Creativity to inspire and change the world

Assessment of Highways England's cost estimation approach for RIS2

Issued on 5 June 2019

Contents

Executive Summary

Highways England is developing its investment plans for the next Road Investment Strategy (RIS2) for Roads Period 2 (RP2) that will run from 2020 to 2025. It has prepared a Draft Strategic Business Plan (DSBP) for the Department for Transport (DfT), to support its and Government's decisions on priorities and funding for RIS2. This DSBP drew on Highways England data for its major project costs as defined in August 2018.

The Office of Rail and Road (ORR), which monitors Highways England's costs and performance, commissioned this review by Nichols of the robustness of Highways England's processes for estimating its major project costs; both historically and as proposed to be applied in RIS2. Highways England has supported this review in providing full details of its costs and processes.

Key findings from this review

Highways England has a comprehensive and effective cost estimating process and procedures in place. It also has a strong Commercial Services organisation leading on major projects cost analysis. It has developed a detailed cost database comprising a growing body of outturn project costs to improve confidence in the accuracy of its estimates and to de-risk cost estimates for new projects proposed in RIS2.

Highways England's cost estimating processes compare favourably with other major organisations. It is proposing further initiatives to support continuous improvement in its capability, to further develop its portfolio-level cost management, budgeting, reporting and controls functions.

Highways England has experienced variances in costs across its projects portfolio in recent years, yet we has not found evidence that these are caused by estimating inaccuracy. Processes and models depict good accuracy. Scope change and external impacts were the primary cause of increases. There is no evidence of a systemic increase in Highways England's costs over time, although because of the inherent cost uncertainty for projects at very early stages of development we consider that additional emphasis is

needed in the reporting and communication of early-stage estimates, and particularly that a range of likely costs should be quoted rather than single point estimates.

We have not found evidence that Highways England's project-level risk provisions are either excessive or optimistic (these compare well with other infrastructure delivery organisations); however, we consider that its stated confidence level in its ability to deliver its RP2 plans within funding assumed is optimistic, given the risks it faces in delivering its challenging major projects portfolio.

Highways England has proposed a £935m portfolio risk allowance to act as a contingency to help it to maintain delivery of the whole project portfolio should cost pressures occur due to risks transpiring throughout RP2. This is a lesson learnt directly from its experiences in Roads Period 1 (RP1) when projects had to be re-scheduled and public expectations of delivery dates adjusted to manage cost pressures in lieu of there being no portfolio risk contingency.

We consider the proposed risk allowance to be a minimum level of contingency appropriate, given the risks it has identified in delivering its major projects portfolio. This contingency may still need to be deployed alongside other mechanisms to manage emerging cost pressures throughout RP2. A larger portfolio risk allowance would inevitably increase confidence but must be weighed against the impact on Government as funder, and Highways England's acknowledgement that other 'levers' such as schedule adjustment and formal change control can also be used to manage cost pressures during RP2 as the projects portfolio is developed.

However, greater clarity is needed from Highways England on how this portfolio risk allowance will be managed and controlled in RP2, to provide assurance to the DfT in support of its justification for approving it. This clarity includes: how it will be governed; how funds will be allocated and for what works; how it will be reviewed; and what the mechanism will be for release of any un-used funds later in RP2.

Highways England has set out robust, independently sourced inflation assumptions for RIS2. As an organisation it is on-risk for inflation, so it must budget appropriately. This is a key learning from its past experiences.

Highways England will need to continue to monitor and report on the cost 'transition' impacts in the run up to the start of RP2; when ongoing project costs that are funded within RIS1 in RP1 formally change to costs funded within RIS2 for RP2. This monitoring and reporting will help Highways England and the DfT mitigate the risk of unplanned changes to project cost schedules or budgets reducing funding availability for the rest of the projects portfolio in RIS2.

There is another source of uncertainty from the proposed treatment and handling of unfunded exclusions and 'headwinds' for RP2 that could impact the affordability and deliverability of RIS2.

In addition, there is also a £3bn cost and funding gap resulting from the withdrawal of Government's private finance for two of the biggest schemes that could have a material impact on the DSBP if not resolved. For example, the Lower Thames Crossing (LTC) project is so significant in cost terms in RP2 that it may warrant being ring-fenced for estimating, portfolio risk and funding purposes within the DSBP, in order to mitigate the potential impact of cost increases to the deliverability and affordability of the wider project portfolio. However, we found good evidence of robust cost estimation and assurance for this project, typical of a more mature scheme in development terms, which is reflective of Highways England's focus on the inherently high levels of complexity and uncertainty for this mega-project.

Introduction

Background

Highways England was set up by Government in 2015. Its responsibilities include delivery of a major investment programme, as defined in the Department for Transport (DfT) Road Investment Strategy (RIS). RIS1 covers Roads Period 1 (RP1) running from April 2015 to March 2020. When published, RIS1 committed to deliver 112 major projects across Highways England Strategic Roads Network (SRN).

Highways England has been developing investment plans for the next RIS (RIS2) for Roads Period 2 (RP2) from April 2020 to March 2025. To inform RIS2, Highways England prepared a comprehensive Draft Strategic Business Plan (DSBP) for issue to the DfT and the Office of Rail and Road (ORR) in early 2019.

ORR independently monitors Highways England's plans and provides advice to the Secretary of State for Transport on whether and at what cost it is meeting the objectives of RIS1, and on the development of plans for RIS2. To support a proposed Efficiency Review of the DSBP for RIS2, ORR commissioned this review by Nichols of the robustness of Highways England's processes for estimating its major project costs.

Scope

The objective of this review is to understand and evidence how Highways England performs cost estimation, and how this process is being applied in RIS2. The review was undertaken in two phases:

Phase 1 undertaken in November 2018, covering Highways England's cost estimation processes in RIS1:

- Review Highways England's cost estimation manual, methodology, processes and procedures.
- Assess the cost estimation approach for major projects.
- Assess the accuracy of Highways England's approach over the project lifecycle.
- Assess risk allowance, assumptions and inflation.
- Compare and contrast Highways England's processes with other comparable sectors.

Phase 2 undertaken in February to April 2019, covering cost estimation processes as they were being applied to plans for RIS2:

- Assess how Highways England has applied its cost estimation methodology to major schemes proposed for RIS2, through review of a further set of sample projects.
- Identify whether, in assembling RIS2 costs, there are any notable departures from the usual process, and address the appropriateness of these.

Review methodology

The review comprised a desktop assessment of Highways England's cost estimation process, supported by workshops to address specific aspects of the review scope. Review phase 1 included an assessment of cost estimates for a sample of 11 RIS1 projects. Phase 2 of the review included an assessment of cost estimates for a sample of 12 projects that are proposed to be delivered in RIS2. These samples, which are listed in the annex to this report, comprised a cross-section of project types, sizes, complexity and lifecycle stages.

Phase 2 of the review addressed relevant parts of Highways England's DSBP, recognising that aspects of this were commercially sensitive and subject to concurrent discussion as DfT and Government further develops its strategy and Statement of Funds Available (SoFA) for RP2.

The DSBP was put together by Highways England based on its major project delivery plans and costs as baselined in August 2018, in order to underpin the formal submission made to the DfT and ORR in January 2019. It is important to note that the DSBP will be subject to ongoing assessment by Government, and indeed some projects costs will change as they continue to develop. Therefore, some aspects of this report and the costs and metrics referred to within it may differ in the final RIS2 that is expected to be published by the DfT in the latter part of 2019.

We would like to thank Highways England's teams for its cooperation and support during this review, providing over 300 existing documents, preparing additional presentations and briefings for a number of cost-focused workshops, and responding to a series of additional clarifications and requests for detailed evidence on its cost modelling and DSBP assumptions.

Structure of this report

The report first addresses phase 1 of the review, covering Highways England's cost estimation process as applied in RIS1/RP1. It then covers phase 2 of the review, assessing how Highways England's cost estimation process is being applied to plans for RIS2/RP2. We set out a summary of our key conclusions and a number of recommendations in support of ORR's proposed Efficiency Review and advice to the Secretary of State for Transport.

Highways England's cost estimation process as applied in RIS1

Cost estimation manual, methodology, processes and procedures

Highways England has a well-established process for managing and delivering its major projects. The Project Control Framework (PCF) comprises a standard project lifecycle, standard project deliverables, project control processes and governance arrangements. It covers cost estimation and provides the over-arching framework within which cost estimation methods and processes are defined and operated.

Highways England has a well-developed cost estimating methodology and document suite. This includes a cost estimation manual, cost estimation procedures, and detailed cost build-up from estimate commissioning through to approval and issue of outputs; all using a consistent templated approach.

