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Before using any downloaded PDF version, or printed copy of the PDF version of this guidance note, readers should check the Department’s website at the below URL to ensure that the version they are reading is current. Note that the current version of the Department’s cost estimation guidance supersedes and replaces all previous guidance published by the Department, other than that already included in current versions of the NOA and NPA (refer to Section 1.1).

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1: Introduction

1.1: Context and authority

This document – Cost Estimation Guidance Note Overview is the overarching component of the suite of documents that constitute the cost estimation guidance (the guidance) published by the Department of Infrastructure, Regional Development and Cities (the Department). It is intended to provide an explanation of the Department’s cost estimation policy framework and its implementation.

The cost estimation guidance comprises the following components:

- Overview;
- Guidance Note 1 (Project Scope);
- Guidance Note 2 (Base Cost Estimation);
- Guidance Note 3A (Probabilistic Contingency Estimation);
- Guidance Note 3B (Deterministic Contingency Estimation); and
- Guidance Note 4 Outturn (Escalation) Cost Estimation.

It is expected that the primary users of the Department’s guidance will be:

- Public sector transport and transport infrastructure agencies;
- Local Government Authorities;
- Government Business Enterprises; and
- Contractors/consultants utilised by these organisations.

These entities have responsibility for delivering infrastructure projects and submitting proposals for Australian Government funding for such projects, generally through the Infrastructure Investment Program (IIP). However, the guidance may also be relevant to other contractors/consultants, academics, other government organisations and members of the public with an interest in major infrastructure projects.

The guidance is referred to in Appendix B to the Notes on Administration for Land Transport Infrastructure Projects 2014-15 to 2018-19 (NOA). The guidance outlines the principles that must be followed by proponents in preparing cost estimates accompanying Project Proposal Reports (PPRs), submitted in accordance with the NOA, which seek Australian Government funding for road and rail infrastructure projects through the IIP.¹

¹ See Section 2.5 for further information on the NOA and the National Partnership Agreement (NPA). The NOA and the associated NPA is available at the following link: http://investment.infrastructure.gov.au/funding/projects/
1.2: Availability and version control

The guidance is subject to periodic update, and is not available from the Department as a printed bound document. Rather it is being published on the Department’s website in PDF form, both as individual components, as well as a single consolidated document, that can either be read online or downloaded for subsequent use. A number of Excel spreadsheets and presentations accompany the various components of the guidance to illustrate various aspects.

The PDF components of the guidance, and the accompanying spreadsheets and presentations are available from the Department’s website at: http://investment.infrastructure.gov.au/about/funding_and_finance/cost_estimation_guidance.aspx and are the current versions of the guidance. The version date of each component of the “Cost Estimation Guidance”, associated Excel spreadsheets, and other accompanying material will be listed on the above webpage.
2: Governance

2.1: The project life cycle and project phases

All projects are temporary in that they have a defined beginning and end in time (a life cycle), and therefore defined scope and resources. For the purposes of Australian Government funding for major transport infrastructure projects, the Department considers that the lifecycle of an infrastructure project has the following phases:

- Identification;
- Scoping;
- Development;
- Delivery; and
- Post Completion.

The description of these phases appear in the NOA and are repeated in Table 1 for reference.

These project phases and their descriptions are generally consistent with the project phases that are used by jurisdiction project proponents.

A project proponent will submit a PPR for funding for a specific phase (in some cases this can be for a combination of phases such as Scoping and Development, particularly for low dollar value projects). In each case, the PPR must be accompanied by a populated Project Cost Breakdown (PCB) template, which provides detailed costing information for the current phase of the project as well as the overall cost of the project, broken out into base estimate, contingency and escalation.

The Australian Government funding commitment to a particular project is normally published on the Department’s website, and updated annually, in the state and territory schedules to the NPA². Funding approval decisions are normally made phase by phase on the basis of validated estimates of P50 outturn costs with the P50 real cost estimates, at each successive phase, being escalated by the most current escalation forecasts. This permits the estimated project costs to be refreshed as a project moves through its lifecycle noting the normal expectation that contingency levels are expected to reduce as a project moves through its lifecycle. The “reserve” funding (the difference between the commitment listed in the NPA schedules and the P50 outturn cost), is notionally held against each project, but only released to jurisdictions as required for individual projects on a demonstrated needs basis. Alternatively, it may be released for use on other projects when it is clear that it is no longer required.

