

Lot 1 - Operations Maintenance and Renewals

The Office of Rail and Road

3 June 2024



FINAL REPORT

Important notice

This document was prepared by CEPA LLP (trading as CEPA) for the exclusive use of the recipient(s) named herein on the terms agreed in our contract with the recipient(s).

CEPA does not accept or assume any responsibility or liability in respect of the document to any readers of it (third parties), other than the recipient(s) named in the document. Should any third parties choose to rely on the document, then they do so at their own risk.

The information contained in this document has been compiled by CEPA and may include material from third parties which is believed to be reliable but has not been verified or audited by CEPA. No representation or warranty, express or implied, is given and no responsibility or liability is or will be accepted by or on behalf of CEPA or by any of its directors, members, employees, agents or any other person as to the accuracy, completeness or correctness of the material from third parties contained in this document and any such liability is expressly excluded.

The findings enclosed in this document may contain predictions based on current data and historical trends. Any such predictions are subject to inherent risks and uncertainties.

The opinions expressed in this document are valid only for the purpose stated herein and as of the date stated. No obligation is assumed to revise this document to reflect changes, events or conditions, which occur subsequent to the date hereof.

The content contained within this document is the copyright of the recipient(s) named herein, or CEPA has licensed its copyright to recipient(s) named herein. The recipient(s) or any third parties may not reproduce or pass on this document, directly or indirectly, to any other person in whole or in part, for any other purpose than stated herein, without our prior approval.

EXECUTIVE SUMMARY	4
1. INTRODUCTION	8
2. STRUCTURE OF REPORT	10
3. OVERALL ASSESSMENT OF NATIONAL HIGHWAYS DRAFT STRATEGIC BUSINESS PLAN SUBMISSION	11
4. ASSESSMENT OF OPERATIONS AND MAINTENANCE	12
4.1. Operations.....	12
4.2. Maintenance.....	22
5. DBFO HANDBACKS	31
6. REVIEWS OF ASSET CLASS RENEWALS	36
6.1. Flexible Pavement.....	36
6.2. Drainage	42
6.3. Structures.....	47
6.4. Vehicle Restraint Systems (VRS).....	54
6.5. Roadside technology	59
6.6. Digital Aspects of dSBP	67
7. BALANCE OF EXPENDITURE BETWEEN ASSET CLASSES	72
8. CONCLUSIONS	74
8.1. RAG Ratings.....	74
8.2. Balance of Expenditure between Asset Classes, Operations, and Maintenance	77
8.3. Concluding remarks.....	77

EXECUTIVE SUMMARY

The Office of Rail and Road (ORR) independently monitors National Highways' management of the strategic road network (SRN) – the motorways and main A roads in England. As part of its role, the ORR advises the government on the appropriate level of funding and performance requirements for future road periods. The ORR conducts a review of National Highways' draft Strategic Business Plan (dSBP) and provides advice to the Secretary of State on the extent to which the proposed requirements for Road Investment Strategy (RIS) 3 are challenging and deliverable within the financial resources to be provided. This is known as the Efficiency Review.

The Department for Transport is yet to finalise the draft RIS. However, to ensure that planning for RIS3 continues to progress, the Department instructed National Highways to prepare an interim version of its draft SBP based on an agreed set of assumptions and requirements and invited the ORR to review those plans. This report sets out the findings of a review of the interim draft SBP. For brevity, in the remainder of this report we refer to the interim submission as the 'dSBP'.

CEPA was commissioned to support the ORR in its Efficiency Review, and this report sets out CEPA's views on National Highways plans to Operate, Maintain and Renew the SRN in road period 3. Supported by TRL, CEPA has reviewed Operations, Maintenance and Renewals (OMR) plans for five asset types and has also reviewed National Highways' plans for handback and subsequent OMR of roads currently managed via Design, Build, Finance, Operate (DBFO) arrangements. Overall, it is ORR's role to advise government on the extent to which National Highways' plans are challenging and deliverable and this report aims to support the ORR in providing this advice.

CEPA's overall view¹ is that **National Highways' dSBP plans for Operations, Maintenance and Renewal of its assets are immature**. While the dSBP contained high-level explanations of the approaches employed there was insufficient information in the submitted dSBP that was relevant or helpful to understand or scrutinise National Highways' intentions and rationale in any detail. Models and calculations that underpinned the company's cost estimates were not initially provided, making it difficult and time-consuming to understand and analyse approaches and expenditure.

National Highways provided further evidence to support its plans during our review. However, even with that, the information provided by National Highways is far less transparent and comprehensive than our experience of plans in the regulated utilities sectors.

However, **National Highways' underlying processes have developed since RIS2**, and the processes applied to estimating expenditure are more transparent for RIS3. For example, we have been able to understand the process used build-up volumes in most cases and, at workshops and in response to Requests for Information (RFIs), we have been able to understand what underlying assumptions drive expenditures.

In our view, despite these improvements, **significant issues remain throughout much of the dSBP:**

- While the processes applied to generate unit costs and volumes appear more robust than in RIS2, the supporting evidence for the assumptions that underpin the forecast expenditure and performance is often poorly justified. These assumptions can drive significant increases in forecast spend. For example, for drainage and roadside technology significant increases in expenditure are proposed but supporting models rely on assumptions that are highly uncertain.
- In most cases efficiencies are stated at a high-level as a management overlay with little evidence of a plan for delivery.
- Climate change is often mentioned but appears to have no impact on plans or forecasts except for drainage.
- The link to performance is generally weak or poorly justified, with some exceptions such as flexible pavement and structures.

¹ As well as this review of OMR, CEPA has examined Enhancements, Safety and Environment areas within the dSBP

Below, we have summarised our view of the quality of the justification and evidence provided by National Highways via a Red-Amber-Green (RAG) rating for the main aspects of the dSBP that we have examined². We have provided our rationale for each of these ratings in the relevant sections of this report.

Section of dSBP	Overall spend	Asset Mngt	Modelling & data use	Climate change	Cost estimation	Risks to delivery	Link to perf.
Operations	Yellow	Yellow	Yellow	Yellow	Yellow	Red	Red
Maintenance	Yellow	Green	Green	Red	Yellow	Yellow	Red
Flexible Pavement	Green	Yellow	Green	Red	Yellow	Yellow	Green
Drainage	Red	Yellow	Green	Yellow	Red	Red	Yellow
Structures	Yellow	Yellow	Green	Red	Yellow	Red	Green
VRS	Green	Yellow	Yellow	Yellow	Green	Yellow	Yellow
Roadside Technology	Red	Red	Yellow	Yellow	Red	Red	Yellow
Digital	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow

Section of dSBP	Delivery of contractual requirement	Operations Planning	Maintenance Planning	Renewals Planning	Risks
DBFO	Green	Yellow	Green	Red	Yellow

In addition to the general points set out above, for these areas we have found that:

- National Highways is forecasting a 9% real decrease in **operations** expenditure compared with actual real expenditure in RP2. National Highways' has employed a broadly sensible process to estimate its operations expenditure, rolling-forward expenditure from RP2, identifying areas where expenditure is specific to RP2, modelling cost uplifts, and targeting cost reductions and efficiencies. However, it has not evidenced that it

² It is important to note that the RAG ratings that we have given for each area are necessarily a broad-brush view of a potentially complex situation, but our aim has been that the RAG rating would typically represent the following criteria:

Red: Area is not addressed, or is poorly justified AND is material for the asset/area in question.

Amber: Area is addressed in part, but there are shortcomings in the analysis or evidence provided to demonstrate deliverability or efficiency; OR

Area is not addressed or poorly justified but is not material for the area/asset in question.

Green: Area is sufficiently addressed AND evidence or analysis provided gives confidence in deliverability or efficiency

has effectively considered the deliverability of their plan. Most notably, it has estimated a requirement for additional staff in network management and asset management and then targeted efficiencies for these areas that eliminate the need for additional staff, without evidence of how these efficiencies will be achieved. Similarly, it has not provided any evidence of how these efficiencies will impact on the target to achieve the same level of performance in RP3 as RP2.

- National Highways has requested a 20% real increase in **maintenance** expenditure compared to real expenditure in RP2. As with the operations expenditure request, the overall process to estimate these costs is sensible at a high-level. However, National Highways does not provide sufficient detail to demonstrate that the impact on renewals is properly captured, sufficient justification of some areas of proposed efficiency or detail that would provide confidence in the deliverability and performance impacts of the plan. Each of these shortcomings could impact cost and/or performance. It is also possible that any maintenance expenditure on priority risk structures has not been removed from RP2 baseline, which would result in double-counting of these costs.
- National Highways understanding of its **flexible pavement** assets, and their renewals needs and costs, are much more developed than for other asset classes that we have examined. National Highways has proposed that renewals expenditure on this asset is reduced below that required to maintain current levels of performance, with real renewals expenditure forecast to decrease by 17% between RP2 and RIS3 and performance on the pavement KPI reducing from 97.1% to 94.7% in RIS3. Forecasts for RIS4 predict either greatly increased renewals to recover the condition of assets or a faster deterioration in asset condition. Some details of the approach that National Highways has applied to estimate unit rates appear inappropriate. Simple averages, rather than weighted averages, have been applied in one stage of the calculation of unit rates. This results in unit rates being 6% higher than alternative estimates developed by National Highways, which apply weighted averages throughout. **We recommend that National Highways' alternative unit rates should be adopted within the RIS3 plans, potentially reducing expenditure on flexible pavement by around £95m.**
- National Highways has proposed a significant increase in expenditure on renewal of its **drainage** assets, with real renewals expenditure forecast to be 59% higher than in RP2. However, there are a number of assumptions built into expenditure forecasts that are very uncertain and that may have a material impact on both expenditure and performance. These include the number of flooding hotspots addressed and the mix of interventions required to address flooding. There is therefore a significant risk that the programme is either over or under-funded. **The ORR should consider whether costs at the proposed level should be funded, or how delivery could be monitored to reduce risks of over or under-funding the renewals.**
- National Highways' renewal plans for **structures** include a 48% increase in real expenditure relative to RP2. Much of the proposed work appears in line with its asset management documentation and whole-life cost principles, but £240m for preventative maintenance has been removed from the budget due to budget challenges – this important decision is not well-justified. Overall, while the processes used to estimate expenditure seem appropriate, there is significant uncertainty in the resulting total expenditure given the uncertainty in either volumes or unit costs for many areas of structures expenditure. The primary risk to structures renewals is due to the complexity of significant structures schemes. While these schemes and costings appear appropriate, they may result in delays or extensions to schedule during RIS3 and actual work volumes/costs may differ from current estimates as the schemes develop. **The ORR should consider monitoring of significant structures renewals against project milestones and bills of quantities costings that have been developed for the projects, and consider advising the government to fund some or all of the removed £240m for preventative maintenance.**
- National Highways plans for renewals of **vehicle restraint systems** (VRS) include a 43% real decrease in expenditure relative to RP2, with around 85% of renewals volume consisting of do minimum interventions (DMIs). While this is not consistent with National Highways' asset class strategy, it appears a pragmatic approach to reduce costs. Given the large reduction in expenditure, we are uncertain whether the assumed 9% efficiency included in forecasts is deliverable.
- **Roadside technology** renewals benefit from a very large increase in renewals expenditure to £906m, including a £300m National Programme. Even excluding the National Programme in RIS3, this is a real

increase of 76% compared to RP2 expenditure. This level of expenditure results in National Highways replacing around 40% of its asset base in RIS3. This forecast expenditure is based on modelling of asset ages, failure rates and obsolescence and the availability of roadside technology, but it is unclear whether it reflects the additional £100m of renewals expenditure in this area in RP2. The basis of the fault rate estimates, and the sensitivity of the model to changes in these are not explained for all technology asset types. While we recognise that the age of the assets likely warrants some increase in expenditure and acknowledge that some of the assets are safety critical, it does not seem credible that replacing 40% of the asset base is the most appropriate response to aging assets. In our view the modelling approach, while appropriate in principle, appears insufficiently mature and stable to be used to justify roughly £600m of additional expenditure. **The ORR should consider excluding some or all of the additional spend for this area, subject to improved detail on how National Highways will improve performance and deliver its long-term vision for this asset class.**

- National Highways has proposed a 14% real increase in expenditure on its **digital** assets. While there are some specific allocations for developing services, such as £17m for spatial data and £48m for connected services, the majority of expenditure is for roll-forward of existing business-as-usual services. Given the scale of expenditure in this area, and the approach to its forecast, **the ORR should consider benchmarking of some aspects of this business as usual expenditure.**
- National Highways approach to understanding the condition of **DBFO roads** to be handed back in RIS3 and the works required to bring them into alignment with the handback conditions appears robust and well-managed. However, a risk remains that retention amounts will be insufficient to address any renewals that are required but that are not complete before handback. Some high-level assumptions might suggest that this risk currently stands at around £100m, though it seems likely that this level will reduce as further inspections and examinations are undertaken and renewal works are completed by the DBFO Co's. In addition, no funds have been set aside to address any assets whose life expires after handback, but within RIS3. Some high-level assumptions might suggest that renewals totalling £30m-£50m might be required for DBFO roads handed back in RIS3. **The ORR should develop its understanding of the magnitude of these potential risks and consider to what extent they might be included within National Highways' risk provisions.**

A well-developed plan also includes compromises that **balance expenditure on the different asset classes**. The dSBP that National Highways has proposed does not include all of the renewals in RIS3 that it considers would be desirable to minimise whole life costs, since National Highways does not consider that all such renewals are deliverable within the available funding. National Highways has therefore had to make decisions as to what extent it can fund renewals for all its assets.

In the case of the lack of preventative structures renewals and flexible pavement this will materially increase renewals and expenditure and introduce deliverability risks in RIS4. In contrast, National Highways has proposed large increases in expenditure for some assets, with expenditure on roadside technology being over £900m, more than three times that in RP2, with targeted performance being held at RP2 levels. While some increase may be justified, it seems likely that a large part of these additional funds could be better spent on other assets or saved.

This decision to prioritise roadside technology appears to be driven by context around the development of the SoFA. While National Highways has set out the process that it has followed to balance funds between the needs of different asset classes, the position that it has reached does not appear to appropriately balance asset risks and whole life costs – albeit that any such balance is always a judgement.

We recommend that the ORR consider this balance of expenditure between assets further and highlight the effect that greatly increased expenditure on roadside technology reliability has on other assets.

In summary, while National Highways processes for developing the dSBP have progressed from those used for RIS2 there remain some significant issues that require attention and further development. In particular, large increases in proposed expenditure in some areas are poorly justified while reductions in expenditure other areas – that will have well-understood impact on future performance – have been proposed in the dSBP. We suggest that the balance of plan in the round requires further consideration.

1. INTRODUCTION

The Office of Rail and Road (ORR) independently monitors National Highways' management of the strategic road network (SRN) – the motorways and main A roads in England. The ORR scrutinises the company and hold it to account for its management of the SRN, including delivery of performance and efficiency.

As part of its role, the ORR advises the government on the appropriate level of funding and performance requirements for future road periods. The requirements for these road periods are set out by the government in road investment strategies (RIS), with RIS3 setting out the requirements to be delivered by National Highways during the period 2025-6 to 2029-30. The ORR will provide advice to the Secretary of State on the extent to which the proposed requirements are challenging and deliverable within the financial resources to be provided. This is known as the Efficiency Review.

The Department for Transport is yet to finalise the draft RIS. However, to ensure that planning for RIS3 continues to progress, the Department instructed National Highways to prepare an interim version of its draft SBP based on an agreed set of assumptions and requirements and invited the ORR to review those plans. This report sets out the findings of a review of the interim draft SBP. For brevity, in the remainder of this report we refer to the interim submission as the 'draft SBP'.

In addition to its aim to scrutinise plans for Road Period 3 (RP3), advise government on whether they are challenging and deliverable and to drive efficient behaviours, the ORR aims to foster a mature approach to asset management that reduces costs in the long term.³ Understanding whether, and how, National Highways' approach avoids storing up costs for the future while managing disruption and balancing short-term affordability constraints is an essential part of this aim.

The ORR has set out a systematic approach to assessing the costs of National Highways' plans. Two of the areas of focus are understanding the planned activities that National Highways proposes in RP3 and the costs of undertaking those activities.

CEPA was commissioned to support the ORR in its efficiency review, and this report sets out CEPA's views on National Highways plans to Operate, Maintain and Renew the SRN in RIS. CEPA has based these views on National Highways' draft Strategic Business Plan (dSBP), supplemented by meetings and workshops with National Highways and National Highways' responses to Requests for Information (RFIs).

The scope of CEPA's work was to:

- Review National Highways' renewals plans for a sample of five asset types i) flexible pavements ii) structures iii) roadside technology iv) vehicle roadside restraint v) drainage. Including:
 - Assessment of the alignment of the renewal plans with Asset Management Policies and Strategies.
 - Review of approach taken to estimating costs; and Review of National Highways' data and modelling tools.
 - Assess how the renewal plans take account of climate change
 - Review the identification and assessment of risks to delivery.
- Review National Highway's plans for operating and maintaining the network, considering:
 - Alignment with broader strategy and alignment with renewals.
 - Linkage to resourcing, outputs and performance.
 - How National Highways has considered changing asset needs, and factors such as climate change.

The ORR asked for three specific areas of focus:

- Providing support with ORR's assessment of whether proposed RIS3 performance targets are challenging and deliverable.

³ [Road Investment Strategy 3 - Our Role and Approach - March 2022 \(orr.gov.uk\)](https://www.orr.gov.uk/road-investment-strategy-3-our-role-and-approach-march-2022)

- Reviewing the approach National Highways is taking to the ‘hand-back’ of DBFO, assessing whether plans for RIS3 take appropriate account of the impact of DBFO hand-back on cost and performance, and how National Highways will establish the condition of the assets
- Reviewing the digital aspects of the draft SBP, including a detailed review of National Highways’ plans for operating, maintaining and renewing roadside technology assets.

Overall, the ORR needs to advise government on the extent to which National Highways’ plans are challenging and deliverable and this report aims to support the ORR in providing this advice.

2. STRUCTURE OF REPORT

This report is one of four reports produced by CEPA to support the Office of Rail and Road's efficiency review, and focuses on the Operations, Maintenance and Renewal (OMR) of the Strategic Road Network (SRN), and National Highways' plans for these as set out in its draft Strategic Business Plan (dSBP). CEPA's overall view of the dSBP, which considers our views of the four areas examined, is set out in Section 3.

Our proposal to review the OMR aspects of the dSBP stressed the importance of the integration of operations, maintenance and renewals (and performance). However, in our initial review of the dSBP it was quickly apparent that, in most cases, there was little linkage between the renewals plans provided and the proposed programmes of maintenance and operations. Section 4 therefore describes National Highways' overall approach to planning and costing operations and maintenance separately, rather than integrated by asset class.

Section 5 considers the handback of DBFO roads in RIS3. This section focuses on (i) forecast expenditure on operations and maintenance, and (ii) risks to renewals expenditure in RP3 to address handback condition. National Highways has not included any expenditure for renewals on these sections of road in RP3 in its dSBP. Any risks to these assumptions are also described.

Section 6 considers each of the five asset classes that we have reviewed. Sections on each asset class examined focus mainly on renewals, but include sections on how maintenance and operations are considered or adjusted for those asset classes. We describe how the high-level approach to operations and maintenance is adjusted for specific classes of assets. Any consideration of performance relevant to that asset class is also described.

In addition to our review of each asset class, we have reviewed evidence provided by National Highways that describes how expenditure was balanced between asset classes. Section 7 sets out our views on how this balancing between asset classes has been undertaken.

Section 8 sets out our overall conclusions.

3. OVERALL ASSESSMENT OF NATIONAL HIGHWAYS DRAFT STRATEGIC BUSINESS PLAN SUBMISSION

National Highways' dSBP plans for Operations, Maintenance and Renewal of its assets are immature. While the dSBP contained high-level explanations of the approaches employed there was little information in the submitted dSBP that was relevant or helpful to understand or scrutinise National Highways' intentions and rationale in any detail: the format and content of the dSBP is, in most cases, identical to that provided for RIS2 with updated high-level numbers. Numbers and supporting models and calculations were almost entirely lacking, making it difficult and time-consuming to understand and analyse approaches and expenditure. While there were often improved underlying processes and analysis, these only became apparent following discussions with National Highways and through its provision of further information.

In consequence, we have primarily relied on information provided in subsequent workshops or via Requests for Information (RFIs). Several RFIs were supplied far more slowly than the 10 working days response time, particularly those requesting information that supported cost estimates, such as unit costs, volumes and supporting models that included the assumptions that underpinned National Highways forecasts. While the information requested was detailed, we would have expected this information to be readily available since it supported calculations already undertaken by National Highways.

Overall, even with additional information provided during our review, the information provided by National Highways is far less transparent and comprehensive than our experience of plans in the regulated utilities sectors, where we would have expected to be provided with much, if not all, of the information that we requested as supporting evidence to the dSBP itself.

However, **National Highways' underlying processes have developed since RIS2** and the processes applied to estimating expenditure are more transparent for RIS3. For example, we have been able to understand the process used build-up volumes in most cases and, at workshops and in response to RFIs, we have been able to understand what underlying assumptions drive expenditures.

Significant issues remain:

- While the processes applied to generate unit costs and volumes appear more robust than in RIS2, the supporting evidence for the assumptions that underpin the forecast expenditure and performance is often poorly justified and can drive significant increases in forecast spend. Examples are drainage and roadside technology, where significant increases in expenditure are proposed, but where the supporting models rely on assumptions that are highly uncertain.
- In most cases efficiencies are stated at high-level as a management overlay with little development of a plan for delivery.
- Climate change is often mentioned but appears to have no impact on plans or forecasts except for drainage.
- The link to performance is generally weak or poorly justified, with some exceptions such as flexible pavement.

4. ASSESSMENT OF OPERATIONS AND MAINTENANCE

4.1. OPERATIONS

Main findings: operations

- National Highways' RP3 request is 9% less in real terms than its actual and forecast expenditure in RP2, albeit 28% more than it forecast that it would spend on operations in RP2.
- National Highways significantly overspent its request in RP2. National Highways' approach to its RIS3 forecast effectively rolls-forward much of this this RP2 overspend.
- The overall approach to cost estimation seems broadly sensible, National Highways has based its forecasts on RP2 figures, removed costs that will not be repeated, modelled cost uplifts and applied cost cuts and efficiency measures.
- National Highways has shown that its planned operations activities largely aligns with its asset management documentation. It has considered how renewals activities will affect operations costs in its request and has stated that the asset delivery approach will be progressed, although evidence of this process has not been provided.
- However, National Highways has not adequately evidenced several important assumptions. For example National Highways has requested an increase in FTEs to a 'full' request, but has not explained to what extent FTE figures, when they were below a fully resourced level, affected performance. National Highways use a rule-of-thumb where a 1% increase in incidents requires a 0.5% increase in FTEs – this rule-of-thumb is based on a subjective assessment; this is not enough evidence to underpin an assumption which has a material impact on National Highways expenditure case.
- We have significant concerns about the deliverability of National Highways' plan – either its ability to deliver the plan within the requested budget, or the ability to deliver the plan without impacting its performance metrics. National Highways has assumed that it can achieve 'efficiencies' in RP3 by removing its expenditure request for the extra operations costs that it assumes will be required to support an increase in renewals work over RP3. No bottom-up evidence has been provided to support how National Highways will implement these efficiencies. Additionally, National Highways has provided no evidence of why these 'efficiencies' can be achieved without affecting performance.

Source: CEPA analysis

National Highway's Operations request covers *'the day to day running costs relating to the Operations Directorate and its people. This funding is fundamental to planning, managing and operating our network. It includes staff, fleet and project work across Opex and Capex'*.⁴

Activities included with the expenditure request, includes:

- Managing customer enquiries.
- Planning and delivering maintenance activities on the network.
- Driving efficiencies and improvements across the systems and roads.
- Responding to incidents across the SRN motorways and major A-roads.
- Gathering and disseminating information to internal and external teams and customers, helping customers to plan journeys effectively (also provide traffic data and alternative diversion routes).
- Management of network assets.

⁴ National Highways (2024) RIS3: Operational Planning Efficiency review. Workshop presentation slides.

- Costs associated with taking back DBFO routes.

These activities cover two functions: Network Management (i.e. for activities required to manage the road network); and Asset Management (i.e. for activities required to manage National Highways' assets). In its funding request, National Highways uses the following categories for its requested expenditure:

- Asset management – staff costs (capex and opex)
- Asset management – other costs (capex and opex);
- Network management – staff costs (opex);
- Network management – other costs (capex and opex);
- DBFO takeback – establishment and operation (capex and opex).

In the following sections we provide our assessment of National Highways approach to its Operations funding request for RIS3.

4.1.1. Overall expenditure and approach

National Highways requested £1,506.1m⁵ for its 'post efficient'⁶ operational expenditure for RP3. An overview of this expenditure is presented in Table 4.1 below.