Highways England has a specialist Commercial Services organisation responsible for cost estimating. This 67-strong division comprises Commercial Intelligence, Value Chain, Commercial Resolution, Commercial Delivery and Cost Planning and Estimating functions. The cost estimating function is responsible for preparing all project cost estimates, in collaboration with project teams and the RIS1 Sponsor and Capital Portfolio Management (CPM) division within Highways England's Major Projects Directorate (MPD).

Highways England has, throughout RP1, developed a framework of cost models and tools to use historic cost information that it now uses to underpin its major project cost estimates. This includes the following:

- A bespoke cost capture model to collate costs, and inform and continuously improve estimates. This contains a library of outturn prices from projects delivered over the last 10 years. It is used to derive estimates for current and potential future projects, with granular cost data broken down by key elements and PCF stages.

- A Cost Analysis Simulation Tool (CAST) which is based on historic scheme outturn costs that provides a benchmark for a scheme under consideration, including historic ranged norms for scope, scale, quantities and productivity levels (for example, reflecting online versus offline delivery) and risks. This is used to inform cost estimates prepared by the cost planning team.
- Strategic estimating models for early-stage schemes, notably a Smart Motorway and a Roadworks Estimator Cost model.
- An On-Screen Take-off (OST) model for more detailed and final estimates, including to read quantities off design drawings to help generate detailed bills of quantities.
- Final estimates, prepared using a negotiated target cost at the end of PCF stage 5. The information collected then provides granular cost capture data for Highways England to include in its cost models and cost database.

Internal assurance of cost estimates is undertaken. This assurance is undertaken through project managers, peer review, cost estimating manager and head of cost planning assurance checks for each estimate at each stage. This forms part of Highways England's Stage Gate Assurance Reviews (SGAR) process that governs how project develop through successive stages in accordance with its PCF Handbook.

Highways England major project costs are generally budgeted and reported on a central 'most likely' basis. Its estimates also define low and high cost ranges. Its cost planning team has confirmed that it is aiming to augment estimates with costs profiled across a range of probabilistic estimates, to help its project teams request the most appropriate level of funding to Highways England's Investment Decision Committee (IDC), not just the central estimate.

Highways England has various initiatives planned or underway to continue to improve its estimating function. Examples include:

- Migration to a new proprietary cost management system to consolidate and link cost estimating, cost reporting, time and schedule, risk management and other data.
- Alignment to Royal Institution of Chartered Surveyors (RCIS) International Construction Measurement Standards for reporting, grouping and classifying project costs. This will also help with benchmarking of costs with other industries.
- A new interim forecasting tool to track and report costs, with 'trigger' levels to help respond to issues, variances and changes.
- Enhancements to estimating process and potential new estimating software.

Cost estimation approach for major projects

Highways England produces consistent, templated cost estimation products with each prepared by its cost estimating team in collaboration with project teams for every major project and at every PCF stage. These include:

- Cost Estimate Summary Sheet (CESS) containing a detailed breakdown of costs for development, land, preliminaries, construction, Non-Recoverable VAT (NRVAT), utilities, and Highways England construction supervision.
- Range Estimating Template (RET) that derives additional inflation and portfolio risks estimates, and also a profile of low, most likely and high cost estimates.
- Estimate Release Form (Form 300) which comprises the formally checked, approved and signed-off summary of costs at the end of each PCF stage by the cost estimating team. It also contains any notable issues, assumptions or exclusions flagged to the subsequent SGAR process that is the process by which projects formally move to the next PCF stage.

A high level breakdown below of costs for all PCF stages up to construction is shown in figure 1 below[1] for the projects sampled in this review.

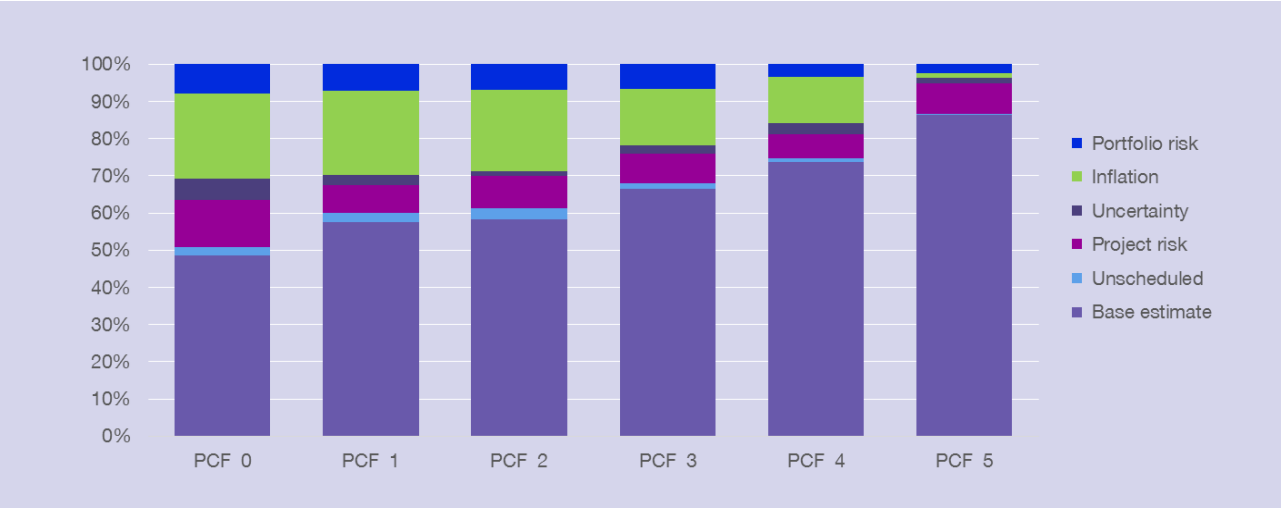

Figure 1: High level cost breakdown per PCF stage (Phase 1 and 2 sample projects)

[1] Cost % proportions are shown to enable comparison across all schemes, which are at varying levels of development and size/cost. Lower Thames Crossing not included as this project is covered separately elsewhere in this report.

There are a number of key factors that drive major project costs and also the comparability of cost estimates. These factors affect each individual project uniquely and include:

- Costs at very early stages of development are uncertain, as these have low levels of definition and often with many options under consideration, each with different estimates attached.
- Scope variation even for similar requirements, for example Smart Motorway Programme (SMP) schemes can have markedly different costs due to structures costs, and junction schemes vary significantly due to grade-separation and topography, flow characteristics and extent of affected link roads.
- Base costs include a number of items that can vary significantly. For example, the aggregate of land acquisition, NRVAT and statutory undertaker costs within the sample schemes ranged between a low of 1% and a high of 38% of total project costs.
- Inflation effects are a significant cost component. Highways England carries inflation risk so its costs are priced in nominal terms to derive an outturn estimate, so absolute costs can vary markedly depending on project delivery timescales.

Cost estimation approach over the project lifecycle

Highways England uses three main estimating approaches, in line with good practice. Each has a different emphasis over its PCF-based project lifecycle, based on increasing scope certainty and level of design detail. These are detailed in its cost estimation manual, and are illustrated in Figure 2 and 3 below.

- **First-principles, or 'bottom-up' estimating.** Detailed estimates for labour, plant and materials for each item of the works, including quantities and rates.
- **Parametric estimating.** Based on known parameters; for example, link-length, gantry spacing and lane widths. Highways England's Commercial Services Division has established a Smart Motorways Cost Model, Roadworks Estimator (for bypass and widening schemes) and a Preliminaries Cost Template.
- **Analogy estimating.** Using historical unit rate data for similar past projects, captured at an elemental or item level, often applying factored adjustments.