The Department generally reviews the costs, including contingency, for projects submitted by jurisdictions, with escalation calculated in accordance with guidance note 4 Escalation, and will not normally recommend approval of a project, or funding for a project phase, unless it can validate that the project cost estimate is robust.

---

### Table 1: The phases of a project for Australian Government funding purposes

<table>
<thead>
<tr>
<th>Phase</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Identification</strong></td>
<td>The project identification phase requires an appraisal/study of broad alternatives such as road and rail technology, travel demand management, land use etc. to solve a particular transport problem. The appraisal considers how well the broad alternatives to address the problem meet the policy objectives or identified infrastructure deficiencies, and identifies a preferred alternative solution for progression to the project scoping phase.</td>
</tr>
<tr>
<td><strong>Scoping</strong></td>
<td>Project scoping entails the investigation of specific options (such as route selections for a bypass) that achieve the preferred alternative to address the transport problem studied in the Identification phase. For each of the specific options a business case analysis is required which should address the Benefit Cost Ratio (BCR), the finances, the scope and budgets/timing (including contingency at P50 and P90 and escalation) for each option, recognising that costs estimates are likely to be based on limited information and hence contingencies are likely to be high. A preferred option will be the result of the business case analysis and the outcome of the scoping phase.</td>
</tr>
<tr>
<td><strong>Development</strong></td>
<td>Project development entails detailed planning (such as environmental approvals, land acquisition, community consultation) and design (such as field studies, preliminary detailed design, quantity estimates) of the preferred option and the development of an updated business case, including updated BCR, detailed and refined project budgets/timings (including a pre-tender estimate) and a procurement method. This phase might also involve some pre-construction or preliminary construction work.</td>
</tr>
<tr>
<td><strong>Delivery</strong></td>
<td>Project delivery entails construction and commissioning of the preferred option following a procurement process and the selection of a construction contractor. Preliminary works (relocation of services, earthworks etc.) could precede the main construction contract. Progress reporting and progress claims are required from the proponent at regular intervals during this phase.</td>
</tr>
<tr>
<td><strong>Post Completion</strong></td>
<td>The post completion phase comprises all activities after a project is complete until the project is closed.</td>
</tr>
</tbody>
</table>
2.2: Legislative and governance hierarchy

The cost estimation guidance sits within a hierarchy of legislation and departmental policy documentation which provides an overall framework for consideration of projects for approved funding.

The overarching piece of legislation in relation to the IIP is the National Land Transport Act 2014 (NLT Act) with reference specifically to parts 3 or 7.

The aim of the NLT Act is to assist national and regional economic and social development by the provision of Commonwealth funding aimed at improving the performance of land transport infrastructure. Parts 3 and 7 of the NLT Act articulate the conditions under which a project is eligible for approval as an Investment Project.

2.2.1: National Partnership Agreement on Land Transport Infrastructure Projects

The NPA is an agreement between the Commonwealth of Australia and the states and territories. Its objective is to ensure a safe, sustainable national transport system that enhances the interconnectivity of corridors (networks) of significant economic opportunity across Australia.

The NPA relates to infrastructure projects administered under the NLT Act or the BAF Act. The schedules to the NPA indicate the levels of funding the Commonwealth intends to provide to the states for individual land transport infrastructure projects and associated arrangements. However, it is not a funding agreement for the purposes of Section 4 of the NLT Act.

2.2.2: Notes on Administration

The NOA provides administrative guidance for managing projects which are to be funded, or proposed to be funded, under parts 3 or 7 of the NLT Act.

Precedence

If any requirements in the NOA are inconsistent with the terms of the NLT Act or the NPA then the NLT Act or NPA will, to the extent of the inconsistency, prevail.
2.2.3: Cost estimation guidance notes

The cost estimation guidance notes constitute the Department’s current cost estimation guidance. They outline the principles that must be followed by proponents in preparing cost estimates. A schematic of document hierarchy is presented in Figure 3.