Table 4.1: National Highways post inflated, post efficient expenditure for Operations (£ million, nominal)

	Year 1	Year 2	Year 3	Year 4	Year 5	RIS3 - Total
Asset management staff costs (capex and opex)	114.5	117.9	121.4	125.1	128.8	607.8
Asset management – other costs (capex and opex)	20.3	20.7	21.2	21.7	22.3	106.2
Network management – staff costs (opex)	86.7	89.2	91.9	94.6	97.4	459.8
Network management – other costs (capex and opex)	54.9	53.5	55.9	59.2	60.5	284.0
DBFO takeback – est. and operation (capex and opex)	6.1	9.7	10.1	11.1	11.4	48.3
Total	282.5	291.1	300.5	311.6	320.4	1506.1

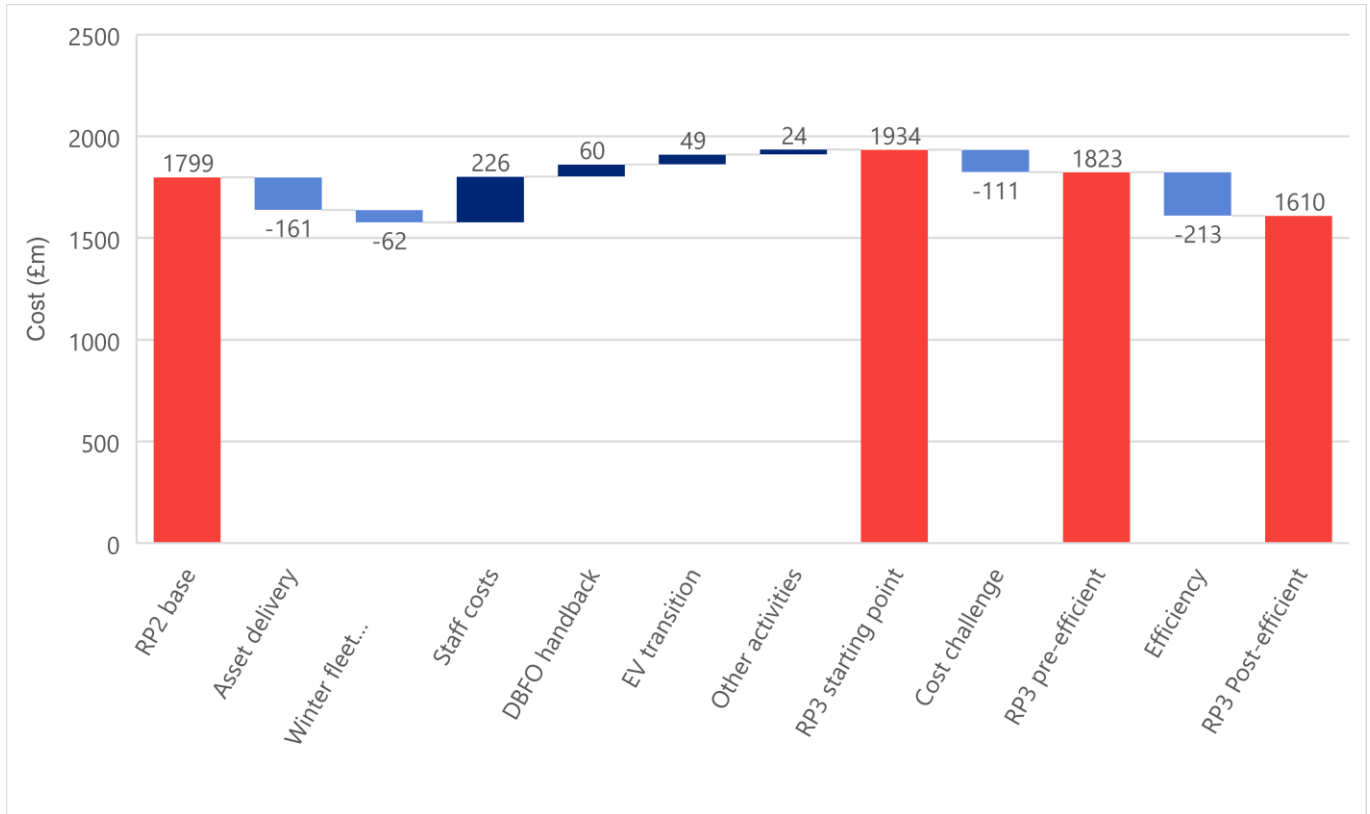
Source: National Highways dSBP

⁵ The total in Table 4.1 differs from the total in Figure 4.1. This is because there is £104m for 'other operations' costs managed by the corporate directorates which is included in Figure 4.1 but not in Table 4.1.

⁶ 'Post-efficient' expenditure refers to National Highways' investment request following the application of its efficiency challenge.

Figure 4.1 presents National Highways’ request for RP3, built up from a base of its RP2 expenditure. The figure includes increases and decreases in expenditure between RP2 and RP3, and both cost challenges and cost efficiencies.⁷ We describe these steps in more detail in Section 4.1.2.

Figure 4.1: Difference in operations expenditure between RP2 expenditure and requested expenditure in RIS3 (£m)



Source: National Highways workshop slides

Figure 4.2 below presents National Highways’ Operations RIS2 forecast expenditure, RP2 actual and forecast expenditure, and the forecast expenditure for RIS3 in a common price base (2023 prices).⁸ As described in footnote 8, we have made adjustments for inflation to the figures presented in Figure 4.2. National Highways has used its own inflation indices when calculating its estimates.⁹ Requested expenditure in 2025/26 is lower than realised spend in the final year of RP2, but increases year on year throughout RIS3.

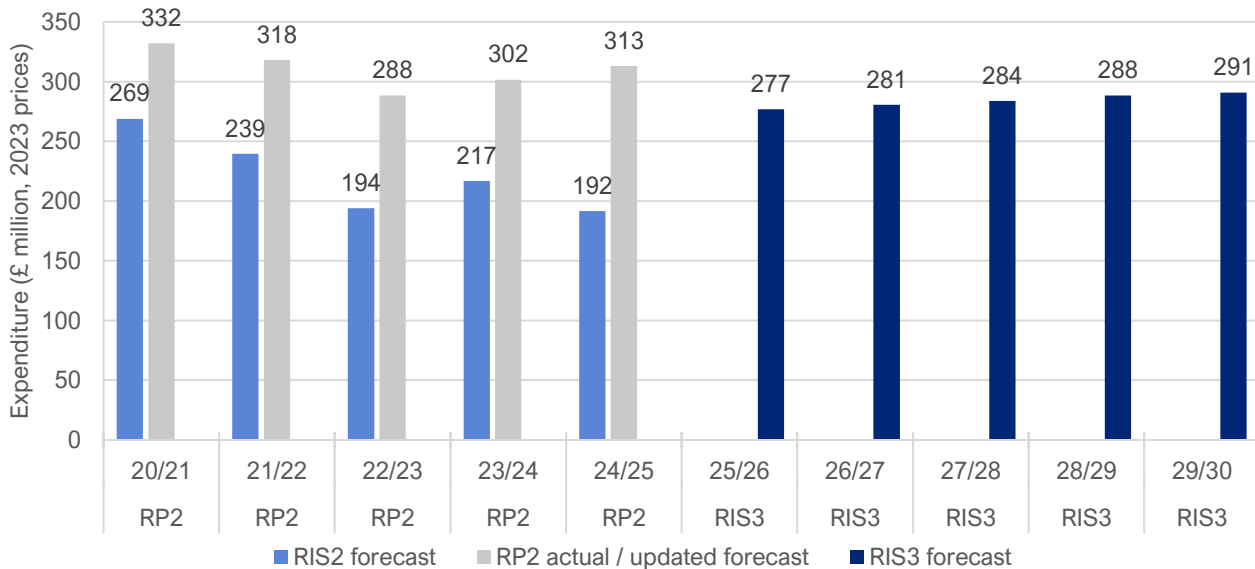
Requested operations expenditure for RIS3 represents a real reduction in expenditure of 9% from what has been realised / forecast in RP2.

⁷ Although not explained explicitly by National Highways, cost challenges appear to relate to areas in which National Highways are compromising its outputs to reduce its investment request (i.e. are delivering less), whereas efficiencies relate to areas where National Highways reduce expenditure without reducing outputs.

⁸ Throughout this report we refer to ‘RIS2 forecast’, ‘RP2 actual / updated forecast’, and the ‘RIS3 forecast’ all in 2023 prices. For the ‘RIS2 forecast’, we deflated the RIS2 forecast estimates to 2019 prices and then inflated these numbers to 2023 prices using actual CPI data from the ONS. For the ‘RP2 actual / updated forecast’ estimate, depending on the year (i.e. whether in the future or past) we either inflated or deflated the estimates to 2023 prices using the inflation assumptions used by National Highways in ‘dSBP Final issued to ORR 240207.xlsx’. The ‘RIS3 forecast’ estimates were also deflated using the inflation assumptions used by National Highways in ‘dSBP Final issued to ORR 240207.xlsx’

⁹ National Highways’ inflation assumptions are the subject of a separate workstream and are not addressed in this report

Figure 4.2: Operations expenditure by year during RP2 and RIS3 (£ million, 2023 prices)



Source: CEPA analysis of RFI 005 - Updated B.3 Financial Model & dSBP Final issued to ORR 240207

National Highways has significantly overspent its request in RP2. Commentary on this overspend has not been provided by National Highways for this review, although it has not been specifically requested. The macroeconomic climate is likely to have influenced this overspend, with outturn inflation reducing the real value of RP2 funding.

National Highways has noted cost pressure changes between RP2 and RP3. Upwards cost pressures include the 10% growth in the managed network following the handover of eight DBFO schemes within RP3. National Highways has also highlighted that staff costs increase with the move to full Asset Delivery (AD) recruitment, as more in-house staff are required; the AD model was not fully recruited during earlier years of RP2, whereas the AD model will be fully recruited for the whole of RP3, increasing the overall costs in RP3 compared with RP2. One downward pressure on costs is winter fleet replacements, as the winter fleet was purchased in RP2 and does not require replacement in RP3. Another downwards pressure is AD transfer costs, which are not required beyond RP2 as the full rollout of AD was completed within RP2.

Based on the information provided by National Highways in its dSBP, the Operations workshop, and the RFIs received, National Highway’s approach to performance estimation (for all performance indicators impacted by Operations) is very simplistic. Our understanding is that National Highways has qualitatively reviewed the expenditure programme (including the assigned resource level) and concluded that the current level of performance is attainable in RP3 (aligning with the performance requirement set by DfT). This has not been underpinned by other forms of analysis.

We discuss our assessment of National Highways’ approach to performance estimation in Section 4.1.5. We have assigned a RAG rating of **amber** to overall expenditure on operations. Overall, we find that National Highways assessment approach provides inadequate justification of how it expects to maintain performance levels across its performance indicators, if its assumptions about cost increases in the pre-efficient case are born out, as it will be required to deliver stretching cost efficiencies and cost reductions.

4.1.2. Approach to estimating costs

National Highways overarching approach to developing its investment case for RP3 has been to roll-forward current RP2 expenditure to 'operate the network in the same way as in RP2'.¹⁰ Its cost estimation methodology reflects this aim, following the following steps:

- Starting with RP2 figures as a baseline.
- Reducing the baseline by costs that occurred in RP2, but that won't be repeated in RP3.
- Increasing the baseline by costs that are needed for RP3, but that weren't needed for RP2.
- Challenging costs required for a number of categories of spend.
- Applying efficiency challenges to a number of categories of spend.

These steps, and the associated costs estimations, are reflected in Figure 4.1.

National Highways are targeting a more 'proactive' delivery of its operations activities. It has not provided a clear model of how this will be achieved, but reference its asset delivery approach as driving more proactive asset management, and use of data to forecast incidents to more proactively perform network management. This has increased costs in RP2 (in moving to its asset delivery approach) and should decrease costs in the long-term.

Cost increases identified by National Highways

National Highways identify four areas in which there are cost increases.

Staff costs (pay and non pay) - £226m: National Highways has identified renewals costs and incident numbers as drivers for asset management and network management staff cost respectively (discussed more in the modelling section below). It has taken the expected 'fully recruited' RP2 position as the RP2 FTE position. It has then increased the investment request based on its FTE renewals and incidents and modelling using RP2 FTE costs per FTE. National Highways has not evidenced how the lack of a 'fully recruited' position in RP2 has affected performance. Given the scale of the cost increase this drives, we would expect this to be set out in order to understand under what basis this fully recruited position has been established, and why it is required for RP3.

DBFO handback - £60m: The DBFO handback will increase the length of the managed network by 10%, although the handback is phased through the first two years of RIS3. The £60m estimate includes opex, capex and £30m for FTEs. The FTE estimate has been calculated on a bottom-up basis for different areas. National Highways has stated it has applied a bottom-up efficiency challenge (described as 'economies of scale'). National Highways has not factored in the possibility that the DBFOs are returned in poor condition. If this were the case it could increase the asset management investment requirement, though the increase is unlikely to be as material as it would be for Maintenance.

Electric vehicle (EV) transition - £49m: National Highways are transitioning to an EV fleet. The £49m estimate is the incremental cost for investing in EVs (above a standard fleet). Its target is to have a fully electric fleet of personal user and asset delivery vehicles by 2027, with traffic office vehicles fully electric by 2030. The 2027 target is to meet government targets,¹¹ whilst National Highways state that the 2030 is an 'agreed commitment'.¹² Given the high turnover of fleet currently, National Highways stated that its approach would not lead to fleet redundancy. Its estimated cost for traffic officer EVs (£99,000 for EX90 Volvos), described in RFI 033 is based on a relatively expensive EV. CEPA has separately¹³ examined National Highways' transition to an electric fleet and noted that

¹⁰ National Highways (2024) RIS3: Operational Planning Efficiency review. Workshop presentation slides.

¹¹ [Greening government policy paper - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/policies/greening-government-policy)

¹² Response to RFI 099

¹³ Assessment of the impact and cost of measures to reduce National Highways' carbon emissions, report for ORR dated April 2024

close alternatives include the Mercedes EQC (£75,000), Jaguar i-Pace (£65,000) and Skoda Enyaq (£45,000). These price points suggest that a more efficient benchmark lies in the range of £50,000 to £70,000 per vehicle (excluding fit-out costs), although ORR will need to keep this under review as National Highways is exploring whether all units in the fleet must meet the same performance standards. We note that this is an area where new vehicles that retail at or around our suggested benchmark level continue to be released¹⁴, and that EV costs are reducing as technologies develop and competition increases.

Other operational activities - £24m: National Highways has estimated that £24m will be required for other operational activities that were not carried out in RP2. We have not received detail of which costs these cover specifically. However, we take these to mean costs not covered by National Highways' staff costs (pay and non pay), the DBFO handback cost increases, or the EV transition costs. For example, this could include costs for equipment required for operations activities (e.g. snowblowers).

Cost reductions

National Highways identified seven areas where it has applied costs challenges.

National Highways has challenged costs in several areas in which costs are not obviously essential, and in which it has reduced costs by less than 20% of the original request. This includes deferring winter depot renewal expenditure (16% challenge); and non-pay staff costs, including uniforms and fuel (15%).

National Highways has also challenged costs in areas that introduce performance or longer-term risks. National Highways reduced the request for diversion route signage and renewal by 85% and the request for small schemes to increase resilience against civil emergency by 67%. Spatial planning funding was reduced by 13%, even though National Highways state that it is 'largely essential to management of the network'.

Efficiencies

National Highways identify five areas in which it thinks it can achieve efficiencies.

National Highways' process for identifying incident screens and trailers (£2m) and National Traffic Information Systems (NTIS) (£18m) efficiencies seems sensible. National Highways has developed a wiring approach to allow trailers to work with the new electric fleet. To reduce NTIS costs, National Highways has reduced the number of licences it needs, estimating the efficiency by comparing against inflated RP2 costs. National Highways has not explained why fewer licenses are needed for RP3, and we have not seen National Highways' models to validate its calculations.

National Highways propose that it can achieve efficiencies for its asset management staff costs (efficiency equal to £95m) and its network management staff costs (efficiency equal to £81m). National Highways' methodology for calculating these efficiencies has been to remove the cost increases for RP3 (pay and non-pay) identified by its cost driver analysis (described in the following section), stating that it will deliver the additional works with its RP2 headcount. The value of its efficiencies is equal to the value of the cost increases it has removed.

National Highways has not provided any rationale for how these efficiencies can be achieved, stating that the additional staff costs will be delivered 'within [National Highways'] RP2 headcount'.¹⁵ National Highways has not provided any bottom-up rationale for why these efficiencies will be achievable. For these estimates to be credible, we would expect National Highways to provide a plan for how these significant decreases can be achieved. We discuss how these efficiency estimates may introduce risks to delivery or performance below.

National Highways' final efficiency is for the 'DBFO uplift on BAU' (£12m). From the information provided in the operations workshop sides, we take this to correspond to an efficiency for the 'cost-reduction' categories (described above), pro-rated for the DBFO routes. E.g., National Highways state this is for an '*Uplift identified in the areas of network resilience, winter depot renewal, spatial planning and diversion routes and safety audits for smaller*

¹⁴ For example the Kia EV9, listed at £55,000 to £76,000

¹⁵ National Highways Operations workshop.

schemes', which we assume has been removed, although this is not expressly stated.¹⁶ In response to our Draft Report, National Highways stated that it classified the reduction as both an 'efficiency' and a 'cost reduction'. This is because, for DBFO costs, the cost reduction is in line with the reductions for the rest of the network, but also (as an 'efficiency') removed the rest of the costs for the 'cost-reduction' categories, i.e. requesting the same costs as if the managed network had not been expanded. Our analysis of the cost reductions above applies equally to these costs.

We have assigned a RAG rating of **amber** for cost estimation in operations. The overall approach of rolling forward an adjusted RP2 baseline appears reasonable, albeit very high-level, but there is insufficient evidence of planning to deliver efficiencies and so the risks to expenditure are larger than we would expect.

4.1.3. Appropriate use of data and modelling tools

National Highways has used two models to estimate its Operations investment request. It has:

- Estimated asset management FTE numbers by modelling the impact of increased renewals work on the number of FTEs required.
- Estimated network management FTE numbers by forecasting incident numbers and applying a rule-of-thumb (that a 1% increase in incident numbers requires a 0.5% increase in headcount).¹⁷

In principle, National Highways use of modelling follows a sensible approach. It has identified plausible costs drivers with which to forecast expenditure.

National Highways have estimated that it would need an additional 311.7 asset management FTEs for RP3¹⁸ (plus an additional 125 FTEs for the DBFO take-back).¹⁹ The modelling of this is simplistic, scaling asset need, programme development and Project Management Office staff numbers by the total renewals budget (in 2020 prices). There are two implications: that the number of asset management staff in these three areas scale directly with renewals expenditure (with no economies of scale) and that the staff numbers on which the scaling is based are efficient.

On the first of these points, while we would expect staff numbers to be higher for higher expenditure we would not expect the relationship to be as direct as implied by National Highways' model, which assumes that all expenditure in all asset areas is equal. For example, the model assumes that £1m spent on pavement renewals requires the same asset management resource as £1m of VRS spend, or that £1m of expenditure on steel VRS is equivalent in resource requirements to £1m of concrete VRS. There are significant changes in the mix of renewals expenditure in RIS3 and it is not clear that historical scaling will be appropriate for the RIS3 mix of renewals. The direct relationship also implies that there are no economies of scale. No evidence is provided to justify these assumptions. For example, no evidence was provided of the rationale for the staff numbers on which the scaling was based or the way that staff numbers and the proposed scaling with renewals expenditure has been tested or justified.

National Highways has estimated a 17.6% required FTE increase for network management. Its modelling is based on a forecast that incidents will increase by 35% in RP3 vs RP2 forecast and realised numbers. To this, National Highways applies a rule-of-thumb that a 1% increase in incidents requires a 0.5% increase in FTEs. Given the magnitude of the forecast increases, we would expect further validation of National Highways assumptions. Further justification of why incident numbers will continue to rise has not been provided, and the 0.5% FTE increase rule-of-thumb requires quantitative evidence for it to be credible. National Highways provided good evidence of historic

¹⁶ National Highways Operations workshop.

¹⁷ This rule-of-thumb is based on the estimate that a doubling in incident expenditure would require a 50% increase in network management FTEs. This estimate has been endorsed by National Highways' Operations Customer Services Director; a central project manager with '14 years' experience of incident management and two Operations Managers from the Midlands region'.

¹⁸ RFI 099

¹⁹ As part of its efficiency challenge, National Highways removed its request for 311.7 additional FTEs for asset management. Its efficiency challenge is set on the premise that it can deliver the required works with the RP2 level of FTEs.

increases in incident numbers²⁰, and the extrapolation of this trend to suggest a 35% increase in RP3 appears reasonable, but quantitative support for the relationship between incident numbers and FTEs was not provided.

We have assigned a RAG rating of **amber** for its use of modelling and data. In principle, the approach used is appropriate, but we are concerned that significant assumptions around important cost drivers are poorly justified.

4.1.4. Risks to delivery

We have concerns about the comprehensiveness and the clarity of National Highways' approach to risk for operations expenditure. Given the top-down approach to cost efficiencies, with a lack of bottom-up consideration of how efficiencies will be achieved, there is a risk that National Highways' investment plan will be delivered at a higher cost or will impact performance. This is discussed more below.

We would expect to see bottom-up analysis, for example a risk register, with risks outlined for different areas and some element of scoring or quantification of how each risk will impact costs and deliverability. This has not been provided. Operations expenditure has also not been included in the CRR.

There is some evidence that National Highways has considered risks to delivery. For example, the headwinds presented in the dSBP and described in more detail at the workshop:

- National Highways has identified 'managing an aging network of assets' as a headwind, which will require increased inspection, monitoring, and planning activities. National Highways has not included this as an additional cost, although it did 'recognise it as an element of the asset management efficiency headcount'.
- Keeping the '10-minute response' target will impact on how National Highways deliver the headcount efficiency for network management.
- 'Impact of weather' - Possible increase in unplanned incidents due to changes in weather, for example, more localised intense rain. This would have an impact on network management staff capacity.

However, National Highways has not attempted to quantify the impact or severity of these risks. The plan to deal with these risks is unsatisfactory. For example, for weather National Highways state that *'no direct costs associated with managing the network in increasing poor weather are included. Should this impact occur, it will be addressed through wider network management efficiency work'*.²¹ National Highways has not justified how greater efficiency would be practicable.

One of the most significant risks to delivery is National Highways' lack of observable planning to achieve its targeted efficiencies, which will impact the ability to deliver efficiencies without impacting on performance or cost. National Highways has taken a top-down approach to estimating efficiencies for asset management and network management staff costs, removing the cost increases which it predicts will result from increased renewals and incidents numbers. The efficiencies are £95m and £81m respectively. This is over 10% of the post-efficient request. Notwithstanding the veracity of the efficiency estimates derived from the pre-efficient cost estimation (discussed in the 'appropriate use of data and modelling tools' section above), we would expect National Highways to present bottom-up evidence of its plans to achieve efficiencies. Without this evidence, any overlaid cost reduction presents a risk to National Highways' plans.

We have assigned a RAG rating of **red** for the risks to delivery of operations. This is due to the lack of evidence that National Highways has considered how efficiencies are deliverable without an impact on performance or cost, as described in more detail above.

²⁰ RFI 099

²¹ From National Highways Operations presentation slides.

4.1.5. Performance

National Highways has demonstrated that it understands, at a high-level, the link between operations activities, and performance. However, it has not evidenced how it has considered the impact of its RIS3 investment plans on performance beyond the superficial.

In its dSBP (Section A: Operations Planning for RIS3 – Chapter 4) National Highways has outlined the performance indicators that are impacted by operations. It lists 13 where operations activities have ‘significant impact’ or ‘impact’, for example it outlines how average delay is significantly impacted by the services of the operations on-road and control room staff. In the workshop National Highways stated that performance would not be affected by the investment plans, and importantly the efficiencies proposed for RP3. This view was based on National Highway’s judgement, which it was indicated was carried out at a top-down level, considering the plan as a whole.

However, we consider that the approach to assessing asset management staff costs and network management staff costs efficiencies present a significant risk to performance if National Highways’ estimation of pre-efficient costs are correct. We would expect evidence-based analysis, for example outlining tangible processes which can be delivered in RP3 that highlight how economies of scale can be achieved, to demonstrate how these efficiencies can be achieved without affecting performance. These are not provided.

We have assigned a RAG rating of **red** for the link of operations to performance. As noted above, we consider that the proposed asset management and staff efficiencies present a significant risk to operations performance.

4.1.6. Accounting for climate change

Based on information provided in the workshop, National Highways does not appear to have accounted for climate change in its expenditure forecasts. When asked at the workshop whether National Highways had accounted for the impact of changes in weather on the number of FTEs required, it said that it had not been factored into its investment plan. While it is included in the ‘headwinds’ section no costs have been attributed to it. That being said, there are no obvious areas in which National Highways’ approach represents a serious omission in an area where climate change will obviously impact on costs.

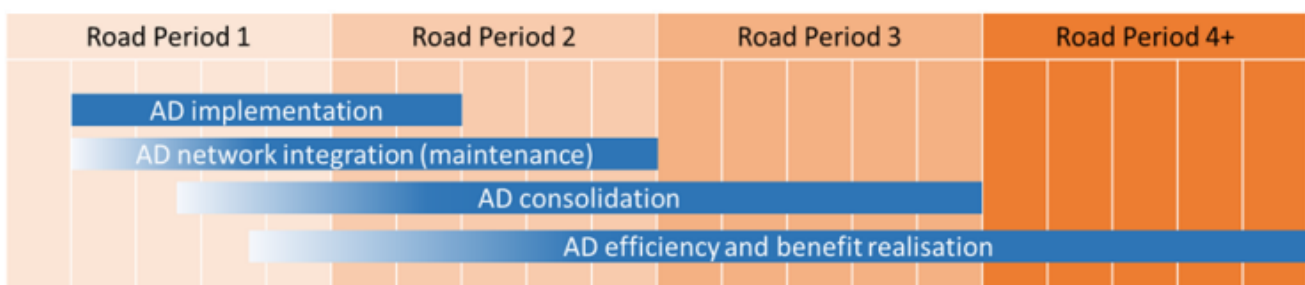
We have assigned a RAG rating of **amber** for the consideration of climate change on operations. While climate change has not been considered in the dSBP beyond its inclusion as a potential, uncosted, headwind we would expect any impact of climate change on National Highways’ approach or expenditure in this area to be small in RIS3.

4.1.7. Alignment of operations plans with Asset Management Policies and Strategies

Implementation of (and alignment with) the overarching asset management strategy is more applicable to the work of renewals and maintenance (as National Highways has specific asset management documents for each of the key asset classes).

However, asset management staff and asset management other costs sit within operations. National Highways’ projected timeline for integrating the asset management approach is provided in Figure 4.3.

Figure 4.3 National Highways timeline for implementing its asset management approach



Source: National Highways (2024) Draft Strategic Business Plan, Section A: Operations Planning for RIS3

National Highways has provided some evidence that it is embedding this approach. It completed the contractual and organisational change to a 'full Asset Delivery (AD) model. Area 9 was the last to transition in July 2022', and in RP3 it stated it will 'consolidate the change and focus on delivering national consistency to plan, manage, and deliver the assets across each region of the SRN'.²²

However, the information that has been provided is too high-level to understand what National Highways is in practice doing to align with and progress its asset management strategy. National Highways state that it will use a 'best in National Highways approach' but it is not clear what this means in practice.²³

We have assigned a RAG rating of **amber** for the alignment of operations to its stated asset management approaches. While there is some evidence that National Highways is embedding an appropriate asset management approach there is insufficient detail to assess to what extent asset management has or will become consolidated within the organisation.

4.1.8. Alignment with broader strategy and alignment between renewals and operations

National Highways has considered renewals expenditure in its overarching process to estimate Operations investment expenditure. In the Operations workshop, National Highways explained that renewals expenditure is one of the cost drivers used to estimate how its operations costs will change from RP2 to RP3. National Highways model the increase in asset management FTE numbers required, using the renewals investment plans as an input. At the time of drafting this report, we had not seen this model.

However, National Highways approach to estimating efficiencies for asset management staff costs has been to maintain staffing levels despite forecast increases in renewals investment. Its efficiency estimate (£95m) is equal to 13.5% of its pre-efficient expenditure request for asset management staff costs (£703m).²⁴ Removing these costs as an efficiency challenge, without evidencing how the efficiency challenge will be delivered, severs the link between the operations and renewals proposals; National Highways asserts that it understands how renewals costs drive operations costs, but has not evidenced that its operations cost proposals are sufficient to deliver the required works.

