Australian Government
Department of Infrastructure and Regional Development

Guidance Note 2

Base Cost Estimation

March 2017

ISBN 978-1-925531-29-9
March 2017 / INFRASTRUCTURE 3180

Ownership of intellectual property rights in this publication

Disclaimer

Creative Commons licence

Use of the Coat of Arms

Contact us

Director - Publishing and Communications
Communications Branch
Department of Infrastructure and Regional Development
GPO Box 594
Canberra ACT 2601
Australia

Email: publishing@infrastructure.gov.au
Website: www.infrastructure.gov.au

Document information

Document Name	**Base Cost Estimation**
Version and Date	1.0: March 2017
Prepared by	Ben du Bois

Approvals

Approval and Authorisation	**Name**	**Position**	**Date**
Prepared by	Ben du Bois	Civil Engineer Change and Project Review Major Infrastructure Projects Office (MIPO)	March 2017
Reviewed by	Warren Fletcher	Director Change and Project Review MIPO	March 2017
Approved by	Andrew Danks	General Manager MIPO	March 2017

Revision history

Issue	**Date**	**Revision Description**
1.0	March 2017	Initial release

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 cost estimation guidance published by the Department, other than that already included in current versions of the NOA and NPA (refer to section 1.1).

http://investment.infrastructure.gov.au/funding/projects/index/cost-estimation-guidance.aspx

Table of Contents

1: Introduction

1.1: Context and Authority

This Guidance Note – *Base Cost Estimation* is one component of the suite of documents that in aggregate, constitute the Department of Infrastructure and Regional Development (the Department) Cost Estimation Guidance.

The base cost estimate will typically represent the greatest proportion of the cost of a project and is the starting point for the determination of contingency and escalation allowances. Therefore it is crucial it be as accurate as possible because contingency and escalation estimates, together with the Base Cost Estimate, comprise the Project Outturn Costs at the various contingency levels.

The Cost Estimation Guidance (the Guidance) is referred to in Appendix B to the "Notes on Administration for Land Transport Infrastructure Projects 2014-15 to 2018-19" (the NOA). The Guidance outlines the principles that must be followed by proponents in preparing cost estimates accompanying Project Proposal Reports, submitted in accordance with the NOA, which seek Australian Government funding for road and rail infrastructure projects. The NOA and the associated National Partnership Agreement on Land Transport Infrastructure Projects (NPA) are available at the following link: http://investment.infrastructure.gov.au/funding/projects/

The Cost Estimation Guidance comprises the following key 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.

In particular, this Guidance Note establishes the principles and framework for developing and preparing a project base cost estimate. Applying the principles and framework herein is intended to result in consistent, realistic, auditable, and appropriate project base cost estimates at each phase of the project life cycle. This Guidance Note should be read in the context of the Overview component of the Guidance and the specific requirements of the NOA.

1.2: Related Guidance

Additional useful guidance on cost estimation practices, to the extent that they do not contradict the guidance provided by the Department's Cost Estimation Guidance, may be found in individual agency cost estimation guidance or manuals, and in the guidance provided by professional associations e.g. Project Management Institute, Australian Institute of Quantity Surveyors, Royal Institution of Quantity Surveyors, or AACE© International.

1.3: Availability and Version Control

The Cost Estimation guidance is subject to periodic update, and hence 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/funding/projects/index/cost-estimation-guidance.aspx, and are the current versions of the guidance. The version date of each component of the "Cost Estimation Guidance" will be listed on the above webpage and will also appear as Appendix A "Current Component Version Status – Cost Estimation Guidance" to the "Cost Estimation Guidance Overview" document.

1.4: Objective and Scope of Guidance Note 2

The objective of this Guidance Note is to foster an improvement in the way in which base estimates for infrastructure projects are prepared and presented. This guidance aims not to be prescriptive, but rather describes the methodology of how to develop a robust base cost estimate as well as providing broad descriptions of the typical elements of a base cost estimate for road and rail infrastructure projects.

The guidance covers the following topics:

- **Definition of a Base Estimate** - description of the key components of a base cost estimate;
- **Base Estimate Preparation** - guidance on the methodology and tools used to develop a base estimate;
- **Work Breakdown Structures and use of the Department's Project Cost Breakdown Template** - guidance on developing a Work Breakdown Structure and its relationship to the Department's Project Cost Breakdown and associated template; and
- **Elements of a Base Cost Estimate** - an overview and broad description of the components of a base estimate.

This Guidance Note is premised mainly towards base cost estimation practices expected to be utilised in major or high risk projects. However, the principles apply generally to projects of all sizes. It applies only to Capital Cost Estimating and does not consider Operation and Maintenance (O&M) costs. While determination of O&M costs may be required for other financial and economic analyses, such as Cost Benefit Analysis, it does not form any part of the subject matter of this Guidance Note.

It is expected that the primary users of this document will be jurisdiction (i.e. Australian State and Territory) public sector organisations (Agencies), including Local Government Authorities and their contractors/consultants that have responsibility for delivering infrastructure projects. However, the

guidance may also be relevant to academics, other contractors/consultants, other organisations and members of the public with an interest in major infrastructure projects.