Figure 3: IIP governance hierarchy

The suite of cost estimation guidance notes aim to:

- Provide detailed guidance (both theory and practical worked examples) on a range of theoretically sound techniques to estimate project costs. This enables estimators to select the most appropriate methodology for their particular project at any point in the project lifecycle;
- Outline techniques that strike a balance between theoretical rigour and practical implementation; and
- Not preclude the use of alternate methodologies not outlined in the guidance, provided evidence of efficacy can be demonstrated.
3: Introduction to cost estimation

Cost estimates are central to establishing the basis for key project decisions and the metrics against which project success will be measured, and for communicating the status of a project at any given point in time. Following good practice in cost estimation throughout each phase of a project will lead to efficient use of scarce public resources and help mitigate the risk of cost overruns. Better cost estimation also provides higher levels of certainty for public sector organisations, governments, and the public to whom government agencies are accountable.

Best practices should consist of an overall process of established, repeatable methods that result in high-quality cost estimates that are comprehensive and accurate and that can be easily and clearly traced, replicated and updated. The cost estimating process is shown schematically in Figure 1 below. Note that for convenience the process is described as a series of successive steps. In practice, it is often an iterative process that will rarely be linear.

**Figure 1. The cost estimation process**

3.1: Components of an estimate

Consistent with many other funding organisations, the Department considers that a project cost estimate comprises three components: the base estimate, a contingency allowance, and an escalation allowance. These components should be developed in the context of the project scope (refer to guidance note 1 Project Scope for further information).

---

3.1.1: The base estimate

The base estimate is the sum of the construction costs and client’s costs. Construction costs are the costs required to complete the tasks or activities associated with the construction elements of a project. Client costs are the costs incurred by the proponent (for example a public sector agency) to develop and deliver a project.

An estimate is never confined precisely to the documented scope because estimators know that drawings do not allow for waste, rework, minor fixings and detail that will not be described fully in early design work.

The base estimate represents the quantities and rates associated with a given scope of work according to a defined estimating practice or policy. It should not include explicit allowances for risk or escalation. It will inevitably be dependent on the estimator’s judgement about elements of the cost that are subject to uncertainty and allowances included to cover costs that are expected to be incurred such as minor items not detailed in early design drawings. These minor items should be confined to the delivery of the defined scope in the planned manner and they should be clearly identified so they are not double counted by being included in the calculation of the contingency.

For projects for which the scope of the project is sufficiently defined, and in particular for high-value projects, the base estimate is typically estimated using a methodology known as first principles estimating.

The first principles method involves the calculation of project-specific costs based on a detailed study of the resources required (plant, labour, material and subcontractors) to accomplish each activity of work contained within the project’s work breakdown structure (WBS). Productivity assumptions\(^5\) are applied to all labour and plant costs with adjustments made to account for unique or unusual site characteristics.

Other estimating methods include:

- **Unit rate estimating** which calculates the quantity of each item of the project by multiplying the quantity of work by historical unit rates obtained from previous projects. While a relatively quick method of estimating, unlike a first principles estimate, it lacks precision. Since each project has unique constraints and requirements, such an approach contains inherent inaccuracies because factors and allowances developed for a previous project (that might not be applicable to the project being estimated) will be applied within the unit rate; and

  a) **Global estimating** which is a method of estimating involving the use of ‘all in’ or ‘global’ composite rates such as road cost per kilometre. While less satisfactory for more developed projects, this method may be appropriate at the very early stage of a project.

---

\(^5\) While there is not necessarily a standard definition of productivity, it can generally be taken to mean labour productivity, or units of work placed or produced per man-hour, i.e. productivity equals output divided by labour, equipment and materials. More practically, productivity may be measured in terms such as square metres of pavement placed per hour or cubic metres or earth moved per hour. Assumptions could include on-site management and coordination, labour skill and experience, losses due to excessively hot or cold weather, and so on.
when the scope is not sufficiently defined to enable a first principles estimate to be developed.

Refer to guidance note 2 Base Cost Estimation for further information.

### 3.1.2: Contingency

The actual cost of a project is only known when it is complete and, as such the best that can be done is to rely on estimates at various stages of planning. The uncertainty inherent in all estimates and estimating processes mean that it is highly misleading to represent an estimate as a single number. Instead, it should be considered as a range of possible outcomes. The distribution of possible outcomes for a particular project is defined by the estimate’s probability distribution that is calculated, or simulated, through the application of probability and statistics.

For its purposes, the Department considers a contingency allowance as being the component of a project’s cost, in excess of the base estimate that accounts for, or reflects, the level of residual risk it is prepared to bear. P50 and P90 are key trigger points in the context of the approval and release of Australian Government funding of projects under the IIP. Section 2.4 provides additional detail.