²² National Highways (2024) Draft Strategic Business Plan, Section A: Operations Planning for RIS3

²³ National Highways (2024) Draft Strategic Business Plan, Section A: Operations Planning for RIS3

²⁴ We have calculated the pre-efficient cost estimate by adding the post-efficient cost estimate with the efficiency estimate.

4.2. MAINTENANCE

Main findings: maintenance

- National Highways’ request for real maintenance expenditure in RP3 is around 20% higher than that experienced in RP2. Expenditure for the first year of RIS3 shows a 20% increase from that forecast for the last year of RP2.
- Increases in RP3 are for ‘priority risk structures’, ‘DBFO take-backs’, ‘maintenance of soft estate’, and ‘asset need’ (total £376m over RP3). National Highways then apply £149m of efficiencies to its request.
- National Highways has provided evidence that it has used broadly sensible analytic processes to estimate its funding request; either rolling-forward historic costs or assessing costs on a bottom-up basis. For example, for cyclical maintenance and inspections, it has multiplied M&R unit costs * Asset inventory * ADAMr/ ADAIr frequencies.

However, there are significant limitations with National Highways’ approach.

- National Highways has only demonstrated a superficial understanding of how its investments will affect performance. It has provided a high level understanding of which performance indicators will be impacted by its expenditure, but not how its proposed investments will impact them.
- National Highways’ justification for its efficiency savings is very high-level. In particular, there is insufficient evidence of the deliverability of £62m of potential efficiency savings by delivering intelligence led data-driven maintenance.
- National Highways has not evidenced how it has accounted for climate change in areas where it could have a material effect on costs (e.g. for road salting costs).
- It is possible that there is some double-counting of costs included in the RP2 baseline for priority risk structures.

National Highways’ Maintenance activities are intended to ‘*sustain the availability, safety, performance, operation, reliability and longevity of the SRN’s physical assets to deliver value to [National Highways’] customers.* National Highways describe these activities in its dSBP (Section A: Maintaining the Network):

- Inspections: which provide National Highways with knowledge of asset condition and performance to inform its maintenance and renewals planning.
- Cyclic maintenance: keep existing assets in good order and manage the asset base through its lifecycle.
- Reactive repair maintenance: fixing assets when they fail unexpectedly, e.g. potholes in running lanes.
- Incident response: responding to incidents on the network such as road traffic collisions or flooding events.
- Winter and severe weather service: gritting/ salting the roads during winter & periods of extreme weather.
- Maintenance away from the carriageway (e.g. clearing litter and removing graffiti).
- Managing and maintaining the soft estate, e.g. thinning woodland, cutting grass and vegetation.

4.2.1. Overall expenditure and approach

National Highways has requested £1701.4m for its ‘post efficient’ maintenance expenditure for RP3. An overview of this expenditure is presented in Table 4.2 below.

Table 4.2: National Highways post inflated, post efficient expenditure for Maintenance (£ million, nominal)

	Year 1	Year 2	Year 3	Year 4	Year 5	RIS3 - Total
Cyclic maintenance & inspections	157.6	161.2	165.3	170.0	174.5	828.3

	Year 1	Year 2	Year 3	Year 4	Year 5	RIS3 - Total
Reactive maintenance	94.8	97.0	99.4	102.2	105.0	498.4
Winter & severe weather service and M&R contract costs	49.5	50.7	51.9	53.4	54.8	260.3
DBFO	0	16.5	31.8	32.6	33.5	114.4
Total	302.0	325.2	348.4	358.0	367.8	1701.4

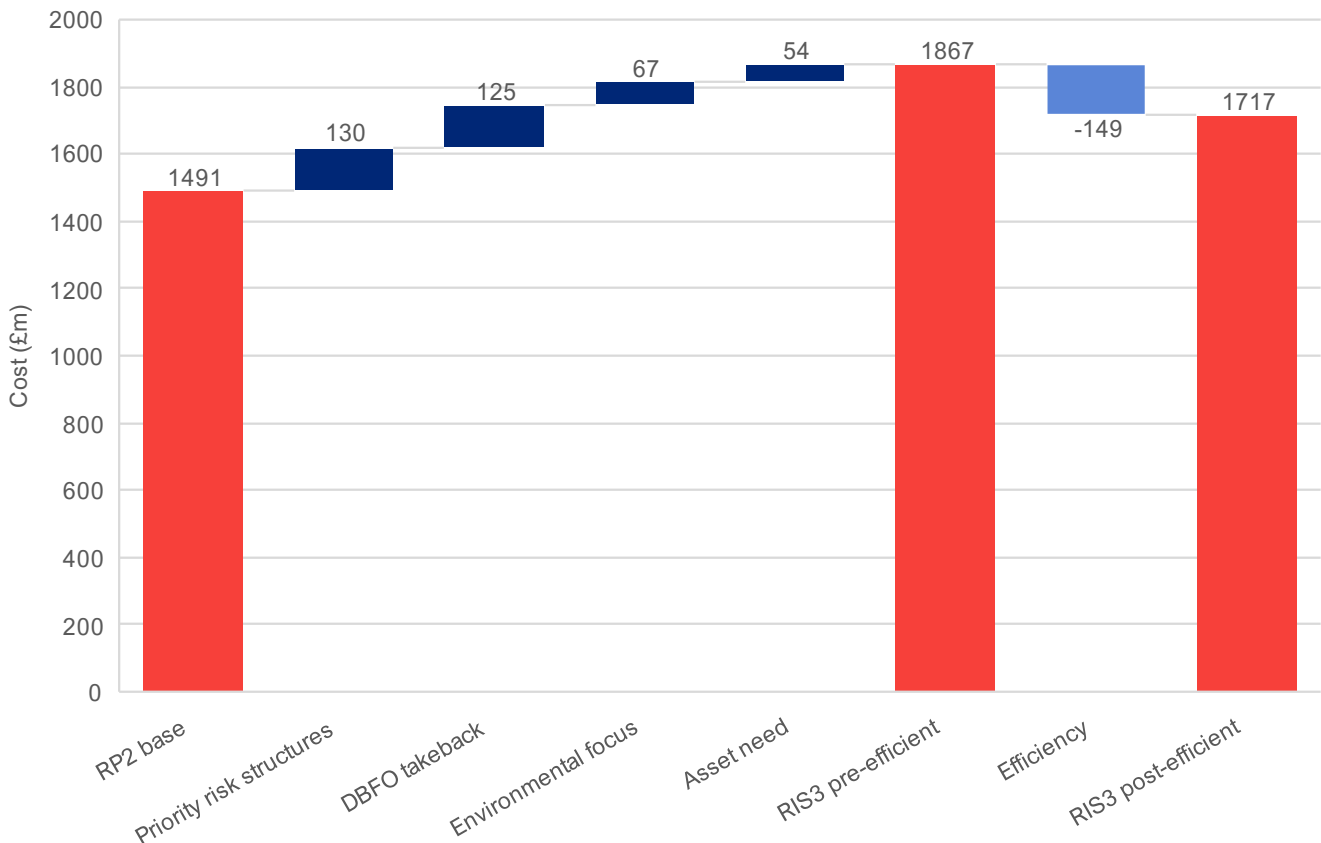
Source: National Highways dSBP

The planned levels of maintenance associated with this expenditure is intended to maintain performance targets for RP2, which involve:

- 90% clearance of reactive 24 hour priority (safety critical) defects.
- 90% volume of cyclic works that are completed within the required timescale.

The difference in maintenance expenditure between RP2 and RP3 is illustrated in Figure 4.4 below:

Figure 4.4: Difference in maintenance expenditure between actual expenditure in RP2 and requested expenditure in RIS3 (£m)



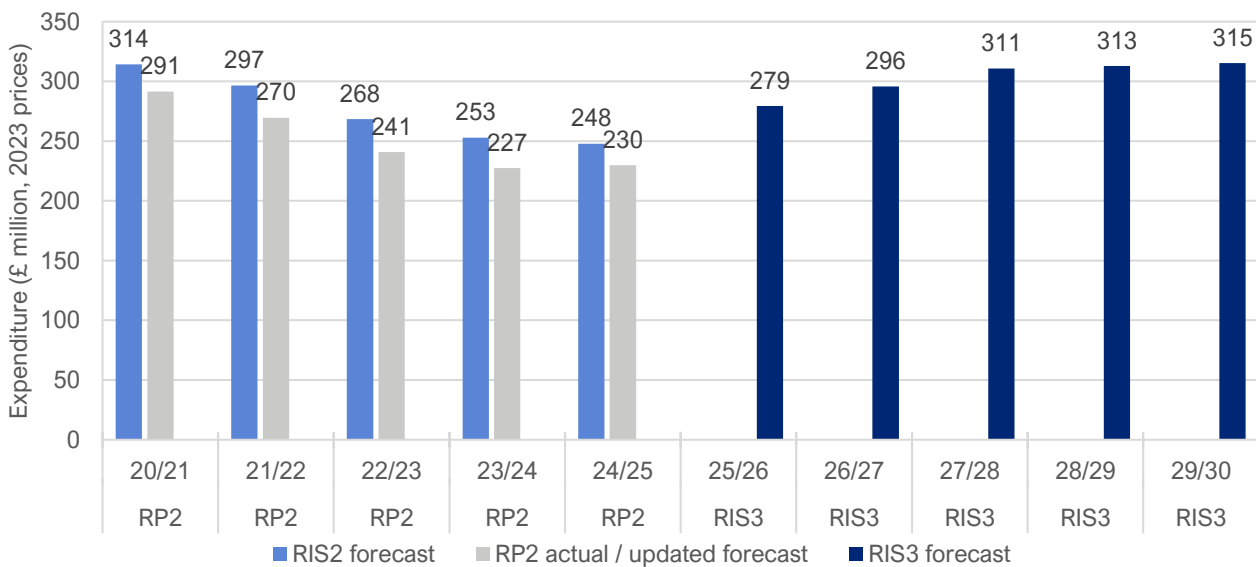
Source: National Highways workshop, modified by CEPA

Figure 4.4 provides National Highways' assessment of increases in costs and efficiency savings between RP2 and RIS3. We analyse these in Section 4.2.2 below. In the Maintenance workshop, National Highways described how an additional £36m of asset need had been identified for pavement condition, however given the timing of when National Highways identified this additional need, it was not included in the request. As the costs do not feature in National Highways' request, we have not included in the figure above.

Figure 4.5 below presents National Highways’ Maintenance RIS2 forecast expenditure, RP2 actual and forecast expenditure, and the forecast expenditure for RIS3 in a common price base (2023 prices). National Highways RIS2 forecasts and RP2 actual expenditure decreased during RP2, with actual expenditure averaging around 10% less than that forecast prior to RIS2.

National Highways’ forecast expenditure includes a 20% (£49m) increase in real expenditure in the first year of RIS3 compared to the final year of RP2. The trend in expenditure differs between the early and late years of RIS3, with requested expenditure plateauing in the latter years of the period. This trend is primarily due to increases in expenditure from the handback of DBFO roads in the early years of RIS3, which will increase the length of road maintained by National Highways by around 10%, offsetting ongoing reductions in real expenditure. Following these handbacks, expenditure is forecast to level off.

Figure 4.5: Maintenance expenditure by year during RP2 and RIS3 (£ million, 2023 prices)



Source: CEPA analysis of RFI 005 - Updated B.3 Financial Model & dSBP Final issued to ORR 240207

4.2.5 We have assigned a RAG rating of **amber** to expenditure on maintenance. The overall approach used to estimate expenditure appears appropriate, albeit that it is possible that there is some double-counting of expenditure on priority risk structures. However, as with Operations expenditure, National Highways has only demonstrated a superficial understanding of how its investments will affect performance. It has provided a high-level understanding of which performance indicators will be impacted by its expenditure, but not how its proposed investments will impact them. There is evidence that National Highways has identified performance issues in RP2, which it is looking to rectify. However, these issues could be compounded with the large step up in maintenance forecast for the first year of RIS3.

4.2.2. Approach to estimating costs

At a high level, National Highways’ process for cost estimation is broadly sensible. However, there are some areas where consistency with other aspects of the RIS (e.g. operations and renewals) is not evident. National Highways’ approach has been to:

- Start with RP2 figures as a baseline.
- Increase the baseline by costs that are needed for RP3, but that weren’t needed for RP2.
- Apply efficiency challenges to a number of categories of spend.

Unlike operations, National Highways has not decreased costs for cost areas that were needed in RP2 and won't be needed for RP3.²⁵ Given that maintenance activities are predominantly smaller, repeated, and less bespoke, this appears a reasonable assumption. National Highways has also only identified 'cost efficiencies' and not 'cost reductions'.

There are differences to the process taken to forecast Operations expenditure. Operations use an estimate in incident numbers to forecast an increase in costs for network management FTEs; a similar cost driver has not been identified for Maintenance since asset numbers and requirements are the primary driver of maintenance. National Highways do align with Operations by using renewals volumes as a cost driver in its models (discussed more below), which aligns with the approach to estimating asset management FTEs.

Cost increase identifies by National Highways

For each of the four areas outlined below (the four categories of cost increases National Highways identified), we requested the models used to estimate the costs as part of an RFI. National Highways did not provide a response to this RFI in time for us to reflect analysis of the models in our findings. This has affected the level of scrutiny we have been able to provide.

Priority risk structures - £130m: National Highways strengthened its approach to assurance and risk management for high priority structures following the 2020 A52 Clifton Bridge incident. Assets within this grouping have "*safety critical structural elements, which are very difficult to inspect and may deteriorate unseen (particularly as structures age), creating a safety risk*".²⁶ The investment request is to ensure compliance with these strengthened standards (activities include risk reviews and risk assessments, special inspections, testing and monitoring, and risk management plans and interim measures). National Highways provided the analysis that supported its forecast of £130m of additional operations costs that would be required²⁷. This clearly described the required actions and basis of the cost estimates, which appear reasonable and appropriately detailed, and the £130m of expenditure to address these issues appears realistic.

The estimates of operations expenditure include consideration of when relevant actions were last undertaken (for example when an inspection or evaluation was last carried out, which might mean that this is not required in RIS3). However, it is not clear that all similar expenditure has been removed from RP2 expenditure. It is plausible, as the issue was first identified in 2020, that RP2 actual expenditures include some spend on similar work. Any such expenditure should be removed from the RP2 baseline. Subject to this adjustment to avoid double-counting, we are content that the £130m of maintenance on priority risk structures is appropriate.

DBFO takeback - £125m: National Highways has included expenditure to maintain the returning DBFO routes. It has estimated the requirement for cyclic maintenance and reactive maintenance. National Highways estimate cyclic maintenance requirements using the GM 701 standards, applied to asset inventory data for the DBFO routes. National Highways estimate reactive maintenance by applying the reactive maintenance cost per lane km of each region to the length of each DBFO route (this proxy has been required as National Highways don't have access to condition data for the DBFO routes). At a high-level the estimate (£125m) seems reasonable given the increase in network length represented by the DBFO routes (an extra 10%).

Environmental focus - £67m: Expenditure is to undertake maintenance to soft estate assets in order to sustain biodiversity at current levels. Examples of activities include thinning and coppicing woodland, and management and removal of invasive plant species and undesirable weed species. This aligns with the KPI being 'net positive for nature', which includes 'no net loss of biodiversity for the existing soft estate asset base'. It has 'broadly' estimated

²⁵ National Highways present a £36m 'reduction' associated with pavement condition expenditure in the waterfall of RP2 to RP3 expenditure presented in the Maintenance workshop. This is caused by an update in pavement renewals figures, which took place after National Highways estimated its maintenance case. National Highways estimate that the updated renewals figures would require £36m more maintenance

²⁶ National Highways Maintenance workshop.

²⁷ RFI 109

the funding request by ‘combining biodiversity-sustaining maintenance activities (as set out in the GM 701 ADAMr standard) with soft estate asset volumes and M&R unit cost rates’.²⁸

Asset need - £90m: Asset need expenditure is estimated to deliver alignment with National Highways’ GM 701 Asset Delivery Asset Maintenance Requirements (ADAMr) standard. The estimates are intended to deliver a proactive, risk-based approach. We interpret this as reducing the whole life cost of maintenance.

Efficiencies

We present National Highways cost efficiencies (which total £149m) in Table 4.3 below.

Table 4.3: Maintenance efficiency levers

Lever	Efficiency	Description	Methodology
New contracts	£51m	National Highways is seeking to drive efficiency in 6 new M&R contracts re-tendered in RP3, through an internal benchmarking of unit rates exercise that will ensure consistency in maintenance costs across regions.	Efficiency saving calculated by identifying outliers in maintenance contracts and calculating the impact of bringing these outliers closer to rates across all contracts.
Intelligence-led, data-driven maintenance	£62m	By delivering a consistent data-driven approach to planning maintenance delivery across regions, National Highways aim to improve the quality of its asset data and utilise decision support tools.	Efficiency saving estimated through a reduction in reactive repairs over time, resulting from use of data to proactively target maintenance activities.
Improved green claims recovery ²⁹	£34m	<ul style="list-style-type: none"> Improving supplier management processes. Improving timeframes between green claims process steps. Incorporating any relevant changes to law or regulation into National Highways standards, agreements, and policy. Upskilling of National Highways staff associated with green claims. Better utilisation of its internal claims management system and litigation partners. 	Efficiency saving calculated through setting a recovery rate target above what was achieved in RP2.
‘Other Maintenance’ efficiency	~£1m	Efficiency applied to ‘Other Maintenance’ costs encompassed within the Maintenance swimlane.	
TOTAL	£149m		

Source: ORR Efficiency Review – Maintenance.pdf

National Highways overall approach to estimating its efficiency request is reasonable at a high-level, it has identified plausible areas where cost efficiency could be achieved. Within that, efficiencies outlined for ‘new contracts’ seem reasonable: it has internally benchmarked unit rates to target consistency in rates across different regions. Other areas are less well evidenced. National Highways has estimated that it will achieve an efficiency of £62m by delivering intelligence-led data-driven maintenance. This is intended to reduce the cost of reactive maintenance. This is a plausible area to assume efficiencies are achievable – the rationale for moving to a proactive maintenance approach requires efficiencies in reactive works. However, we have not seen the model which has been used to

²⁸ National Highways Maintenance workshop.

²⁹ “Green Claims” are where National Highways seeks to recover funds from third parties for damage to the SRN

achieve this significant efficiency, so cannot validate the assumptions and calculations used to estimate this material area.

Similarly, the savings for ‘improved green claims recovery’ are in an area where it is realistic to target efficiency savings. National Highways highlight sensible steps to achieve this efficiency (e.g. improving processes and targeting timeframes) however, we have not seen current performance levels or how National Highways has assumed its steps for improvement will achieve its targeted performance level. Therefore, it is difficult to assess how credible the estimate is.

The final efficiency is for ‘other maintenance efficiency’ equal to c. £1m. We have no understanding of how this will be achieved. The figure is less material than other efficiencies, which *may* improve achievability in RP3.

We have assigned a RAG rating of **amber** for its cost estimation in operations. Overall, the build-up of forecast expenditure appears reasonable. However, there are three main areas of National Highways’ maintenance cost estimation for RIS3 that the ORR might examine further:

- Any expenditure on priority renewals in RP2, which should be removed from the RP2 baseline;
- The evidence justifying potential efficiency savings of £62m by delivering intelligence led data-driven maintenance; and
- The deliverability of the timing of the cost increases and efficiencies result in a step-up in expenditure from the end of RP2 to the start of RIS3. It is not clear whether this step-up is realistic. A more gradual ramp-up in expenditure would be more achievable.

4.2.3. Appropriate use of data and modelling tools

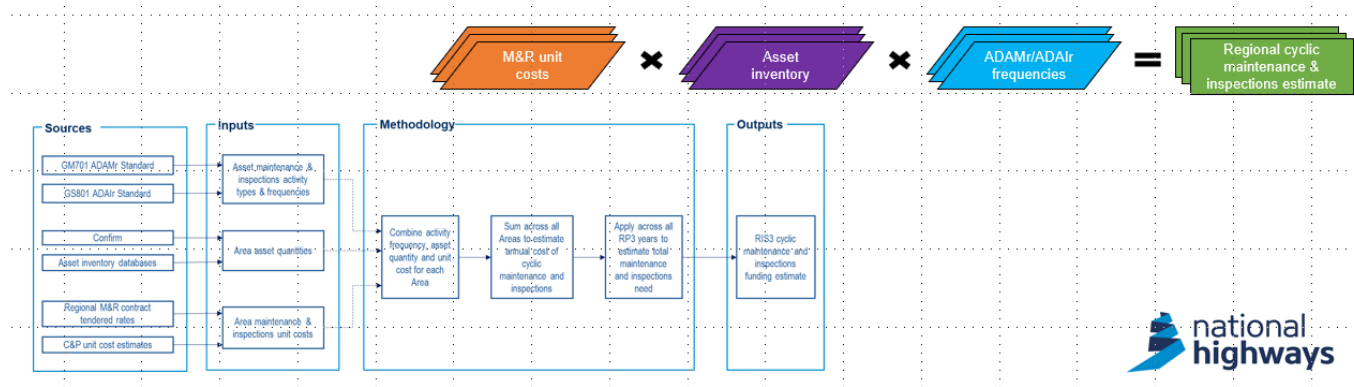
National Highways used four modelling tools for maintenance:

- Cycle maintenance and inspections;
- Reactive maintenance;
- Winter/ severe weather service;
- DBFO maintenance.

The high-level methodologies seem sensible, either using bottom-up assessment to estimate costs or forecasting costs based on historic trends.

In Figure 4.6 we provide an overview of the high-level approach taken by National Highways’ to estimate the cyclical maintenance and inspections investment request.

Figure 4.6 Overview of approach used to assess cyclical maintenance and inspections costs

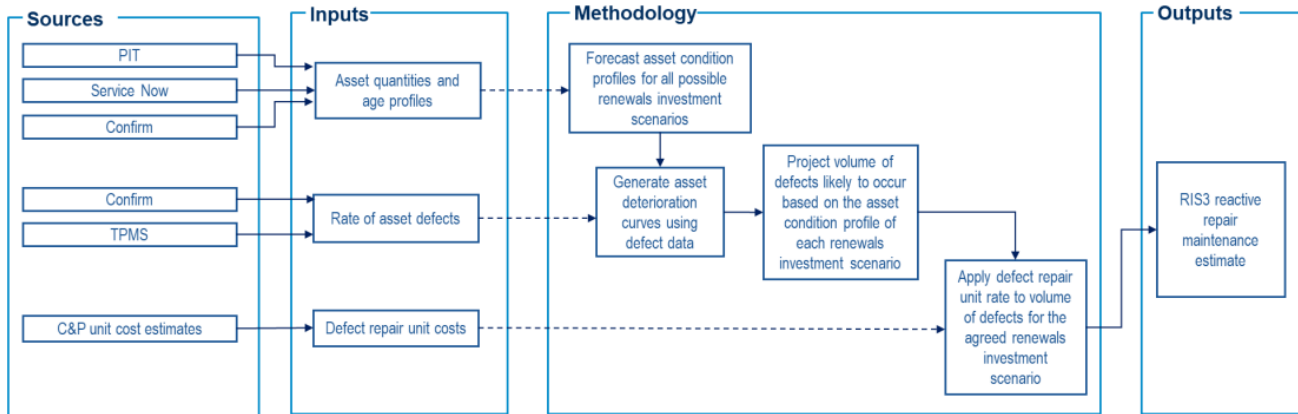


Source: National Highways Maintenance workshop

National Highways built up its estimate by multiplying the Asset Inventory by the ADAMr/ ADAlr frequencies to obtain estimates for the required volumes, which were multiplied by the M&R unit rates to give total costs.

For reactive maintenance, National Highways used multiple sources (for example, its Programme Investment Tool, PIT) to develop a picture of asset quantities and their age profile. This is multiplied by asset defect curves to project defect volumes, which are responsive to the asset condition profile of each renewals investment scenario. These volumes are multiplied by C&P unit cost estimates to develop total cost estimates. We provide an overview of this estimation methodology in Figure 4.7.

Figure 4.7 Overview of approach used to estimate reactive maintenance costs



Source: National Highways Maintenance workshop

Winter/ severe weather costs have been forecast using historic data. National Highways has not stated how these costs have been projected forward. Identifying cost drivers would provide a better understanding of how costs are likely to change in the future (e.g. as described in the Section **Error! Reference source not found.**, climate change will impact these costs). We have not seen evidence that these have been identified and used.

DBFO costs have been estimated using asset quantities for each DBFO routes, multiplied by contract rates, and asset condition estimates. National Highways does not have access to condition data for the DBFO handback routes, so it has assumed that the DBFO routes will be in similar condition to rest of the region they are in. This appears a reasonable assumption to make in the absence of other data; assuming comparability on a regional basis is likely to provide more accuracy than if taking the national level. Using assumptions from the handback requirements in the DBFO contracts might have led to a more accurate estimate or cross-check of these assumptions.

We have assigned a RAG rating of **green** for its use of modelling and data. The approaches applied use the most appropriate modelling tools available to National Highways. While some areas could be improved, for example with increased identification and application of cost drivers, the overall application of modelling appears sound.

4.2.4. Risks to delivery

National Highways has not provided any evidence of how it has assessed risk to delivery for its maintenance expenditure. We would expect risks to be identified, which could then be managed during the period. For example, if there are forecasts of supply chain issues then National Highways should look to take steps to manage this ahead of time, otherwise this could impact costs and delivery timelines. These issues may be less material for maintenance (where activities are more repeatable) than for renewals or enhancements. However, we would still expect acknowledgment of these issues.

National Highways are forecasting a material increase in expenditure between the last year of RP2 and the first year of RP3. This introduces a risk that volumes won't be achievable, as resourcing, plant, and materials need to be scaled up – a more phased investment profile would be more obviously achievable.

Performance levels can also be affected by the materialisation of delivery risks. No evidence of how this has been considered has been provide and this issue is discussed in more detail in the section below.

We have assigned a RAG rating of **amber** for the risks to delivery of maintenance. National Highways has provided insufficient detail on the assessment and management of risks to the programme, but the repeatability of maintenance activities results in risks being of smaller magnitude than in other areas.

4.2.5. Performance

National Highways show that it has a qualitative understanding of the impact of its maintenance work on its performance indicators. However, although National Highways state that performance targets feed into its funding request it has not evidenced how this is considered. For best practice, National Highways would show quantitative analysis of how different funding levels affect performance indicators (or at least key performance indicators) – it has not done this.