1.5: Cost estimating challenges

Developing a robust base estimate requires a well-defined scope, access to detailed documentation and historical data, and well-trained and experienced cost analysts. Even in ideal circumstances cost estimating is difficult and requires the application of both science and judgment. The cost estimator typically faces many challenges which may lead to suboptimal estimates – that is, estimates that contain poorly defined and unrealistic assumptions, have limited or no supporting documentation, are characterised by inadequate data collection and inappropriate estimating methodologies, are built from irrelevant or out of date data, provide limited or no basis or rationale for the estimate, or can show limited or no defined process for generating the estimate. Some of the challenges a cost estimator may face on road and rail projects are:

- not having access to historical cost databases;
- unreasonable program baselines;
- a vague or incomplete scope;
- unknown ground conditions or other site conditions; and
- uncertainty around (rail) possessions.

Some of these challenges are widespread, for example it appears that cost estimators in Australia do not have ready access to the kinds of historical data from Australian road projects available to their US or European counterparts from their projects.

1.6: Definitions and Abbreviations

Table 1: Definitions and Abbreviations[1]

Term	Definition
Agency	A state or territory government body that generally will deliver an infrastructure project.
Assumption	A documented, cost-related factor that, for the purpose of developing a base cost estimate is considered to be true, real or certain.
Base Date	A 'base date' is a reference date from which changes in conditions, (including rates and standards) can be assessed. In the context of a base estimate it is the date for which the rates included in the cost estimate reflect current market conditions.
Base Estimate	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.
Construction Costs	The costs required to complete the activities or tasks associated with the construction elements of a project.
Client Costs	In this guidance note, 'client' is taken to mean the project proponent. Client costs are the costs incurred by the proponent (for example, public sector delivery agency) to develop and deliver a project.
Contractor Direct Costs	All Contractors' costs directly attributable to a project element including, but not limited to, plant, equipment, materials, and labour.
Contractor Indirect Costs	Costs incurred by the contractor to perform work but which are not directly attributable to a project element. These generally include costs such as preliminaries, supervision, and general and administrative costs.
Contingency	As per Appendix B of the Notes on Administration: "*.the component of a Project's cost in excess of the Project Base Estimate that accounts for, or reflects, risk*". Contingency aspects do not form part of the scope of this document. For further information refer to Guidance Notes 3A and 3B.

[1] Definitions have been derived, where appropriate, from AACE International Practice No. 10S-90: Cost Engineering Terminology

Term	Definition
Escalation	The component of a project's total cost at any point in time that reflects changes in prices and costs since the Base Cost Estimate date. Escalation is added to the Project Cost to obtain the Outturn Cost. Escalation aspects do not form part of the scope of this document. For further information refer to Guidance Note 4, "Escalation".
Escalation Rate	The Department derives escalation rates from actual or forecast composite index series that reflect the characteristics of infrastructure projects, where the escalation rate in any financial year is calculated from the average of the composite quarterly indexes for that financial year divided by the average of the composite quarterly indexes for the previous financial year.
Estimator	The person or organisation that prepares a cost estimate.
First Principles Estimate	The method of preparing a cost estimate by calculating the dollar rates and rates of productivity required to complete each of the individual tasks within the Work Breakdown Structure.
Jurisdiction	An Australian state or territory.
Labour	Effort expended by people for wages or salary.
Margin	An allowance that includes the construction contractor's corporate overheads and profit.
Material	An article, material, or supply brought to a construction site by the Contractor or a subcontractor for incorporation into the work. Also includes any items brought to the site preassembled from articles, materials or supplies.
NOA	The Notes on Administration for Land Transport Infrastructure Projects 2014-15 to 2018-19 provide administrative guidance for managing projects to be funded under the National Partnership Agreement.
NPA	National Partnership Agreement on Land Transport Infrastructure Projects.
Outturn Cost	The sum of the price-escalated costs for each year of a Project's duration. Outturn Cost calculation requires the non-escalated Project Cost 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. The Department's Project Cost Breakdown Template can be used to calculate outturn costs. In economic terms non escalated costs are often referred to as Real costs while Outturn Costs are often referred to as Nominal costs.

Term	Definition
Overhead(s)	A cost or expense inherent in the performing of an operation, (e.g., engineering, construction, operating, or manufacturing) which cannot be charged or identified with a part of the work, product or asset and, therefore, must be allocated on some arbitrary basis believed to be equitable, or handled as a business expense independent of the volume of production.
PCB	Project Cost Breakdown.
Project Cost	The Base Estimate Cost plus an allowance for contingency and generally prefixed by the applicable "P" or probability level. The Project Cost reflects costs as at the Base Estimate Date.
Plant	All plant, motor vehicles, appliances and things (for example, scaffolding and formwork) of whatsoever nature used or in use in or about the execution of the Work, but does not include materials, plant, equipment intended to form or forming part of the Works.
Project Proposal Report (PPR)	A statement detailing the scope and benefits of the project submitted by proponents as part of the project approval process.
Project scope	The work that must be performed to deliver a product, service or result with the specified features and functions.
Subcontractor	A contractor that enters into a subcontract and assumes some of the obligations of the primary contractor.
Sunk costs	Costs which have already been incurred, such as investigation, research, and design costs. Sunk costs are included in an outturn cost.
Work Breakdown Structure (WBS)	A hierarchical decomposition of the work to be executed to accomplish the project objectives and create the required deliverables. The WBS organises and defines the total scope of the project.

