Management implementation, some of which are more easily measurable than others. For example, direct savings that occur in the form of either reduced risk or reduced maintenance costs may be quantified based on improved performance or reduced resources. However, other benefits, such as public satisfaction resulting from increased availability of the asset may provide efficiencies indirectly, through increased custom and the resulting value of the business.

The efficiencies of a systematic Asset Management approach may be realised over several years but given the large scale of investment associated with major infrastructure, even small improvements can produce big savings. Potential efficiencies have been evidenced in the following areas.

### Operating and Maintenance Cost Savings

Although bottom line efficiencies are not always apparent at first glance, the evidence shows that efficiencies can be achieved in various forms and combinations, including one or more of better performance, increased productivity, reduced risk or reduced costs. For example, in 2007/08 Network Rail achieved efficiencies of £178 million in this area by adopting a systematic approach to Asset Management. [Network Rail Annual Return 2011].

### Extending and Preserving the Life of Assets

Ensuring timely asset intervention is the key to optimisation of asset life. The New York State Department of Transport found that replacement of highways that had reached 'very poor' condition was 5 to 6 times the cost of replacement in 'poor' state ones [NYSDOT, Multimodal transportation Programme submission: 2009-2014].

### Performance Improvement

There are various key performance indicators (KPIs) which an organisation can consider in order to monitor service delivery, quality and performance. The perceived wisdom is that if something gets monitored it will be improved with the right incentives in place. However, there have been several cases where the wrong indicators were monitored, or findings ignored which can give an organisation a false sense of security in terms of the underlying state of the assets and associated risks. The final report into the Piper Alpha Disaster of 1988 found that one of the causes was that although the asset owner carried out regular safety audits of its facility, the findings were not acted upon and serious deterioration of critical assets was often ignored [The Public Inquiry into the Piper Alpha Disaster, Cullen, The Honourable Lord, HMSO 1990.].

### Business Risk Reduction

Every type of business faces risks that can present various types of threats to its success. Risk can play a key role in informing Asset Management decision making. It is also the mechanism by which an organisation can prepare for significant events like accidents, incidents or the impacts of climate change to ensure that it has appropriate contingency planning in place and mechanisms for assuring business continuity. By understanding risk in relation to your assets you can facilitate the constant and evolving trade-off between performance, cost and risk.

Reducing business risk is, however, a benefit of Asset Management that is difficult to quantify. By reducing business risk you've reduced the chances of that risk happening. However, when a recognised risk or issue does occur, and contingency plans aren't in place, the effect on an organisation can be significant. One such example is Jarvis plc [BBC news "Jarvis's Track record" Oct 2003] where failures in maintenance procedures on a stretch of railway line, that the company was responsible for, contributed to the death of 7 people and injuries to more than 70. Following this incident Jarvis lost its maintenance contract and went from a diverse services company with an 8,000-strong workforce and annual sales of £750m to an organisation with 3,000 staff and sales of £200m.

## Compliance with Legal and Regulatory Requirements

Compliance is usually seen as a cost to a business. However, this could be viewed as an investment in risk mitigation. When managed properly this protects the business from possible losses involving financial penalties, loss of reputation, market confidence, etc. Good practice Asset Management considers the legal obligations, standards, statutory requirements and so on to ensure that the business meets its obligations to customers, stakeholders and regulators. As an example of the impact of noncompliance, Thames Water was fined £11.1 million in September 2007 for failing to provide Ofwat with robust information because of poor processes and systems resulting in poor service.

## Sustainability

The concept of triple bottom line accounting was first coined by John Elkington in 1994 [Elkington, J "Cannibals with Forks: The Triple Bottom Line of 21st Century Business"] and later developed in his book on the subject. In practical terms triple bottom line (TBL) accounting means considering an altruistic approach which considers environmental, social and financial performance. The term "sustainability" pre-dates TBL and was first defined by the Brundtland Commission of the United Nations in 1987. TBL requires an organisation to be more responsible to stakeholders (including customers and end-users) rather than just to its shareholders, placing their interests on par with maximising profits. The development of high-speed rail lines in Europe in the 1980/90s have not only improved travel times on intra-national corridors but have cut carbon emissions compared to air travel. A 2008 study found that when compared to budget air travel (Ryanair) the Eurostar produced 60% less CO2 emissions per 100 seat Km [Transport Watch UK. Fact sheet 5(b) "Carbon Emissions: High-speed rail and air compared" June 2008].

## Auditable Plans in Support of Budgeting

The importance of having robust and auditable plans cannot be over-emphasised. Typically, for large infrastructure organisations the approach to gaining funding approval used to be an annualised ritual. The organisation would use best endeavours to calculate maintenance and renewals requirements for the coming year. The departments would have a budget allocation and manage these funds to best effect. If the budgets were not used up by the end of the year, then they would be cut the following year. Without having justified Asset Management plans in place an organisation will be at a disadvantage in negotiations with its sponsors and stakeholders especially where decisions are based on a qualitative rather than a quantitative approach. When Railtrack was placed into administration in 2001 the regulatory settlement was £14.8 billion for the period 2001-2006, however due to issues previously unidentified the new Network Rail settlement was reset for 2004-2009 at £26billion. [Network Rail Annual Return 2011].