Methods for establishing contingency for cost estimates are generally divided into two groups\(^6\): deterministic methods and probabilistic methods.

The deterministic method is a simple approach that often involves applying a flat rate percentage to the base estimate to allow for risk, however this simplistic approach is not recommended by the Department. A number of other more rigorous deterministic methods are available to estimators which the Department considers acceptable under certain circumstances.

The probabilistic method of contingency assessment is recommended wherever possible as the process of conducting this type of assessment provides the opportunity to discuss and document the risks with relevant stakeholders and agree the appropriate quantum and probability for each risk item.

Australian Government policy settings require that a probabilistic cost estimation method be used for road and rail infrastructure projects with a total anticipated outturn (or escalated) cost (including contingency) exceeding $25 million. Probabilistic or risk-based cost estimation methods are a form of quantitative risk analysis which generally use Monte Carlo simulation to assess contingency requirements.

Monte Carlo simulation generates a very large sample of possible project outcomes and the frequency of occurrence of each. Consequently, the results of a Monte Carlo simulation include the confidence levels (i.e. likelihood that a particular cost will not be exceeded) that can be assigned to all the generated outcome values of the total project cost.

Each generated outcome value of the total project cost can be given a P-value which reflects the likelihood of that value not being exceeded. For instance, a P50 cost is the project cost with

\(^6\) While modern mathematical methods such as Fuzzy Techniques and Artificial Neural Networks are classed as separate contingency calculation methods, they are rarely, if ever, used on land transport infrastructure projects.
sufficient contingency allowance to provide a 50 per cent likelihood that this cost will not be exceeded. A P90 cost is the project cost with sufficient contingency to provide a 90 per cent likelihood that this cost will not be exceeded.

The examples in Figure 2 below are an output from a Monte Carlo simulation. The P50 value is depicted in the chart to the left and the P90 value in the chart to the right. The overlay S-shaped curve on each chart is a cumulative representation of the cost distribution that permits any P-value, including the P50 and P90 costs, to be directly read off the chart.

Figure 2. Monte Carlo simulation outputs

Refer to guidance notes 3A and 3B for detailed information on contingency estimation.

3.1.3: Escalation

Escalation takes into account the changes in costs for the period from the base date of the estimate (the date in which the rates for cost elements were current) to some future period, generally the completion of construction. An escalation allowance is applied to the project cash flow (the sum of the base estimate and contingency allowance in the financial years in which the expenditure will occur).

A project cost which includes escalation is referred to as an outturn (nominal) cost. For the purposes of Australian Government funding for transport infrastructure projects, escalation is generally expressed as an annual rate which reflects the changes in costs (actual or forecast) from one financial year to the next. For road projects the Department provides project proponents with escalation rates based on a composite quarterly index series with the subordinate index series reflecting the weighted contribution of key infrastructure cost drivers. In that context, for road projects, the Department defines annual escalation as the average of the indices in the current financial year divided by the average of the indices for the previous financial year, expressed as a percentage change. The approach of using indices also permits the rebasing or uplifting of previous cost estimates to current costs before applying forecasts of escalation.

Due to the bespoke nature of many rail projects, it is challenging to determine an appropriate weighting for key cost drivers and subsequently develop an appropriate weighted index series. As
such, for rail projects, proponents may propose their own escalation rates, which the Department may seek to check and validate.

Refer to guidance note 4 Escalation for further information.

3.2: Purpose and scope of estimate

A cost estimate is rarely a single number, but rather a compilation of many lower-level cost element estimates. Credible cost estimates are produced by giving due consideration to the steps outlined previously at Figure 1 and should be accompanied by detailed supporting documentation.

The purpose of a cost estimate is determined by its intended use, and its intended use determines its scope and detail. Purposes of an estimate could include:

- Project screening and economic viability;
- Selection of alternatives or preferred options;
- To support the project financing or budget approvals process;
- Tender and bid-check estimates; and
- Cost to completion forecasts at any given time once a project is already under way.

The scope of the estimate is not to be confused with the scope of the project. The scope of the estimate refers to the level of detail and inclusions within the estimate itself, which is driven by its intended purpose and by the needs of the customer. The scope of the estimate will be determined by such issues as:

- The time involved/available;
- What elements of the work need to be estimated;
- The level of estimate detail to be included; and
- The phase of its lifecycle that the project is in.