Table 2: The Phases of a Project for Australian Government Funding Purposes

Phase	Description
Identification	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 Infrastructure Investment objectives and identifies a preferred alternative solution for progression to the Project Scoping phase.
Scoping	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.
Development	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 a 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.
Delivery	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.
Post Completion	The Post Completion Phase comprises all activities after a Project is Complete until the Project is Closed. This phase is not expected to exceed 12 months.

2: The Base Estimate

At the highest level, the Base Estimate (including sunk costs) is the sum of two key components; the Client Costs and Construction Costs as at the applicable base date and which should cover all phases of the project. The base estimate should be prepared based on the estimator's best assessment of the quantities and market rates that will be required for a given scope of work at the time the estimate is prepared. Allowances for Contingency (inherent and contingent risks) or Escalation do not form part of the base estimate and should not be considered at this point of the estimating process.

Figure 1 below indicates schematically where the Base Estimate fits into the overall structure of an Outturn Cost Estimate:

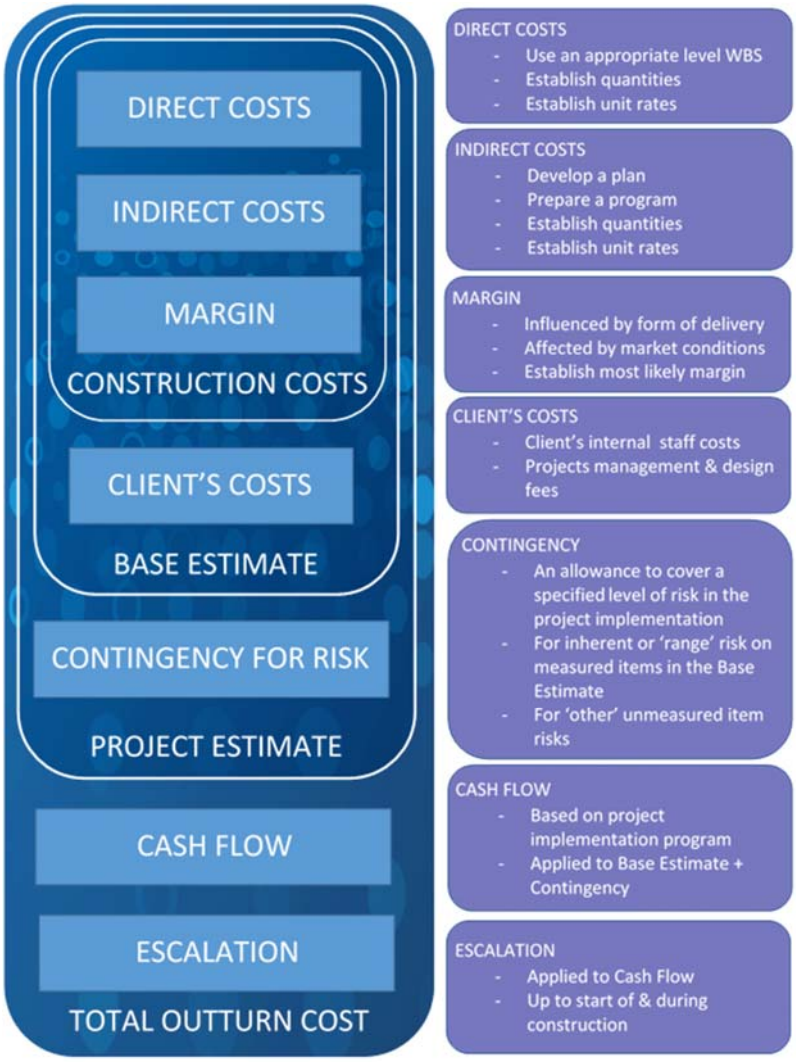

Figure 1: Components in the structure of an Outturn Cost Estimate

2.1: Estimating methods

The aim of any estimating process is to generate the most accurate reflection of the known project scope at the time the estimate is prepared. For that reason, the most appropriate cost estimating methodology may change as a project moves through its life cycle and the scope is refined or changed. For example, there is unlikely to be sufficient information available at the Project Identification phase to justify committing the resources required to prepare a detailed first principles estimate, and where a higher level of confidence in the estimate may be achieved through the application of an order of magnitude estimate.

The common methods used in the preparation of estimates are briefly outlined below. Note that for the purposes of meeting the Department's requirements of estimate reliability, a first principles estimate is expected to have been undertaken at the Development and Delivery phases for projects with an anticipated total outturn cost of over $25 million seeking Commonwealth funding.

Global estimating

Global (or order of magnitude) estimating is a method of estimating involving the use of 'all in' or 'global' composite rates such as road cost per kilometre. As such the estimate may be considered to consist of one element only.

Composite estimating

Composite estimating is a more refined method than using global rates as it involves the use of rates that include the combination of a number of work items to construct a single element of the project. The estimate is generally considered as having a small number of estimating elements only such as: drainage, environmental works, or traffic management costs per km, or bridge costs per square metre of deck area.

Unit rates estimating (based on historic rates)

Unit rate estimating calculates the cost of each item of the project by multiplying the quantity of work by historical unit rates. The project cost is then determined by the sum of the elemental costs. Unit rates are typically obtained from previous tenders for similar rate and are commonly selling rates that include indirect costs, contractor contingencies, margins and allowances.

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 Subcontract) to accomplish each activity of work contained within the project's work breakdown structure (WBS). Productivity assumptions are applied to all labour and plant costs with adjustments made to account for unique or unusual site characteristics.