AMCL worked with Network Rail High Speed (NR (HS)) to deliver detailed plans for funding for the control period (2014-2019), plus the 40-Year Strategic Plan - which identified over £10m worth of savings [NR (HS) 40-Year plan].

## E.2 RANGE OF EFFICIENCIES

To support the assessment of efficiency ranges for Highways England, AMCL has based its figures on multiple quantified examples. These come from a variety of infrastructure sectors where savings have been realised through the implementation of good practice Asset Management processes and regimes.

### Asset Management System Efficiency Ranges

A study by the Institute of Asset Management (IAM) was presented at its 2015 conference on the efficiencies of establishing a well-defined, continually improving and ISO55001 compliant (or beyond) Asset Management System<sup>16</sup>. It identified an observed range of annualised total expenditure efficiencies of between 1% and 8%. This was based on 20 case studies from corporate members of the IAM and the majority of the efficiencies are likely to be applicable to National Highways during the remainder of RP2, as the organisation seeks to achieve ISO 55001 certification in 2023. However, as well as forming the foundation for more specific and focused efficiencies in RP3, the efficiencies actually achieved in this range by National Highways will depend on how effectively the organisation develops and applies its Asset Management System in the remainder of RP2. Asset Management efficiencies are an ongoing journey, which require focus and effort to realise.

The study used a value chain approach (the DFID Results Chain<sup>17</sup>) to understand where value was identified and realised within typical infrastructure businesses. The study then focused on where a systematic Asset Management approach could impact the efficiency of an organisation in converting inputs to outputs, and its effectiveness in converting those outputs to tangible benefit impacts.

The 1% to 8% observed improvement in total expenditure was driven by:

- Improved understanding of lifecycle costs and how these can help link demand, utilisation and risk together to improve decision-making. This was often associated with an improved use of information supplied by better integration of information systems.
- New or improved skills and competences operating to produce insightful asset strategies and decision support tools. This was coupled with integrated planning processes and plans and funding that was aligned to strategic decision-making.
- New or improved skills, tools and data capture technology coupled with an enhanced ability to verify, monitor and review plans, delivery and performance.

The study noted the limitations in the data and information it could extract from the 20 case studies. These included the fact that the efficiencies were presented in different ways, most were unverified forecasts rather than 'actuals', few described a robust baseline from which to measure improvements and many did not quantify the costs to implement.

However, the structure of the approach and the broad logic of the findings provides good evidence of a qualitative improvement in the performance of asset intensive organisations when they introduce systematic ways to manage their asset portfolios within a Plan-Do-Check-Act environment.

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<sup>16</sup> The impact, value and quantifiable benefits of AM, Tim Kersley, IAM Faculty & Council IAM conference, Brighton, June 2015

<sup>17</sup> [DFID Results Chain](#) | [Download Scientific Diagram \(researchgate.net\)](#)

## Quantifying the Financial Efficiencies of Asset Management

There have been several attempts at understanding whether financial reporting information can give insight into the improvements an Asset Management approach can unlock for asset intensive organisations. Two examples are:

- **Impact on financial performance by physical asset management**<sup>18</sup> – this study presented the findings from a standard financial statement analysis of all Danish financial statements from the 2014 financial year. In total 187,184 financial statements published in XBRL-format were analysed in the survey. The paper explained how coordinated Asset Management of physical assets can improve the financial performance of the organization and proposed specific measures of asset intensiveness based on data from financial statements.
- **Asset Management: The Financial Benefit Case**<sup>19</sup> – this study suggested that organisations that practise Asset Management to an extent reported higher ROA, EBIT Margin, ROE and ROCE than those that do not. Across 100 organisations in the study, those organisations that were assessed to have been practising Asset Management to an extent reported 1.5-2.6 percentage points higher ROA, 11.1-19.0 percentage points higher EBIT Margin, 10.5-13.4 percentage points higher ROE and 2.1-2.6 percentage points higher ROCE than those assessed as not practising Asset Management. Although these specific financial measures may not be as applicable to National Highways as other asset intensive organisations, they do provide evidence of significant cost savings and financial efficiencies.

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<sup>18</sup> [Impact on financial performance by physical asset management | IET Conference Publication | IEEE Xplore](#)

<sup>19</sup> Asset Management: The Financial Benefit Case, KPMG and the IAM, December 2016

## Summary Efficiency Ranges for Key Areas

The case studies listed in Appendix F.2 have been filtered to identify 'typical' benefit ranges across four key benefit areas as organisations move beyond the ISO 55001 certification level of capability maturity into more focused capability improvements to achieve efficiencies. These are summarised in Table 18, as a guide for the potential efficiencies National Highways could target, if the capability improvements and trajectories defined in Appendix D are delivered and achieved.