3.3: Attributes of a good estimate

Estimates and forecasts can be wrong in many ways. While there is perhaps no answer to the question, “what is a good estimate?” it is possible to break down the quality of an expert’s judgment in four ways as follows:

- Accuracy measures how close an expert’s quantitative estimate is to the truth. Accuracy can be measured by the difference between an expert’s estimate and the correct answer. Over several questions, it may be the average difference;
- Bias measures the tendency of an expert to deviate consistently from the truth in a single direction, either too high or too low. Bias can only be measured over the answers to several questions;

7 Burgman M 2015 Trusting Judgements, How to Get the Best out of Experts, Cambridge University Press
- Calibration is the frequency with which uncertainty intervals enclose the truth, compared to the frequency with which the expert expects them to. Calibration can be measured by counting, over several questions, the frequency with which the expert’s intervals enclose the truth; and
- Reliability is a property of an expert. It is the degree to which an expert’s estimates are repeatable and stable.

This list is certainly not complete but it represents a useful starting point. Good estimates are accurate and well calibrated and a good judge is accurate, unbiased, well calibrated and reliable.

If an expert is routinely close to the truth but provides very wide margins of confidence (i.e. estimates which are poorly calibrated), the judgements are accurate but uninformative. If an expert confidently provides narrow bounds but is routinely far from the truth (precise but inaccurate), the judgements are simply misleading. In neither case will the estimate be useful for a decision-maker who is trying to choose between alternative solutions or trying to set a project budget.
4: Presentation of costs

The structure of a project cost estimate should include the following key components:

- A base estimate comprising the sum of construction costs and client’s costs;
- A contingency allowance - an amount added to an estimate to allow for items, conditions, or events for which the state, occurrence, or effect is uncertain and that experience shows will likely result, in aggregate, in additional costs; and
- Escalation that is applied to the cash flow and which takes account of increased costs for the period from the base date of the estimate to the completion of construction.

These components are shown schematically in Figure 4 below. Definitions of each of the terms can be found in guidance note 2 Base Cost Estimation.
4.1: Project Cost Breakdown (PCB) Template

To permit consistent presentation of costs and the automatic calculation of escalation, the Department, in consultation with state jurisdictions, has developed road and rail PCB templates as macro-enabled locked down excel spreadsheets. Populated PCB templates must accompany each submission for Australian Government funding for transport infrastructure projects. The templates include nine separate worksheets. Instructions on how to populate the PCB templates are provided in the first worksheet and must be adhered to when populating the template. Four worksheets contain instructions and information, and five worksheets relate to project details and data required for each of the scoping, development and delivery phases. For each funding submission, proponents must complete the Project Details worksheet and the worksheet relevant to the phase for which funding is being sought.

4.2: Tagging a project

There are several different ways of expressing the project cost estimate, each of which is legitimate, and may be appropriate in different circumstances. Therefore, it is important that when a project cost is presented, it is “tagged” with the appropriate definition.

The Department uses the following nomenclature:

**Base Estimate** - the base estimate is the sum of the construction costs and client’s costs at the applicable base date. It represents the best prediction of the quantities and current rates which are likely to be associated with the delivery of a given scope of work. It should not include any allowance for risk (contingency) or escalation.

**Project Estimate** - the project estimate is the base estimate cost plus a contingency allowance and generally prefixed by a “P” or probability level. Hence, there are a theoretically infinite number of project estimates, each defined by a different “P” level bounded between 0 and 100 percent. In practice, for the purposes of funding submissions, the P50 and P90 project estimates are of primary significance.

**Outturn Estimate** - an outturn estimate is the sum of the price-escalated costs for each year of a project’s duration. Outturn cost calculation requires the non-escalated project cost estimate to be presented as a cash flow and the application of an escalation factor for each project year to derive the price escalated cost for each year.