Hybrid (unit rates/first principles) estimating

The hybrid method uses some features of the unit rate method and some of first principles estimating which can result in an increased accuracy of estimate over that of the unit rate method without requiring the resource investment required of a full first principles estimate.

2.2: Estimate Preparation

Insufficient attention to the quality of inputs and the approach to the preparation of estimates will lead to unreliable results. Important aspects to consider when preparing estimates are:

- using appropriately qualified and experienced staff e.g. trained Quantity Surveyors or specialist estimators;
- using an appropriate Work Breakdown Structure (WBS);
- the project scope definition and requirements;
- using the input and review by experienced people to increase the estimate's reliability;
- using appropriate software tools to assist in developing and presenting the Base Estimate; and
- using applicable benchmarking and cost databases where available to validate cost estimates.

Generally, the main issue underlying the reliability of any cost estimate is the ability to appropriately define the project scope. The scope description defines what is, and what is not included and is the starting point for any base estimate. Readers are referred to Guidance Note 1 (Project Scope) for a more detailed explanation and for guidance on project scope definition. Significant inaccuracies in base cost estimates are generally a consequence of poor scope definition. Attempting to develop a base estimate without a reasonable and consistent level of defined scope is merely 'guesswork' and is of little value to those seeking to establish and manage a project budget.

The uncontrolled or unapproved additions and alterations to a project after the scope has been defined (scope creep) are likely to result in additional costs. This will undermine the original estimate as any cost estimate can only represent the defined scope of work. For example, McKinsey & Company[2] found that with bridge replacements, changes made by owners to the scope of projects tend to be the biggest cause of cost and schedule overruns.

An estimate should identify costs for all scope items to the maximum extent possible for the phase the project is in. Where information is insufficient or unavailable and assumptions must be made in order to prepare the base estimate, these assumptions should be noted and recorded appropriately. Any inclusions listed as assumptions should be adjusted or removed when more detail becomes available.

As a project progresses from the Scoping to Development phase, the robustness and detail of underlying information which supports the estimates should increase. Cost estimates can benefit from refinement during the course of a project to reflect the additional detail available. It is expected that the accuracy of a project estimate will increase as the project progresses through its different phases. An example of an Estimate Checklist and Design Maturity Matrix applicable to the road sector is presented at Appendix GN2-1. The Matrix, or a similar approach appropriate to the

[2] http://www.mckinsey.com/client_service/infrastructure/tools_and_solutions/roads_and_bridges <accessed 21/02/2017>

particular application, is a useful indicator to the suggested level of input information that should be available by the end of each phase of project development.

2.2.1: Estimate Validation

A competent, unbiased team should validate the base cost estimate. Estimates on very large projects are complex and may be subject to perceptions of being inappropriately manipulated. A second independent set of eyes to review the estimate will afford managers and decision makers an opportunity to capture a different perspective or at least a second opinion[3]. Note that as part of its process of considering submissions for Australian Government funding for road and rail infrastructure projects, the Department will review and assess the associated cost estimates; refer to the Overview component of the Department's Cost Estimation Guidance for more information on this process.

Peer Review: The formality and depth of review will depend on the type of project and its complexity. A peer review involves a line by line review by an estimator other than the original estimator. This may be someone with the necessary qualifications and experience from within the same agency, however at times it may be appropriate to seek these services from an independent, external professional cost estimation service provider. A peer review may focus on such aspects as: computational checking, review of estimating method used, review of the quantities and rates used to build the estimate, review of the schedule, reproducibility of the estimate, and review of the scope to determine whether it achieves the project objectives and whether the assumptions, inclusions and exclusions are valid. An engineering solution review may also be undertaken which assesses the appropriateness of the proposed engineering solution underpinning the cost estimate.

Revalidation of Estimates: Conditions and underlying assumptions for original and subsequent estimates often change, thus estimates need to be refreshed to account for these changes. Additionally, if changes to the scope of the project have occurred, the base estimate must be revised to reflect the change. Note that the Department generally requires estimates for projects for which Australian Government funding is sought to be updated at each project phase.

[3] US Department of Transportation Federal Highway Administration (2007) *Major Project Program Cost Estimating Guidance* (downloadable from https://www.fhwa.dot.gov/ipd/pdfs/project_delivery/major_project_cost_guidance.pdf)

2.3: Construction Costs

2.3.1: General

Construction Costs in an estimate are generally prepared by one of two methods or a combination of both where appropriate:

1. First principles build up of estimates based on the detailed resources required to perform the work; or
2. Unit rate estimating (based on historic rates), which are used at a direct cost level, or an "all up" rate level.
   a. The Direct Cost level uses "net" rates to estimate the work which requires the addition at cost summary level for Contractor's Indirect Costs and Margin.
   b. The "all up" rates level uses a "gross" rate that includes all the on-costs described in '2a'.

The **first principles** method involves building up an estimate for each item in the work breakdown structure using its most basic resources[4]. This methodology computes the cost of a Work Breakdown Structure element by estimating at the lowest level of detail wherein the resources (Plant, Labour, Materials and Subcontractors) to accomplish the work effort are readily distinguishable and discernible. Productivity assumptions are applied to all labour and plant costs with adjustments made to account for unique or unusual site characteristics. All activities are included in the base estimate, including temporary works and staging.