In the dSBP National Highways list 23 indicators for which its maintenance activities have a ‘significant impact’; and two in which there is a secondary impact. The qualitative rationale for why maintenance works affects these different areas seems reasonable (e.g. outlining the direct link between maintenance works and i) maintenance and construction emissions; and ii) safety on the network). There is also potential for a link between the ‘noise’ performance indicator, and maintenance work – presumably maintenance activities can be managed so as to restrict noise; this link has not been made by National Highways.

National Highways provided an excel (IP5 Q3 2023-24 Regional Summary) which outlined regional performance for a subset of its performance indicators (defects, drainage performance, etc). Performance varies, with the East performing well in general and the Midlands performing poorly.

National Highways has stated that it is currently working through some ‘known contract management issues’ which is affecting RIS2 performance; a plan has been implemented and the target is for improvement in the remainder of RP2, with progress reviewed and remaining a ‘priority into RP3 until the issues have been sufficiently rectified’. We agree that National Highways are right to target this area, however, we have not seen enough detail of its plan to fully assess whether the actions, tasks, and timelines are realistic given the requirement. These acknowledged issues, and the large differentials in performance between regions, do seem to indicate that there are material areas where improved management of maintenance can improve performance without any additional cost being incurred.

We have assigned a RAG rating of **red** for the link of maintenance to performance. While there is a qualitative understanding of the impact of maintenance on performance this has not been translated into a quantitative assessment of the impact of the proposed programme on performance. This lack of a quantitative link makes it impossible to assess whether the volume of maintenance proposed strikes an appropriate balance between cost and performance.

4.2.6. Accounting for climate change

National Highways states in its response to RFI 109 that ‘*No direct quantification of the impact of climate change on maintenance need has been incorporated into the cost models*’. It states that the basis of its funding request is an effective application of the GM701 Asset Delivery Standard, implying that this may to some extent cover the impacts of climate change; this might be because the standard will help target specific areas of the network that present the highest risk to users – however, the link is not made clear.

While National Highways does recognise that climate change may impact the performance of its asset base in RP3, its lack of a direct approach to account for climate change introduces a risk that either i) its performance will be affected in RP3; or ii) the programme of works will not be deliverable in RP3 for the expenditure outlined. Climate change introduces new costs/ requirements on maintenance, which have not been captured in the investment case.

A direct example of this risk is the winter and severe weather expenditure, which is based on historic data. It can be realistically assumed that expenditure requirements will change as weather patterns evolve. This can change either way (more severe weather on specific days, but milder winters overall). We would expect National Highways to appreciate this in its expenditure plan, with relevant assumptions flowing into its cost, risk, and performance estimation.

We have assigned a RAG rating of **red** for the consideration of climate change on maintenance as no direct quantification of the impact of climate change on maintenance has been provided.

4.2.7. Alignment of maintenance plans with Asset Management Policies and Strategies

National Highways state that its maintenance case is compliant with the GM 701 Asset Delivery Asset Maintenance standard and GS 801 Asset Delivery Asset Inspections standard. These standards have been used to drive the maintenance frequencies discussed in the cost estimation section (Section 4.2.2).

We have assigned a RAG rating of **green** for the alignment of its maintenance plans with Asset Management Policies and Strategies since maintenance frequencies are in line with documentation and standards.

5. DBFO HANDBACKS

Main findings: DBFO handbacks

- National Highways' approach to understanding the condition of the assets to be handed back and the works required to bring them into alignment with the handback conditions appears robust and well-managed.
- Maintenance costs have been calculated based on combination of meeting asset maintenance standards and a pro-rating of reactive maintenance costs per lane km.
- Operations costs have been estimated bottom-up, with similar levels of efficiencies applied to that of Operations more generally. No specific economies of scale have been applied.
- Retention amounts are limited to 40% of the cost of renewals to bring assets into the handback conditions. While DBFO Co's appear to be agreeing plans to undertake required renewals prior to handback, and some renewals are complete, there remains a risk that the retention amounts will be insufficient to address any incomplete renewals. Some high-level assumptions might suggest that this risk currently stands at around £100m, though it seems likely that this level will reduce as further inspections and examinations are undertaken and renewal works are completed by the DBFO Co's.
- No funds for renewals are included in the dSBP for renewals of handed back assets in RIS3. Given that 15% of pavement assets, in particular, can have 0-10 years of life remaining it seems unlikely that no works will be required. Some high-level assumptions might suggest that pavement renewals totalling £30m-£50m might be required in RIS3.
- **We recommend that the ORR should develop its understanding of the magnitude of these potential risks and consider to what extent they might be included within National Highways' risk provisions.**

National Highways has used the Private Finance Initiative (PFI) to procure, build, and operate areas of the Strategic Network. Through PFI funding National Highways³⁰ entered into 11 Design, Build, Finance and Operate schemes (DBFO) between 1996 and 2009, with the aim of enabling early investment in the SRN.

Hand back schedules were formally triggered for eight of these DBFO contracts in 2021. National Highways has been planning for the transition of responsibility for each route since 2018. Table 5.1 presents each DBFO route due to be handed back to National Highways in RIS3.

Table 5.1: Summary of the eight routes being handed back to National Highways in RIS3

DBFO routes to be handed back in RIS3	Lane length (km)	Handback year
A69 Carlisle to Newcastle	257	2025/26
A19/A168 Dishforth to Tyne Tunnel	600	2026/27
M1-A1 Link Lofthouse to Bramham	252	2025/26
A50 Stoke to Derby	271	2026/27
A1M Alconbury to Peterborough	173	2025/26
M40 Denham to Warwick	833	2026/27
A417/A419 Swindon to Gloucester	242	2025/26
A30/A35 Exeter to Bere Regis	314	2025/26
Total	2,942	

Source: ORR_DBFO.pptx

³⁰ The Highways Agency at the time the contracts were entered

5.1.1. Overall expenditure and approach

National Highways has requested £2,718.3m for its 'post efficient' operational expenditure for RP3. An overview of this expenditure is presented in Table 5.2 below.

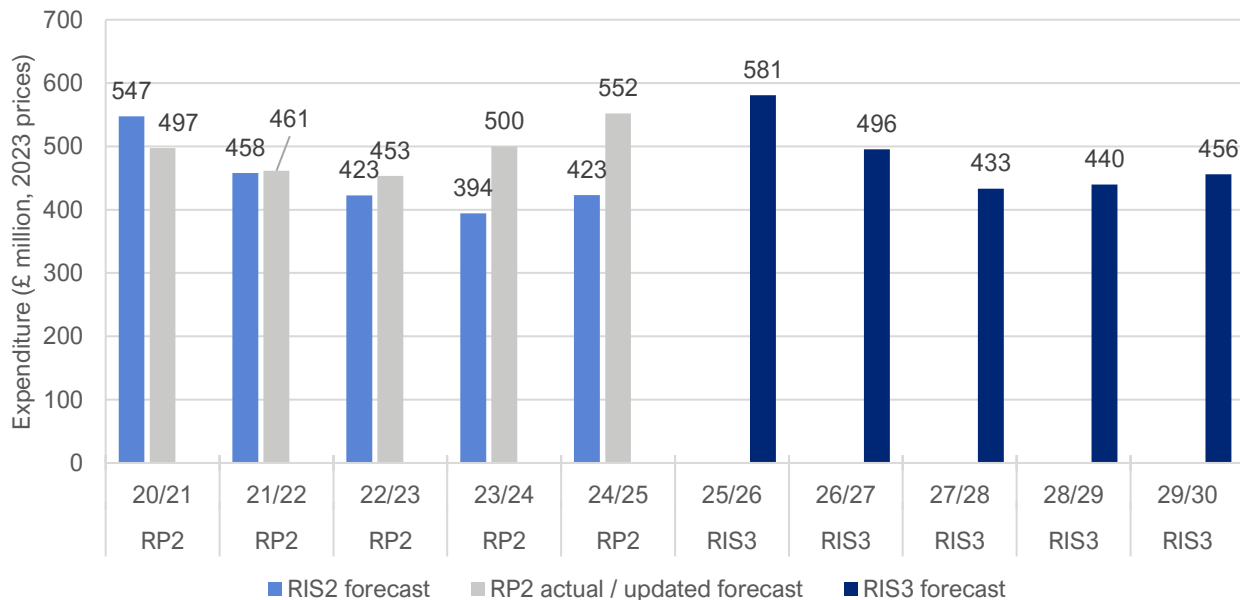
Table 5.2: National Highways post inflated, post efficient expenditure for DBFO routes in RIS3 (£m, nominal)

	Year 1	Year 2	Year 3	Year 4	Year 5	RIS3 - Total
PFI Funding Requirement	633.7	549.9	490.4	507.5	536.9	2,718.3

Source: National Highways dSBP

Figure 5.1 illustrates the expenditure related to the management of DBFO routes across RP2 and RIS3 in real terms. Expenditure in RIS3 is forecast to decrease significantly in real terms from 2025/26 to 2027/28, with all DBFO hand-backs planned for RIS3 taking place during first two years in RIS3. This information is included for information and context. We have not reviewed expenditure on DBFO roads, focusing on the handback of DBFO roads in RIS3.

Figure 5.1: DBFO expenditure by year during RP2 and RIS3 (£ million, 2023 prices)



Source: CEPA analysis of RFI 005 - Updated B.3 Financial Model & dSBP Final issued to ORR 240207

5.1.2. Delivery and enforcement of contractual requirements

The process being followed is the same for each of the eight DBFOs being returned in RIS3 and is depicted below. Subsequent paragraphs describe these stages.

Figure 5.2: DBFO handback process



Source: ORR_DBFO.pptx

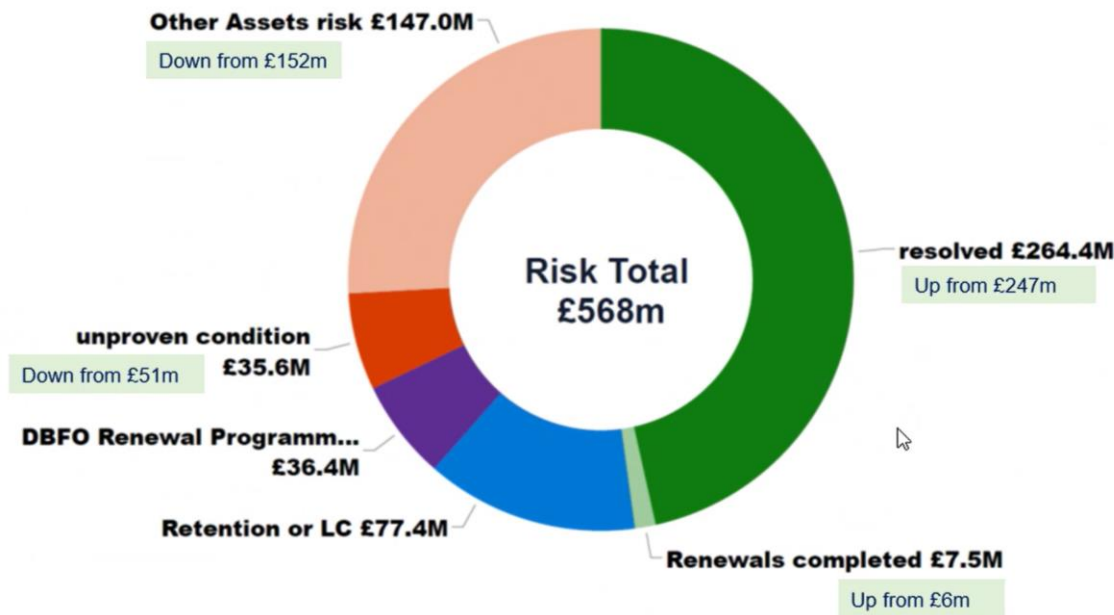
The baseline position is set based on a register of assets, predominantly comprising pavement, structures and lighting, with condition initially based on a paper-based assessment of potential asset condition. It appears that this is a relatively conservative assessment based on anticipated lives of components. This is used to identify a quantum of potential risk amount, which is effectively the cost of potential renewals to the assets to meet the handback condition requirements.

The DBFO Co undertakes inspections and surveys to demonstrate the condition of the assets and, based on these, risks are either “resolved” (i.e. actual condition does not require any renewals), incorporated into a DBFO renewal programme (i.e. DBFO undertakes renewals) or a retention amount for the renewal is agreed. The position for the resulting risk amounts is reported monthly and can be tracked, and more detailed information of the relevant risks accessed, via a web-based record of the assets and risks.

An example of the resulting “doughnut” plot is provided below. This shows the total risk of the baseline position for all DBFO handbacks (£568m), with £264m of risks resolved (i.e. assumed based on paper-based assessment, but demonstrated not to be a risk from inspections, with no renewals required).

Risks in red (£35.6m) are those where inspections have been undertaken, and where work is required, but that have not as yet been included in a renewal plan or that do not have retention amounts agreed. Other assets risk (£147.0m) is where risk remains solely based on the paper-based assessment (i.e. inspection has not yet been undertaken).

Figure 5.3: National Highways estimated risk baseline risk position for all DBFO handbacks



Source: ORR_DBFO.pptx

We have assigned a RAG rating of **green** for its delivery and enforcement of contractual requirements. This process appears well understood by both National Highways and the DBFO Companies, and reviews by the IPA have given positive ratings. National Highways’ processes appear robust and fit for purpose.

5.1.3. Operations planning post-handback

DBFO handbacks are included in National Highways’ RIS3 operations case as a cost uplift. Costs for the handed back DBFO roads are added for set up and day to day management. These estimated costs are allocated to the relevant location of the country for each DBFO handed back, since the amount handed back differs greatly with handbacks being concentrated in the north-east.

National Highways has applied both a ‘cost reduction’ and an ‘efficiency’, totalling £12m, to its DBFO operations costs. The cost reduction is in line with the rest of the network but the efficiency is in addition, further reducing costs in the ‘cost reduction’ areas. The build-up of DBFO operations costs and efficiencies are described in more detail in Section 4.1.2.

We have assigned a RAG rating of **amber** for its operations planning post-handback. The build-up of base costs appears reasonable, but there is insufficient evidence of planning to deliver efficiencies and higher risks to expenditure than we would expect.

5.1.4. Maintenance planning post-handback

Forecast maintenance expenditure has estimated cyclical maintenance based on meeting its GM 701 standard for the volume of assets on each route, making use of the available asset inventory. Reactive maintenance costs have been forecast based on the reactive maintenance cost per lane km, based on the current expenditure in the region that each DBFO route is being taken back into.

We have assigned a RAG rating of **green** for its maintenance planning post-handback. This appears to be a reasonable approach, albeit that it does not include any subsequent consideration of RIS3 efficiencies.

5.1.5. Renewals planning and risks to delivery

The main risks to the National Highways’ plans relate to renewals. Operations and maintenance costs appear fully covered within proposed RIS3 budgets but no allowance for renewals is made, under the assumption that any necessary renewals are addressed via the handback requirements and processes. This assumption appears

optimistic. While the handback process appears well run and robust, the handback requirements are not, in some cases, consistent with this assumption.

A notable example is for pavements, where the contractual requirement is that 15% of pavement may have a residual life of 0-10 years. All DBFO handbacks are in the first two years of RIS 3, with three years remaining in the RIS. A very high-level assumption might be that, in these remaining 3 years, $3/10 = 30\%$ of the pavement in the DBFO handbacks might reach its end of life and require some renewals. Applying unit rates for life extension of rigid pavement or a 180mm treatment of flexible pavement results in total renewal costs of around £40m, so a range of perhaps £30m to £50m might be plausible in RIS3.

The second risk is due to the scale of the retention amounts. Retention amounts are limited to 40% of the cost of renewals to bring assets into the handback conditions. While DBFO Co's appear to be agreeing plans to undertake required renewals prior to handback, and some renewals are complete, there remains a risk that the retention amounts will be insufficient to address any incomplete renewals. The maximum amount that this risk could currently comprise would be 60% of the amounts not resolved or completed, which based on Figure 5.3 would comprise £178m.

A more realistic assessment might assume that (i) many of the renewal risks are based on a conservative assessment of the non-pavement assets and so will not be required; and that (ii) much or all of the agreed programme of renewals would be completed. If we assume that a similar proportion of non-pavement assets require renewals, compared to the paper-based estimate, to that experienced to date for pavement³¹ and that the DBFO Co's complete all of the work that they have agreed to undertake, then this residual risk drops to around £100m³².

Both of these assumptions are uncertain and could be monitored by tracking the evolution of the "doughnut" plots, an example of which is shown in Figure 5.3, together with the progress of the DBFO Co's in completing the agreed renewal programme. We would expect this residual risk to be more accurately estimated as (i) inspections of non-pavement assets are completed, which might either increase or decrease the risk; (ii) the DBFO Co's agree further renewals, which would reduce the risk; and (iii) the DBFO Co's fall behind on their renewals programme, which would increase the risk.

We recommend that the ORR should develop its understanding of the magnitude of these potential risks and consider to what extent they might be included within National Highways' risk provisions.

We have assigned a RAG rating of **red** for its renewals planning post-handback. No allowance for renewals in RIS3 is made.

We have assigned a RAG rating of **amber** for its risks to delivery. There are clear uncosted risks, albeit that robust and transparent handback processes will reduce the likely magnitude and likelihood of any risks due to limitations in handback retention amounts.

³¹ $1 - (264.4 / (568 - 147)) = 37\%$

³² 60% of (37% of £147m, plus £35.6m, plus £77.4m)

6. REVIEWS OF ASSET CLASS RENEWALS

6.1. FLEXIBLE PAVEMENT

Main findings: flexible pavement

- Total real renewals expenditure in RIS3 is forecast, at £1.2bn, to be 17% lower than that in RP2.
- National Highways' approach to flexible pavement (Scenario Z) results in a deterioration of pavement condition, with the KPI declining to a forecast 94.7% while the "maintain current condition" scenario predicts a KPI of 97.1%.
- Both of these scenarios are based on meeting RP2 targets for the pavement KPI. We would expect that any shortfalls in meeting RP2 targets will result in similar, or greater, forecast underperformance in RIS3 since renewal requirements are likely to be increased for pavement in worse condition.
- Risks to delivery of the dSBP in RIS3 are primarily around the accuracy of forecast volumes and deterioration and their impact on the pavement KPI.
- While there are some risks around the delivery or costs of the works themselves, these appear to be manageable. Comparison of RP2 actual unit rates to those proposed for RIS3 show a reduction of 25% in RIS3. This can be plausibly explained by the inclusion of a level of VRS and drainage renewals, together with any crystallised risk, in the actual schemes.
- Some details of the approach that National Highways have applied to estimate unit rates appear inappropriate. Simple averages, rather than weighted averages, have been applied in one stage of the calculation of unit rates. This results in unit rates being 6% higher than alternative estimates developed by National Highways, which apply weighted averages throughout. **We recommend that National Highways' alternative unit rates should be adopted within the RIS3 plans, potentially reducing expenditure on flexible pavement by around £95m.**
- The relatively low volume of renewals in RIS3 under Scenario Z results in a very high volume in RIS4 to retain or recover pavement quality. Depending on the approach planned for RIS4 and performance in RIS3 this could result in potentially undeliverable volumes in RIS4.
- National Highways has made appropriate use of its modelling capabilities to address these risks to forecast interventions and performance.
- Climate change could have a material effect on flexible pavements and the need for renewals several mechanisms, for example a reduction in the amount of freezing conditions that would reduce deterioration in the winter months or increased frequency of hot summer conditions that increase deterioration. No attempt has been made to estimate the impact of climate change on the assets or National Highways plans and performance in RIS3.

National Highways classifies pavements as 'flexible' if:

- the upper layers of the pavement are asphalt (bound in bitumen); and
- the lower (base) layers are either asphalt (flexible pavement with asphalt base) or a hydraulic bound material (flexible pavement with HBM)

or

- base and binder layers are rigid pavement, which have been covered with 50mm or more of new asphalt surfacing.

National Highways considers the stated purpose of the pavement asset to be as follows:

- Withstand an appropriate load over the design period.
- Provide acceptable ride quality for all road users.
- Ensure no significant ponding of water by draining the water off the carriageway.
- Maintain skid resistance and provide a safe running surface.

6.1.1. Overall expenditure and approach

The planned total expenditure and volumes for flexible pavements in RIS3 is outlined in Table 6.1 and Table 6.2 respectively.

Table 6.1: National Highways post inflated, post efficient expenditure for Flexible Pavement (£ million, nominal)

	Year 1	Year 2	Year 3	Year 4	Year 5	RIS3 - Total
50mm	264.0	265.5	266.6	262.9	267.5	1,326.5
100mm	6.0	7.8	9.8	15.5	16.3	55.3
180mm	0	0	0	1.6	0	1.6
Total	270.7	273.3	276.4	280.0	283.8	1,383.4

Source: National Highways dSBP

Table 6.2: National Highways post inflated, post efficient outputs for Flexible Pavement

	Year 1	Year 2	Year 3	Year 4	Year 5	RIS3 - Total
50mm	1592	1581	1570	1528	1534	7806
100mm	25	33	41	63	66	228
180mm	0	0	0	5.3	0	5.3
Total	1617	1614	1611	1597	1600	8039

Source: National Highways dSBP

National Highways utilised condition surveys and deterioration models within its Programme Investment Tool (PIT) to forecast the volume of renewals required to maintain flexible pavement condition. It plans to maintain a regular programme of service renewals to minimise the need for reactive maintenance and disruption resulting from reconstructing the foundation layers of flexible pavement. The PIT model incorporates three main categories of treatment types, with associated unit costs, and condition or age-based triggers. Whilst the outputs from PIT formed the basis of the proposed plan for RIS3, National Highways reduced its planned spending for flexible pavements by £259m under a 'financially constrained scenario' due to an affordability challenge from government. Its expected performance at this level of investment against the 'Pavement Condition' KPI is summarised in Table 6.3, with National Highways forecasting a reduction in performance over RIS3.

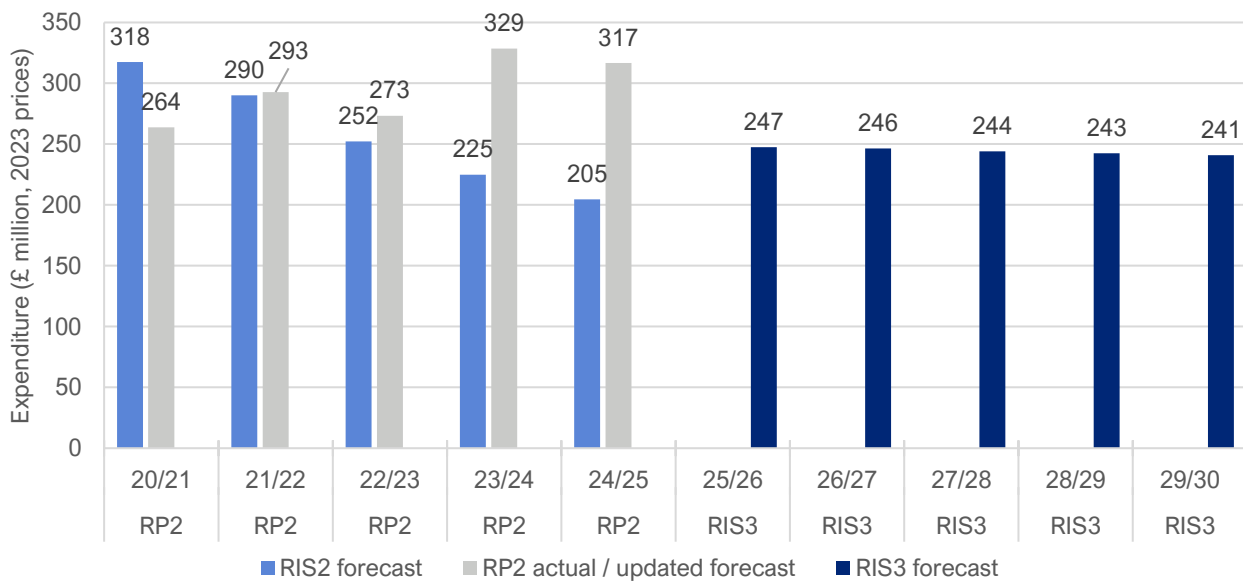
Table 6.3: Expected performance against the 'Pavement Condition' KPI over RIS3

Year	KPI performance
2025/26	96.2%
2026/27	96.2%
2027/28	96.2%
2028/29	96.0%
2029/30	94.7%

Source: National Highways dSBP

Figure 6.1 illustrates National Highways' Flexible Pavement RIS2 forecast expenditure, RP2 actual and forecast expenditure, and the forecast expenditure for RIS3 in a common price base (2023 prices). The RIS2 forecast proposed a decrease in expenditure across RP2, but the actual expenditure and updated RP2 forecasts exceed this prediction in all but the first year of RP2. The RIS3 forecast represents a significant decrease from the updated RP2 forecast, with a small decrease projected across the road period. Total real expenditure in RIS3 is forecast to be 17% lower than that now forecast for RP2.

Figure 6.1: Flexible Pavement renewals expenditure by year during RP2 and RIS3 (£ million, 2023 prices)



Source: CEPA analysis of RFI 005 - Updated B.3 Financial Model & dSBP Final issued to ORR 240207

We have assigned a RAG rating of **green** to overall expenditure on flexible pavement renewals. Expenditure levels are lower than in RP2 and the impact on performance appears well understood, with the reduction in expenditure reducing performance levels.

6.1.2. Renewals volumes

Alignment of renewals plans with Asset Management Policies and Strategies:

The Asset Class Handbook (ACH) promotes lifecycle planning decisions to include consideration of the total costs of an asset, balancing the costs of maintenance (funded through Opex) and capital renewals (funded from Capex), with the affordability of each. The dSBP confirms the use of the Programme Investment Tool (PIT) for lifecycle planning.

We have assigned a RAG rating of **amber** for the alignment of its flexible pavement renewal plans with Asset Management Policies and Strategies, since the proposed approach does not minimise the whole-life costs of the asset.

Modelling:

PIT uses condition surveys and deterioration models to forecast the volume of renewals required to maintain condition and performance against the KPIs. The output from PIT has been used directly to form the proposed plan for RIS3.

The dSBP states that PIT adopts an approach that aligns with pavement renewals maintenance treatments in CD 227 Design for Pavement Maintenance. The dSBP states that PIT treatments are based on different condition, or age-based triggers within PIT. National Highways since clarified what condition parameters are used in PIT to trigger the treatment types, and that there are 107 specific trigger rules in PIT based on combinations of condition data and threshold combinations.³³ The extent to which the assumed treatments fully cover the proposed maintenance plans is not clear, and comparisons of historic works with those previously forecast by PIT are not provided.