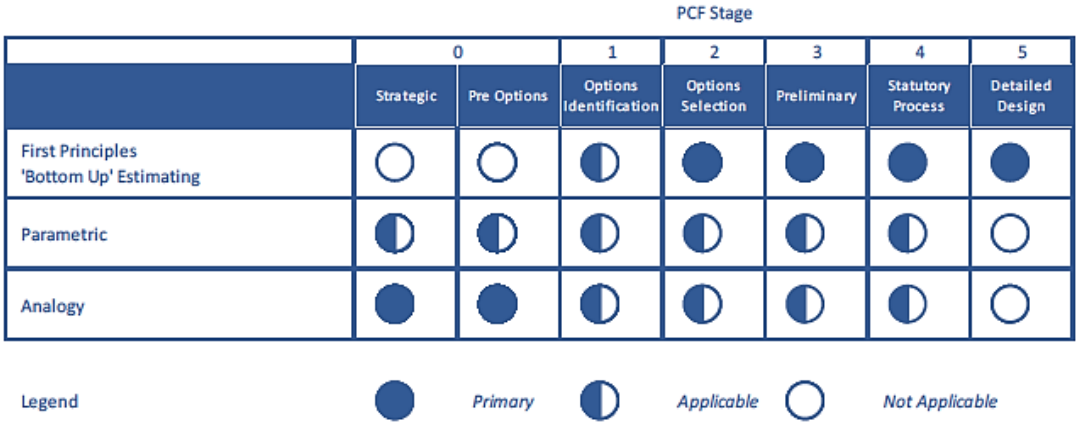

Figure 2: Highways England's application of estimating methods during lifecycle phases

		Pre-project	Options		Development			Construction	
		0 Strategy, shaping and prioritisation	1 Option identification	2 Option selection	3 Preliminary design	4 Statutory procedures and powers	5 Construction preparation	6 Construction, commissioning and handover	7 Closeout
Scope	Client scheme requirements	Produced	Reviewed	Reviewed	Reviewed	Reviewed	Reviewed	Reviewed	
	Appraisal specification report	Produced	Refined	Refined	Refined				
Cost estimating	Order of magnitude estimate	Produced							
	Options estimate		Produced	Refined					
	Developing estimate				Produced	Refined			
	Final estimate						Produced		
Risk	Risk management plan	Produced	Updated	Updated	Updated	Updated	Updated	Updated	Updated
	Risk register	Produced	Refined	Refined	Refined	Refined	Refined	Refined	Refined

Figure 3: Highways England's cost product matrix

Standard cost estimating approaches utilise data from Highways England's cost database and models. For example: early Order of Magnitude Estimates draws on strategic estimating models; the CAST model produces top-down estimates to inform option sifting; the Roadworks Estimator and Smart Motorway Estimator models derive Options Estimates; a Developing Estimate may utilise the On-Screen Take-off model; and a Final Estimate is derived from costs/rates agreed with contractors during the Price Negotiation Process at PCF stage 5.

Outturn cost information is fed back into Highways England's cost database to ensure this reflects firm, accurate prices. This process is undertaken periodically based on the availability of new outturn cost data, and ensures that the cost planning team are sighted on experience, learning and any project variances experienced during construction.

Risk, assumptions and inflation

Highways England's cost estimating methodology includes four standard components to address various aspects of risk and uncertainty. It assesses, calculates and applies these consistently to all of its major projects in line with its Cost Estimation Manual and risk management procedures. These risk provisions, which are itemised within Highways England's three standard cost estimation products, are as follows:

- **Project risk.** A 'bottom-up' assessment of risk (and opportunity) through registers and processes and procedures, including Quantified Cost Risk Analysis (QCRA) when a project is mature enough to enable this. Database benchmarks that are cross-checked with Government Optimism Bias[2] is applied in lieu of a quantified assessment for very early stage schemes.

- **Unscheduled items.** An assumption or allowance for certain aspects of work and scope, notably for projects at early stages of development, where there is lack of design information to cost these accurately within the estimate. For example, in relation to quantities for key roadworks elements.

- **Uncertainty.** Comprising assumptions and risks that cannot be easily quantified at any given PCF stage, often including statutory undertaker costs, environmental aspects, accommodation works and stakeholder requirements.

- **Portfolio risks.** Portfolio-level Quantified Risk Analysis (QRA) is used to calculate a portfolio risk allowance for risks that are more appropriately managed at that level. This ensures the risk allowances are separate from projects costs, but are included in business case appraisal.

Highways England does not include a separate provision for Optimism Bias in its major project cost estimates. In line with common practice this is subsumed within its project risk, uncertainty and portfolio risk items, which are calculated on a bottom-up basis. Optimism Bias is also subsumed within low/high range estimates, which additionally model uncertainties in scope, schedule and other risk factors. Its cost planning and estimating team monitor project risk levels and their comparability with Optimism Bias levels at each lifecycle stage (typically based on the 'standard civil engineering scheme' category).

Highways England captures and models risk benchmarks within its cost database. Its increasingly mature database is used to improve confidence in estimates and can be used to challenge risk provisions (up and down) including to mitigate the risk of recycling or compounding risk provisions in new schemes entering the major projects portfolio.

[2] HM Treasury's Green Book: Appraisal and Evaluation in Central Government.

Average risk provisions for sample projects were broadly consistent across RIS1 and proposed RIS2 projects at each stage of development. We have assessed Highways England's risk provisions for all major projects sampled in review phase 1 and phase 2. An illustration of the average proportion of risk included within project cost estimates at each PCF lifecycle stage is shown in Figure 4 below using the central 'most likely' costs and risks within range estimates.

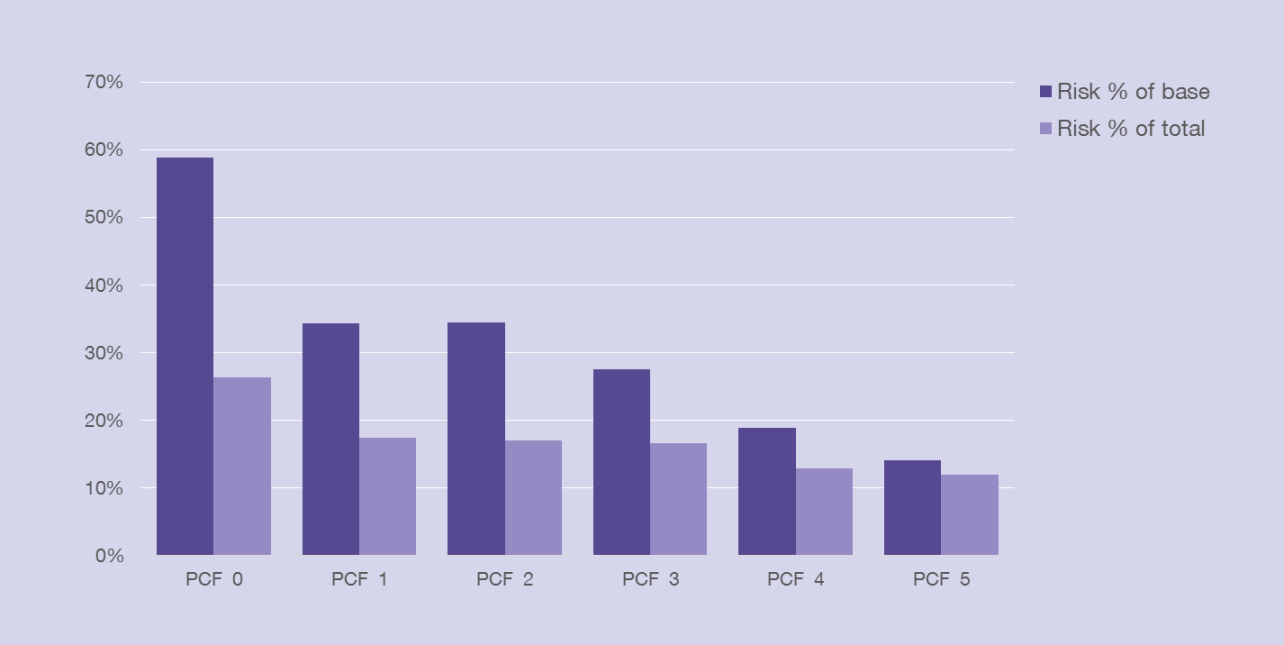

Figure 4: Risk provisions per PCF stage
('base' cost is the aggregate of all costs excluding risk and inflation; 'risk' aggregates all four risk items)

The proportion of risk within Highways England's cost estimates appears in line with good practice[3]. It also compares well with peer organisations – see figure 5. These proportions trend downward as projects develop through the PCF lifecycle, in line with increasing scope and cost certainty, with risks either mitigated or absorbed into base costs as committed activity and scope, and as contractor-owned risks. This is notable at the end of the options stage when a single option is confirmed, and particularly through PCF development stages 3 to 5 when the detailed design, statutory process and contractor negotiations are concluded. The average figures per PCF stage do, however, disguise notable differences in risk provisions within individual projects, as risk profiles can and do vary by project depending on scope, scale and complexity.

[3] Infrastructure and Projects Authority Guidance: Early financial cost estimates of infrastructure programmes and projects and the treatment of uncertainty and risk, 26 March 2015.