Direct cost rates, indirect costs (including offsite overheads) and margin are calculated to develop a direct cost rate for each element, that, when applied to the calculated elemental quantities, gives a direct cost forecast. Estimates may also be supported by quotations from suppliers or contractors for all or part of an activity.

In order to be properly applied, first principles estimating requires productivity-based historical rates and knowledge including:

- production rates for equipment (excavators, pavement machines, tunnel boring machines and the like);
- use of consumables such as fuel;
- wastage factors;
- labour productivity, crew size and crew mix;
- knowledge of working hours, shifts and down time; and
- employment awards (such as Enterprise Bargaining Agreements if applicable) and rate calculations.

[4] First principles estimating may also be variously known as "bottom-up", or "basic cost" estimating.

An example of a first principles build up for laying 100 metres of pipe is shown in figure 2 below. Note that notional details, quantities and rates have been used in the table which is for illustrative purposes only.

Example of First Principles Estimating Methodology - Civil Works						
Item	**Description**	**Unit**	**Quantity**	**Number**	**Rate**	**Total**
1.0	**Activity: Installation of 100m of DN200 PE pipe**					
	Estimating Notes and Assumptions:					
	Estimate based on 10 hour shift					
	Assume 5% wastage of pipe					
	Inputs					
	Length of pipe	m	100			
	Trench Depth	m	1			
	Trench Width	m	0.5			
	Total volume of excavated material	m^3	50			
	Production rate	m per shift	50			
	Duration	shifts	2			
	Calculations:					
	Labour					
	Supervisor	shift	2	1	$700	$1,400
	Machine Driver	shift	2	2	$550	$2,200
	Labourers	shift	2	3	$550	$3,300
	Plant					
	Excavator - 20t	shift	2	1	$800	$1,600
	Tipper - 15t	shift	2	1	$450	$900
	Ute	shift	2	1	$200	$400
	Materials					
	200mm pipe inc. 5% wastage	m	105		$37	$3,885
	Bedding and backfill material	m^3	50		$30	$1,500
	Subcontract					
	Disposal of unsuitable material (Provisional Quantity as directed)	m^3	10		$45	$450
	Total Cost of Activity - lay 100m of pipe	**$**				**$15,635.00**
	Total Cost - rate per metre	**m**	**100**			**$156.35**
	Note: all values in this table are for illustrative purposes only					

Figure 2: Example First Principles build up to calculate the cost of laying Polyethylene pipe

Unit Rate estimating calculates the cost of each element of the project by multiplying the quantity of work by historical unit rates to obtain a price. While a relatively quick method of estimating, one disadvantage is in the interpretation of what is included for in the unit rate. Additionally, in general it does not consider resources, the underlying construction methodology, or any site-specific conditions so the estimator must make adjustments in order to account for the differences between projects. This can lead to inaccuracies if the circumstances, project location, and site conditions for the historic project differ significantly from the project being estimated. As such it is important that the makeup of the historical unit rates is well understood.

Supporting data for 'all up' rates is generally only available from tender schedules of past projects and for this reason can be unreliable because it often relates to a project from a different context, location and risk profile. Gathering accurate information on all up rates and rates for direct costs, indirect costs and margin is difficult for agencies and requires careful analysis from well-structured tender schedules. However, well maintained historical cost data is useful in benchmarking estimates to highlight potential omissions through sanity checking and to achieve a level of confidence in the overall pricing levels.

The more transparent forms of contract, e.g. Alliance, Cost Plus etc. provide the detail of contractor's costs broken up by Direct Costs, Indirect Costs, risk allowances and margin, thereby providing more ready access to the detail. The benefit of splitting the estimate into Direct and Indirect Costs, and using first principles estimating methods is that the estimated cost of the work reflects the methodology required to perform the work, the construction program and the resources required.

Additional advantages of the first principles method include[5]:

- it is an intuitive method for experienced practitioners;
- it is defensible;
- credibility is provided by visibility into the basis of estimate for each cost element;
- it is easily audited to determine exactly what the estimate includes and whether anything was overlooked;
- with greater granularity through first principles, the entire estimate is less compromised by the miscalculation of an individual cost element; and
- it provides excellent insight into major cost contributors.

Based on the variable results experienced with historic cost estimating methods, the first principles method is the preferred method to identify and assess construction costs and it is recommended that it be used wherever possible.

What constitutes the Direct and Indirect Cost portions of an estimate can be subject to interpretation between estimators. Sections 4.2.2 and 4.2.3 provide broad guidance as to which

[5] Adapted from NASA (2015) *Cost Estimating Handbook Version 4.0* (downloadable at https://www.nasa.gov/pdf/263676main_2008-NASA-Cost-Handbook-FINAL_v6.pdf)

project elements should be categorised as Direct or Indirect Costs on road or rail projects. An additional checklist for Indirect Costs is provided in Appendix GN2-2, “Indirect Costs Checklist”.

All construction costs should be calculated as being effective at a specific date or month/year, i.e. the Estimate Base Date. Note that for the purposes of escalation calculation, escalation is calculated from the Base Quarter (e.g. the September Quarter comprising July, August and September) that corresponds to the Estimate Base Date.

2.3.2: Approaches to calculating Construction Costs for road projects

The key components of road projects are bulk earthworks, structures and pavement(s). Drainage may also be a significant component depending upon the topography and prevailing climate. A large component of the project cost is driven by the location and geotechnical factors which require the application of productivity rates to properly take into account the design and effort to construct the works. There is not a significant level of proprietary or manufactured items in above ground road projects (except for items such as bridge beams, drainage and road furniture items) as most materials are sourced as locally as possible. Investigation of material prices through local sources is necessary to properly estimate project costs.