³³ RFI 020

The data used include cracking, surface deformation, polishing of surface aggregates and surface disintegration. Cracking is measured through TRACS for crack measurement and visual surveys, and TRASS for structural condition. Surface deformation is measured through TRACS eLPV, bumps and rutting. Polishing of surface aggregates is measured by SCRIM. Surface disintegration is measured through TRACS fretting and texture. However, no detail has been provided on the deterioration rates used in PIT.

There is a risk that the KPI targets for RIS2 may not be met, which could affect the results of the RIS3 modelling.

We have assigned a RAG rating of **green** for the use of modelling in its flexible pavement renewal plans. National Highways models have been appropriately used to develop plans and appear based on reasonable rules and appropriate data.

Climate change:

The dSBP (4.4.5) acknowledges that a changing climate is likely to affect the deterioration mechanisms of the pavements. However, it also states that the impact of climate change on deterioration of pavements is not yet fully understood and could mean that the projections are over or underestimated. It is not clear how the risk of climate change is being managed.

We have assigned a RAG rating of **red** for the consideration of climate change in flexible pavement renewal plans. We would expect climate change to have a material impact on these assets, but no quantified impact of climate change effects has been included in plans.

6.1.3. Approach to estimating costs

We understand from a presentation of the costing methodology that unit costs for renewals are based on contractual rates for the various modelled renewal interventions. National Highways provided a comparison of the forecast unit rates with those delivered for schemes in RP2. This showed that the forecast rates for RIS3 were around 25% less than those delivered in RP2. However, the RP2 unit rates include costs that are not present in the forecasts, in particular the pavement renewals will include a level of vehicle restraint system and drainage renewals as well as any crystallised risk in the RP2 schemes. Both of these factors will increase the RP2 unit costs, and so the comparison appears to show that unit costs are broadly consistent with those experienced in RP2.

National Highways has provided data for us to examine the calculation of the unit rates that it has used in its forecasts³⁴. National Highways have used a simple average of unit rates for each region to calculate a national unit rate for each intervention for motorways and trunk roads. It has then combined the motorway and trunk road unit rates using a weighted average based on the number of lane km of each road type.

This approach results in higher unit rates than if weighted averages were used at each stage, since regions with longer networks have lower unit rates. For a 50mm TSCS treatment, the most common type, the comparison is £164k / lane km in the dSBP, compared to £155k / lane km if weighted averages were used throughout. National Highways estimate that its minimum expenditure to maintain condition would be £95m lower in RIS3 if the alternative unit rates were applied.

An approach that utilises weighted averages throughout would be most appropriate in the absence of any clear rationale to apply simple averages. For example, it would be appropriate to use simple averages if funds for renewals were split between regions irrespective of the length of network managed by each region. No such rationale for moving away from this position is provided. While National Highways have stated that the potential for the alternative unit cost expenditure has been captured as a risk for consideration at a later point, we believe that the alternative weighted average approach would be a more appropriate base assumption, with risks around this baseline more likely to be balanced to both the upside and downside. **We recommend that National Highways should adopt its alternative unit rates within the RIS3 plans, potentially reducing expenditure on flexible pavement by around £95m.**

³⁴ RFI 108

In addition to this unit cost estimation, and the volumes derived from PIT, National Highways has applied some cost efficiencies to the overall expenditure. It is not clear to what extent these are the result of reduced volumes required or reduced unit costs. The efficiencies associated with flexible pavement represent ~£125m across RIS3 and equate to approximately 8% of the pre-efficient post-inflated flexible pavement estimate of £1,508m. This appears to be the result of an overall efficiency challenge for renewals rather than a bottom-up plan of specific actions to improve efficiency. While we might expect to see some efficiency gains that are not present in the modelled approach, such as packaging of works into efficient sizes for delivery, we would expect to have seen stronger justification for efficiency gains of this scale. It is therefore plausible that this cost challenge will be delivered by reducing the volume of renewals delivered, which is likely to reduce the condition of pavement assets.

We have assigned a RAG rating of **amber** for the cost estimation approach. Comparison of the proposed unit rates with those delivered in RP2 show that the proposed unit costs are broadly realistic, but we believe that the averaging approach used to calculate unit costs overstates them.

6.1.4. Linkage between Ops, Maintenance, Renewals and Performance

The dSBP (7.2.2) states that the selected funding scenario (SZ) will have an immediate impact on road users through an increase in the number of potholes and the extent of rutting, albeit that this will not have a noticeable impact on KPI performance for some time. It is also likely that there will be an increase in fretting and surface deterioration, and an impact on levels of skid resistance. Managing the issues without renewals spend may mean traffic disruptions by imposing lane or speed restrictions, although in the case of skid resistance the standard (CS 228) does require the erection of Slippery Road warning signs at sites that have been recommended for treatment which should then remain until the treatment has been completed; this does enable the risk to be managed without lane/speed restrictions but could be open to legal challenge depending on how long a sign was in place without treatment progressing.

National Highways has assigned additional opex expenditure across RIS3, increasing the allocation from £189m in Scenario 4 to £217m in SZ, which recognises that the £259m reduction in renewals expenditure will increase its operational expenditure.

KPIs are referenced throughout the dSBP. Table 7.3 identifies a reduction in the Condition Performance to 94.7% under Scenario SZ, versus 97.1% in Scenario S4 (least cost approach to maintain current performance). All analyses of KPI impacts are based on results of PIT modelling, and so there is a clear link between expenditure and performance.

We have assigned a RAG rating of **green** for the link to performance. There is a clear and transparent link between the funding proposed and the performance forecast.

6.1.5. Risks to delivery

PIT models 100 metre lane lengths. It is not clear how lane lengths are reduced or combined into lengths that do not fall on 100 metre intervals. Similarly, it is not clear how multi-lane schemes are generated if, for example, measured condition of lanes 1 and 2 trigger different treatments. There is therefore a risk that the treatments that are modelled by PIT are not realistic representations of actual interventions. For example, PIT treatments might be triggered in adjacent lengths or lanes in successive years. In practice, this situation would likely be treated by a single scheme rather than piecemeal over more than one year. This is a common issue with such deterioration models. However, in practice, while the actual lane km that are renewed might differ greatly from those modelled, they tend to have sufficient accuracy at an aggregate level, and so the scale of renewals is likely deliverable.

We understand that expenditure for renewals will be divided and delivered on the basis of modelled need in each region, so there are potential risks around resourcing if some areas have high level of renewals; however, the likely split across regions/areas should be known in advance to enable planning for such a scenario. This regionalisation of expenditure exacerbates the potential issue with generating deliverable schemes noted above, since schemes will be planned within the regions.

The dSBP (8.7.7) highlights risk to delivery, including policies as to mix of hot rolled asphalt (HRA) and thin surface course system (TSCS), as deterioration rates and costs of materials change. Also, National Highways is concerned that the reduced level of expenditure may result in a loss of capacity for some surfaces or areas. While these are a risk, we do not consider that they make the renewals undeliverable or highly risky in RIS3.

The dSBP (7.1.10) also indicates that network availability is not a concern, as work is generally undertaken in night closures and contractors are well practiced at undertaking work quickly and with minimum disruption.

National Highways highlighted some long-term risks with its proposed plan in its workshop. In particular, the reduced level of renewals in RIS3 may result in insufficient industry capacity being available for the likely much higher level of renewals required in RIS4.

We have assigned a RAG rating of **amber** for its risks to delivery. While some risks relate to RIS3, we are more concerned with the longer-term risks that reduced RIS3 renewals might introduce.

6.2. DRAINAGE

Main findings: drainage

- Total real drainage renewals expenditure in RIS3 is forecast to be about 59% higher than that spent in RP2.
- National Highways' approach to drainage is primarily based on addressing flooding hotspots, whether based on historical flooding or identifying potential future hotspots via modelling, with some additional closed pipe renewals.
- It is unclear how National Highways stated aim of maintaining flooding incidents at RP2 levels is consistent with the large increase in expenditure.
- The approach to estimating drainage requirements appears consistent with National Highways' asset documents and makes appropriate use of modelling. However, due to a lack of asset condition data National Highways' approach relies on estimating and addressing the symptoms of poor asset condition rather than proactively managing condition. We would expect that the increased number of flooding incidents addressed to allow National Highways to improve its asset data and to move to a more predictive asset-condition based approach for RIS4.
- There are a number of assumptions built into expenditure forecasts that are very uncertain and that may have a material impact on both expenditure and performance. These include the number of flooding hotspots addressed and the mix of interventions required to address flooding.
- Climate change has been incorporated via a 4% year on year increase in hotspots and increased renewals of closed pipes, based on historic flood trends. While this appears a reasonable approach, the projection of this historic trend introduces an additional source of uncertainty into forecasts.
- Drainage most directly affects the drainage resilience PI, and safety and network availability/delay are less directly affected. The impact on all of these is neutral due to the underlying target of maintaining current levels of flooding.
- Overall, while the approach is not unreasonable it relies on uncertain assumptions which result in a large increase in forecast expenditure with no clear evidence of the impact of this increase, resulting in a significant risk that the programme is either over or under-funded.
- **The ORR should consider whether costs at the proposed level should be funded, or how delivery could be monitored to reduce risks of over or under-funding drainage renewals.**

The drainage asset collects water from the carriageway, pavement, and other adjacent structures, storing and conveying this water to receiving ground and surface water systems. It mitigates the risk of flooding to and from the Strategic Road Network, and prolongs the condition of other assets such as pavements and VRS.

The drainage asset National Highways manages consists of:

- 13,800km of pipework;
- over 9,000km of ditches and channels;
- over 9,000km of gravel drains; and
- a large number of point assets that make up the drainage system.

6.2.1. Overall expenditure and approach

The planned total expenditure for drainage in RIS3 is outlined in Table 6.4.

Table 6.4: National Highways post inflated, post efficient expenditure for Drainage (£ million, nominal)

	Year 1	Year 2	Year 3	Year 4	Year 5	RIS3 - Total
Total	78.4	79.3	80.0	81.0	81.9	400.5

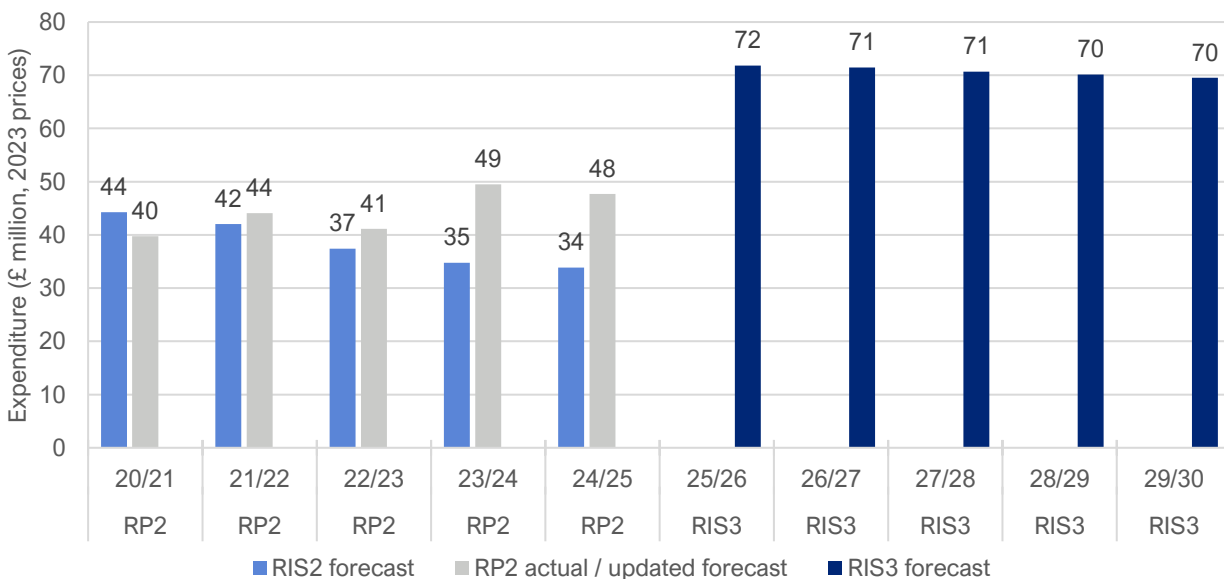
Source: National Highways dSBP

National Highways’ approach determining the investment need for drainage seeks to maintain performance, through maintaining a constant level of flooding across RIS3. It utilises an investment optimisation model that identifies the reactive cost of dealing with flooding events and then targets a reduction in flooding, using a blended unit cost rate that National Highways believes represents the mix of intervention types required to address drainage assets that will reduce flooding levels.

National Highways has also identified £45m of renewal need across RIS3 for assets that it deems essential for the drainage system to operate, but are not related to addressing flooding events. For these assets ‘expert opinion’ has been applied to determine the volume of renewals required.

Figure 6.2 below presents National Highways’ Drainage RIS2 forecast expenditure, RP2 actual and forecast expenditure, and the forecast expenditure for RIS3 in a common price base (2023 prices). As illustrated in Figure 6.2, requested drainage expenditure within RIS3 represents a significant step-up from what was forecast for RIS2, as well as the actual expenditure experienced and updated RP2 forecast. Whilst annual real expenditure was expected to gradually decrease across RP2, expenditure is now projected to increase toward the end of RP2.. Expenditure in the first year of RIS3 represents a 51% step increase from forecast expenditure in the final year of RP2. Overall, the drainage renewals forecast for RIS3 represents a real 59% increase from the updated RP2 forecast.

Figure 6.2: Drainage renewals expenditure by year during RP2 and RIS3 (£ million, 2023 prices)



Source: CEPA analysis of RFI 005 - Updated B.3 Financial Model & dSBP Final issued to ORR 240207

We have assigned a RAG rating of **red** to overall expenditure on drainage renewals. Expenditure levels are significantly higher than RP2, but National Highways expects the level of flooding to be consistent with RP2 despite this substantial increase. While National Highways has argued that the level of flooding will increase, it is not clear why a 4% year on year increase in flooding results in a 59% increase in expenditure. It seems most likely that unit costs, potentially the mix of interventions included in the cost estimates, are driving the proposed expenditure increase.

6.2.2. Renewals volumes

Alignment of renewals plans with Asset Management Policies and Strategies:

The Asset Class Handbook (ACH) confirms that CD 535 Drainage Asset Data and Risk Management requires the management and minimisation of current and future predicated impacts of flooding. In addition to the drainage asset inventory and condition data it also requires records of flood events, and flooding hotspots to be maintained.

The majority of the renewals budget is to address flooding hotspots with aim to keep flooding incidents at same level as RIS2 (6,667 flood clusters identified) and so is aligned with the ACH and National Highways standards.

The ACH also promotes lifecycle planning to achieve the best whole-life balance between opex and capex expenditure. The dSBP states that the funding scenarios considered for renewals have considered the interaction with opex spend, and opex costs associated with flooding events are calculated within the AIM model. However, it is not clear whether the balance of costs proposed if or how these costs are incorporated within the operations and maintenance funding request.

We have assigned a RAG rating of **amber** for the alignment of its drainage renewal plans with Asset Management Policies and Strategies, since it is not clear how operations and maintenance costs are incorporated into the wider dSBP.

Modelling:

Records of flooding incidents have been used to identify “hotspots” and to group these into clusters based on proximity. Hotspots are assigned a priority risk status (A1-D); currently 887 high risk (A1, A, B) hotspots on SRN, and example cost calculations provided identify 792 clusters that will be addressed in RIS3.

Inventory data is available for 91% of the assets (though only 54% of this is validated) and condition grade data is available for 44% of that length. This data will assist in identifying suitable treatments but will need to be collected as part of scheme options development where not currently available.

Historical data has been used to identify the likely number of locations that have not flooded in the past, but which could become hotspots.

The dSBP did not identify volumes of work and work type planned for individual sites, but these were provided in the response to a request for information. Understandably for the dSBP, these are based on the historical mix of treatments used to address hotspots rather than outline scope of works for individual hotspots.

The modelling tool AIM was used to select the best combination of clustered assets to achieve the objective defined for each funding scenario and took account of whole life costs. Each flooding cluster is presented as a potential renewal and the tool then selects the clusters and timing of works to maximise net present value.

We have assigned a RAG rating of **green** for the appropriate use of modelling within its drainage renewal plans. National Highways has used the models and data that it has available appropriately. However, we note that there are significant shortcomings in the underlying drainage data, and it is important that this is improved in future to enable a modelling approach that considers and addresses underlying asset condition rather than addressing symptoms.

Climate change:

Modelling has assumed a year-on-year increase in flooding (approx. 4%), which is based on historical trends in flooding. An allowance has also been made for 2% increase in closed pipe renewal based on an Environment Agency report. Both of these estimates are high-level and will be intrinsically uncertain. The level of uncertainty is not clear, and it is not clear how the risk of these estimates being inaccurate will be managed.

We have assigned a RAG rating of **amber** for the consideration of climate change within its drainage renewal plans. National Highways has made some efforts to address climate change within its costing, but this is very high level and mainly based on recent historical trends.

6.2.3. Approach to estimating costs

National Highways has developed a ‘blended unit cost’ rate that it believes represents the mix of intervention types required to address drainage assets that will reduce flooding levels. This blended cost rate is calculated by applying unit cost rates by asset / intervention type which are provided by its Commercial and Procurement division, to the actual assets registered within a cluster. National Highways has clarified that the default volume or length of the asset, as well as the proportion of assets that require intervention, was developed through an analysis of renewals and work mix. This combined Oracle data with expertise from drainage asset leads.

Basing the number of flooding events and interventions on historic events and trends is not unreasonable given the asset data available. However, the implicit assumption is that these historic events and trends are a good predictor of future flooding and interventions. Without a good understanding of the asset base, its condition, deterioration and drivers of flooding events it is inevitable that there are large uncertainties in the output costs and performance. This is particularly the case given the very different interventions that can be required, and the large differences in unit costs that result as described further below.

The efficiencies associated with drainage represent ~£34m across RIS3 and equate to approximately 8% of the pre-efficient post-inflated drainage estimate of £434m. There is no detailed build-up of the source of these efficiencies, which appear to be an overall cost-challenge rather than the result of a detailed plan.

The underlying assumptions associated with the expenditure forecast introduce significant uncertainty in the level of expenditure. In particular, the blended rate assumes a mix of interventions required to address flooding. Within the AIM modelling the work-types are based on the mix of historical interventions with the costs based on the asset types. The level of expenditure for different interventions varies greatly: for example, we would expect the cost of rebuilding drainage if it has collapsed to be orders of magnitude greater than unblocking the outflow of a drain. The blended rate is therefore extremely sensitive to the assumptions of the relative frequency of these very different interventions. This is an unavoidable result of the very different interventions that might be required – and there is therefore significant uncertainty in the level of funding that will be required to address a given number of flooding hotspots.

Overall, while the approach is not unreasonable it relies on uncertain assumptions to result in a large increase in forecast expenditure with no clear evidence of the impact of this increase, resulting in a significant risk that the programme is either over or under-funded. We therefore believe that **the ORR should consider whether costs at the proposed level should be funded, or how delivery could be monitored to reduce risks of over or under-funding the renewals.**

In addition, the approach applied in the dSBP of addressing flooding hotspots does not make extensive use of asset data to ensure that it has appropriate capacity and condition and to manage these. The approach employed manages the symptoms of insufficient capacity or maintenance rather than proactively addressing issues before they occur.

There is a risk that, without systematic collection of asset and condition data, this treatment of symptoms will continue indefinitely. While the systematic collection of condition data across the whole of the network might well be too expensive a pragmatic approach might be to systematically collect/validate drainage data as flooding hotspots are identified, and to record actions taken to address the flooding hotspot. We understand that National Highways will collect/validate drainage asset data as hotspots are identified. This will, over time, improve both National Highways' asset data (and confidence in its asset data) and its understanding of the interventions required to address flooding hotspots. Combining these two areas of information would allow there to be greater confidence in forecast costs in the future. We would expect that the increased number of flooding incidents addressed to allow National Highways to improve its asset data and to move to a more predictive asset-condition based approach for RIS4.

We have assigned a RAG rating of **red** for the cost estimation of its drainage renewal plans. While the approach is not unreasonable it relies on uncertain assumptions to result in a large increase in forecast expenditure with no clear evidence of the impact of this increase, resulting in a significant risk that the programme is either over or under-funded.

6.2.4. Linkage between Ops, Maintenance, Renewals and Performance

The drainage workshop presentation stated that the RIS3 case balances capex and opex by forecasting the volume of flood events that may occur on the network under different funding scenarios. The principle is that a larger drainage renewals programme would result in a lesser opex requirement for reactive maintenance and vice versa.

The strongest link between drainage and performance is via the Drainage Resilience PI. Reduced renewals would result in increased flooding incidents, resulting in worse performance under this PI. Drainage also affects safety

metrics such as KSI, due to the risk of injury or fatalities resulting from traffic incidents due to flooding. There is also some impact on traffic delays when traffic management measures are required to address flooding. Given that the proposed approach maintains RIS2 levels of flooding, all of these measures remain at RIS2 levels.

We note that National Highways has a Water Quality Performance Indicator (PI), where works may alter existing drainage arrangements to improve water quality. We would expect that there will be potential for drainage renewals to contribute to the Water Quality PI, and vice versa. We understand that National Highways argue that there is a distinction between capital works to improve water quality and renewals and maintenance to ensure that assets are fit for their purpose, but we remain unconvinced that opportunities for efficient delivery of these two different aspects of drainage delivery have been sufficiently considered.

We have assigned a RAG rating of **amber** for the link between renewals and performance within its drainage renewal plans. While the link to the Drainage Resilience PI is clear and the link to safety is apparent, it is not clear whether maintaining RP2 levels of performance is the most appropriate outcome, or whether better value would be delivered by better or worse performance.

6.2.5. Risks to delivery

The large increase in funding from RIS2 could present a delivery risk since supply chain and National Highways will have to significantly increase expenditure. National Highways stated that the proposed plan was deliverable, but no formal assessment has been provided.

Flooding incidents may be higher than predicted due to adverse weather conditions. This might result in the need to manage risks through lane closures or speed restrictions, for example, if the required volume of renewals is higher than forecast. This risk is mitigated by the assumption of an increase in flooding in RIS3, based on recent historical trends, but the uncertainty in this estimate is unclear.

We have assigned a RAG rating of **red** for the risks to delivery of its drainage renewal plans. As noted above, the large increase in proposed expenditure introduces a material risk that the programme is either under over funded, and there are uncertainties in the underlying levels of flooding.

6.3. STRUCTURES

Main findings: structures

- Total real structures renewals expenditure in RIS3 is forecast to be about 48% higher than that spent in RP2, with around 60% of forecast RIS3 expenditure on “significant renewals”; larger, more complex interventions on high-risk structures.
- Much of the proposed work appears in line with asset management documentation and whole-life cost principles, but preventative maintenance has been removed from the budget due to budget challenges – this important decision is not well-justified.
- This removal seems unlikely either to minimise whole life costs or to offer good value for money since subsequent interventions are likely to be substantially more costly.
- Appropriate use of National Highways’ modelling and data has been used to derive the programme of structures renewals.
- Climate change will have an impact on structures, for example increased scour of foundations due to increased flood events, but this has not been addressed in the dSBP as these impacts are not yet fully understood or quantified by National Highways.
- National Highways has forecast the impact on specific structures condition PIs, which show slight improvements in condition in RIS3 but a deterioration in RIS4. Uncertainty in these trends exceed changes in RIS3.
- The primary risk to structures renewals is due to the complexity of significant structures schemes. While these schemes and costings appear appropriate, they may result in delays or extensions to schedule during RIS3 and actual work volumes/costs may differ from current estimates as the schemes develop.
- Overall, while the processes used to estimate expenditure are appropriate, there is significant uncertainty in the resulting total expenditure given the uncertainty in either volumes or unit costs for many areas of structures expenditure.
- **The ORR should consider monitoring of significant structures renewals against project milestones and bills of quantities costings that have been developed for the projects, and consider advising the government to fund some or all of the removed £240m for preventative maintenance.**

The structures asset class encompasses a diverse range of built infrastructure within the Strategic Road Network. the primary purposes of structures assets are as follows:

- To reduce journey times between two points by providing more direct links;
- To provide connectivity between communities and business;
- To support other assets such as technology, pavements and lighting;
- To support the highway as it crosses an obstacle or a service or to support the passage of a service over the highway.

The following structures assets are out the scope of this asset class review:

- **Tunnels** assets have a separate investment case.
- **Masts** are included within the investment cases for lighting, roadside technology and ancillaries.
- **Other structures** such as large signs and environmental barriers are included in the investment case for ancillaries.
- The two **Severn River Service crossings** are funded through the Protocols envelope and sit outside of renewals.

6.3.1. Overall expenditure and approach

The planned total expenditure for drainage in RIS3 is outlined in Table 6.5.

Table 6.5: National Highways post inflated, post efficient expenditure for Structures (£m)

	Year 1	Year 2	Year 3	Year 4	Year 5	RIS3 - Total
Avonmouth	8.3	18.7	3.8	3.4	0.7	34.9
Predictive renewals	120.0	121.4	122.7	124.3	125.8	614.1
Predictive renewals – other sources	20.3	20.5	20.7	21.0	21.2	103.7
Preventative renewals	0	0	0	0	0	0
Priority Structures	40.5	41.0	41.4	42.0	42.5	207.5
Significant renewals	183.5	320.5	326.1	389.3	294.4	1,513.7
Total	372.6	522.0	514.8	579.9	484.7	2,474.0

Source: National Highways dSBP

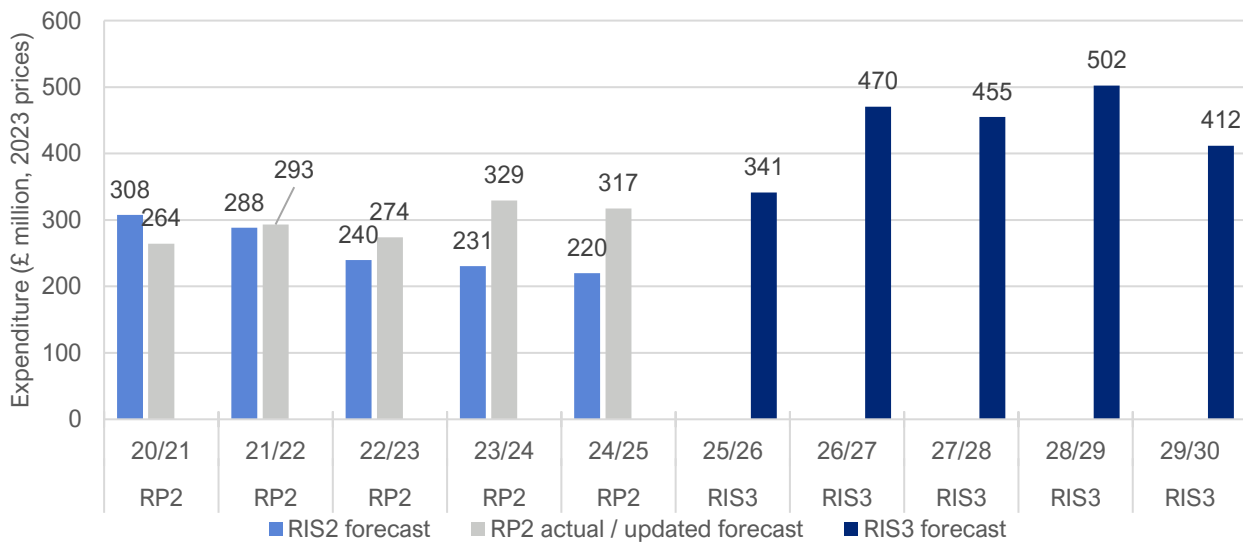
National Highways has estimated an overall investment need of over £4bn for structures assets, but considers addressing all asset needs to be both unaffordable and undeliverable. It has proposed a reduced programme that aims to balance asset need, safety, service levels, and deliverability. Its strategy is centred around different investment themes, with the different approaches adopted for each theme summarised in Table 6.6 below.