Highways England has experienced cost variances in its major projects portfolio during RP1. This was evident in a number of the sample projects assessed. It has a good understanding of the root causes, which are documented in its reporting, and in previous monitoring by ORR[4]. The majority of the variance was rooted in the early stage of development of the portfolio when it was commissioned at the start of RP1, as well as scope change and external factors that were not related to cost estimating accuracy. A large proportion of the total variance related to a small number of projects. Variances in some projects do not indicate a widespread insufficiency in risk provisions at project level. Nevertheless, Highways England did not have sufficient funding headroom in RP1 to deal with these variances.

Portfolio risk is an important factor in dealing with cost variances across all projects. This sits outside project costs; because portfolio risk relate to risks that operate above projects, and ensures provisions are not subsumed within project budgeting. Going into RP1, Highways England did not have a mature portfolio-level management capability, however, its CPM directorate is now fully established. This lack of maturity going into RP1 resulted in portfolio level risks not being reported and managed in such a way that they could address variances; and funding was insufficient to mitigate the combined effect of emerging variances and over-programming (planning more work than funding provided for, to anticipate for projects to be delayed or drop out).

The size, management and governance of portfolio risk provisions was identified as an issue in review phase 1. It was flagged as an area of focus for review phase 2 which is covered in the next section of this report covering the cost estimation process being applied to plans for RIS2, specifically in assessing the overall approach to and specific plans for portfolio risk in Highways England's DSBP.

Highways England has established a bespoke inflation model and calculates and applies inflation costs consistently to all major project cost estimates. The roads programme experienced significant cost variances due to inflation effects historically[5]. Reflecting this learning and the scale of inflation costs within estimates, Highways England's Cost Intelligence team is responsible for inflation monitoring, analysis and forecasting. It commissions Building Cost Information Service (BCIS) to provide current market data, typically updated every six months. This data is used as inputs to a bespoke model, with indices weighted to reflect the profile of spend across Highways England's primary resource and asset types. The resulting forecast is assured internally and agreed at Board level.

Highways England's inflation model and independent data will be used to develop estimates for RIS2, which is addressed in the next section of this report.

[4] ORR/Nichols, Review of Highways England's capital delivery plan, July 2018.
[5] NAO's Progress with the Road Investment Strategy and Nichols Review of Highways Agency's Major Roads Programme, March 2007.

Comparison with other sectors and best practice

Highways England's cost estimating processes are similar to comparator organisations, for example Network Rail's Governance for Railway Investment Projects (GRIP) and Transport for London's (TfL) Pathway lifecycle models. There are some slight differences evident in lifecycle stages, as shown in figure 5. There is good consistency in the three main types of estimates which trend towards increasingly accurate bottom-up estimates over the project lifecycle.

The amount of risk retained within Highways England's cost estimates compare well with its peers; within a reasonable degree of tolerance, including its estimating accuracy as expressed in its range estimates. Note that potential differences in how risk is treated in other organisations may affect quantitative comparisons with Highways England's four main categories of risk.

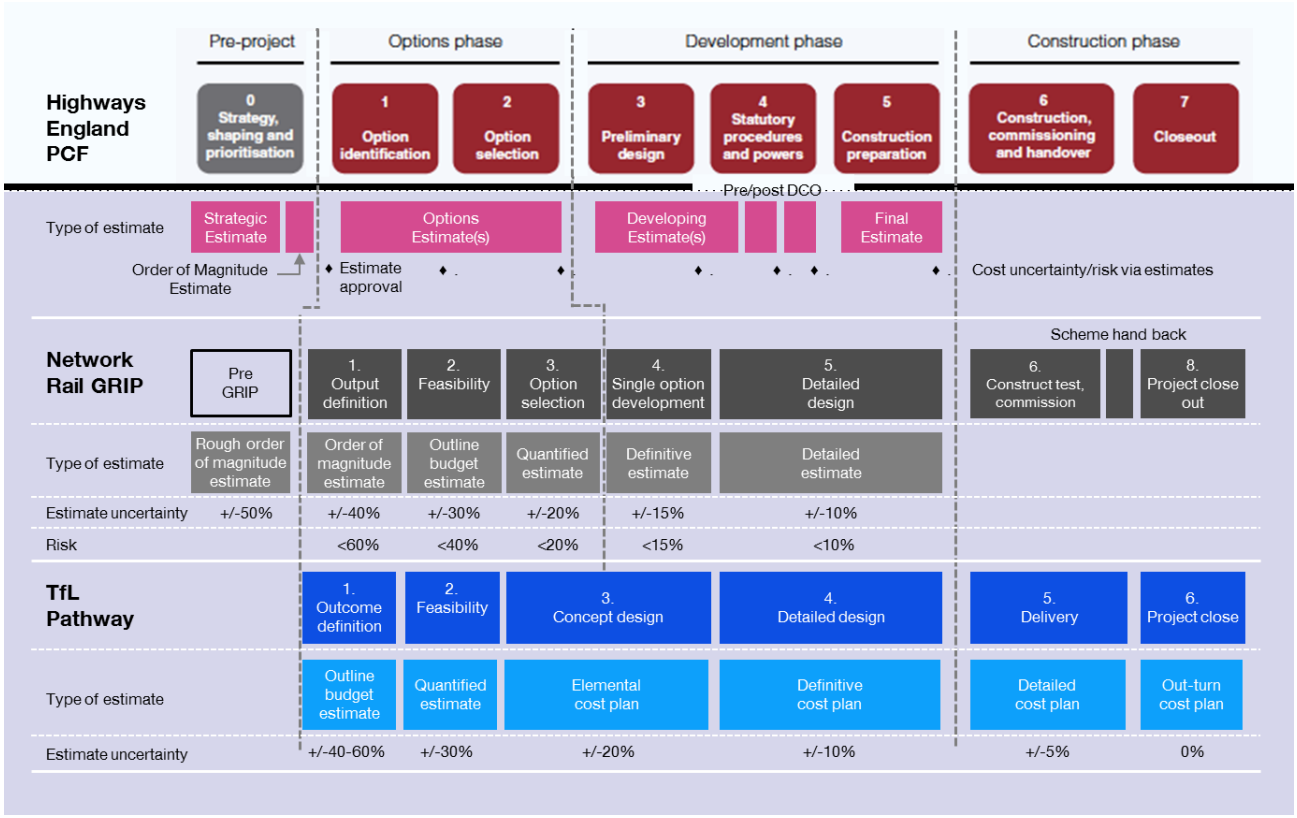

Figure 5: Comparison of between Highways England lifecycle and other organisations

Highways England's cost estimating capability has been independently assessed and compares favourably with its peer group. It is part of the Transport Infrastructure Efficiency Strategy (TIES) group that also comprises Network Rail, High Speed 2, TfL and Thames Tideway. The group's remit includes to establish a common approach to estimating and cost management and thus to work together to improve cost confidence and assurance. A TIES taskforce commissioned a Cost Planning and Estimating Capability & Maturity Assessment to be undertaken by Arcadis. This review assessed a large number of standard aspects of cost processes, systems resource and capability. It confirmed that Highways England has "the most mature and effective all-round capability in cost planning and estimating against its peers [and] is leading all its peers in the cost capture and analysis of data to support effective benchmarking".

Cost estimation process being applied to plans for RIS2

How Highways England has applied its cost estimation methodology to major schemes proposed for RIS2

Highways England's DSBP for RIS2 contains 79 major projects[6] costing £12bn in RP2. This includes 'transition' costs for previously committed projects that have been developed and delivered in RP1 that will be completed in RP2, as well as a significant package of proposed new schemes. These new schemes span its Smart Motorway Programme (SMP), Regional Investment Programme (RIP) and Complex Infrastructure Programme (CIP) programmes. The portfolio of 79 schemes does not include schemes that are planned to be completed before the end of RP1 or schemes proposed to be removed from RIS2 plans, therefore, this number may differ slightly in the final RIS2 publication.

Highways England has provided a detailed cost plan for all major projects within its DSBP. It has provided further clarification on several key points, including evidence of the reconciliation of costs for sample projects compared to its current outturn estimates and reporting of costs for its major projects. This reconciliation is illustrated in figure 6 below.

[6] At start of RP2 comprising a forecast of 41 in construction, 23 in development, 11 in options and 4 third-party schemes that are part-funded by Highways England.