2.3.3: Approaches to calculating Construction Costs for rail projects

Rail projects, unless they are large greenfield projects (of which there are some but not many), tend to be major upgrades, duplications, or enlargements to existing rail infrastructure. Unlike roads, there tends to be a higher level of manufactured items of a proprietary nature such as turnouts, signaling, communications, power equipment, rolling stock, track, and sleepers, in rail projects.

Rail construction work within operating rail networks has to be planned and estimated around “possessions”, in other words, those windows of time when normal train operations shut down and site access is provided to enable construction work to take place.

The influence of planning around possessions makes rail construction cost estimating different to cost estimating for road construction and arguably more variable. Examples of some of the factors that require special attention when costing rail projects are:

- costing must be based around the constraints imposed by the operating rail and safety requirements;
- working at night, or during weekends, is common practice, and needs to be factored into any cost estimate;
- costing of rail systems such as signaling and communications requires specialist knowledge and needs to take into account the interim staging and commissioning of the works; and
- work done in narrow sites (rail reserves) with limited physical access and specific rail safety requirements tends to result in extended program duration, resulting in a significant proportion of indirect costs compared with a road project.

2.4: Client's Costs

Agency guidance notes and estimating manuals should explain the makeup of Client's Costs, including whether internal staff costs are included in project costs or covered elsewhere in their agency's overhead costing.

For the purposes of presentation of cost estimates in funding submissions, the Department's standard Project Cost Breakdown (PCB) templates for Road and Rail projects (refer to Section 4), requires that Client's Costs are broken up by project phases into the broad categories of:

- Project Management, which includes the management of commercial, procurement, legal, environmental, planning and other project issues; and
- Design and Investigation, which includes geotechnical investigation, site survey, concept and detail design.

Property acquisition costs are a subset of Client's costs and should also be assessed at the same Base Date as the estimate and should include all associated costs such as agent's fees, valuations, legal costs, compensation etc. Note that sometimes the terms "Owner's" or "Principal's" cost are used instead of "Client's" costs. In this guidance note "Owner's" costs are recommended to be included as a subset of "Client's" costs in circumstances where the client or delivery agency is not the end owner – refer Section 4.2.1.

3: Work Breakdown Structure

A disciplined approach is fundamental to achieving a robust cost estimate. A standard Work Breakdown Structure (WBS) provides the structure to guide the disciplined preparation and presentation of capital cost estimates. While WBSs are likely to vary from one jurisdiction or agency to another, it would be expected that each agency would have a standard documented WBS.

A work breakdown structure is the cornerstone of an estimate because it defines in detail the work necessary to accomplish the end goal. A WBS deconstructs an end product into successive levels with smaller specific elements until the work is subdivided to the lowest level WBS components, or work packages, for which the cost can then be estimated. A 100 percent rule is followed whereby the next level of decomposition of a WBS element (child level) must represent 100 percent of the work applicable to the next higher (parent) element. A WBS following the 100 percent rule ensures that all costs for all deliverables are identified[6].

Projects are invariably made up of logical components or sub-projects, which may for example be functionally or geographically defined. It is beyond the objectives of this document to define the detail that might be appropriate for these sub-projects; however the components of the sub-projects should be rolled up into the WBS as defined. Examples of sub-projects include: the breakdown of rail or road projects into logical sections of chainage, or an intermodal terminal or stabling yard which forms part of a larger rail project. This level of breakdown is at the discretion of the agency and what is best for the project, provided the summary level WBS can be maintained. This approach also reflects the approach normally taken by estimators.

Some of the benefits of a standard WBS include:

- clearer delineation of major cost items contained in project funding proposals through defined elements, leading to more efficient evaluation of proposals;
- clearer identification of variances in elemental cost summaries between project milestones;
- providing a structure which could inform a quantitative risk assessment;
- enabling collection and analysis of key cost data and global rates for purposes of relativities and benchmarking of major projects; and
- by providing the ability to “roll up” subordinate items into a high level summary only, agencies are more readily able to comply with departmental requirements and achieve a more strategic overview of project costs.

Figure 3 illustrates an example extract of a detailed Work Breakdown Structure. To ensure consistency, quantitative elements should be expressed in International System of Units (SI), or SI derived units as specified in Schedule 1 – Australian legal units of measurement, of the National Measurement Regulations 1999 (or subsequent versions).

[6] Adapted from US Government Accountability Office (2009) GAO Cost Estimating and Assessment Guide (downloadable from http://www.gao.gov/new.items/d093sp.pdf)

LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
Element	Heading	Main Item	Sub-item or price build-up
EARTHWORKS	**Earthworks Preparation**	Clearing and Grubbing	Dozer, Type x
			Tipper
			Loader
			Labourers x 4
		Strip Topsoil	(Rate make up generally as above)
	Bulk Excavation	Bulk Excavation (other than rock), cut to fill	(Rate make up generally as above)
		Excavate and dispose of unsuitable material	
	Bulk Filling	Imported bulk filling to embankment, compacted	Supply imported filling
			Grader, Type x
			Compaction roller
			Water truck
			Labourers x 4
	Subgrade	Subgrade in cuttings	(Rate make up generally as above)
		Geotextile	Geotextile supply
			Geotextile lay
DRAINAGE	**Removal / Demolition**	Remove culverts	(Detailed make-up)
	Culverts	Concrete Pipe Culverts (by size)	(Supply, install rate make-up)
		Concrete Box Culverts (by size)	(Supply, install rate make-up)
		Steel, corrugated culverts (by size)	(Supply, install rate make-up)
	Pavement Drainage		
	Subsurface Drainage		