The 'Benefit Areas' identified in Table 18 are:

- Capex Efficiency (including deferral) – this includes case studies related to qualitative prioritisation, bundling and deferral of capital activities and increased project, commercial and engineering delivery efficiencies.
- Opex Efficiencies – this includes qualitative refinements to maintenance specification and delivery activities.
- Risk based capital investment – this is a specific and systematic approach for the prioritisation and optimisation of capital investments based on semi or fully quantitative assessments of risk to inform timing or deferral decisions.
- Risk based maintenance – this is a specific and systematic approach for the prioritisation and optimisation of maintenance or inspection based on semi or fully quantitative assessments of risk to inform tasks and periodicities and the prioritisation of defects.

The risk based approaches described in the last two bullets are focused on making the best decisions (**'doing the right things'**) and enable a better justification of expenditure against the most pressing need in terms of mitigating and managing risk, effectively tailoring expenditure to your risk profile. The approaches described in the first two bullets are more focused on seeking efficiencies in delivery (**'doing things right'**).

The third column (*Benefit Range (proposed)*) indicates our view of a reasonable efficiencies range to be considered by National Highways with the high-end outliers from the case studies removed, where applicable.

| Efficiency Area                       | Efficiency Range (reported) | Efficiency Range (proposed) | Efficiency Unit   |
|---------------------------------------|-----------------------------|-----------------------------|---|
| Capex efficiency (including deferral) | 2% -62%                     | 2%-15%                      | May be realised through financial or other gains (e.g. reduction in work volumes or transfer of effort) |
| Opex efficiencies                     | 10%-50%                     | 10%-30%                     |   |
| Risk based capital investment         | 5%-30%                      | 5%-30%                      |   |
| Risk based maintenance                | 15%-53%                     | 15%-30%                     |   |

Table 18 Summary Efficiency Ranges for Key Benefit Areas

From the end of RP2 to the final year of RP3, it is our opinion that efficiencies in the generalised range of 5%-15%<sup>20</sup> are achievable. This range is supported by the case study evidenced 'bottom-up' efficiencies identified.

<sup>20</sup> This proposed efficiency range is a realistic annual efficiency gain between the final year of RP2 and final year of RP3. The efficiency range applies to OMR activities that can be influenced by improvements to National Highways' Asset Management capability over the same period. It may be realised through financial or other gains (e.g. reduction in work volumes or transfer of effort).

## Appendix F ‘Bottom-up’ Efficiencies

The following table identifies areas of focused improvement for National Highways to consider as it moves through the ‘Effective’ maturity scale band, i.e. once ISO 55001 certification has been achieved and in doing so, the organisation has demonstrated that it is at the top end of the ‘Competent’ maturity scale band for all subjects. The efficiency ranges included in the third column of the table summarise the relevant efficiencies demonstrated by the case studies documented in Appendix F.2.

## F.1 EFFICIENCY AREAS MAPPED TO THE 6 SUBJECT GROUPS

| Ref. | Proposed National Highways Efficiency Area   | Reported Efficiency Range from Relevant Case Studies | Units of Benefit Identified in Relevant Case Studies   | S&P | AMDM | LCD | AI | O&P | R&R |
|------|--|--|--|-----|------|-----|----|-----|-----|
| 1    | Improve alignment of objectives to enable better direction of National Highways' business activities | 0% - 20%   | Customer Satisfaction Score                            |     |      |     |    |     |     |
| 2    | Establish end-to-end planning and efficiencies realization process                                   | 2% - 62%<br>3% - 14%                                 | Capex Cost per Annum<br>Average Rate of Return         |     |      |     |    |     |     |
| 3    | Improve understanding of lifecycle costs and risks for critical assets                               | 5% - 30%   | Annualised Lifecycle Cost for critical assets          |     |      |     |    |     |     |
| 4    | Improve health and reliability of National Highways' asset portfolio                                 | 5% - 80%   | Downtime reduction                                     |     |      |     |    |     |     |
| 5    | Tailor maintenance activities to manage costs and risk exposure                                      | 3% - 25%<br>15% - 30%                                | CM Cost per Annum<br>Maintenance Cost per Annum        |     |      |     |    |     |     |
| 6    | Tailor spares procurement and holdings to manage costs and risk exposure                             | 10% - 50%<br>10% - 30%                               | Inventory Procurement Costs<br>Inventory Holding Costs |     |      |     |    |     |     |
| 7    | Improve alignment of supply chain with National Highways' Asset Management objectives                | 50%<br>10% - 50%                                     | Maintenance Cost per Annum<br>Under-Warranty Work Cost |     |      |     |    |     |     |