Table 6.6: National Highways approach for each investment theme within the Structures asset class for RIS3

Investment theme	Definition	Approach
Predictive Renewals	Seeks to achieve a target average condition of the entire asset stock through deterioration modelling, with renewal need identified through condition monitoring, asset management tools, and end-of-life policies.	National Highways used an analytical model called Agile that considers the condition of each major element making up the individual structures, providing outputs of specific interventions and the associated costs at each structural element. Planned investment is less than Agile predicts is necessary to maintain performance for RIS3.
Preventative Renewals	Early or additional investment that accounts for whole life cost management of a structure.	Investment plan does not include any preventative renewals.
Priority Risk Structure Renewals	Groups of structures with special risk-based management processes, with structural elements that's condition is challenging to determine through General or Principal Inspections.	During RIS3 National Highways proposes to focus on the most critical types of vulnerability (such as post tensioned, half joint, hinge joint, scour, fatigue prone) and develop a better understanding of the condition of types of structure through the Priority Risk Structures programme throughout RIS3.
Significant Renewals	Major interventions on larger, complex, or more vulnerable structures that could represent significant proportions of the renewals budget.	Significant renewals were identified within operational regions and peer reviewed by SES Technical Specialists. Each intervention was assigned a risk ranking between 1-5 in line with National Highways' standard value management assessment of structures. Significant renewal investment for RIS3 reflects significant structures with a risk score of 5, proposing to defer structures with scores of 4 and below until those rated as 5 have been completed.
Avonmouth	The Avonmouth Viaduct is a large major structures asset on a key strategic route in the South West. As it has its own independent structures management system, it cannot be included in wider predictive structures modelling.	A bespoke bottom-up renewals plan has been developed for the Avonmouth Viaduct. Investment is being made at a Do Minimum level to maintain serviceability.

Figure 6.3 below presents National Highways' Structures RIS2 forecast expenditure, RP2 actual and forecast expenditure, and the forecast expenditure for RIS3 in a common price base (2023 prices). Structures expenditure was expected to decrease year-on-year throughout RP2. Actual expenditure realised and RP2 updated forecast does not decrease, with the final two years of RP2 anticipated to have the highest expenditure. The RIS3 forecast for structures represents a 48% real increase from the updated RP2 forecast with greater year-on-year variation as works on significant structures are undertaken.

Figure 6.3: Structures renewals expenditure by year during RP2 and RIS3 (£ million, 2023 prices)



Source: CEPA analysis of RFI 005 - Updated B.3 Financial Model & dSBP Final issued to ORR 240207

We have assigned a RAG rating of **amber** to overall expenditure on structures renewals. While the processes used to estimate expenditure are appropriate, there is significant uncertainty in the resulting total expenditure given the uncertainty in either volumes or unit costs for many areas of structures expenditure.

6.3.2. Renewals volumes

Alignment of renewals plans with Asset Management Policies and Strategies:

The ACS states that the renewals programme will be developed across the four streams of predictive maintenance, preventative maintenance, significant structures and priority-risk structures. This has been reflected in the development of the RIS3 case.

The Asset Class Strategy (ACS) has an ambition for a proportion of the renewals budget to be ring-fenced for preventative maintenance in RIS3 and beyond, but due to funding challenges in the dSBP no budget allowance has been made. The ACS also expresses a focus on Priority-risk structure in RIS3 and this is reflected in the dSBP to assign funding for enhanced inspections to better understand deterioration of these structure types. The ACS states that interventions should be based on whole life cost (WLC) principles. This is the case for Predictive maintenance where a decision support tool (DST) has been used to identify and optimise renewals requirements in RIS3. We understand that, for significant or priority-risk structures, WLC principles are applied when options are considered, prior to proceeding to the design stage of a given project. We would expect WLC principles to have been addressed for projects in design, but not for those at earlier stages in the project.

The ACS states an aim to develop a Structures metric for RIS3. This is not addressed in the dSBP but monitoring of the structures renewals was discussed in the structures workshop and appears to be a work in progress.

We have assigned a RAG rating of **amber** for the alignment of structures renewals with asset management documentation. The key shortcoming is the lack of preventative maintenance in RIS3.

Modelling:

National Highways has used its Agile deterioration modelling capability to build up the predictive maintenance case and is based on current condition of individual components (from inspections) and deterioration algorithms to identify when components will need to be replaced. These are then grouped across individual structures to build up the programme. The modelling uses the Structures Asset Management Planning (SAMP) Toolkit methodology, which is endorsed and recommended by DfT, ADEPT, UK Bridges Board & CIPFA.

The Significant structure programme is based around known maintenance requirements and a list of structures with outline scope of works, indicative costs, stage of development and confidence in these has been provided.

The priority-risk programme is based around enhanced inspections to better understand deterioration and risks associated with these structures.

We have assigned a RAG rating of **green** for the appropriate use of modelling within its structures renewal plans. Overall, National Highways has made appropriate use of its modelling capabilities in developing its plans for structures.

Climate change:

It is acknowledged that climate change will have an impact on structures, for example increased scour of foundations due to increased flood events, but this has not been addressed in the dSBP as these impacts are not yet fully understood or quantified. Climate change therefore presents a residual risk in terms of rates of deterioration, for example.

We have assigned a RAG rating of **red** for the consideration of climate change within its structures renewal plans. We would expect climate change to have a material impact on some assets, but no quantified impact of climate change has been included in plans.

6.3.3. Approach to estimating costs

The approach to translating volumes to total expenditure differs across investment themes within the structures asset class.

The funding request for **predictive renewals** represents a moderate increase on RIS2, despite the Agile model estimating a large increase in the volume of predictive maintenance work. National Highways were not able to provide a clear link between the Agile predictions and forecast expenditure, arguing that:

- Agile utilises variable unit rates that are dependent on defects, and so unit rates could not be derived from the schedule in a unit rate multiplied by volume sense.
- Agile is only used to inform each regional team's delivery plan.

National Highways did provide a spreadsheet containing a schedule of predicted works, but we were unable to translate this into the total costs of the predictive renewals programme.

As discussed above, the scenario chosen by National Highways allocates no costs to **preventative renewals** due to funding constraints. Despite this, National Highways provided a spreadsheet that estimated a total cost of £247m in RIS3, utilising different unit rates and predicted volumes for each preventative intervention required.³⁵ National Highways state that these unit rates are based on a combination of expert judgement and historical costs of similar works, but it is not immediately clear to what extent each approach factors into cost estimation.

The cost estimates for **priority risk structure renewals** equate to the number of tasks required, multiplied by estimate unit rates of each task. The approach for each priority risk structure differed, but all were reviewed by the relevant regional teams. National Highways acknowledged that priority risk structures represent a group of assets where it needs to build a greater understanding of condition. In the absence of this detailed understanding, it has employed 'generic' average intervention costs that were estimated using engineering judgement.³⁶ Whilst we acknowledge that the lack of data on priority risk structure condition means assumptions need to be employed in its cost estimates, the number of assumptions used and the uncertainty created by these assumptions increases the likelihood of variance between this estimate and the actual cost of renewals.

³⁵ RFI 104

³⁶ RFI 104

The programme cost for **significant renewals** is built up from scheme-level cost estimates. Regional teams start by pricing works in comparison to similar previous works, and providing a scope to the National Highways Commercial and Procurement team.³⁷ The Commercial and Procurement team then build its own cost estimates as the investment case for works progresses, with the central cost of each scheme then spread over regional draft design and construction plans to provide an indicative spending profile, cost per scheme, and schedule estimate. The risk estimate for each project utilises Tag unit A1.2 guidance, but risk was not included in the renewals case for structures in the dSBP.³⁸ One assumption the Significant Renewals case has made is assuming an even expenditure profile for projects that last multiple years. Whilst we acknowledge that an assumption was necessary without detailed work programming when the dSBP was submitted, this approach may understate Significant Renewals costs if inflationary pressures in construction are realised, as happened in 2022/23.

For **Avonmouth**, National Highways utilised both historical data and the expertise of Amey, who have prior experience with working on significant bridge schemes and similar large structures across the UK.³⁹ For example, Amey provided an indicative cost of per gantry. National Highways acknowledge that this is an imperfect approach, as gantry design and construction is largely bespoke. National Highways has expressed a higher level of confidence in the cost estimates for other work activities, where it has used costs and rates incurred from previous works undertaken by the National Highways specialist bridges group.

Clearly, the approach to cost estimation, the utilisation of historical data, and number of assumptions made differ by investment case. National Highways provided spreadsheets for each investment case with the exception of predictive renewals, containing unit rates, predicted volumes, and relevant assumptions.⁴⁰

The efficiencies associated with the structures asset class represent ~£234m across RIS3 and equates to approximately 9% of the pre-efficient post-inflated flexible pavement estimate of £2,708m. As with other asset classes, there is little evidence of the deliverability of these efficiencies, which appear to have been set at a very high level.

Overall, the processes applied to develop estimated costs appear appropriate, but there is significant uncertainty in the resulting estimates since they are based on:

- Modelled volumes and unit costs, in the case of predictive renewals;
- Unit costs based on the engineering judgement for assets where National Highways has a poor understanding of condition in the case of priority structures;
- Early scheme-level cost estimates for significant renewals; and
- Costs of other similar works for a major scheme at Avonmouth.

We have assigned a RAG rating of **amber** for the cost estimation of its structures renewal plans. Overall, while the processes used are appropriate, there is significant uncertainty in the resulting total expenditure.

6.3.4. Linkage between Ops, Maintenance, Renewals and Performance

. National Highways recognise that reduced investment in predictive renewals below that required to maintain performance, and deferring priority 4 significant renewals will necessitate holding measures, temporary repairs and additional monitoring, all of which will impact operations and maintenance needs. £130m of expenditure on priority structures is included within the maintenance forecast expenditure, and we have commented on that sum within the maintenance section of this report.

³⁷ RFI 022

³⁸ RFI 103

³⁹ RFI 103

KPIs and PIs have been referenced in the dSBP. Both specific structures condition PIs (Structures Stock condition measured through the CPLav and CPLcrit) as well as wider KPIs associated with safety (KSI target), Network availability/delay targets are described. The dSBP suggests that requested funding scenario will have a slightly positive impact on CPLav but within the ± 2 tolerance, with a decrease in RIS4. CPLcrit is predicted to decrease in RIS3.

We have assigned a RAG rating of **green** for the link between renewals and performance within its structures renewal plans. A link between maintenance and renewals is made for priority structures and structures PIs are modelled.

6.3.5. Risks to delivery

The risks for structures renewals mainly involve uncertainty in the extent, composition and timing of the renewals. For example:

- The predictive renewals programme has been built up from asset intelligence and modelling of deterioration. Agile modelling provides predictive outputs but actual works and volumes required may differ, so some risk that volumes have been over or underestimated. Agile also predicts the timing of interventions for predictive maintenance but details of individual schemes have not been provided.
- The complexity of significant structures schemes may result in delays or extensions to schedule during RIS3 and actual work volumes/costs may differ from current estimates as the schemes develop. The proposed phasing of Significant structures schemes provided in spreadsheet with RFI response, but as stated above there is a risk that this may change as schemes are developed further.
- For Priority-risk structures the numbers of structures assumed to require some intervention or monitoring (not always renewal) have been provided but not details of individual structure or phasing of inspections or monitoring.

As noted above where we described National Highways' approach to estimating costs, while the overall processes used are appropriate there is significant uncertainty in the resulting total expenditure.

We have assigned a RAG rating of **red** for the risks to delivery of its structures renewal plans. There are risks in most of the areas addressed by these renewals, but we believe that the largest risks relate to the complexity of significant structures schemes. Many of these risks are intrinsic to large and complex projects, but they have the potential to significantly increase the expenditure on structures renewals.

6.4. VEHICLE RESTRAINT SYSTEMS (VRS)

Main findings: vehicle restraint systems (VRS)

- Total real VRS renewals expenditure in RIS3 is forecast to be 43% lower than that spent in RP2, with almost three-quarters of forecast RIS3 expenditure on do minimum interventions (DMIs, 85% of volume).
- This is not consistent with National Highways' asset class strategy and is unclear to what extent it will minimise whole life costs. However, the decisions that have been made to increase DMIs, and avoid concrete barrier upgrades, appear pragmatic approaches to reduce costs.
- National Highways has made appropriate use of its modelling and data to estimate renewals volumes.
- Climate change has not been incorporated into the renewals planning process, albeit that we would expect any impact to be small.
- Comparison of the unit rates for steel VRS between those delivered in RP2 and forecast for RIS3 show a small (4%) increase. While this is an imperfect comparison, since the proportion of DMI in RP2 is uncertain (though lower than the 85% assumed for RIS3), it gives some confidence that the estimated unit rates are appropriate. Forecast efficiencies, at 9% of expenditure, might be undeliverable given the already large decreases in forecast expenditure.
- KPIs and PIs have been referenced in the dSBP, for example increased delays due to repeat visits to sites, but no quantification of the impact of VRS is provided.
- It is unclear how delivery will be reported and further clarity is needed over how differing levels of "Do Minimum" works might qualify as "renewal" of a given length of VRS
- Risks relate to the completeness and quality of the available condition data, in particular that condition data is only available for 60% of the network. National Highways aims to improve this coverage in RIS3.

Vehicle Restraint Systems (VRS) are the safety barriers that form the basis of the road restraint asset. There are two main categories of safety barriers:

- **Roadside barriers** are installed around obstacles or along the roadside to reduce the risk of vehicles colliding with roadside hazards, falling down slopes, or into water when leaving the carriageway.
- **Central reserves barriers** (also known as median barriers) are included on all dual carriageways and motorways, separating opposing lanes of traffic of divided roadways. These barriers are designed to reduce the risk of vehicles crossing carriageways and causing head-on collisions.

6.4.1. Overall expenditure and approach

The planned total expenditure and volumes for RIS3 is outlined in Table 6.7 and Table 6.8 respectively.

Table 6.7: National Highways post inflated, post efficient expenditure for Vehicle Restraint Systems (£m)

Road Restraints	Year 1	Year 2	Year 3	Year 4	Year 5	RIS3 - Total
Concrete	0	0	0	0	0	0
DMIs	43.4	43.9	44.3	44.8	45.3	221.6
Steel Barrier	15.9	16.1	16.2	16.4	16.7	81.3
Total	59.3	60.0	60.5	61.2	61.9	303.0

Source: National Highways dSBP

Table 6.8: National Highways post inflated, post efficient outputs for Vehicle Restraint Systems

Road Restraints	Year 1	Year 2	Year 3	Year 4	Year 5	RIS3 - Total
Concrete	0	0	0	0	0	0
DMIs	202	202	202	202	202	1012
Steel Barrier	36	36	36	36	36	179

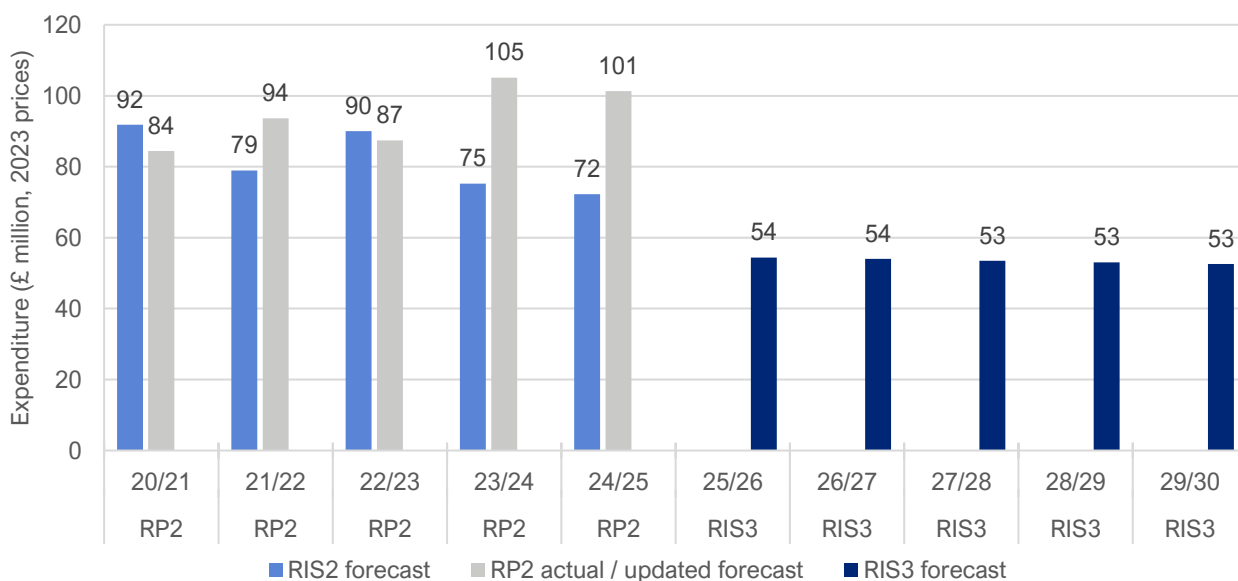
Road Restraints	Year 1	Year 2	Year 3	Year 4	Year 5	RIS3 - Total
Total	238	238	238	238	238	1191

Source: National Highways dSBP

National Highways utilises condition data and a deterioration model to generate outputs of renewal need over time, renewing grade 5 (unserviceable or at end of life) back to grade 1 (as new) condition. Its proposed investment programme for VRS represents a departure from its preferred level of investment, due to affordability constraints within the RIS3 programme. It involves renewing the worst condition assets with 85% DMIs, with the remaining 15% being full renewals in steel. No concrete renewals are proposed, due to cost benefit analysis that suggests only 4% of renewals would meet a cost benefit ratio of at least 1.5. Overall, the interventions proposed result in 1,191km of barrier renewals or repairs.

Figure 6.4 below presents National Highways' VRS RIS2 forecast expenditure, RP2 actual and forecast expenditure, and the forecast expenditure for RIS3 in a common price base (2023 prices). Requested VRS expenditure in RIS3 represents a significant reduction from both the RIS2 and updated RP2 forecasts, with requested expenditure in the first year of RIS3 being a 46% decrease from the updated expected expenditure in the final year of RP2. In real terms, total forecast real RIS3 expenditure represents a 43% decrease from RP2 levels.

Figure 6.4: Vehicle Restraint System renewals expenditure by year during RP2 and RIS3 (£ million, 2023 prices)



Source: CEPA analysis of RFI 005 - Updated B.3 Financial Model & dSBP Final issued to ORR 240207

We have assigned a RAG rating of **green** to overall expenditure on VRS. While there are risks to the proposed approach, National Highways has proposed a plan that significantly reduces costs while maintaining safety.

6.4.2. Renewals volumes

Alignment of renewals plans with Asset Management Policies and Strategies:

National Highways aims to improve the consistency and coverage of asset condition information in RIS3. This move is in line with the Asset Class Strategy (ACS), as is approach to identification and renewal schemes. However, the funding option selected does not support the ACS aim for a planned end of life replacement programme and the upgrading of central reserve VRS to concrete. In addition, it is not clear that proposed renewals programme aligns with whole life cost principles or the more proactive and preventative approach to operations, maintenance and renewals outlined in the ACS.

We have assigned a RAG rating of **amber** for the alignment of VRS renewals with Asset Management documentation. While the approach is inconsistent with some of the aims in the ACS, the approach set-out in the

dSBP is a pragmatic one which reduces expenditure while maintaining safety and having a minimum impact on whole life costs.

Modelling:

Modelling of required volumes is based on projections of condition based on current asset condition information and assesses the percentage remaining life of the asset in each condition grade at the end of RIS3. Expected lifetimes for the various types of VRS, based on current condition, are used to identify when renewal will be needed. Current condition data is only available for 54% of the network, with the lengths of network without condition data assumed to have the same proportion of condition grades as the survey data.⁴¹

Data sources are appropriate as they are based on the outcomes of regular condition inspections and a consistent approach to assessment set out in National Highways' standards. Remaining life estimates are based on experience/expert judgement rather than defined rates for loss of galvanising and corrosion.

National Highways' proposal provides for 1,191km of renewals to be undertaken (15% full renewal, 85% Do Minimum interventions), but not clear how this decision was taken within National Highways rather than promoting alternative scenarios that would have increased renewals. Modelling shows a slight decrease in overall asset condition during RIS3.

We have assigned a RAG rating of **amber** for the appropriate use of modelling within its VRS renewal plans. National Highways has made appropriate use of its modelling capabilities in developing its plans for VRS, but the quality is limited by the availability of current condition data.

Climate change:

Climate change has not been incorporated into the renewals planning process. Remaining life estimates are based on recent experience so may incorporate some elements associated with climate change, but factors such as changes to rainfall patterns/intensity and temperature changes that might impact the need for gritting, and how these might impact future deterioration rates have not been discussed or incorporated into planning.

We have assigned a RAG rating of **amber** for the consideration of climate change within its VRS renewal plans. No quantified impact of climate change has been included in plans, but we would expect the impact of climate change to be small for this asset type.

6.4.3. Approach to estimating costs

The unit rates for both the steel and concrete full replacement renewals, as well as DMIs, were calculated on a bottom-up basis, utilising Schedule Delivery Framework rates from Q1 2021 from the National Highways Commercial and Procurement team that include:

- Preconstruction Costs
- Indirect Works
- Direct Works
- Construction Costs.
- Project Risks and Uncertainty

These unit rates differ from the cost estimates present in the deterioration model used to measure required volumes, which is used to output renewal volumes under an unconstrained scenario.⁴² The bottom-up unit rates

⁴¹ See RFI 100

⁴² See RFI 024.

described above, and the outputs of the deterioration model are applied to budgetary constraints to produce Scenario SZ, National Highways' proposed option.

National Highways provided a comparison of the forecast unit rates with those delivered for schemes in RP2. This showed that the forecast rates for RIS3 were around 4% higher than those delivered in RP2. While this is an imperfect comparison, since the proportion of DMI in RP2 is uncertain (though lower than the 85% assumed for RIS3), it gives some confidence that the estimated unit rates for RIS3 are appropriate.

As discussed above, National Highways has opted to not undertake any full scale concrete renewals in RIS3, following a cost-benefit analysis (CBA) that suggested the whole-life cost of concrete renewals was much greater than steel renewals and DMIs. This suggests that National Highways is adopting a pragmatic approach when developing costs and provides further confidence that its cost estimates for VRS are appropriate.

National Highways assumes efficiency savings of £29m across RIS3, but has not provided an explanation of how such efficiency is to be achieved. This efficiency equates to approximately 9% of the pre-efficient post-inflated VRS estimate, greater detail is required on how efficiency savings specific to this asset class will be made. Given the significant reductions in expenditure compared to RP2 and the assumption of high levels of DMIs it is not clear how further efficiencies will be delivered, although some efficiencies might plausibly be delivered by integration of VRS renewals with other works.

We have assigned a RAG rating of **green** to cost estimation on VRS renewals. Overall, the cost estimation appears appropriate, though we have some concerns as to the deliverability of the efficiencies stated.

6.4.4. Linkage between Ops, Maintenance, Renewals and Performance

There is no clear linkage in the renewals section of the dSBP on how selected funding scenario (SZ) may impact operations and maintenance needs. The dSBP highlights that 364 km of barrier that is in condition grade 4 (i.e. toward the bottom of the 5 point scale), but will not be subject to renewal during RIS3, will pose a potential risk that will need to be managed through, for example, using increased inspections, lane closures, speed restrictions or use of temporary barriers. It is not clear in the dSBP where the funding to enable this risk management will come from, but it is recognised in the dSBP (8.3.1) that there will be an impact on Opex costs to potentially maintain traffic management over prolonged periods.

KPIs and PIs have been referenced in the dSBP, but none are VRS specific. The relevant KPIs relate to VRS contribution to safety (KSI targets) and Network Availability/Delay targets. The dSBP suggests that funding scenario SZ will have a negative impact on both of these indicators.

There is no detailed analysis of the impact on KPIs, but increased congestion levels due to repeat visits to the same road stretches to undertake Do Minimum works and potential need for speed/lane restrictions that will also increase congestion/delays are mentioned. It is not clear how the safety KPI will be negatively impacted as the aim of the approach is to maintain safety.

We have assigned a RAG rating of **amber** for the link between renewals and performance within its VRS renewal plans. While there is no quantitative link between renewals and performance in the dSBP, there are no VRS specific KPIs or PIs. The main link between VRS and performance will be via the VRS contribution to safety and Network Availability/Delay targets. Assuming that the proposed approach maintains VRS in a safe condition we would expect little impact on these KPIs or PIs from this asset class.

6.4.5. Risks to delivery

Planning has been bottom-up based on condition information from the regions, but not clear how lengths without asset condition data have been addressed in the modelling/planning. There is a risk that the condition of these lengths without condition data has been over/under-estimated. In addition, there is a risk that deterioration or remaining life may differ from that assumed. Increased deterioration could require additional renewals or increased lengths where risks will need to be managed.

The programme will be divided and delivered on the basis of condition in each region, so there are potential risks around resourcing if some areas have high level of renewals. This risk is mitigated since the likely split across regions/areas should be known in advance to enable planning for such a scenario.

As noted above, there is a residual risk associated with the 364 km of VRS in CG4 that will not be subject to renewal during RIS3.

Notwithstanding these points, and the risk that the level of further efficiency that can be delivered falls short of the 9% anticipated, the VRS renewals appear deliverable.