Figure 3: Example extract of a Work Breakdown Structure

Figure 3 demonstrates the application of the 100 percent rule where the sum of a parent's children must always equal the parent. The sum of earthworks preparation, bulk excavation, bulk filling and subgrade must equal Earthworks. The sum of clearing and grubbing and strip topsoil must equal Earthworks Preparation, and so on. In this way the WBS ensures that each element is defined and related to only one work effort, so that all activities are included and accounted for.

3.1: Appropriate Level of Detail

The amount of detail that can be generated in an estimate is related to the amount of design and other documentation available. The “detail” in an estimate refers to quantity and rate detail.

The quantity detail is largely dictated by the availability and quality of drawings, as this will determine the number of Elements, Headings, Main Items and Sub-items into which the project is divided. The detail in the rate is largely influenced by the time available to prepare the estimate and whether sufficient effort is applied to taking account of factors with the potential to influence the rate such as plant production rates and labour inefficiencies. Both quantity and rate detail play complementary roles in making up an estimate.

The project phases that should be used for cost estimates for Australian Government funded projects are, Project Scoping, Project Development and Project Delivery as discussed in Table 2. The level of detail in the quantities that can be generated increases as the project develops through each phase.

In summary, the level of detail required in regard to both quantity and rate increases during the project life cycle, commencing with a concise strategic estimate and finishing (at pre-tender estimate just prior to the Delivery phase) with a large detailed estimate.

The level of detail is expressed as levels in a Work Breakdown Structure that underpins how an estimate is structured. The levels referred to in this guidance material are:

- Level 1 Elemental level
- Level 2 Heading level
- Level 3 Item level
- Level 4 Rate Build up level

Estimates at all stages should be presented showing a cascade of Elements, Headings and Items, however the headings and items expand as more design information is made available. Not all estimates will use all four levels for all items at once. A Scoping Phase estimate might use Levels 1, 2 and 3 with some Level 4 supporting information, while a Development Phase estimate may use Levels 1 to 4, with a significant detail at Level 4 (unit rate build-up).

The detailed estimates prepared by agencies should generally be expressed in Work Breakdown Structure Level 3 item description, but contain Level 4 rate build up detail (which can be viewed in supplementary estimate reports in most estimating systems).

To meet Departmental requirements to provide reliable estimates, the table below sets out the appropriate level of supporting detail that is required for an estimate at each project phase.

Table 3: Recommended level of detail at each project phase

Estimate Content	Project Identification	Project Phase		
		Project Scoping	Project Development	Project Delivery
Construction Cost & Base Estimate Report	Report based on WBS Level 1	Report based on WBS Level 1	Report based on WBS Level 1	Report based on WBS Level 1
Estimating Approach	Global estimate, Composite rates, Historical rates	First Principles, Historical Unit rates, Composite rates	First Principles, Historical Unit rates	First Principles, Limited Historical Unit rates
WBS Levels used	WBS 2 supported by Level 3 items	WBS 1, 2, 3 with some Level 4 rate build up	WBS 1, 2, 3 & 4 used throughout	WBS 1, 2, 3 & 4 used throughout

In summary, the use of Global (order of magnitude) and / or historical rates that may be used to develop the cost estimate at the Project Identification phase shifts towards a First Principles build up by the Project Delivery phase.

4: Project Cost Breakdown Template

The Department has developed spreadsheet-based Road and Rail Project Cost Breakdown (PCB) templates which reflect the principles of estimate preparation and presentation described in this guidance material. The PCB templates are described in more detail in Appendix GN2-3 to this document and in the Overview component of the Department's Cost Estimation Guidance. Microsoft Excel versions of the PCB templates are available from State and Territory infrastructure delivery agencies.

The PCB templates were developed in consultation with state jurisdictions. Their purpose is to achieve improved consistency of presentation of cost estimates included in submissions for Australian Government funding for road and rail infrastructure projects. Over time, collection of cost data as reported in the PCB templates will enable the Department to create a dataset from which strategic level benchmarking of road and rail projects can be undertaken.

As outlined in the NOA, the Department requires that all estimates included in Project Proposal Reports (PPR) be accompanied by a completed PCB template. The structure of the PCB reflects the project phases namely the Scoping Phase, Development Phase and Delivery Phase.

Within each phase a limited breakdown of costs is identified within the PCB template. This approach enables the early project development costs and agency costs to be separately identified from the main construction costs.

It is not intended that the Department PCB template replace the WBS used by agencies. The PCB template is a high-level summary only, capturing key cost data and is not an appropriate tool to develop a detailed base cost estimate. It is expected that the data required to populate the Project Cost Breakdown template would draw on the same data a Proponent would use to develop the Project's Base Estimate. In other words, all required fields within the PCB template should be readily available within an agency's WBS allowing data to be mapped between the two. Jurisdiction agencies have confirmed that they can map data from their existing WBS or comparable structure into the PCB format, noting that in the PCB templates each cost element description is accompanied by a detailed definition.