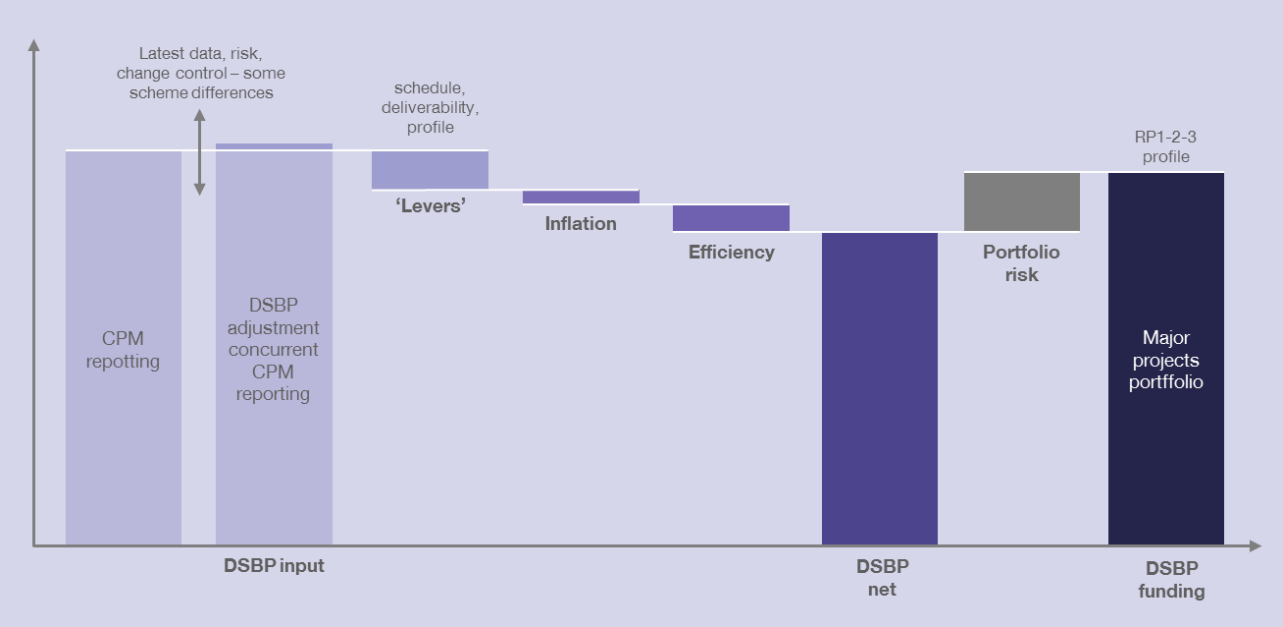

Figure 6: Reconciliation and adjustment of costs to DSBP (not to scale)

Project costs can be traced from pre-existing reporting to confirm that there are no notable or unexplained variances in the DSBP. Where there are differences evident, they relate to specific projects where adjustments are explicitly proposed by Highways England to pull 'levers' to optimise delivery timescales, manage risks or where projects are subject to change control with the DfT. Other top-down adjustments are for inflation, efficiency and risk. In all cases, costs were profiled per year to confirm outturn cost estimate as well as the breakdown of this is RP1, RP2 and RP3 (the latter running from 2025 to 2030).

Highways England is not making changes to its cost estimating methodology for RIS2. It is using the same core processes and products as deployed throughout RP1, as described previously. This was evidenced in a review of a sample of 12 RIS2 projects. This consistency between RIS1 and RIS2 covers its estimate types, use of models, build-up of costs and approach to project-level risk. A number of top-down adjustments are proposed for inflation and efficiency that do not alter its overall methodology. These are dealt with later in this report.

The major projects portfolio is still at a relatively early stage of development maturity, resulting in inherent cost risk. While the major project portfolio will be more mature in overall development terms at the start of RP2 than it was at the start of RP1, it still contains many schemes that are in options and development stages; representing approximately two thirds of total project costs in RP2, assuming that all schemes proposed by Highways England to enter construction before the end of RP2 do indeed so. This profile is as illustrated in figure 7, derived from Highways England's DSBP. Early stage schemes have inherently higher levels of scope and cost uncertainty as they develop, therefore, the overall projects portfolio is still subject to a significant level of cost risk.

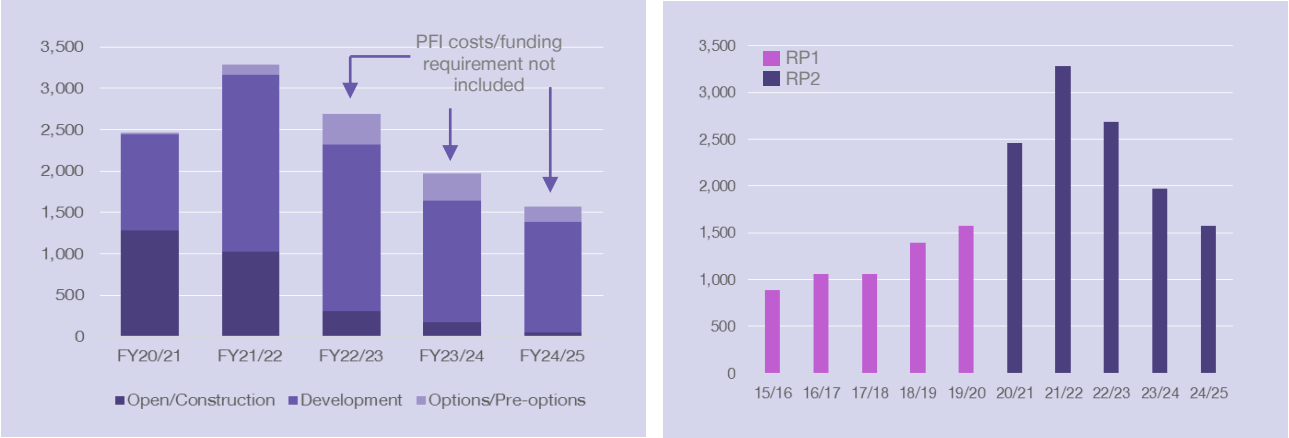

Figure 7: DSBP profile of project costs per life-cycle phase as at start of RP2 (£m nominal)

The increasing profile of spend evident in figure 7, at the start of RP2, and the deliverability implications of this, are being addressed separately in an ORR review undertaken by Cambridge Economic Policy Associates (CEPA).

The portfolio contains several extremely large projects that will have a significant impact on costs and risks in RP2. For example, just six Tier 1[7] schemes will cost £5bn in RP2 (38% of total capital funding required). These are M4 Junctions 3 to 12, A428 Black Cat to Caxton Gibbet, A12 to A20 Widening, A417 Missing Link, A303 Amesbury to Berwick Down and Lower Thames Crossing (LTC). Actual funding required for these will be significantly higher still, due to the 'gap' resulting from the withdrawal of Government's private finance scheme for the latter two projects[8]. It is noted that these schemes are profiled over time by Highways England, for delivery from the latter stages of RP1 through until late RP3.

The large number of schemes entering into construction at the end of RP1 and the start of RP2 may reduce Highways England's flexibility to manage the profile of work and spend. In RP1 it undertook an optimisation exercise to re-time projects on a route and/or programme basis to mitigate risk and disruption to road users, and also pause or cancel schemes that were determined to be poor value for money. Highways England has less flexibility to adapt and re-optimise projects that are approaching construction stage after their plans are contractualised through its supply chain.

There will be a 'transition risk' in major project costs in RIS2. With approximately one year until the start of RP2, there will inevitably be some movement in the profile of costs for projects that span RP1 and RP2, that are sensitive to Start of Work (SOW) or where changes may be contemplated. This risk is enhanced by the large number of projects planned to start construction at the end of RP1.

[7] Tier 1 schemes are subject to additional governance and approvals from Government.
[8] Government announced that it will no longer use the PF2 model of Private Finance Initiative (PFI) in October 2018.

Assumptions

Highways England has identified a number of unfunded exclusions and 'headwinds'. Highways England has been transparent in itemising these unfunded exclusions and 'headwinds' and has assessed these as a central cost impact of £1.9bn. They include: HMRC VAT risks; output risk on delivering all RIS2 DSBP commitments; changes to standards; exceptional items for selected projects; and RP1-2 transition risk. This represents a significant unfunded amount. At the time of writing this report, Highways England was in discussions with the DfT on the handling and mitigation of these exclusions and 'headwinds' within plans for and funding of RIS2.

There are a number of important assumptions highlighted by Highways England in its DSBP that are important to its project costs and risks for RIS2. These are:

1. Highways England assumes that Government will address the funding gap that results from the withdrawal of Private Finance Initiative (PFI) funding for A303 Amesbury to Berwick Down and LTC. This represents a significant 'gap' of approximately £2bn and £1bn respectively, and is therefore a material issue to DSBP delivery confidence; and one that Highways England is addressing as a priority in its discussions with Government given its scale, where the aggregate gap dwarfs the size of portfolio contingency proposed.