Table 2 illustrates how the costs of a project with a base estimate of $100 million can be expressed in multiple ways. Supporting data is shown at Figure 5.
Table 2: Representations of project cost

<table>
<thead>
<tr>
<th>Different representations of a project cost</th>
<th>Cost Components</th>
<th>Total ($ Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Estimate</td>
<td>Base Estimate</td>
<td>100.00</td>
</tr>
<tr>
<td>Project Estimate (P50)</td>
<td>Base Estimate + P50 project risk</td>
<td>115.00</td>
</tr>
<tr>
<td>Project Estimate (P90)</td>
<td>Base Estimate + P90 project risk</td>
<td>140.00</td>
</tr>
<tr>
<td>Outturn Estimate (P50)</td>
<td>Base Estimate + P50 project risk + escalation</td>
<td>124.33</td>
</tr>
<tr>
<td>Outturn Estimate (P90)</td>
<td>Base Estimate + P90 project risk + escalation</td>
<td>151.36</td>
</tr>
</tbody>
</table>

Figure 5. Supporting data for outturn cost calculations

<table>
<thead>
<tr>
<th>Project Cash Flows</th>
<th>YEAR 1 2016-17</th>
<th>YEAR 2 2017-18</th>
<th>YEAR 3 2018-19</th>
<th>YEAR 4 2019-20</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Cash Flows</td>
<td>($ Millions)</td>
<td>($ Millions)</td>
<td>($ Millions)</td>
<td>($ Millions)</td>
<td></td>
</tr>
<tr>
<td>Base Estimate</td>
<td>5.00</td>
<td>15.00</td>
<td>40.00</td>
<td>40.00</td>
<td>100.00</td>
</tr>
<tr>
<td>P50 Contingency Allowance (e.g. 15%)</td>
<td>0.75</td>
<td>2.25</td>
<td>6.00</td>
<td>6.00</td>
<td>15.00</td>
</tr>
<tr>
<td>P50 Risk Adjusted Estimate</td>
<td>5.75</td>
<td>17.25</td>
<td>46.00</td>
<td>46.00</td>
<td>115.00</td>
</tr>
<tr>
<td>P50 Outturn Estimate*</td>
<td>5.89</td>
<td>18.12</td>
<td>49.54</td>
<td>50.78</td>
<td>124.33</td>
</tr>
<tr>
<td>P90 Contingency Allowance (e.g. 40%)</td>
<td>2.00</td>
<td>6.00</td>
<td>16.00</td>
<td>16.00</td>
<td>40.00</td>
</tr>
<tr>
<td>P90 Risk Adjusted Estimate</td>
<td>7.00</td>
<td>21.00</td>
<td>56.00</td>
<td>56.00</td>
<td>140.00</td>
</tr>
<tr>
<td>P90 Outturn Estimate*</td>
<td>7.18</td>
<td>22.06</td>
<td>60.31</td>
<td>61.81</td>
<td>151.36</td>
</tr>
</tbody>
</table>

*The P50 and P90 Outturn Estimates reflect a hypothetical annual escalation rate of 2.5%
4.3: Estimate rounding

When presenting the headline estimate numbers, consideration should be given to selecting an appropriate level of rounding consistent with the stage of the project and the expected accuracy of the estimate. This is true not just of deterministic estimates (for <$25 million dollar projects), but also of probabilistic estimates.

While also dependent upon the probability distribution functions used in the model, the margin of error resulting from a Monte Carlo simulation process is generally governed by the inverse of the square root of the number of iterations performed. For example, if a simulation is performed using 5,000 iterations, the margin of error (with a 95% confidence level) will be \( \frac{1}{\sqrt{5000}} \), or approximately 1%. It therefore makes little sense to present estimates to the nearest dollar or cent.

Whilst not a requirement for funding submissions, Table 3 below, replicated from the RMS estimating manual\(^8\), provides suggestions for appropriate levels of rounding. The table provides a guide only, and estimators may judge that an alternate level of rounding is more appropriate depending upon individual circumstances. Note that rounding should only be done once at the end of the estimate and not progressively within the estimate.

*Table 3: Suggested rounding for estimate ranges at different phases*

<table>
<thead>
<tr>
<th>Range of estimate</th>
<th>Round up to the next</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Scoping phase</td>
</tr>
<tr>
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5: Cost estimate review process

Consistent with Clause 2.1.3.3 of the NOA, the Department will review and assess the cost estimate provided in the PPR before making a recommendation to the Minister. The Department will either review the cost estimate with internal resources, or from time to time, utilise specialist external support.

Specialist external support services are typically procured through the Infrastructure Project Cost Estimation Services Panel, specifically set up by the Department for this purpose. See Appendix C for further details of the panel.