| Ref. | Proposed National Highways Efficiency Area  | Reported Efficiency Range from Relevant Case Studies | Units of Benefit Identified in Relevant Case Studies                 | S&P | AMDM | LCD | AI | O&P | R&R |
|------|---|--|--|-----|------|-----|----|-----|-----|
| 8    | Improve alignment of data collation with National Highways' decision making and risk exposure | 1% - 5%  | Annualised Lifecycle Cost  |     |      |     |    |     |     |
| 9    | Improve efficiency of data access for users   | 7% - 35%<br>3% - 50%                                 | Maintenance Cost per Annum<br>IT Opex Costs                          |     |      |     |    |     |     |
| 10   | Improve understanding and use of risk throughout National Highways                            | 14% - 50%<br>7% - 30%<br>42% - 55%                   | Normalized Risk Value<br>Capex Cost per Annum<br>Capex Cost Overruns |     |      |     |    |     |     |
| 11   | Improve how National Highways manages change to minimise risk exposure                        | Qualitative  | None   |     |      |     |    |     |     |
| 12   | Improve the sustainability of National Highways as an Asset Management organization           | Qualitative  | None   |     |      |     |    |     |     |

## F.2 CASE STUDY DETAILS

| Ref. | Potential Efficiency   | GFAMAM Subject. | NH AM Way (best fit – may be multiple)                                      | National Highways Outcomes              | National Highways Benefit    | Example Benefit Case Studies Summary Description   |
|------|--|-----------------|---|---|------------------------------|--|
| 1.1  | Improve customer and stakeholder satisfaction                          | 39              | Mature our asset management capability in line with our licence requirement | Meeting the needs of all users          | Demonstrate Alignment        | <p>1. City of Guelph case study shows the most significant benefits of the corporate asset management function has been the communication of the state of assets and how this incorporates into the budget, needs and priorities.</p> <p>2. In April 2010, when Duke Energy was building a US\$60m substation and transmission line in North Carolina, a local group of Cherokee Indians raised a concern. After negotiating with the Cherokee tribe, and government leaders Duke opted to move the project to a new location, thereby building the new station in time, while accommodating the concerns of the Cherokee community.</p> <p>3. NorthWestern was able to get regulatory approval of the \$200 million Mill Creek Generating Station on the condition that NorthWestern pay for a regulatory consultant to oversee the project. NorthWestern agreed to this because they viewed the regulators as partners.</p> <p>4. A case study from Central Georgia EMC (CGEMC) showed that member-owners at CGEMC are benefiting directly from the co-op's ability to use detailed usage data to provide valuable insights. CGEMC received an American Customer Satisfaction Index score of 87, on ACSI's scale of 0 to 100. The average electric utility score is around 72.</p> |
| 1.2  | Improve decision making and coordination of activities and investments | 2               | Standardise our asset management processes, to support consistent decisions | A well-maintained and resilient network | Manage Risks & Opportunities | <p>1. At MnDOT, the Transport AM Plan (TAMP) serves as an accountability and communication tool, informs capital and operations planning efforts, evaluate risks, develop mitigation strategies, analyse life cycle costs, establish asset condition performance measures and targets, and develop investment strategies. The TAMP formalizes and documents key information to meet federal requirements including bridge asset condition, AM objectives, gaps between goals and performance, life-cycle cost and risk, financial plan and investment strategies.</p> <p>2. Hastings Utilities saw improved process of capital investment prioritization, coordinate replacements with external stakeholder projects, more informed repair vs replace decisions, and an enhanced replacement strategy through optimized prioritization of capital improvements.</p>  |

| Ref. | Potential Efficiency  | GFAMAM Subject. | NH AM Way (best fit – may be multiple)                         | National Highways Outcomes              | National Highways Benefit          | Example Benefit Case Studies Summary Description   |
|------|---|-----------------|--|---|------------------------------------|--|
| 2.1  | Improve understanding of long-term expenditures, liabilities and risks                  | 4               | Manage asset risks effectively and consistently on our network | A well-maintained and resilient network | Manage Risks & Opportunities       | <ol style="list-style-type: none"> <li>1. A leading US utility implemented a comprehensive capital transformation that freed up \$30 million during the first year and identified opportunities to release a further \$300 million per year for redeployment over the long term.</li> <li>2. A utility with a seven-year program of investments worth \$50 billion saved \$1 billion on a \$10 billion project bundle through a systematic review of scope and a contract-terms renegotiation with suppliers.</li> <li>3. Using Copperleaf Technologies to perform capital investment risk ranking, a major utility was able to realize reductions of 5 to 30% in its long-term capital costs.</li> <li>4. A major regulated power-and-gas utility increased the efficiency of its \$1 billion annual transmission capital portfolio by capturing near-term savings of 6 percent and ongoing savings of 12 to 15 percent across more than 2,000 projects.</li> <li>5. According to ME Water &amp; Power, capex efficiency assessment can save 2% of annual capital costs.</li> </ol> |
| 2.2  | Better prioritization and deferral of asset investment expenditure while managing risks | 4, 5            | Manage asset risks effectively and consistently on our network | A well-maintained and resilient network | Manage Asset Health and Resilience | <ol style="list-style-type: none"> <li>1. EPCOR implemented a qualifications process for capital project submissions and was able to reduce submissions from \$100 million to \$37.5 million, thereby increasing the speed &amp; efficiency of its portfolio decision-making process.</li> <li>2. For every capital improvement project with an expected cost over \$250,000, Seattle Public Utilities project managers must submit a plan to the AM committee. Implementing this process has led to deferring, eliminating, or altering several capital improvement projects, and contributing to a reduction in the utility's 2004 capital improvement project budget for water.</li> <li>3. Using benefit-to-cost analysis, several large capital projects have been deferred since 2006 to achieve \$52 million savings in capital costs over the last 8.5 years on a budget of \$100/year.</li> </ol>   |