2. Highways England plans to make a significant investment in a long-term SMP Alliance, to be procured in 2019. Lesser funding available for SMP projects in RP2 (and indeed RP3) may weaken the rationale for this and erode the efficiency savings assumed in RP2, which are being used to fund some of the new SMP schemes proposed.

3. There is limited mentioned of Heathrow expansion, as this is a Heathrow Airports Ltd (HAL) promoted scheme that its outside Highways England's RIS2 scope, and is predicated upon a number of external factors and decisions. Depending on if and how it is delivered, it could have a major impact on Highways England as it requires significant alterations to major arteries within its SRN concurrent with planned delivery of several adjacent major projects in RP2.

Risk

Highways England proposes a £935m of portfolio risk provision within its DSBP funding requirement. The various project risks described earlier, and our findings from review phase 1, all emphasise the importance of a portfolio-level risk provision to enable Highways England to manage the risks associated with development and delivery across all of its major projects in RP2.

Highways England has applied its standard methodology to calculate portfolio risk for RP2. For early stage projects, this has been profiled over RP1 and/or RP2 in line with their schedule and cost profile. For projects at a more advanced stage of development (i.e. approaching SOW or in construction) Highways England has not added portfolio risk to its DSBP funding for RP2, recognising that these risks crystallise early in development and so fall in RP1. Highways England has evidenced this approach in its reconciliation for sample projects to confirm the alignment to its project cost estimates.

Highways England plans to go into RP2 with portfolio risks aggregated and managed as a ring-fended contingency fund. This approach is in contrast to RP1, as described previously. Analysis confirms that portfolio risk provisions are, on average, 7 to 8% of total costs including inflation for those sample schemes at options and development phases, reducing to around 2 to 3% for projects entering construction. The proposed £935m amount equates to approximately 8% of total project costs of £12bn in RP2, which correlates with this analysis, whilst making some allowance for the various DSBP risks described above. The portfolio risk calculation does, however, appear to uniform and mechanistic, so may not be bespoke to project context.

Highways England has assessed its total project funding as equivalent to a P50 confidence level[9]. It has used its 'most likely' project cost estimates (not greatly dissimilar to P50 in statistical terms) to compile its funding requirement, so a P50 result is not surprising; and has also undertaken a Quantified Cost Risk Analysis (QCRA) using the proprietary 'Monte Carlo analysis' to corroborate this. Highways England ran a bespoke QCRA across its entire business-wide DSBP post-efficient costs of £25.3bn including portfolio risk, but where only its major project costs could vary between their low (P10) and high (P90) cost ranges as per their defined range cost estimates.

We address the sufficiency of the portfolio risk provision in the conclusions section of this report.

[9] P50 represents 50% confidence that the portfolio can be delivered as planned in RP2 without additional funding.

Inflation

As in RP1, Highways England has estimated and reported project costs for RIS2 in a nominal outturn basis. Costs are estimated in a standard 'base year' (to-date this has been in 2015 prices) and then inflated by its application of Highways England's bespoke inflation model and RET. Our review of sample projects within the DSPB cost plan confirms that this is consistent with this approach.

Highways England has set out detailed inflation cost assumptions for RIS2, drawing on a range of up-to-date BCIS and other forecasts. This is equivalent to a compound average annual rate of inflation of 3.9% over the term of RP2; less than the figure of 4.3% adopted at the start of RP1, and more recently adjusted to 4.1%. Highways England has included a 0.25% per annum 'risk premium' to input forecasts within this provision, to account for inflation modelling uncertainty and forecasting robustness. The new inflation forecast has been applied in the DSBP, resulting in a small reduction to pre-existing cost estimates.

Highways England's overall inflation forecast in the DSBP lies at the mid-point of independent forecasts. These forecast, including some results published after the DSBP was issued, flag a number of short/medium-term inflationary factors, such as rising materials costs, labour costs, supply chain capacity, economic growth, exchange rate effects and construction market risk appetite. There are also deflationary factors such as Brexit, pressure on margins and weak market confidence. The result is a forecast for construction Tender Price Indices (TPI) that most closely approximate to Highways England's supply chain will continue to outstrip Retail Price Index (RPI) and Consumer Price Index (CPI) benchmarks and may be as high as 5% per annum in the short term.

This forecast results in a total inflation cost estimate for major projects of £1.2bn in RP2. Of this the 0.25% risk premium is £80m. The total inflation provision is equivalent to 10.7% of Highways England's total project costs. This impacts on each project differently because of their profiles over time, and is more significant in early-stage schemes that do not start construction until late in RP2. Part of this cost is effectively committed regardless of the rate set. This is for schemes in construction that run into RP2 or that are in the latter stages of development, where costs are agreed in negotiation with Highways England's supply chain.

Efficiency

A detailed assessment of Highways England's efficiency proposals is being undertaken for ORR by CEPA. A summary of these are provided here.

Highways England has proposed a package of efficiency savings within its DSBP. Evidence of the application of this efficiency was provided in its reconciliation of sample project cost estimates to the DSBP. This comprises:

- An 'embedded efficiency' for developed projects with well-defined scope. These align to efficiencies logged by individual RIP and SMP projects in their efficiency registers and also itemised as evidence of bottom-up deliverability detail in the DSBP. These cover, for example: supply chain cost challenge; value engineering; design and standards challenge; construction phasing; route and programme schedule optimisation; renewals integration; and third party funding contributions.

- A 'KPI efficiency' for schemes that are at an early stage of development, where a pre-efficient cost cannot be defined. This is applied as a top-down target, to 'overlay' onto project cost estimates within the DSBP.

- A 'carry-over efficiency' for savings previously assumed in RIS1 for schemes that will be completed in RIS2. Highways England has been transparent in identifying these explicitly to avoid these being lost in re-setting the efficiency baseline for RIS2.

Major project efficiencies proposed by Highways England total just over £1bn in RP2. This is a significant sum that equates to 8% of pre-efficient costs. The aggregate of the efficiencies that are not rolled-over from RP1 is £0.7bn, spread across Highways England's SMP, RIP and CIP/Tier 1 programmes. These equate to 6% of total pre-efficient costs.

Highways England's portfolio risk provision also includes a form of efficiency saving. This is embedded as an opportunity item in all cost estimates that offsets costs for risk items. This aggregate to a further saving of approximately £300m spread across the RP2 portfolio, in addition to the efficiency targets defined above.

Highways England is procuring a new alliance to help it to deliver efficiencies in its SMP schemes. The costs of the SMP Alliance are included in the DSBP. The benefit of this alliance hinges on funding commitment to a long-term pipeline of schemes in order to justify the investment and secure large enough efficiencies to re-invest in additional SMP schemes. We note that Highways England is also refining its procurement approach, to enable it to deliver efficiencies across its RIP portfolio.

Departures from the usual process and appropriateness of these

There are no notable departures from Highways England's usual cost estimating methodology and processes in its plans for RIS2. This is evident in its DSBP submission and subsequent clarifications documents, and in our detailed assessment of a sample of its major projects. There are, however, a number of cost factors that are explicitly adjusted in Highways England's DSBP for RIS2, as highlighted above. For clarity these are:

- Major project costs and funding requirements exclude the private finance elements of the A303 Amesbury to Berwick Down and LTC projects; equivalent to approximately £3bn in total.
- A number of other assumptions, exclusions and 'headwinds' are flagged that are not explicitly covered by its cost and risk provisions, where these are being addressed in negotiations with the DfT.
- Portfolio risks for all projects are proposed to be aggregated and managed as a contingency pot.
- Inflation is proposed to be 're-set' using latest indices for the RP2 period, resulting in a reduction in costs.
- Bespoke efficiency savings are proposed, to be applied to pre-efficient cost estimates.
- There is no explicit 'over-programming' of the major projects portfolio compared to assumed funding. This is therefore not a variable in assessing its deliverability and affordability risks in RP2.

As an additional review task we assessed costs for a further small sample of schemes, specifically to test if there is any evidence of cost escalation in proposed early-stage schemes compared to those previously delivered in RP1. This 'side-by-side' assessment was undertaken with Highways England using data extracted from its CAST model.