For reviews of cost estimates, the specialist external support supplier engaged by the Department will undertake comprehensive and detailed review and analysis of the estimate covering some or all of the following aspects:

- Base estimate;
- Contingency;
- Escalation; and
- Constructability.

Reviewers are expected to prepare a comprehensive report addressing these aspects utilising the Department’s standard “Project Cost Estimate Review Report” template.

A summary of the cost estimate review process is as follows:

- A cost estimate reviewing supplier (reviewer) is selected through the Infrastructure Project Cost Estimation Services Panel;
- The reviewer is provided with relevant project documentation and an initial consulting hour cap to review the documentation before submitting a brief interim report accompanied by a quote for the further work to complete the review (Deliverable 1);
- Assuming the Department decides to proceed with the review, the Department will typically facilitate a meeting between the reviewer and the proponent’s cost estimating consultant and/or in-house cost estimating team as early as practicable in order to assist with the review process. This meeting enables the reviewer to gain a greater understanding of the scope of the estimate and any underlying assumptions. It is expected that the proponent’s estimator will provide the reviewer with at least full access, under supervision, to all underpinning data making up the estimate such as native Expert Estimation, Primavera P6, and @Risk files, as well as representative extracts from these files to permit the reviewer to undertake detailed analysis;
- Subsequent to the review meeting, the reviewer is required to submit an initial draft project cost estimate review report (Deliverable 2) detailing results and findings of analysis. The Department will review this report and provide detailed feedback/commentary for the Supplier to address;
- The reviewer must submit an updated draft project cost estimate review report that addresses the Department’s comments on the initial draft report (Deliverable 3); and
At this point, the project cost estimate review report may be provided to the proponent for comment. If required by the Department, the reviewer must address comments on the updated project cost estimate review report as a consequence of the proponent’s review (Deliverable 4).

In addition to being a mechanism to validate the cost estimate for a particular project, and provide valuable information and recommendations to improve subsequent iterations of the estimate, the exercise also potentially improves the quality of subsequent cost estimates submitted by a project proponent for other projects.

5.1: Review meetings

As briefly described above, the cost estimate review meeting provides the reviewer with the opportunity to:

- gain a greater understanding of the scope of the estimate;
- interrogate the estimate in detail; and
- understand the assumptions behind the base estimate and the risk model.

Past experience indicates that a minimum of half a day is required for this exercise and that a full day is often required for more complex projects. While not all projects will be subject to a review, proponents should factor the time and cost implications of a potential review into the overall PPR submission process.

5.2: Documentation requirements

For projects subject to a cost estimate review, proponents are expected to provide the following information:

- The cost estimation tool (for example, @RISK or Crystal Ball) output report files, which must at a minimum include charts showing the non-outturned project cost probability distribution and associated cumulative probability distribution, simulation summary details (that is, sampling type, number of iterations, random number generator, tornado diagram and accompanying regression and rank information table);
- Summary statistics for the project cost including the project cost estimate (unescalated) at 5 per cent intervals from 5 per cent to 95 per cent confidence;
- The cost estimation tool input data files in spreadsheet format that includes sufficient information to permit the Department or its contractors to re-run the simulation; and
- A bibliography of all documents consulted by the cost estimator in preparing the cost estimate (including version number/date, proper title, document format and author).

Note: it is a requirement that the proponent maintains a digital library of all documents consulted in preparing the cost estimate, and will provide copies of these documents at the Department’s request.
Appendix A: Recent history of the Department’s cost estimation guidance

In late 2007, after observing that a number of Australian Government funded transport infrastructure projects had experienced substantial cost overruns, the Department engaged Evans and Peck (now Advisian) to develop a set of road and rail construction cost estimating standards. Following extensive consultation with jurisdictions, Evans and Peck delivered their final report “Best Practice Cost Estimation for Publically Funded Road and Rail Construction” dated 19 June 2008, which became known colloquially as the 2008 Best Practice Cost Estimation Standard (2008 BPCES) and which the Department published on its website (since withdrawn). Subsequently, in 2009 the Department engaged Evans and Peck to deliver a series of jurisdiction training sessions relating to the 2008 BPCES content and in its July 2009 update of the Notes on Administration, advised that the 2008 BPCES “…must be applied when preparing cost estimates for projects for which Australian Government funding is sought under the scope of these notes”.