| Ref. | Potential Efficiency  | GFAMAM Subject. | NH AM Way (best fit – may be multiple)                                      | National Highways Outcomes              | National Highways Benefit    | Example Benefit Case Studies Summary Description   |
|------|---|-----------------|---|---|------------------------------|--|
| 2.3  | Improve program throughput against agreed annual budget and visibility of future projects | 5               | Embedding asset management  | Achieving efficient delivery            | Increase Efficiency          | <p>1. The Enhanced Infrastructure Renewal Program (EIRP) at the City of Thunder Bay was integrated into the budget process to address ongoing capital needs through incremental and dedicated property tax increases. By 2014, the gap between the amount of funding required to implement the City's asset management plan and annual capital spending is expected to have been reduced by approximately 60%.</p> <p>2. Municipality of Lambton Shores increased visibility into its assets, asset condition and the level of infrastructure spending deficit and funding requirements in the system. By integrating with financial planning and long-term budgeting, Lambton Shores could develop a plan to achieve full funding in 5, 10 or 15 years.</p> <p>3. ProjectWise allowed United Utilities to extract digital data about its assets from delivered projects and import it into corporate systems with minimal effort for complete data ownership. Owning the data from design conception through to commissioning combined with the ability to customize the system to enforce a data structure tailored to its business, United Utilities can more efficiently integrate new assets and soft land its projects – which is estimated to save GBP40 million on the capital delivery program.</p> |
| 2.4  | Increase average rate of return of asset investments                                      | 5               | Standardise our asset management processes, to support consistent decisions | Achieving efficient delivery            | Reduce Cost                  | <p>1. Studies performed by Portland Energy Conservation, Inc. (PECI) indicate that the average operating costs of a commissioned building range from 8% to 20% below that of a non-commissioned building.</p> <p>2. BOMA cost data for office buildings suggests that building commissioning can result in energy savings of 20% to 50% and maintenance savings of 15% to 35%.</p> <p>3. An SAP study showed 3-5% increase in return on assets through proactive maintenance regimes</p> <p>4. An SAP study showed 7-14% increase in return on assets through improvement in EAM system maturity</p>   |
| 3.1  | Reduce lifecycle costs for critical assets while managing lifecycle risks                 | 8               | Developing our whole life cost approach                                     | A well-maintained and resilient network | Manage Risks & Opportunities | <p>1. A London Underground case study has shown a reduction of 15% in capex costs through whole-life cost analysis</p> <p>2. Studies from multiple asset owners (including Orange County Sanitation District) have shown a reduction of 5 to 30% in capex costs through whole-life cost analysis.</p> <p>3. Network Rail realized a 14% reduction in capex costs through whole-life cost analysis.</p>   |

| Ref. | Potential Efficiency   | GFAMAM Subject. | NH AM Way (best fit – may be multiple)                         | National Highways Outcomes              | National Highways Benefit    | Example Benefit Case Studies Summary Description   |
|------|--|-----------------|--|---|------------------------------|--|
| 4.1  | Improve reliability of and reduce risks within the asset portfolio | 16, 35          | Manage asset risks effectively and consistently on our network | Providing fast and reliable journeys    | Improve Reliability          | <ol style="list-style-type: none"> <li>1. A large chemical company, implemented predictive capabilities for one asset class, extruders, resulting in an 80 percent reduction of unplanned downtime and cost savings of around \$300,000 per asset.</li> <li>2. Italian train operator, Trenitalia was able to maximize its brake pads' useful life while reducing the number of needed spares. Overall, Trenitalia was able to decrease downtime by 5–8 percent and reduce its annual maintenance spend of \$1.3 billion by an estimated 8–10 percent</li> <li>3. One manufacturer reduced downtime on a robotic manufacturing line by 50 percent and increased performance by 25 percent by leveraging a machine learning platform for its predictive algorithms.</li> </ol>  |
| 5.1  | Reduce asset risks that can be managed through maintenance         | 7               | Manage asset risks effectively and consistently on our network | A well-maintained and resilient network | Manage Risks & Opportunities | <ol style="list-style-type: none"> <li>1. Massachusetts Water Resources Authority officials reassessed maintenance practices for 12 equipment systems, such as different types of pumps. By using the assessment results to improve maintenance planning for these assets, the utility decreased the labour hours spent on preventive maintenance by 25 percent from the hours recommended by the original equipment manufacturers.</li> <li>2. Transition from time-based to condition-based maintenance reduced maintenance costs by 10% for a major electricity network provider.</li> <li>3. Studies by Aberdeen Group showed a reduction of 3-6% in O&amp;M costs through proactive maintenance procedures.</li> <li>4. TWPL/AMCL studies have shown that risk-based maintenance can reduce operating budgets by 15-30%.</li> </ol> |
| 5.2  | Prioritize and/or reduce maintenance budgets                       | 7               | Manage asset risks effectively and consistently on our network | Achieving efficient delivery            | Reduce Cost                  | <ol style="list-style-type: none"> <li>1. Studies by IBI Group, the Brookings Institution and the Canada Mortgage and Housing Corporation have found that compact, smart growth development saves up to 15% on operating costs for infrastructure compared to traditional development patterns.</li> <li>2. TWPL/AMCL studies have shown that risk-based maintenance can reduce operating budgets by 15-30%.</li> <li>3. A UK based water utility has realized improved levels of preventative and scheduled maintenance through 30% reduction in CM work.</li> </ol>  |