There are important issues that affect the comparability of project cost estimates. This side-by-side assessment demonstrated that these issues need to be made clear and understood when reviewing project costs. The assessment also highlighted a number of factors that help to explain why individual project costs, when viewed at high-level, appear to indicate variances, including across families of outwardly similar schemes. While direct 'build cost' works and cost rates can be compared across schemes in Highways England's cost estimates, a number of other factors can and do vary significantly. These include:

- Construction preliminaries[10] and enabling works – these vary according to scheme type, scope, scale, contracting arrangements, construction methodology, and site topography and constraints.
- Abnormal items – these include land, statutory undertaker and NRVAT costs, which are broken down in Highways England's CESS. These items are sensitive to project scope and requirements; as stated previously varying from 1% to 38% of sample project costs.
- Risk – the levels of which correctly reduce as projects develop, as options are narrowed and cost certainty increases. This results in differences in comparing as-built costs for completed schemes with estimates for early stage schemes.
- Inflation – this makes up a large proportion of costs, particularly when comparing historic with proposed future schemes; equivalent to approximately 20% for each five year roads period. These costs are calculated based on the standard indices applied to RIS1 and RIS2 via a consistent price base.

There is an issue related to the presentation of early stage schemes estimates. The side-by-side assessment reinforced that estimates can vary significantly, both up and down, as schemes develop, as evident more generally in this review. This issue particularly applies to pre-PCF schemes (Stage 0) when there is no well-defined scope, and at Stage 1 and 2 when different scheme options are being considered.

[10] Including insurance, site facilities, accommodation, access, services, temporary works, plant and supervision costs.

Conclusions

The key conclusions from this review are detailed below. It is important to note that a number of these conclusions relate to the DSBP developed by Highways England based on its major project delivery plans costs as defined at August 2018. The DSBP issued in January 2019 is subject to ongoing assessment by Government. Some schemes will have evolved through PCF stages since, therefore some conclusions and cost metrics reported here may differ from those within the final RIS2 due to be published at the end of 2019.

Cost estimation methodology and processes

1. **Highways England has a comprehensive and effective cost estimating process and procedures in place.** It has provided a significant body of evidence to support this, and has provided visibility of its estimating tools and models, and demonstrated their use.

2. **Highways England has a strong Commercial Services organisation in place to lead on major project cost analysis.** It includes a team responsible for cost estimating and a cost intelligence team that operates a comprehensive cost database and inflation forecasting model.

3. **Highways England has developed a detailed cost database.** A growing body of outturn project costs are being fed back into Highways England's cost library, to improve confidence in the accuracy of its estimates. This will inform and help to de-risk cost estimates for new projects within RIS2.

4. **Highways England's cost estimating processes compare favourably with other major organisations.** It is proposing further initiatives to support continuous improvement in its capability in RIS2. Highways England also has portfolio-level management, budgeting, reporting and baseline controls in place. It is planning further improvements to this and its risk reporting and systems in RP2.

5. **While Highways England has experienced variances in costs across its projects portfolio, we has not found evidence that these are caused by estimating inaccuracy.** Processes and models depict good accuracy. Scope change and external impacts were the primary cause of increases.

6. **We have not found evidence of a systemic increase in Highways England's project costs over time.** A comparison of schemes using Highways England data revealed that scope related factors drive major project cost increases and the comparability of cost estimates. These factors affect each individual projects uniquely, notably due to site related factors, land acquisition, NRVAT, statutory undertaker costs, inflation over time, and the impact of different scope options on estimated costs for early-stage schemes.

7. **Additional emphasis may be needed in the reporting and communication of early-stage estimates.** This will help to address top-down challenge and stakeholder understanding of costs. It is also consistent with HM Treasury advice that such estimates are indicative and uncertain; resulting in a range of likely costs and should be quoted as a range rather than a single point estimate; and that communication of these costs should be caveated to include the full context. Highways England does present range estimates for all projects. This includes the 'mode' or most likely forecast outturn estimate, as well as a low-high range to account for uncertainties that are not modelled in the most likely estimate. However, inevitable use of single point estimate in reporting and a stakeholder focus on these values, adds weight to the need for greater prominence of range costs. We would support Highways England's plans to augment range data in its standard cost estimates, and to drive additional top-down challenge to its projects to aim for lower (for example, P40 to P45) costs, rather than simply work to a central budget estimate. This will be important for larger schemes where the reported range is significant in cost terms, for example LTC with its key scope, schedule and inflation uncertainties.

Assumptions

8. **There is uncertainty on the proposed treatment and handling of unfunded exclusions and headwinds.** These are defined by Highways England in its DSBP, and have the potential to import risk to the affordability and deliverability of plans for RIS2. At the time of writing Highways England was engaged in dialogue with the DfT to address these. It will be important to set out the agreed position on exclusions and headwinds within the final Strategic Business Plan (SBP), including clarity on whether these are intended to flag pressures that Highways England is on-risk for, which ones (and why) are expected to be covered by the portfolio risk provision, and which are assumed to be owned and funded by Government, through a defined and agreed risk allocation between Highways England and the DfT. This clarity will mitigate risk to the final SBP and avoid differences in views by the parties during RP2 on who was responsible for each risk.

9. **There is a multi-£bn cost and funding gap resulting from the withdrawal of Government's private finance scheme.** At the time of writing, this issue was being discussed by Highways England and the DfT. If not resolved, both schemes affected could be unaffordable or have a material impact on the DSBP.

10. **Heathrow expansion could have a major impact on Highways England's network in RP2.** This is not a Highways England project, so is not part of its DSBP baseline for RIS2. However, its implications on the SRN is such that more explicit detail on potential impacts and risks may be needed. We assume this is in hand in Highways England's detailed discussions with the DfT and HAL.

Risk

11. **We have not found evidence that project-level risk provisions are either excessive or optimistic.** These are broadly consistent across the sample projects, trend downwards through project life-cycles in line with increasing levels of maturity and cost certainty, and compare well with comparator organisations. Highways England's overall contingency provision for risk and uncertainty in its RP2 modelling within the DSBP is typically well below the maximum benchmark levels of Optimism Bias set out in HM Treasury's Green Book guidance. Setting more cautious project-level risk provisions may be counterproductive, especially as maturing cost data helps to mitigate cost risk and avoids recycling risk provisions into future estimates. Highways England's team recognised the need to retain adequate risk provisions, but also not to set excessive provisions that may undermine emphasis on cost efficiency.

12. **Highways England's stated P50 confidence level may be optimistic and over-stated.** This reflects evidence provided, including that it does not include pressures created by exclusions and headwinds. It does not model a range of expected costs for LTC (the only project where costs were 'held flat' in its QCRA model at the project's externally agreed budget amount). It assumes that all efficiencies are delivered in full; as intended by Highways England although a challenging saving to realise nonetheless. Finally, it does not fully address potential schedule risks, including the implications of slippage to project delivery compared to planned dates and the knock-on inflation implications of this.

13. **The portfolio risk provision is a positive feature of Highways England's cost estimating and proposals for RIS2.** This £935m proposed sum is necessary to allow it to manage the significant risks it faces in delivery of a challenging major projects portfolio, learning directly from its experiences in RP1. The portfolio risk calculation would benefit from additional narrative and assurance checks to mitigate the risk that it is the same risks and mark-ups applied mechanically without being fully bespoke to project context.

14. **Portfolio risk may not be sufficient to enable Highways England to deliver the DSBP.** Highways England acknowledges the risks and high levels of uncertainty for some schemes. Its estimated costs in RP2 will be particularly sensitive to any variance in Tier 1 schemes, which could have a high impact in a similar way that a small number of projects were responsible for the majority of variances experienced in RP1. Its post-efficient funding position equates to a P50 confidence level that is less than some infrastructure clients hold. For comparison, a P80 confidence level would require an additional £0.7bn of funding; equivalent to a portfolio risk/contingency of £1.65bn. Set against these challenges, however:

    - Highways England's major projects portfolio and underpinning estimates are more mature than at the equivalent point going into RP1. It is also not over-programmed, as was the case in RIS1.
    - It has a robust estimating methodology and has very good confidence in its costs; it has also learnt from and addressed cost issues experienced in RIS1.
    - It has stated that it is now challenging its project teams to deliver to reduced costs, below central budget assumptions, and so is wary of increasing its funding requirements.
    - The portfolio risk provision is in addition to the (larger) project risk provisions that have been assessed and quantified for each scheme at a level commensurate with each stage of development.

15. **Portfolio risk may need to be deployed alongside other 'levers' in RP2.** Highways England is client for a large portfolio of schemes to be delivered over a long-period of time, rather than a singular project with a greater degree of scope, time and cost constraint. Therefore, as in RP1, it can consider other mechanisms to manage cost pressures rather than simply deploying contingency or tying up a greater Government funding provision for this. Other levers include to re-assess or de-scope poor value schemes once they are developed enough to inform appraisal, send projects back to PCF Stage 0 if costs escalate, perform schedule optimisation and adjust delivery dates, or deploy change control with the DfT. It would be helpful to agree this multi-faceted approach to mitigating portfolio-level cost risk with the DfT in finalising the SBP, and being clear on the interaction between this approach and the agreed ownership of exclusions and 'headwinds'.