However, it is not clear how National Highways intends to report and monitor these works, for example whether do minimum works will be reported separately to full renewal of VRS or combined. We consider that doing so is important, such that the level of do minimum interventions can be assessed. As part of this clarity over what level of “Do Minimum” works needed to qualify as “renewal” of a given length of VRS is important.

We have assigned a RAG rating of **amber** for the risks to delivery of its VRS renewal plans. The approach appears deliverable though there are some residual risks around the level of further efficiency that can be delivered given that expenditure has already been significantly reduced.

6.5. ROADSIDE TECHNOLOGY

Main findings: Roadside technology

- In total, National Highways proposes nominal expenditure of £906m in RIS3 on roadside technology, of which £300m is for a National Programme. Even excluding the proposed National Programme, total renewal expenditure in RIS3 is forecast to be 76% more than spent in RP2.
- This level of expenditure results in National Highways replacing around 40% of the asset base in RIS3. However, a further update provided by National Highways subsequent to the dSBP suggests that this budget could support replacement of around half the asset base.
- The roadside technology renewals plan aligns with asset class strategies (ACS) to maximise performance and availability to maintain the level of service to customers. However, the large-scale renewal of assets seems fundamentally inconsistent with National Highways long-term vision to eliminate implementation of roadside technology requiring maintenance by 2035.
- An in-depth modelling programme has been undertaken. Appropriate data, such as the age at which each asset sub-class becomes obsolete and the rate at which fault rates increase by age are included in modelling. However, the basis of the fault rate estimates, and the sensitivity of the model to changes in these are not explained for all technology asset types.
- The analysis enables the level of performance delivered to be predicted using various investment programmes (to reduce, maintain, or exceed current performance levels). Within its dSBP National Highways proposes that, whilst the expenditure of £906m in RIS3 would replace around 40% of assets, it would not improve performance. This did not seem credible. Following a revisit to the model since the delivery of dSBP, National Highways has provided a note that proposes that this level of funding could be applied to replace 19,000 assets and deliver an increase in current performance, to meet a 95% target set by National Highways.
- Climate change is not considered in any detail, albeit that the impact of climate change on these assets is small. Expectations in asset class strategy to reduce carbon emissions are not addressed.
- Risks relate to the practicality of undertaking such a major renewal programme in 5 years due to capacity constraints both in National Highways and the supply chain, as well as the uncertainty in some of the assumptions included within modelling.
- **The ORR should consider excluding some or all of the additional spend for this area, subject to improved detail on how it will improve performance and address its long-term vision for this asset class.**

The Roadside Technology asset class contributes to the safety and reliability of the Strategic Road Network through three primary functions:

- **Monitoring** the network to detect incidents that could impact safety or journey times.
- **Informing** road users with information necessary to make safe decisions whilst using the Strategic Road Network.
- **Directing** the flow of traffic on the Strategic Road Network.

The primary sub asset groups within the scope of this review are outlined in Table 6.9.

Table 6.9: Scope of the Roadside Technology asset class

Assets in scope	Assets out of scope
<ul style="list-style-type: none"> • Message Signs • Signals • CCTV • Telephones • Traffic Signals • National Traffic Information Services • Detection • Weather Information Services 	<ul style="list-style-type: none"> • Gatso cameras • Enforcement ANPR cameras • Magnetometers • MIDAS loops

Source: National Highways dSBP

6.5.1. Overall expenditure and approach

The planned total expenditure for RIS3, excluding the National Programme, is outlined in Table 6.10.

Table 6.10: National Highways post inflated, post efficient expenditure for Roadside Technology (£ million, nominal)

	Year 1	Year 2	Year 3	Year 4	Year 5	RIS3 - Total
Renewals programme	119	120	121	122	124	606
National Programme	56	57	60	63	65	300
Total	175	177	181	185	189	906

Source: National Highways dSBP

Planned expenditure represents a scenario of 92.5% technology equipment availability. In line with a DfT direction for National Highways to improve availability, National Highways developed a preferred modelling scenario that forecast 98% availability (presumably to improve over the 95% levels currently achieved by the higher performing asset sub-classes). National Highways has since further analysed these modelling scenarios and found the availability reported for technology (and forecast by the models) is overestimated by approximately 2.5%. However, in the dSBP National Highways have stated that its preferred scenario is undeliverable due to funding constraints.

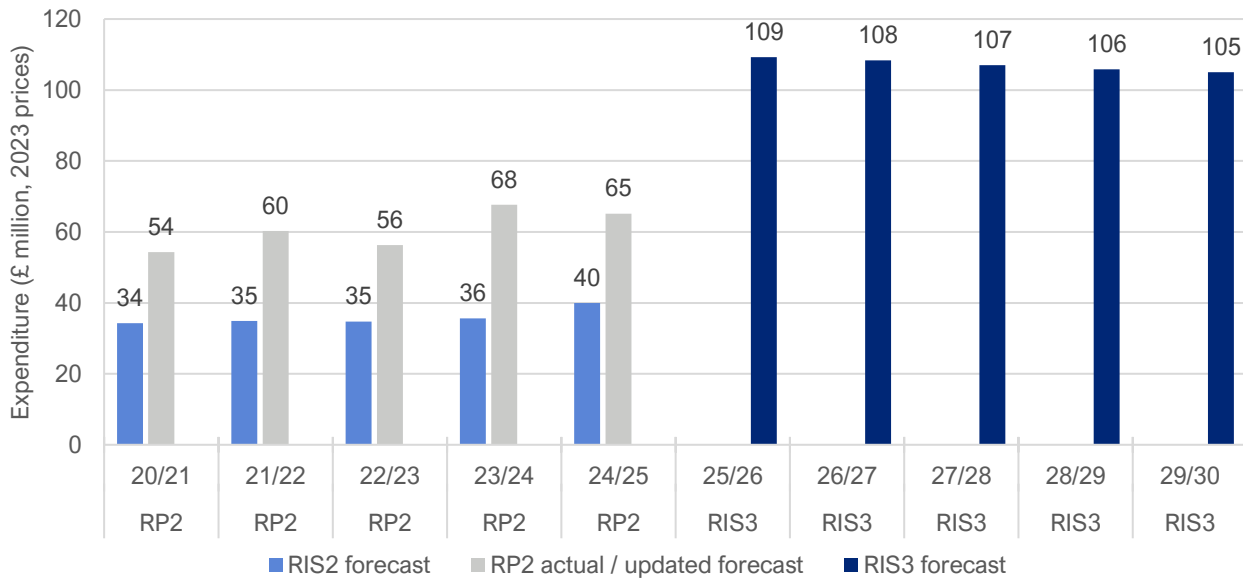
National Highways' planned expenditure of £906M in the dSBP therefore involves the replacement of 14,400 assets and forecasts technology availability at 92.5% (or 95% if the 2.5% overstatement of availability in the initial modelling is excluded).

Since delivery of the dSBP, National Highways has further developed its model, prioritising asset renewals based on asset age, road type and asset type. This new modelling suggests that the £906m expenditure over RP3, would replace ~19,000 assets and deliver overall availability of ~95% over RP3. This is consistent with the levels of availability achieved for higher performing asset classes in RIS2 and an improvement in the overall level of availability.

Figure 6.5 below presents National Highways' Roadside Technology RIS2 forecast expenditure, RP2 actual and forecast expenditure, and the forecast expenditure for RIS3 in a common price base (2023 prices). During RP2 National Highways was provided with ~£100m for an operational technology modernisation programme, which is

included within the ‘RP2 actual / updated forecast’ series in the diagram below⁴³. Even when this operational technology modernisation programme is included, forecast RIS3 expenditure represents a significant increase from RP2, with expenditure over RIS3 forecast excluding the £300m National Programme, being 76% greater than the updated RP2 forecast.

Figure 6.5: Roadside Technology expenditure (excluding National Programme) by year during RP2 and RIS3 (£ million, 2023 prices)



Source: CEPA analysis of RFI 005 - Updated B.3 Financial Model & dSBP Final issued to ORR 240207

National Highways point out that the proposed step change in investment is strongly influenced by the expected situation with regard to roadside technology assets at the start of RIS3. The limitations on RP2 funding have prevented renewals being undertaken at the required rate. As a result ~10,000 assets will have already reached end of life or become ‘obsolete’, despite the £105m modernisation and refresh programme. A further 9,100 assets are expected to become obsolete in RIS3. The original dSBP programme of 14,400 assets would not have kept up with this rate of failure. However, the revised model submitted since the delivery of the dSBP suggests that this rate would be met, which is reflected by a predicted ability to deliver its performance target (95%). National Highways particularly emphasise the influence of the programme on the ability to maintain minimum levels of service on Smart motorways, due to the interdependence of different technology assets, and the need to maintain them “as one service”. However, it is noted that ~50% of technology is active on smart motorways, and it is unclear whether National Highways have considered wider options (models) that address the essential requirements on smart motorways but consider alternatives on other areas of the network.

We have assigned a RAG rating of **red** for overall expenditure on its roadside technology renewal plans. National Highways has proposed an extremely large increase in renewals expenditure in this area. This is primarily based on modelling of the renewals required to achieve certain levels of reliability. While we recognise that the age of the assets likely warrants some increase in expenditure and acknowledge that some of the assets are safety critical, it does not seem credible that replacing half 40% of the asset base, which will include a large number of assets that are not directly safety critical, is the most appropriate response to aging assets.

⁴³ This £100m is spread throughout RP2 in this diagram, though we understand that it was/will be spent in the final two years of RP2

6.5.2. Renewals volumes

Alignment of renewals plans with Asset Management Policies and Strategies:

The roadside technology renewals plan aligns with Asset Class Strategy's (ACS's) approach to maximise performance and availability to maintain the level of service to customers. The modelling approach taken in the plan reflects the ACS objectives of the roadside technology strategy to identify and replace end of life assets using a process that takes into account least whole life costs. The decisions in the plan build on information such as asset inventory and performance. The proposal for a single renewals programme with a combined budget (the national programme) is consistent with the ACS to develop a nationally consistent approach to roadside technology. The ASC proposes the development of a decision support tool to improve decision making. The strategy states that such as tool has been developed and will influence decision making across RIS3. The plan does not fully consider the carbon reduction actions proposed in the ACS, especially regarding the provision of any detailed proposals for identifying or implementing solutions that might enable the continuation of existing levels of service, with lower carbon (e.g. rationalisation of technologies).

National Highways has a long-term vision to eliminate implementation of roadside technology by 2035. The large-scale renewal of assets seems inconsistent with this vision. However, National Highways does not consider that current technologies are sufficiently progressed to enable a paradigm shift at this time. Given estimated average lifetimes of 12 years, technology implemented now will be reaching the end of its life by the mid 2030s. It would seem appropriate to consider this future vision, where practical, during asset replacement programmes in RIS3.

We have assigned a RAG rating of **red** for alignment with asset management documents for its roadside technology renewal plans, primarily because the large-scale replacement of a large proportion of assets in the years to 2030 is inconsistent with long-term aims for the asset class.

Modelling:

An in-depth modelling programme has been undertaken, initially using a third party provider, but National Highways have undertaken work to bring this modelling capability in-house. The model has been applied to estimate the impact of different funding scenarios on the achievement of indicators such as condition and safety. The model includes a wide range of costs in addition to the technology itself (e.g. traffic management). Nine scenarios are identified and modelled. The model applies a combination of bottom up and top-down approaches, as it models the assets that will need renewal - and budget required to undertake these renewals - to achieve certain levels of network wide performance (asset availability).

National Highways have noted that, in contrast to other physical assets, which degrade over time and can still be used even at end of life (enabling a delay in their renewal while accepting reduced performance) technology assets typically function correctly or are defective. National Highways cannot 'sweat' these assets. A major part of the management of roadside technology is therefore periodic replacement/renewal of groups of assets, determined either by age or when a significant number of those assets start to exhibit faults. This differs from assets such as pavement where there is an inspection regime to track condition, ongoing maintenance and then periodic renewal. The assumption made in the modelling, which is based in National Highways statistical analyses, is therefore that roadside technology assets will develop increasing numbers of faults over time, leading to a need for replacement, and to model this fault rate for different sub-asset classes.

The fault numbers are then used to estimate the availability (i.e. the proportion of assets that do not have a fault) for each asset sub-class, drawing on the known distribution of ages. There is a factor built in to address obsolescence so that renewals, rather than repairs, will be recommended by the model. The approach seems to be logical. The model is further discussed below under Linkage between Ops, Maintenance, Renewals and Performance.

The data sources include an estimate of the age at which each asset sub-class becomes obsolete⁴⁴, the rate at which fault rates increase by age for each asset sub-class and the age and numbers of each asset sub-class. This is an appropriate set of data as would be required by such a model. National Highways provided RAG ratings for its modelling inputs, which is summarised in Table 6.11 below.

Table 6.11: National Highways confidence ratings for its Roadside Technology modelling inputs

Category	Confidence level	National Highways rationale for confidence level
Asset inventory	High	Developed from data in T-TOC. Figures were compared with Cycle 3 TPMS numbers and changes were reasonable. Review has taken place with five regional teams with high confidence in the data.
Unit costs	High	Unit costs provided by Commercial and Procurement team. Costs were reviewed with five regional teams which demonstrated they were similar to their expectations.
Repair costs	High	Repair costs have been developed based upon contract figures provided by Commercial and Procurement. A 'blended' repair cost to take into account the frequency of different types of incident were then developed for each asset type.
Fault rates	Medium	Fault rates were developed using TPMS data in Cycle 3 and were approved by the virtual team. Fault rates work has not been validated using T-TOC data; this decision was made in light of the funding available, work required and trade-offs with other activities needed.
Availability impact	Medium	Faults were linked to availability in the process noted in this answer. Availability figures were reviewed and adjustments made to targets as detailed in section 1.1.9 of the dSBP, however these are an adjustment made outside the model rather than a change in model parameters. Additional modelling was not possible due to budget and timing limitations.
Obsolescence	Medium	Obsolescence ages were developed with the Roadside Technology virtual team but are not official policies but based upon the knowledge and experience of VT members. The assumption that obsolete assets have a 365-day downtime when they fault is a modelling assumption to trigger renewals and is not based on a measured downtime duration.
Greenhouse gas emissions	High	Calculations of greenhouse gas emissions associated with renewals activity have been developed based upon figures from the National Highways Carbon Tool used across the organisation and take into account factors including the materials used in manufacture and the method and distance of transportation.

Source: RFI 023

National Highways developed annualised fault rates using fault data on roadside technology assets and this was combined with asset ages in the model to estimate a volume of faults per year for each asset class.⁴⁵ As outlined above in Table 6.11, National Highways does not have full confidence in these fault rates as they were not validated using T-TOC data. National Highways has not conducted specific sensitivity analysis to how fault rates impact each scenario. The budget estimates for the scenarios do not suggest lower/upper ranges, although the prices do state that they exclude risk. The risks, issues and opportunities (dSBP, table 7.4) does raise the "lack of understanding with regards to asset needs" as a risk for Traffic Signals.

⁴⁴ This is a point in time where either it is uneconomic to continue to repair or when spares simply are no longer available or are unsupported

⁴⁵ RFI 023

The process employed by the model appears reasonable. However, the outputs of the model – in particular the quantum of forecast expenditure compared to RP2 – depend on both established data and on assumptions/extrapolations (e.g. regarding fault rates as noted above) that are not clearly explained. This could affect the conclusions regarding the size of budget. In our view the modelling approach appears insufficiently mature and stable to be used to justify roundly £600m of additional expenditure without further evidence of its robustness.

We have assigned a RAG rating of **amber** for appropriate use of modelling and data for its roadside technology renewal plans. While the modelling approach is appropriate, the outputs are reliant on the quality of the input data and assumptions. In some key areas these assumptions would have a material impact on the forecast budget requirement.

Climate change:

Table 4.1 of the roadside technologies renewals recognises the link between technology renewals work and carbon, and section 8.4 notes the carbon embedded in the technology itself and, its consumption of energy for operation. However, there are few clear proposals on how to address (reduce) the carbon impact. The programme assumes new systems will consume the same energy as existing equipment and suggests key carbon reduction will be achieved by scheduling maintenance/repair at the same time as other works are taking place. This does not seem to reflect priority action 6 of the roadside technology asset class strategy which suggests that actions will be taken to deploy renewable energy, reduce embedded carbon and rationalise the approach to reduce the need for this technology. The roadside technology workshop suggested that National Highways now consider this reduction in the need for tech to be a RIS4 aim.

We have assigned a RAG rating of **amber** for addressing climate change within its roadside technology renewal plans. While there is little that addresses long-term resilience to climate changes, we would expect this to have minimal impact on this asset class.

6.5.3. Approach to estimating costs

National Highways' approach calculates volumes of repairs and renewals based on its model and then applies unit rates for these to calculate its total renewals expenditure. As noted in Table 6.11, these unit costs are based on costs provided by Commercial and Procurement, with further assurance by regional team. This approach is appropriate and we have no reason to doubt the unit costs as presented.

In our view the main uncertainty for this asset class relates to the volume of renewals required rather than the unit costs.

We have assigned a RAG rating of **red** for cost estimation within its roadside technology renewal plans. As noted in our commentary on modelling and overall costs, we do not believe that the modelling of costs is sufficiently mature and robust to justify the estimate of expenditure within the dSBP.

6.5.4. Linkage between Ops, Maintenance, Renewals and Performance

As noted above to estimate the costs for roadside technology, the modelling attempts to directly link cost to performance. The approach selects "availability" as the KPI for roadside technology performance. Note:

- The plan states that DfT have set a desirable aim of achieving 98%
- The plan states that the currently the level is around 95%, hence the DfT target is an improvement on current performance.
- There is discussion in the plan regarding errors in the calculation of the KPI that reduce the calculated KPI by ~2.5%.
- This would reduce the above figures to 95.5% (DfT target) and 92.5% (continue to deliver at current level)

The figures provided for current levels of performance suggest that, when considered by sub-asset class, only message signs, telephones and weather information systems miss this target. All sub-classes miss the enhanced

“target” of 98% that National Highways propose as an improvement to meet DfT goals. Achieving the 98% (95.5%) goal would require significant improvements to the technology asset base over the period of RIS3. In the roadside technology workshop National Highways clarified that it interprets the key requirement to be to “maintain current performance levels” for roadside technology assets – i.e. 95% (92.5%) availability.

As noted above (renewals volumes), the analysis calculates the availability based on fault rate (a function age and time to fix) and because the planned expenditure is based on the amount of assets that are repaired or replaced the analysis does clearly link expenditure to the PI. This linkage will be influenced by the confidence in the data. As discussed above (Renewals volumes), this is not discussed in the plan in terms of its influence (quantitatively) on the analysis and modelling outcomes.

The relationship between expenditure and impact on the PI is explored using nine scenarios. The scenarios selected seem appropriate (including do nothing, do minimum, various least cost approaches and a fixed asset life assessment). We have not seen the model so have assumed that the mechanics of the calculations within the model are appropriate, including the approach to determine “least cost”. However, there is no benchmarking presented for the model to provide assurance that it is operating as anticipated: for example, a backcast of the RP2 expenditure and performance (i.e. does the model predict similar performance in terms of the PI when provided with a similar budget and asset profile as experienced in RIS2?) or forecast with RP2 levels of expenditure (i.e. What would be the impact of rolling forward historical levels of expenditure and if output performance differs, why is this – for example because of the further ageing of assets?). National Highways have stated that not all of the scenarios modelled were included in the dSBP.

The direct relationship between the scenario costs and resulting KPI values is only presented for the selected scenario (S6B “least cost incremental improvements to achieve 95% KPI”). This would provide improvement over RIS2. Comparisons between the impact of maintaining the current level of performance, and the proposed improvements in performance are not discussed in detail. There is a brief discussion of the impact of constraining the budget in 8.1.3, but this is principally focussed on operational, rather than road user issues. In the note that National Highways provided following the dSBP, it has emphasised the relationship between availability and safety of road users.

Overall, while the approach and its links to performance appear appropriate, it is highly dependent on the underlying assumptions, which as noted earlier have some uncertainties.

We have assigned a RAG rating of **amber** for linkages between renewals and performance within its roadside technology renewal plans. Clear linkages to performance under the PI are made. However, we do not believe that the underlying assumptions are sufficiently certain for the outputs to be relied upon at present.

6.5.5. Risks to delivery

The plan identifies a preferred scenario, which will deliver enhancements (S4A), but this is identified as unachievable due to the budget constraints therefore a different scenario is selected (S6B) which has a lower budget. The scenario in the dSBP will replace 14,400 assets (about 40% of the asset base). The more recent update provided by National Highways suggests that this may increase to 19,000 assets (over half the asset base) using the same budget. The dSBP plan does not present detail on phases with respect to the number of assets that would be renewed each year. The financial breakdown suggests that the spend is quite even over the RIS period, which presumably suggests that the phasing is even.

The practicality of undertaking such a large-scale replacement programme, in terms of in-house capacity and supply chain capacity, is the main risk to delivery of the proposed renewals. These are not discussed in any detail.

The proposed outcomes of implementing the selected scenario (S6B) suggest that the availability indicator will be even across the period, at ~95% (92.5%) for all sub-class assets. Given the current poor availability for some of the sub-class assets, we would expect that there might need to be a more intense programme for these assets in the early period, which is not reflected in the resourcing profile.

The national programme removes the component of “regionalisation” from the budget allocation, instead identifying where there is most need for investment/renewals and undertaking them there. However, there is risk that the use

of a central model identifies that large amounts of work are needed in a specific region, and there are not enough resources to achieve this. National Highways recognised this as a risk when raised in the workshops and understand that this may lead to a need to refine some of the programme.

We have assigned a RAG rating of **red** for the risks to delivery of its roadside technology renewal plans. This is due to the scale of the proposed renewals, which suggest that 40-50% of assets will be renewed in RIS3. This would be a massive increase from historical levels of renewals, and it is not clear that such a step-up is practical in terms of either in-house or supply chain capacity.

6.6. DIGITAL ASPECTS OF DSBP

Main findings: digital aspects of dSBP

- In total, National Highways has proposed expenditure of £1,504m in RIS3. In real terms this is about 14% higher than in RP2.
- Fundamentally, the plan for digital services is based on an extrapolation of existing costs from FY23/24.
- Many of the main areas of expenditure (for example, £275m on corporate IT, £134m on Asset Management operational services) are roll-forward existing contracts or service costs for "BAU" services.
- There are some specific allocations (for example £17m for spatial data, £48m for connected services) for developing services.
- While the plan extrapolates expenditure, there is no clear evidence of any efficiencies that can be delivered or benchmarking of the expenditure to demonstrate that it is in line with expectations.
- Digital and operational tech have indirect influence on other KPIs, and these are discussed in the plan. It is clear that many of these KPIs rely on the data facilitated by corporate tech. The operations tech strategy states a number of ambitions for National Highways for 2030, in relation to achieving improved safety, carbon reduction, connected services, implementation times for technology etc. It is unclear how the BAU approach would address these.
- Key risks associated with the plan are linked to assumptions about continuity of costs from RIS2 to RIS3 in an unpredictable business/financial environment. With many technology components bought in from outside the UK, there is a risk of volatility in prices that could affect these assumptions. Likewise the costs and availability of specialist staff resources in this sector introduce cost risks.
- **Given the large expenditure in this area, the ORR might consider benchmarking of some aspects of this expenditure.**

The digital services function captures a range of systems that enable National Highways to function. The two main categories within the Digital Services programme are:

- **Corporate Technology** encompasses the digital, data and technology services needed for communication, collaboration and information sharing. This includes device provision, Microsoft 365 products, cyber security, and data services.
- **Operational Technology Communications & Systems** involves the running the data, digital and technology services to support the operation of the Strategic Road Network.

These categories are further subdivided in the dSBP into service lines, which are five broad categories of expenditure with a different purposes. These are:

Digitally Capable Organisation (£631m): This provides corporate services (IT equipment), the capability to manage and exploit data and security services.

Mature Asset Lifecycle Ownership (£189m): This provides asset management systems and works management systems, design and engineering services to support technical specifications for roadside products and the collection and improvement of spatial data.

Integrated & Flexible Capital Delivery (£34m): Licenses for delivery of capital schemes.

Proactive Control of Our Network (optech, £637m): This supports the transition to new telecoms services such as the Emergency Services Network (from Airwaves), support to the National Roads Telecommunication Services (NRTS) and transition to a new NRTS contract, as well as supporting Regional operation centres, connected services for customers (e.g. on works, diversions) and speed enforcement.

Environment & Sustainability Deeply Embedded in What We Do (£0.5m): Overall statement that there will be a plan to enable carbon reductions.

6.6.1. Overall expenditure and approach

The planned total expenditure for RIS3 is outlined in Table 6.12.

Table 6.12: National Highways post inflated, post efficient expenditure for Digital services (£m)

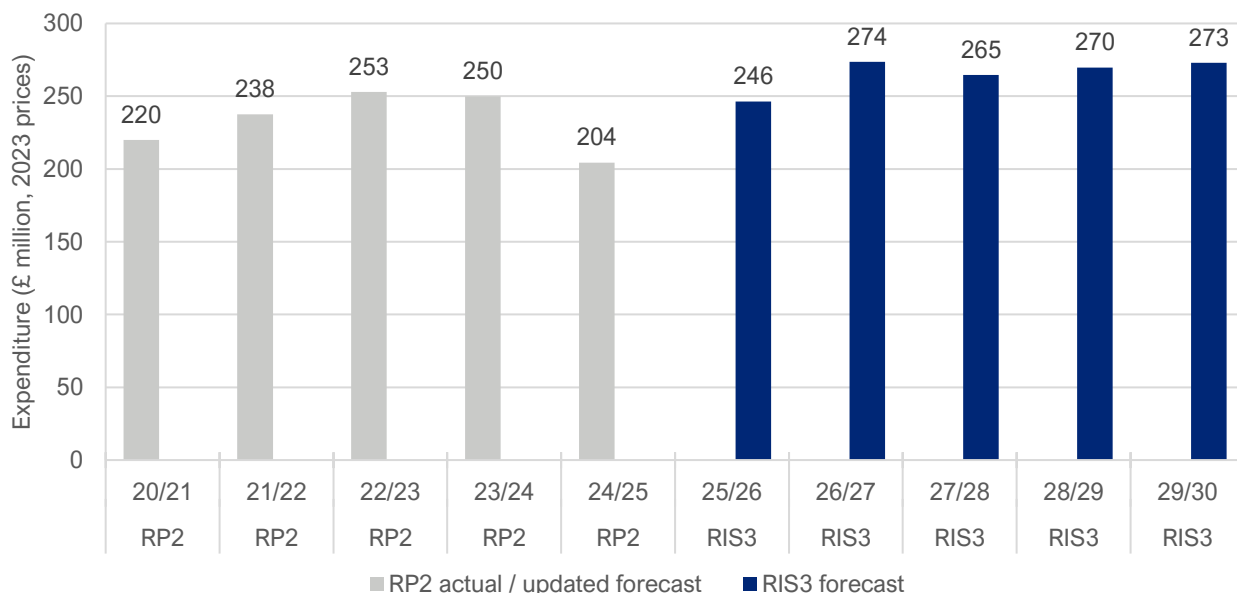
	Year 1	Year 2	Year 3	Year 4	Year 5	RIS3 - Total
Total	239.8	273.8	269.0	279.9	288.9	1,351.3

Source: National Highways dSBP

Planned expenditure aims to meet legislative requirements and maintain the digital capabilities and services National Highways delivered in RIS2. National Highways states that, in light of the constrained indicative funding available, the planned programme will be unable to investment at the level required to fundamentally modernise its digital services in line with the Digital Roads Strategy and Connecting the Country’s long-term strategy to 2050.