| Ref. | Potential Efficiency                                     | GFMAM Subject. | NH AM Way (best fit – may be multiple)                         | National Highways Outcomes           | National Highways Benefit | Example Benefit Case Studies Summary Description  |
|------|--|----------------|--|--------------------------------------|---------------------------|---|
| 6.1  | Reduce inventory procurement costs                       | 18, 26         | Manage asset risks effectively and consistently on our network | Achieving efficient delivery         | Reduce Cost               | <ol style="list-style-type: none"> <li>1. A Port of Cartagena study showed a 15% reduction in inventory holding cost through item/service catalogue analysis.</li> <li>2. An IBM study showed 10-50% reduction in inventory procurement costs by optimizing inventory management.</li> </ol>  |
| 6.2  | Reduce inventory holding costs                           | 18, 26         | Manage asset risks effectively and consistently on our network | Achieving efficient delivery         | Reduce Cost               | <ol style="list-style-type: none"> <li>1. A rail maintenance company realized 20% reduction in materials costs through inventory management.</li> <li>2. A fleet management company realized inventory cost savings by reducing FTEs in-charge of inventory management by 20%.</li> <li>3. IBM studies have shown 10-30% reduction in inventory holding costs through obsolete inventory management.</li> </ol>                                   |
| 7.1  | Improve contractor performance against NH's requirements | 26             | Manage asset risks effectively and consistently on our network | Providing fast and reliable journeys | Improve Reliability       | 1. A gas utility utilized a contractor software solution to configure pipeline inspection content and criteria to precisely fit the company's design standards, regulatory environment, workflows, physical environment, internal legacy systems and operating practices. Without any adjustments in manpower, inspectors more than doubled the tasks inspected per inspection and the number of inspections per inspector increased by over 50%. |
| 7.2  | Reduce supply chain costs                                | 26             | Manage asset risks effectively and consistently on our network | Achieving efficient delivery         | Reduce Cost               | <ol style="list-style-type: none"> <li>1. IBM SAP case studies have shown a 10-50% improvement in warranty recoveries by optimizing procurement.</li> <li>2. A consumer products company realized 50% savings in warranty recoveries through procurement management.</li> </ol>   |

| Ref. | Potential Efficiency  | GFAMAM Subject. | NH AM Way (best fit – may be multiple)   | National Highways Outcomes              | National Highways Benefit    | Example Benefit Case Studies Summary Description  |
|------|---|-----------------|--|---|------------------------------|---|
| 8.1  | Improve effectiveness of decision-making                                    | 23              | Maximise the use of our data, asset management systems and digital technology to make intelligence led decisions | A well-maintained and resilient network | Manage Risks & Opportunities | <p>1. A manufacturing company case study showed that it had a new \$35,000 gearbox installed as part of new process start-up. Three months after start-up, the gearbox suffered a major gear failure, requiring complete replacement. The failure also caused a five-day shutdown of the new process that was generating \$50,000/day in revenue. Because the maintenance team did not have the operation and maintenance manuals at start-up, they did not know there were critical backlash checks that needed to be performed before and just after start-up that would have prevented the failure.</p> <p>2. By establishing and maintaining good quality asset information that is reliable, trusted and fully utilized by users, huge efficiencies can be realized, particularly during the operational and maintenance phases. Conservative independent studies have shown that good quality configured asset information can reduce an organization's whole life costs by at least five percent, or one to two-years operating expenses (OPEX), based on a 20 to 40 average asset life.</p> |
| 9.1  | Improve efficiency of decision-making                                       | 24              | Maximise the use of our data, asset management systems and digital technology to make intelligence led decisions | Achieving efficient delivery            | Increase Efficiency          | <p>1. A case study from Dubai airport showed a 10% reduction in maintenance man-hours through EAM system optimization.</p> <p>2. Vychodoslovenska Energetika showed a 7% reduction in labour man-hours through real-time workforce management.</p> <p>3. According to Data Management Association (DMA), "approximately 15% of operating expenses for almost all organizations are wasted due to data quality issues." Collecting data on paper typically doubles the workload for staff, for it eventually requires transcription into digital systems. Manual data collection and entry also results in transcription errors, non-standardized values and an overall lack of control over the data. This presents great risks and costs to organizations.</p>   |
| 9.2  | Improve accuracy and reduce costs of information system outputs and reports | 24              | Maximise the use of our data, asset management systems and digital technology to make intelligence led decisions | Achieving efficient delivery            | Reduce Cost                  | <p>1. A Des Moines Water Works study showed a reduction of 35% in labour hours by reducing errors in data entry.</p> <p>2. An IBM study found an 8-15% improvement in productivity through optimizing asset information systems and data.</p>   |