16. **Greater clarity is required on how Highways England's portfolio risk contingency will be managed.** This includes how it will be governed, how funds will be agreed and allocated and for what works (and what it will not be used for), how it will be reviewed on an on-going basis and, if appropriate, what the mechanism will be for release of any un-used funds later in RP2 to re-allocate into a pipeline of new projects or studies. This detail may be very important to provide clarity going into RP2, and to provide assurance to the DfT as part of the justification for approving it.

Inflation

17. **Highways England has set out robust, independently sourced inflation assumptions for RP2.** We have not found evidence to challenge and suggest changes to these assumptions. As an organisation Highways England is on-risk for inflation effects, therefore it must budget appropriately. This is a key learning from its past experiences. There is not an obvious case for the 0.25% risk premium that is proposed to be added to BCIS-based forecasts however, the overall inflation rate proposed for RP2 is within the mid-point of independent forecasts and the range of these are evidence of prevailing inflation risk. RP2 inflation costs are proposed to be applied incrementally to the assumed end of RP1 inflation index, so may need to be adjusted to account for outturn inflation rates for the latter stages of RP1, once confirmed.

18. **There is no compelling case to adopt an inflation risk-share mechanism with Government.** Highways England has flagged this as an option if lower inflation rates were assumed within the SoFA for RIS2. This may have merit, given that these are forecasts, and hence subject to long-term uncertainties; although this mechanism could also dilute Highways England's incentive to bear down on costs and also create extra complexity to implement and manage a risk-share mechanism.

Efficiency

19. **Highways England has set itself quantified cost efficiency goals in its DSBP, totalling over £1bn in RP2.** The majority of this sum reflects defined targets for specific projects and also existing efficiency commitments that roll-over from RP1, which provide assurance of deliverability. A smaller proportion are for early stage schemes where goals act as a form of top-down opportunity set against a (generally) high level of risk provision for those schemes. Efficiency is addressed in detail within ORR's Efficiency Review in the parallel review undertaken by CEPA.

Other factors

20. **Highways England will need to continue to monitor and report on the cost 'transition risk' in the run up to the start of RP2.** This will require further careful synchronisation of evolving major project costs in the RP1/RP2 period together with the DSBP baseline, including as it is finalised with the DfT and its confirmed SoFA. Ideally this process should result in a neutral 'zero sum' effect, utilising agreed 'budget flex' mechanisms to avoid unplanned changes to project delivery schedules or budgets. The new portfolio risk provision is not intended as a mechanism to fund this risk.

21. **LTC is so significant that it may warrant being 'ring-fenced' for cost, portfolio risk and funding purposes within RIS2 and the final SBP.** This approach may mitigate the risk that any cost variances for LTC, which is perhaps the biggest and most complex road project for a generation, could have a disproportionate impact on the affordability of the wider projects portfolio. Specifically noting for context and to evidence this conclusion:

    - Private finance costs of almost £2bn are currently excluded from Highways England's funding requirement in its DSBP. Its cost estimate is also exposed to NRVAT cost pressures that result.

    - The project's risk provision of 23% of base costs (15% of all costs) at PCF Stage 2 is relatively low compared to other sample projects at that stage; although is a large amount in cost terms, and we saw evidence of mature assessment of cost benchmarking, and risk and opportunity assessment as needed to underpin its risk provision.

    - Low and high range cost estimates represent ±£1.3bn compared to the central cost estimate assumed for funding purposes. To illustrate the scale of this, this range is greater than the proposed portfolio risk allowance in total for RP2 across all other major projects.

    - The project accounts for approximately 25% of all RP2 inflation costs on its own. It may warrant a bespoke inflation index reflecting its scope, including specialist tunnelling works.

22. **LTC demonstrated robust cost estimation, controls and assurance.** This unique project is uncertain in terms of scope and design (and hence costs), including impacts of ground conditions, environmental works and tunnelling aspects. However, it depicts well-developed cost management that is more typical of a scheme at a later stage. It has detailed bottom-up estimates appropriate to scale, complexity and uncertainty, with three separate tunnelling works estimates commissioned and cross-checked (using the highest as its baseline). It has integrated its QCRA and Quantified Schedule Risk Analysis (QSRA). The project is accessing the TIES taskforce to identify appropriate tunnelling cost benchmarks, as this is a key scope and cost challenge for the project. Finally, the project is subject to significant and regular internal, independent and Government scrutiny, including on costs.

Recommendations

With reference to the conclusions of our review we make the following recommendations to ORR below.

No.	Recommendation
1.	Highways England strengthen the emphasis on cost estimate ranges and the communication of these with stakeholders, notably for early stage estimates (conclusion No.7)
2.	Highways England provide details on the latest status of and formal treatment and handling of unfunded exclusions and 'headwinds', including the agreed allocation of risk across Highways England and Government for funding each item (conclusion No.8)
3.	ORR engage the DfT and Highways England to seek greater clarity on the latest status of unfunded private finance costs for A303 Amesbury to Berwick Down and LTC, and the implications of this for the DSBP and SoFA (conclusion No.9)
4.	The £935m portfolio risk provision is considered the minimum amount that should be set aside for this. Highways England provides clear narrative to SoS on the cost confidence level this relates to, that it does not cover unfunded exclusions and headwinds and also that it is expected to be considered alongside other levers to manage and mitigate cost risk during RP2 (conclusion No.12 to 14)
5.	Further details are set out by Highways England on how the portfolio risk/contingency provision is proposed to be managed and governed in life, to assure and help inform funder's approval for this (conclusion No.16)
6.	DfT to adopt the RP2 inflation proposals for RIS2 as set out by Highways England in its DSBP, as incremental to the RP1 baseline for inflation in the final two years of RP1 once confirmed (conclusion No.17)
7.	Highways England to provide evidence of its ongoing monitoring and reconciliation of RIS1 major project costs compared to the DSBP assumed baseline as it evolves, to assure costs in setting the final SBP (conclusion No.20)
8.	Highways England and the DfT to consider an option to 'ring-fence' LTC, to immunise the wider portfolio from what could be significant cost risks associated with this project (conclusion No.21)

Table 1: summary of review recommendations

Abbreviations

BCIS	Building Cost Information Service (Royal Institution of Chartered Surveyors)
CAST	Cost Analysis Simulation Tool
CERT	Cost Estimate Report Template
CESS	Cost Estimate Summary Sheet
CIP	Complex Infrastructure Programme
CPI	Consumer Price Index
CPM	Capital Portfolio Management (directorate)
DCO	Development Consent Order
DfT	Department for Transport
GRIP	Governance for Railway Investment Projects
IDC	Investment Decision Committee
IPA	Infrastructure and Projects Authority
LTC	Lower Thames Crossing
MP	Major Projects (Directorate)
NAO	National Audit Office
OFT	Open For Traffic
ORR	Office of Rail and Road
OST	On Screen Take-off (model)

PFI	Private Finance Initiative
QCRA	Quantified Cost Risk Analysis
QSRA	Quantified Schedule Risk Analysis
RET	Range Estimating Template
RIP	Regional Investment Programme
RIS1	Roads Investment Strategy 1 (for RP1)
RIS2	Roads Investment Strategy 2 (for RP2)
RP1	Roads Period 1 (2015/16 to 2019/20)
RP2	Roads Period 2 (2020/21 to 2024/25)
SGAR	Stage Gate Assessment Review
SMP	Smart Motorways Programme
SoFA	Statement of Funds Available
SOW	Start Of Works
SRN	Strategic Road Network
TfL	Transport for London
TIES	Transport Infrastructure Efficiency Strategy
TPI	Tender Price Index

Annex – Sample projects

Review phase 1 (RIS1)	Review phase 2 (RIS2)
A556 Knutsford to Bowdon	M1 Junctions 13-16
M1 J19 Catthorpe	M56 Junctions 6-8
M60 to M62 Smart Motorway	M3 Junctions 9-14
A160/A180 Immingham	A5036 Access to Port of Liverpool
A21 Tonbridge to Pembury	M42 Junction 6
M6 junctions 16-19	A12 Chelmsford to A120 Widening
A14 Cambridge to Huntingdon	M25 Junction 28 improvement
M20 junction 10a	A30 Chiverton to Carland Cross
M56 junctions 6-8	Lower Thames Crossing
A500 Etruria widening	A417 Missing link at Air Balloon
M49 Avonmouth	A46 Newark Northern Bypass
	M62 Junctions 25 to 30 ALR retrofit