Figure 6.6 illustrates the profile of real expenditure on digital technology in RP2 and RIS3. The RIS3 forecast represents a 14% increase in real terms from what was forecast across RP2.

Figure 6.6: Digital Services expenditure by year during RP2 and RIS3 (£ million, 2023 prices)



Source: CEPA analysis of RFI 005 - Updated B.3 Financial Model & dSBP Final issued to ORR 240207

The strategy relates to the delivery, management and maintenance of corporate technology and operational technology. This includes central IT, business and data services and telecoms to assets located on the network, but not the assets themselves – these are the subject of roadside technology – a separate class/plan.

We have assigned a RAG rating of **amber** for overall expenditure on digital asset renewals. The approach applied to estimate costs in this area appears appropriate and the scale of tasks undertaken aligns with longer term strategies. The approach used to forecast expenditure relies heavily on RP2 expenditure, and implicitly assumes that this level of expenditure is efficient. There is limited evidence, such as benchmarking of expenditure in business-as-usual areas, to support this assumption.

6.6.2. Renewals volumes

Alignment of renewals plans with Asset Management Policies and Strategies:

Key strategies published by National Highways within the broad area of digital include its strategies for digital roads, operational technology and, in particular, the digital, data and technology strategy. The plan itself does not discuss the relationship in any detail, but National Highways has stated elsewhere that the plan and the strategy are aligned.

In terms of the alignment of the main service lines with these strategies:

Digitally Capable Organisation: Much of the expenditure is to support the ongoing provision of corporate services. However, there is around £97m (of which 73% is capex and 27% is opex) associated with managing and exploiting data to support National Highways in understanding data needs of customers and collating data to make it accessible and robust. This will include investment in standardisation, quality, consistency and reliability and cloud storage for data as a service. The customer section of the dSBP emphasises the importance of information/data to customers and highlights areas where satisfaction surveys have showed the need for improvement in this area. Both of National Highways' data and digital roads strategies focus on the importance of this. The plan does not state whether there are links between this data investment and any specific (new) RIS3 services or tools that the capex might deliver that could address customer priorities. National Highways has clarified that this data investment is focused on the management of data, ensuring it is fit for purpose (to make decisions inside the business to support all KPIs), and not "external data". However, the proactive control of the network service line does consider this use of data to some extent.

Also within this service line is National Highways' approach to cybersecurity, which focuses on a risk-based approach to cybersecurity – protecting services nominated as critical only. The plan will provide support to meet the requirements of the Network and Information Systems Regulations 2018 (NIS Regulations that aim to address the threats posed to network and information systems) for systems that are able to achieve this.

Mature Asset Lifecycle Ownership: This provides asset management systems and works management systems, design and engineering services to support technical specifications for roadside products and the collection and improvement of spatial data.

Integrated & Flexible Capital Delivery: The Digital Roads vision for digital design and construction has strategic themes of digitally enabled design, modular and standardised approaches and automated construction. The digitally enabled design would be supported by software tools to support digitised standards, the Rapid Engineering Model and digital twins. These will deliver more efficient, higher quality and more environmentally friendly construction. It is not clear where these are supported in the plan.

Proactive Control of Our Network: This service line includes support for regional operation centres, required to support continuity of service. This does broadly reflect the underlying vision of this Digital plan, which is to ensure a minimal viable service, legislative compliance and maintain critical services.

The service line also includes support for connected services. RIS2 is developing a set of services to provide additional information to customers on works, diversions etc, that will be operational for RIS3. The RIS3 funding will support implementation and communication of the outputs of these tools to customers, perhaps including improvements to real time delivery (i.e. over cellular) in poorly equipped (for cellular) locations. The National Highways operational technology strategy has a vision to provide such real time information to customers by 2030, with a vision to expand the range of information. The plan does not confirm whether the RIS3 funding will provide any expansion beyond that already "visible" at the end of RIS2. However, National Highways has provided further clarification that the RIS3 funding will support them in increasing the quality and volume of data provided into navigation systems, in connecting with in-car systems. This will help in the preparation for the forthcoming Autonomous Vehicles bill. We note that the RFI breakdown provided includes "Build of C-ITS data feeds to interface with car management systems and support autonomous vehicles". In addition, funds for speed enforcement align with the operational technology objective to continue to enhance the speed of response to incidents on the strategic road network.

Environment & Sustainability Deeply Embedded in What We Do: We note that the Op tech strategy has an ambition to "Reduce the carbon impact of operating our operational technology by 15%" by 2030. Although no clear link to deliver this strategy is included in the dSBP, National Highways has provided some further clarification of its' approach in this area. It proposes to progressively make changes to the operational technology specifications to achieve carbon reduction, and National Highways has begun consultation with the supply chain to achieve this (including more energy efficiency and resilience to changing and more unpredictable climatic conditions). Re-

tendering of digital services will also incorporate lower carbon options. However, it may be beneficial to have a clearer view on the overall strategy and links across the business in this area.

We have assigned a RAG rating of **amber** for alignment with asset management documentation for digital asset renewals. The service lines that National Highways is proposing all support, to a lesser or greater extent, relevant strategies within the business. National Highways' dSBP could benefit from more explicit and time-based targets that would allow its progress toward delivering its strategies to be better understood and monitored.

Modelling:

Little in the way of modelling of volumes is provided, given that much of the forecast RIS3 budget is based on an extrapolation of RP2 costs.

We have assigned a RAG rating of **amber** for appropriate modelling for digital asset renewals. The overall approach is appropriate, given the range of services that are included. We would expect to see clearer work breakdowns and analysis of tasks required for new services.

Climate change:

There is little evidence of the impact of climate change on the plan. Many of the services costs are based on continuity from RIS2 including installation of some services on the network, and (presumably) the comms systems. There is no analysis of any potential impact of climate change on assets. For example:

- Will changes in climate affect the need to maintain these systems (e.g. are comms. systems vulnerable to weather for both above and below ground assets)? Subsequent to the dSBP, National Highways has provided clarification that resilience will be built into the Operational Technology (OT) specifications (as noted above), with work on this planned for 2024/5.
- What changes in technology have been considered that could reduce the need to procure or install assets (this may be considered in the OT specification review above).
- What is being done about circular approaches to renewals and maintenance? We suggest that this could be an important consideration for National Highways when reviewing its OT.

We have assigned a RAG rating of **amber** for climate change for digital asset renewals. Relative to other asset groups, we would not expect climate change to have a material impact on National Highways digital services and so the lack of focus in this area is less problematic.

6.6.3. Approach to estimating costs

The digital services plan is fundamentally based on an extrapolation of existing RIS2 costs from the 23/24 financial year. Some of the entries include estimates based on anticipated uplifts to bought in support costs or licences, and on an anticipated estimations for competitively tendered contracts. For significant costs such as the £376m Connectivity and telecoms service line the costs are based on a combination of existing service contract costs and, for the transition to ESN for the Radio network, the Home Office financial annex included in the Programme Business Case. Similarly, for the £275m corporate services and the £120m Services that control the network the costs of existing contracts are extrapolated.

The data is based on the existing costs. These are not provided in any detail other than staff costs. However, it would be appropriate to base it on this approach given that the fundamental proposal is to continue to provide either business as usual or to reduce the service in some areas.

The components of the service lines appear generally reasonable and well-aligned with requirements, and in addition to items that we would expect to see roll-forward (for example corporate services IT) there appear to be some new or developed capabilities. Examples are:

- £17m allocated to collection of and improvement to spatial data. Spatial data has become the foundation of robust asset management, enabling better linking of datasets, analysis and interpretation of asset status, and

improving the ability to share data with 3rd parties. The investment is probably very important to the management of the network; and

- £48m for connected services, as described previously.

It is difficult to judge the extent to which the costs associated with digital services are at an efficient level, since the costing of such areas is highly dependent on the tasks to which the funds are applied in different organisations. However, the approach applied appears appropriate and the scale of tasks undertaken aligns with longer term strategies.

However, the approach used to forecast expenditure relies heavily on RP2 expenditure, and implicitly assumes that this level of expenditure is efficient. There is limited evidence (e.g. benchmarking of expenditure in this area) to support this assumption, albeit that we recognise that any such evidence is always difficult to apply to an individual organisation – especially for the areas that are most specific to National Highways such as expenditure to control its network. Given the scale of expenditure in this area, the ORR might consider benchmarking of this area of expenditure.

We have assigned a RAG rating of **amber** for cost estimation for digital asset renewals. While the approach employed is appropriate it relies heavily on RP2 expenditure. There is insufficient evidence that this RP2 expenditure was at an efficient level.

6.6.4. Linkage between Ops, Maintenance, Renewals and Performance

There are no specific KPIs related to the digital component of the dSBP, except for the related KPI on availability of roadside technology, covered in a separate plan. Digital and operational technology has indirect influence on other KPIs, and these are discussed in the plan. It is clear that many of these KPIs rely on the data facilitated by corporate technology. The plan is mainly based on continuity of service. If it achieves this then the associated KPIs will still be supported.

The Op tech strategy states a number of ambitions for National Highways for 2030, in relation to achieving improved safety, carbon reduction, connected services, implementation times for technology etc. It is unclear how the business as usual approach would address these. However, National Highways has indicated that, although there is no programme for transformation, there is an approach of “maturing” the services as opportunities arise during RIS3, for example as contracts/equipment are replaced.

We have assigned a RAG rating of **amber** for linkage to performance for digital asset renewals. National Highways has not modelled performance as a result of deliver (or non-delivery) in this area and it is clear that many KPIs will be affected by corporate technology. However, it is difficult to envisage how National Highways could realistically have made an explicit link between success in this area of expenditure and delivery of KPIs elsewhere.

6.6.5. Risks to delivery

Key risks associated with the plan are linked to assumptions about continuity of costs from RP2 to RIS3 in an unpredictable business/financial environment. With many technology components bought in from outside the UK, there is a risk of volatility in prices that could affect these assumptions. Similarly, the cost and availability of specialist staff resources in this sector present a risk.

There are specific risks raised in the plan over the confidence in delivering the security requirements across all services, especially when deploying legacy systems and monitoring supplier compliance. Legacy systems will not be upgraded and would rely on actions by the “owner” of the system to reduce risk. The risk of privacy data breaches in the supply chain is mentioned due to the resource constraints on the ability to audit suppliers’ processes. A policy of zero trust will be employed to control access to systems. Whilst appears a sensible security option, there is risk that restricted access could affect the ability to share data and innovate.

We have assigned a RAG rating of **amber** for risks to delivery for digital asset renewals. While risks are apparent in the delivery of this area, they do not appear to be insurmountable.

7. BALANCE OF EXPENDITURE BETWEEN ASSET CLASSES

Main findings: balance of expenditure between asset classes

- National Highways is not proposing that it undertake all of the renewals in RIS3 that it considers would be desirable to address asset needs. In the case of the lack of preventative structures renewals and flexible pavement this will materially increase renewals requirements and costs in RIS4, potentially increasing deliverability risks.
- In contrast, National Highways has proposed large increases in expenditure for some assets, with expenditure on roadside technology being over £900m, more than three times that in RP2. While some increase may be justified, it seems likely that a large part of these additional funds could be better spent on other assets or saved.
- This decision to prioritise roadside technology appears to be driven by context around the development of the SoFA, in particular Government expectations of the reliability and availability of certain classes of roadside technology.
- While National Highways has set out the process that it has followed to balance funds between the needs of different asset classes, the position that it has reached does not appear to appropriately balance asset risks and long-term costs – albeit that any such balance is always a judgement.
- **We recommend that the ORR consider this balance of expenditure between assets further, and highlight the effect that an overall funding constraint combined with greatly increased expenditure on roadside technology reliability has on other assets.**

National Highways has developed a range of scenarios that describe the extent of renewals that it could undertake in RIS3 at different levels of expenditure for most asset areas that we have examined. For example, for flexible pavements two main scenarios were explained in the dSBP:

- Scenario 4: Least cost approach to maintain current performance; and
- Scenario Z: Financially constrained scenario with £259m removed from budget to reflect challenge from government.

National Highways has then selected one of these scenarios for each asset class to propose as part of its dSBP for RIS3, combining scenarios for each asset area to result in a plan for all assets. In some cases, this results in National Highways proposing that it undertakes less renewal of its assets than it considers would be desirable to maintain current performance and / or to minimise whole life costs.

We have examined three areas where renewals have been reduced below RP2 levels: flexible pavement, structures and VRS. National Highways has proposed that less flexible pavement is renewed in RIS3 than is required to maintain current performance, with the result that performance under the pavement KPI to 94.7% in RIS3, compared to 97.1% in the modelled Scenario 4 that maintains performance. National Highways noted that this reduction in expenditure in RIS3 would result in much higher expenditure, or an even more rapid reduction in KPI road condition, in RIS4. It also potentially increased deliverability risks in RIS4, since capacity would likely be lost in RIS3 due to low levels of renewals and so sufficient capacity for the increased RIS4 renewals might not be available.

National Highways has also proposed that no preventative renewals of structures be undertaken in RIS3, while it considers that £240m of such renewals would be necessary to minimise whole-life costs. National Highways acknowledged in its workshop that described its structures plans that this might significantly increase costs in RIS4 and beyond. Although not quantified, we concur with this view: preventative renewals can be extremely good value for money. For example, the corrosion that preventative renewals prevent can mitigate the risks of very significant expenditure on replacement or renewals of structural elements, with the cost of these renewals being perhaps ten times that of the preventative maintenance.

Total real VRS renewals expenditure in RIS3 is forecast to be 43% lower than that spent in RP2, with almost three-quarters of forecast RIS3 expenditure on do minimum interventions (DMIs, 85% of volume). It is unclear to what

extent it will minimise whole life costs. However, the decisions that have been made to increase DMIs, and avoid concrete barrier upgrades, appear pragmatic approaches to reduce costs. It is important to note that, for VRS, these compromises have been made for an asset class that is safety critical.

In contrast, National Highways has proposed large increases in expenditure for some assets. Most notably, expenditure on roadside technology is forecast to be over £900m, three times that delivered in RP2. This increase in expenditure is based on a model where key underlying assumptions, that have a material impact on the forecast budget requirement, are uncertain. Some of these assets are safety critical and their renewal is important to maintain safety levels, but it seems unlikely that all the roadside technology assets that National Highways proposes to replace contribute to a safe SRN in as clear a manner as VRS. While some increase may be justified, it seems likely that a large part of these additional funds could be better spent on other assets or saved.

National Highways has set out the process that it has followed to balance funds between the needs of different asset classes. This was an iterative process that aimed to determine the best affordable plan that considered the impact on performance, recognised the maturity of the investment cases and sought to achieve the best balance between reducing investment in the RIS3 period and deferring problems to RIS4.

National Highways also highlighted the context of the Statement of Funds Available (SoFA) and government expectations on its development of the dSBP. The decision to prioritise roadside technology appears to be driven by context around the development of the SoFA, in particular Government expectations of the reliability and availability of certain classes of roadside technology.

In our view the position that it has reached does not appear to appropriately balance asset performance, risks and long-term costs, albeit that any such balance is always a judgement based on decision-makers' perceptions of the benefits and risks of the different options available. **We recommend that the ORR consider this balance of expenditure between assets further, and highlight the effect that an overall funding constraint combined with greatly increased expenditure on roadside technology reliability has on other assets.**

8. CONCLUSIONS

8.1. RAG RATINGS

These conclusions set out the conclusions of our review of National Highways plans for RIS 3. We have summarised our findings via a Red-Amber-Green (RAG) rating of each area that we have examined, together with a brief description of the rationale for these RAG ratings and any recommendations that we have made. It is important to note that the RAG ratings that we have given for each area are necessarily a broad-brush view of a potentially complex situation, but our aim has been that the RAG rating would typically represent the following criteria:

- Red:** Area is not addressed, or is poorly justified AND is material for the asset/area in question.
- Amber:** Area is addressed in part, but there are shortcomings in the analysis or evidence provided to demonstrate deliverability or efficiency; OR
Area is not addresses or poorly justified but is not material for the area/asset in question.
- Green:** Area is sufficiently addressed AND evidence or analysis provided gives confidence in deliverability or efficiency

Section of dSBP	Overall spend	Asset Mngt	Modelling & data use	Climate change	Cost estimation	Risks to delivery	Link to perf.
Operations	Yellow	Yellow	Yellow	Yellow	Yellow	Red	Red
Maintenance	Yellow	Green	Green	Red	Yellow	Yellow	Red
Flexible Pavement	Green	Yellow	Green	Red	Yellow	Yellow	Green
Drainage	Red	Yellow	Green	Yellow	Red	Red	Yellow
Structures	Yellow	Yellow	Green	Red	Yellow	Red	Green
VRS	Green	Yellow	Yellow	Yellow	Green	Yellow	Yellow
Roadside Technology	Red	Red	Yellow	Yellow	Red	Red	Yellow
Digital	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow

Section of dSBP	Delivery of contractual requirement	Operations Planning	Maintenance Planning	Renewals Planning	Risks
DBFO	Green	Yellow	Green	Red	Yellow

Our high-level comments on the areas that we have examined are:

- National Highways is forecasting a 9% real decrease in **operations** expenditure compared with actual real expenditure in RP2. National Highways' has employed a broadly sensible process to estimate its operations expenditure, rolling-forward expenditure from RP2, identifying areas where expenditure is specific to RP2, modelling cost uplifts, and targeting cost reductions and efficiencies. However, it has not evidenced that it has effectively considered the deliverability of their plan. Most notably, it has estimated a requirement for additional staff in network management and asset management and then targeted efficiencies for these areas that eliminate the need for additional staff, without evidence of how these efficiencies will be achieved. Similarly, it has not provided any evidence of how these efficiencies will impact on the target to achieve the same level of performance in RP3 as RP2.
- National Highways has requested a 20% real increase in **maintenance** expenditure compared to real expenditure in RP2. As with the operations expenditure request, the overall process to estimate these costs is sensible at a high-level. However, National Highways does not provide sufficient detail to demonstrate that the impact on renewals is properly captured, sufficient justification of some areas of proposed efficiency or detail that would provide confidence in the deliverability and performance impacts of the plan. Each of these shortcomings could impact cost and/or performance. It is also possible that any maintenance expenditure on priority risk structures has not been removed from RP2 baseline, which would result in double-counting of these costs.
- National Highways understanding of its **flexible pavement** assets, and their renewals needs and costs, are much more developed than for other asset classes that we have examined. National Highways has proposed that renewals expenditure on this asset is reduced below that required to maintain current levels of performance, with real renewals expenditure forecast to decrease by 17% between RP2 and RIS3 and performance on the pavement KPI reducing from 97.1% to 94.7% in RIS3. Forecasts for RIS4 predict either greatly increased renewals to recover the condition of assets or a faster deterioration in asset condition. Some details of the approach that National Highways has applied to estimate unit rates appear inappropriate. Simple averages, rather than weighted averages, have been applied in one stage of the calculation of unit rates. This results in unit rates being 6% higher than alternative estimates developed by National Highways, which apply weighted averages throughout. **We recommend that National Highways' alternative unit rates should be adopted within the RIS3 plans, potentially reducing expenditure on flexible pavement by around £95m.**
- National Highways has proposed a significant increase in expenditure on renewal of its **drainage** assets, with real renewals expenditure forecast to be 59% higher than in RP2. However, there are a number of assumptions built into expenditure forecasts that are very uncertain and that may have a material impact on both expenditure and performance. These include the number of flooding hotspots addressed and the mix of interventions required to address flooding. There is therefore a significant risk that the programme is either over or under-funded. **The ORR should consider whether costs at the proposed level should be funded, or how delivery could be monitored to reduce risks of over or under-funding the renewals.**
- National Highways' renewal plans for **structures** include a 48% increase in real expenditure relative to RP2. Much of the proposed work appears in line with its asset management documentation and whole-life cost principles, but £240m for preventative maintenance has been removed from the budget due to budget challenges – this important decision is not well-justified. Overall, while the processes used to estimate expenditure seem appropriate, there is significant uncertainty in the resulting total expenditure given the uncertainty in either volumes or unit costs for many areas of structures expenditure. The primary risk to structures renewals is due to the complexity of significant structures schemes. While these schemes and costings appear appropriate, they may result in delays or extensions to schedule during RIS3 and actual work volumes/costs may differ from current estimates as the schemes develop. **The ORR should consider monitoring of significant structures renewals against project milestones and bills of quantities costings that have been developed for the projects, and consider advising the government to fund some or all of the removed £240m for preventative maintenance.**

- National Highways plans for renewals of **vehicle restraint systems** (VRS) include a 43% real decrease in expenditure relative to RP2, with around 85% of renewals volume consisting of do minimum interventions (DMIs). While this is not consistent with National Highways' asset class strategy, it appears a pragmatic approach to reduce costs. Given the large reduction in expenditure, we are uncertain whether the assumed 9% efficiency included in forecasts is deliverable.
- **Roadside technology** renewals benefit from a very large increase in renewals expenditure to £906m, including a £300m National Programme. Even excluding the National Programme in RIS3, this is a real increase of 76% compared to RP2 expenditure. This level of expenditure results in National Highways replacing around 40% of its asset base in RIS3. This forecast expenditure is based on modelling of asset ages, failure rates and obsolescence and the availability of roadside technology, but it is unclear whether it reflects the additional £100m of renewals expenditure in this area in RP2. The basis of the fault rate estimates, and the sensitivity of the model to changes in these are not explained for all technology asset types. While we recognise that the age of the assets likely warrants some increase in expenditure and acknowledge that some of the assets are safety critical, it does not seem credible that replacing 40% of the asset base is the most appropriate response to aging assets. In our view the modelling approach, while appropriate in principle, appears insufficiently mature and stable to be used to justify roughly £600m of additional expenditure. **The ORR should consider excluding some or all of the additional spend for this area, subject to improved detail on how National Highways will improve performance and deliver its long-term vision for this asset class.**
- National Highways has proposed a 14% real increase in expenditure on its **digital** assets. While there are some specific allocations for developing services, such as £17m for spatial data and £48m for connected services, the majority of expenditure is for roll-forward of existing business-as-usual services. Given the scale of expenditure in this area, and the approach to its forecast, **the ORR should consider benchmarking of some aspects of this business as usual expenditure.**
- National Highways approach to understanding the condition of **DBFO roads** to be handed back in RIS3 and the works required to bring them into alignment with the handback conditions appears robust and well-managed. However, a risk remains that retention amounts will be insufficient to address any renewals that are required but that are not complete before handback. Some high-level assumptions might suggest that this risk currently stands at around £100m, though it seems likely that this level will reduce as further inspections and examinations are undertaken and renewal works are completed by the DBFO Co's. In addition, no funds have been set aside to address any assets whose life expires after handback, but within RIS3. Some high-level assumptions might suggest that renewals totalling £30m-£50m might be required for DBFO roads handed back in RIS3. **The ORR should develop its understanding of the magnitude of these potential risks and consider to what extent they might be included within National Highways' risk provisions.**

8.2. BALANCE OF EXPENDITURE BETWEEN ASSET CLASSES, OPERATIONS, AND MAINTENANCE

- National Highways is not proposing to undertake all of the renewals in RIS3 that it considers would be desirable to address asset needs. In the case of the lack of preventative structures renewals and flexible pavement this will materially increase renewals requirements and costs in RIS4, potentially increasing deliverability risks.
- In contrast, National Highways has proposed large increases in expenditure for some assets, with expenditure on roadside technology being over £900m, more than three times that in RP2. While some increase may be justified, it seems likely that a large part of these additional funds could be better spent on other assets or saved.
- This decision to prioritise roadside technology appears to be driven by context around the development of the SoFA, in particular Government expectations of the reliability and availability of certain classes of roadside technology.
- While National Highways has set out the process that it has followed to balance funds between the needs of different asset classes, the position that it has reached does not appear to appropriately balance asset risks and long-term costs – albeit that any such balance is always a judgement.
- **We recommend that the ORR consider this balance of expenditure between assets further, and highlight the effect that an overall funding constraint combined with greatly increased expenditure on roadside technology reliability has on other assets.**

8.3. CONCLUDING REMARKS

National Highways' dSBP plans for Operations, Maintenance and Renewal of its assets are immature.

Numbers and supporting models and calculations were almost entirely lacking in the dSBP, making it difficult and time-consuming to understand and analyse approaches and expenditure. In consequence, we have primarily relied on information provided in subsequent workshops or via Requests for Information (RFIs). Overall, even with additional information provided during our review, the information provided by National Highways is far less transparent and comprehensive than our experience of plans in the regulated utilities sectors, where we would have expected to be provided with much, if not all, of the information that we requested as supporting evidence to the dSBP itself.

However, **National Highways' underlying processes have developed since RIS2** and the processes applied to estimating expenditure are more transparent for RIS3. For example, we have been able to understand the process used build-up volumes in most cases and, at workshops and in response to RFIs, we have been able to understand what underlying assumptions drive expenditures.

However, significant issues remain:

- While the processes applied to generate unit costs and volumes appear more robust than in RIS2, the supporting evidence for the assumptions that underpin the forecast expenditure and performance is often poorly justified and can drive significant increases in forecast spend. Examples are drainage and roadside technology, where significant increases in expenditure are proposed, but where the supporting models rely on assumptions that are highly uncertain.
- In most cases efficiencies are stated at high-level as a management overlay with little development of a plan for delivery.
- Climate change is often mentioned but appears to have no impact on plans or forecasts except for drainage.
- The link to performance is generally weak or poorly justified, with some exceptions such as flexible pavement.



UK

Queens House
55-56 Lincoln's Inn Fields
London WC2A 3LJ

T. **+44 (0)20 7269 0210**

E. info@cepa.co.uk

www.cepa.co.uk



Cepa-ltd



@cepaltld

Australia

Level 20, Tower 2 Darling Park
201 Sussex Street
Sydney NSW 2000

T. **+61 2 9006 1308**

E. info@cepa.net.au

www.cepa.net.au