| Ref. | Potential Efficiency   | GFAMAM Subject. | NH AM Way (best fit – may be multiple)   | National Highways Outcomes              | National Highways Benefit    | Example Benefit Case Studies Summary Description   |
|------|--|-----------------|--|---|------------------------------|--|
| 9.3  | Reduce IT operational costs  | 24              | Maximise the use of our data, asset management systems and digital technology to make intelligence led decisions | Achieving efficient delivery            | Reduce Cost                  | <ol style="list-style-type: none"> <li>1. An IBM study showed a 10-25% reduction in opex costs through optimizing asset information systems and data.</li> <li>2. SAP study shows a 3-6% reduction in opex costs through EAM system maturity improvement.</li> <li>3. Through effective SAP system integration, Connective Energy realized 50% reduction in opex costs.</li> </ol>   |
| 10.1 | Increase understanding of AMS contribution to corporate risk exposure                | 31              | Manage asset risks effectively and consistently on our network   | A well-maintained and resilient network | Manage Risks & Opportunities | <ol style="list-style-type: none"> <li>1. A University of California study showed a 39% reduction in risk costs through effective risk management.</li> <li>2. A NiSource case study showed a 14-50% reduction in 3rd party liabilities through risk assessment, analysis and management.</li> </ol>   |
| 10.2 | Increase understanding of current and targeted corporate or functional risk exposure | 31              | Manage asset risks effectively and consistently on our network   | A well-maintained and resilient network | Manage Risks & Opportunities | <ol style="list-style-type: none"> <li>1. In addition to transmission planning, risk-based approaches can also be used for choosing optimum substation configuration and spare equipment analysis. A British Columbia Transmission Corporation showed a 30% reduction in capital costs.</li> <li>2. Use risk-based approaches in making planning decision to balance cost and service reliability. Atlantic Electric showed a 7% reduction in capex costs by incorporating risk analysis in planning.</li> </ol> |
| 10.3 | Manage and reduce corporate or functional risk exposure                              | 31              | Manage asset risks effectively and consistently on our network   | A well-maintained and resilient network | Manage Risks & Opportunities | <ol style="list-style-type: none"> <li>1. London Jubilee Line extension case study showed a 42% reduction in capital cost overruns by incorporating risk in capital planning.</li> <li>2. Netherlands' HSL-Zuid line realized a 43-55% reductions in capital cost overruns using a risk-based capital budgeting approach.</li> <li>3. A SODEXO case study showed a 40% reduction in risk costs through effective risk mitigation.</li> </ol>   |

| Ref. | Potential Efficiency   | GFMAM Subject. | NH AM Way (best fit – may be multiple)                                      | National Highways Outcomes              | National Highways Benefit    | Example Benefit Case Studies Summary Description  |
|------|--|----------------|---|---|------------------------------|---|
| 11.1 | Reduce change management costs and negative impact of change | 34             | Standardise our asset management processes, to support consistent decisions | A well-maintained and resilient network | Manage Risks & Opportunities | <p>1. An ADCO case study shows 15% improvement in action tracking closure through proper Management of Change and Action Tracking Process Enhancement.</p> <p>2. A BC Hydro case study demonstrates how a group of change management practitioners from across the company came together to share best practices, knowledge and tools to develop an Enterprise Change Management Framework. This scalable and flexible framework ensures a consistent and optimized approach to managing change within the company.</p> |