In May 2011, with input and advice from Evans and Peck, followed shortly afterwards by a series of jurisdiction training sessions delivered by Evans and Peck, the Department developed an update to the 2008 BPCES, which was titled “Best Practice Cost Estimation Standard for Publicly Funded Road and Rail Construction” and watermarked “proof version for jurisdiction training”. That document, which was referred to colloquially as the 2011 BPCES, restated the principles from the 2008 BPCES, removed some no longer relevant background material and included additional material in regard to probabilistic cost estimation. It also advised that it was not a formal “standard” in the context of a “Standards Australia” standard, but rather a document providing principles based guidance. The May 2011 standard was not published on the Department’s website, but was distributed widely in printed and electronic form.

In its November 2014 update to the NOA, the Department introduced Appendix B “Cost Estimation Guidance” which outlined the Department’s expectations and the new Project Cost Breakdown (PCB) templates that jurisdictions were required to use and made generic reference to the current versions of the “Department’s Cost Estimation Guidance”.

In 2015 the Department recognised that the May 2011 BPCES was by then significantly out of date, was inconsistent with guidance embedded in the PCB templates, and was due for significant revision. Rather than develop and publish a single printed guidance document that reflected the Department’s expectations for cost estimation, the Department instead decided to develop a suite of cost estimation guidance notes. The intention was that these guidance notes would underpin the NOA, would only be web published, would be version controlled to permit ready updating as required, and could be read online or downloaded. The Department also decided that it would undertake extensive public consultation, including publishing draft versions, as appropriate, as it developed the suite of guidance notes.

These guidance notes outline the principles that must be followed by proponents in preparing cost estimates accompanying PPRs, submitted in accordance with the NOA, which seek Australian Government funding for road and rail infrastructure projects.
The Department recognises that guidance documents periodically need updating and welcomes feedback at any stage which should be provided by email to costestimation@infrastructure.gov.au. The Department’s intention is that incremental improvements to the guidance notes, as and when required, will be undertaken by replacing the existing version of a particular guidance note with an updated guidance note.
Appendix B: Engagement

To inform its cost estimation policy settings, the Department engages widely with:

- Transport infrastructure and cost estimation related organisations in both Australia and overseas including Highways England, Transport for London, the US Government Accountability Office (GAO), the US Federal Highways Authority (FHWA) and NASA;
- Industry and professional bodies including AACE International, the Royal Institute of Chartered Surveyors (RICS), the Australian Institute of Quantity Surveyors (AIQS), Consult Australia, and Engineers Australia;
- Industry, particularly cost estimation service providers; and
- Academia.

Cost Estimation Network

The Cost Estimation Network (CEN) is a bi-annual forum, chaired by the Department, with representation from jurisdiction cost estimation/risk practice leaders.

It was established in 2013 with the following intentions:

- To formalise the good bilateral relationships that the Department already had with state and territory cost estimation representatives;
- To create a multilateral discussion forum for these representatives to exchange ideas;
- To be a mechanism to discuss and road test any proposed incremental improvements to the May 2011 Best Practice Cost Estimation Standard and associated guidance; and
- To report any key/significant issues of discussion to the Nation Building Forum as necessary.

Due to the passage of time some of these roles and intentions, such as discussions regarding the 2011 Best Practice Cost Estimation Standard or reporting to the Nation Building Forum, have become redundant. Nonetheless, the CEN continues to be a valuable forum to share cost estimation ideas, discuss prevailing market conditions, and build positive working relationships.
Appendix C: Infrastructure Project Cost Estimation Services Panel (# 20000381)

Following a competitive Request for Tender (RFT) process undertaken in 2015, the Department selected the following firms, in the categories indicated, to become members of the Department’s “Provision of Infrastructure Project Cost Estimation Services” panel. See also SON 3312041 on the Austender website.

The panel expires on 30 June 2020.

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**Category No.** | **Category (Cat) Title**
---|---
1 | Base Cost Estimate: (Review, Advice and Preparation)
2A | Contingency (Probabilistic/Quantitative Risk Analysis) (Review, Advice and Preparation)
2B | Escalation Cost Estimate: (Review, Advice and Preparation)
3 | Rapid Cost Estimation Services
4 | Theory and Policy Advice on Contingency Estimation (Probabilistic/Quantitative Risk Analysis)