| Ref. | Potential Efficiency  | GFAMAM Subject. | NH AM Way (best fit – may be multiple) | National Highways Outcomes     | National Highways Benefit | Example Benefit Case Studies Summary Description   |
|------|---|-----------------|--|--------------------------------|---------------------------|--|
| 12.1 | Increase ability to demonstrate reliability, safety, capacity and performance over time | 33              | Embedding asset management             | Meeting the needs of all users | Demonstrate Alignment     | <p>1. Wright-Hennepin rural electric co-op in Minnesota is a positive example of how utilities can align themselves with the sustainability values of their customers. By as early as 2016, the utility was offering community solar, remote control of appliances, and home security systems. They even provided electric water heaters free of charge that can only operate during off-peak hours, to encourage peak reduction and fill in during low-usage periods.</p> <p>2. According to an Accenture study, for some utilities in the United States, the traditional method of rate recovery based on the amount of electricity/gas sold in a year has been modified to encourage energy efficiency. This decoupling of sales from revenue may provide the necessary financial incentives for utilities to encourage their customers to use less energy. This decoupling may also be a contributing factor to helping utilities take the longer-term view that sustainability requires.</p> <p>3. When Eskom, the South African utilities company, decided to increase the proportion of renewable energy of its generation mix, it was responding to the pressures brought about by climate change and the future resource constraints that threaten its long-term growth. It was also acknowledging, at the same time, a significant opportunity to lead in a growth market. Traditionally a coal-dominated utility, Eskom is now increasingly emphasizing renewables in its strategy with the aim of reducing the amount of coal in its generation mix from the current 88 percent to 70 percent by 2025.</p> <p>4. The GridWise Alliance is a coalition of more than 150 companies across the energy supply chain—from utilities and large technology companies to academia, venture capitalists and emerging tech companies—that has joined together to transform the electric grid for a more sustainable future. The variety of stakeholders gives the GridWise Alliance a unique diversity of perspectives which enables interactive dialogue between members and helps to establish a dialogue that can begin to bring greater clarity to the direction of future regulation.</p> |

| Ref. | Potential Efficiency  | GFAMAM Subject. | NH AM Way (best fit – may be multiple) | National Highways Outcomes     | National Highways Benefit | Example Benefit Case Studies Summary Description   |
|------|---|-----------------|--|--------------------------------|---------------------------|--|
| 12.2 | Improve prioritisation of budgets and resources to enable achievement of objectives | 33              | Embedding asset management             | Meeting the needs of all users | Demonstrate Alignment     | <p>1. Seattle Public Utilities has developed organizational structures to deal with improved project review and decision making. Reviews use standardised Stage Gate business case documents, which include a triple-bottom-line (TBL) analysis. This structure is intended to produce near-optimal project decisions. A TBL analysis considers the economic, social, and environmental impacts of a project. Those impacts include positive and negative effects.</p> <p>2. OMV, an Austrian-based integrated oil and gas company, deals with a highly challenging business environment involving volatile oil prices. The company is following a three-fold strategy to help reduce its carbon footprint and ensure a secure energy supply. First, its current core business of supplying fossil fuels is conducted in the most environmentally responsible and climate-friendly way possible. Second, the company is developing carbon capture and storage (CCS) technologies and projects as an interim solution as it seeks to pursue renewable energy sources. Finally, OMV is actively expanding its renewable energy activities.</p> |
| 12.3 | Increase understanding of organizational resource constraints                       | 33              | Embedding asset management             | Meeting the needs of all users | Demonstrate Alignment     | <p>1. SMUD has a tool kit for each senior leader that includes a detailed description and goals of her or his position. Then, each person completes an assessment to determine qualities such as overall potential, learning agility, a desire to lead and leadership competencies. Using that information, SMUD can evaluate each senior leader and hold career and development planning conversations to determine whether he or she is ready to advance to the next level or from one area of the company to another.</p> <p>2. Since 2008, Employee and Leadership Development has remained one of the most critical Attributes for Columbia Water Works (CWW). It engages in external partnerships with learning/career development organizations, such as a partnership with the Columbus State University Leadership Institute. At the Executive level, CWW is also partnering with the Leadership Institute to review and redefine the utility's Strategic Plan, and to conduct a Community Leaders Survey, which was initiated in 2013.</p>   |

| Ref. | Potential Efficiency                        | GFMAM Subject. | NH AM Way (best fit – may be multiple) | National Highways Outcomes   | National Highways Benefit | Example Benefit Case Studies Summary Description   |
|------|---|----------------|--|------------------------------|---------------------------|--|
| 12.4 | Increase resource efficiency / productivity | 33             | Embedding asset management             | Achieving efficient delivery | Increase Efficiency       | <p>1. In 2017, Lehigh County Authority (LCA) focused on succession planning and knowledge loss prevention. LCA identified, planned for, and addressed retirement-related staff turnover challenges, recruitment and retention strategies, and leadership development and capacity building for new and existing employees.</p> <p>2. In 2014, Scottsdale Water created its Apprentice Program to engage prospective employees newly entering the workforce. The utility also expanded its recruitment program to include attending job fairs and industry conferences to increase visibility as a utility and as an employer, and continues to implement both initiatives. The utility began implementation of an Employee Leadership and Development Program in 2016 to improve training for supervisors through quarterly leadership training sessions, reinforcing Scottsdale Water’s commitment to help young supervisors develop professionally.</p> <p>3. Boston Water &amp; Sewer Commission (BWSC) has placed substantial focus on improving knowledge transfer within the organization as an important way to grow new employees. In 2017, BWSC created a lecture series where long-term staff give lectures to newer staff on knowledge obtained over the course of their careers to share “tribal knowledge,” preparing for upcoming retirements and subsequent knowledge loss. These lectures are open to all staff, and they are recorded and posted on the internal shared drive for future reference. The first two lectures in 2017 were highly reviewed by staff and the lectures are now held monthly.</p> |