Agencies are encouraged to maintain a standard WBS with relevant levels of detail applicable to each project phase using a structure that will ensure consistent preparation, review and comparison of project estimates. There are many resources such as computer databases and software available to assist with the preparation of estimates. Agencies may prefer certain software and are likely to have databases of costs and unit rates from completed projects. However, caution is needed when considering the appropriateness and applicability of information in these databases, and how the project may be different from past projects[7].

[7] Austroads (2014) *Austroads Guide to Project Delivery Part 2 – Planning and Control,* Austroads, Sydney

4.1: Differences between Road and Rail PCB templates

The overall structures for both Road and Rail PCB templates are very similar. As much as possible, the same terminology has been used in both PCB templates; however some of the construction elements are unique to each sector.

The Construction Costs for Road and Rail differ only in the areas unique to each sector, otherwise common civil construction works are under the same WBS headings, for example:

- The Road PCB template identifies elements for Pavements, Traffic Management, Traffic Signals, etc;
- The Rail PCB template identifies elements for Rolling Stock, Rail Systems, Transport Stations, Trackwork, etc.

4.2: WBS and PCB Element Content

The elements that make up a Work Breakdown Structure, particularly at levels one and two, should be high level and designed to be obvious so as to permit easy categorization.

In the Department's PCB template the estimated Client Costs have been rationalised to collect all project costs that are not part of the estimated Construction Cost (except for the identified Contingency and Escalation allowances). Sections 4.2.1 through to 4.2.4 provide broad guidance as to the content contained within Client Costs, Contractor's Direct Costs, Contractor's Indirect Costs, and Client Supplied Materials and Services respectively. Every project is unique and may involve activities and/or cost elements not shown and the list of cost elements and the activities within each are not to be considered exhaustive.

An agency estimating manual would be expected to contain a highly detailed reference guide defining the type of activities/tasks and materials that need to be considered in the base estimate build-up. In addition, a cost estimation manual or procedure should clearly define the content of components contained in a WBS in a way such that a newcomer or novice has little difficulty understanding its application. For example it may not be clear whether an item such as concrete includes only supply and delivery, or whether it is an all up rate which includes formwork, reinforcement, placing, finishing, etc. To avoid misinterpretation such items should be broken down through successive WBS levels as necessary.

Conversely, a project-specific WBS, although likely derived from a standard template, should be populated only with the elements appropriate to the project.

4.2.1: Client Costs

- **Project Management:** Includes the costs incurred by the agency (including in-house staff or externally sourced staff) for:
    - project management in managing the work;
    - contract management and administration;
    - procurement of the construction works, most notably where there are reimbursable costs for tendering (Alliance, Early Contractor Involvement, Public-Private Partnership);
    - obtaining consents and approvals;
    - cost planning and cost advisory services;
    - stakeholder consultation and communication;
    - on-costs related to the above services (e.g. offices, IT etc); and
    - Agency corporate overhead (if applicable).
- **Design and Investigation:** Includes the technical support performed or engaged by the agency for:
    - project planning (i.e. route selection, operational requirements and track layout, etc);
    - design, including concept, preliminary and detailed design;
    - design verification; and
    - site investigation including site geotechnical or other technical studies, survey, environmental studies etc.
- **Client supplied Insurances, Fees and Levies:** This element contains costs for items which are not provided by the Contractor. It is possible that the procurement process may transfer this responsibility to the Contractor, in which case the relevant costs are also transferred in a revised estimate summary.
- **Property Acquisition**
    - **Purchase price:** purchase price of property or access rights;
    - **Transaction and other costs:** legal, stamp duty, property valuation, surveys, etc;
    - **Business compensation:** business and/or personal compensation, relocation costs of owners or tenants; and
    - **Environmental Offsets:** purchase of offset land, development/planting of land under an environmental offset.

While they do not form part of the Department's Project Cost Breakdown, the following additional client costs may be experienced on some projects and reasonable judgement should be applied to allocate cost elements not identified:

- **Integrated Testing and Commissioning:** This element is generally unique to rail projects and includes the costs incurred by the Owner and delivery agency in the commissioning and acceptance of the completed works;

- **Possession and Bussing:** This element is generally unique to rail projects and includes the cost of temporarily suspending rail operations (Possessions) and supplying alternative temporary travel arrangements for passengers (Bussing) while critical construction work is undertaken. It is common practice for the asset owner or operating entity (e.g. RailCorp in NSW) to arrange these services; and
- **Owners' Costs:** This element occurs when the delivery agency is not the end owner. For example, in New South Wales, RailCorp is the entity that ultimately owns the asset that is constructed by the delivery agency. The Owner incurs costs through reviewing and approving the proposed design in accordance with its own standards and requirements.

4.2.2: Contractor's Direct Costs

Tables 5 and 6 on the following pages provide broad guidance only to the content contained within elemental level components of Direct Costs. The Department's PCB templates provide a more detailed explanation of the items and activities contained within each element. Reasonable judgment should be applied to allocate cost items not identified.

4.2.3:Contractor's Indirect Costs

- **Preliminaries and Supervision:** This element contains the Contractors Site establishment and site running costs, along with the Management and Supervision required to manage the works.
- **Other:** Depending on the form of procurement, there may be agreed or estimated costs associated with developing the Contractor's scope and price proposal (e.g. Early Contractor Involvement or Alliance forms of contract). In these cases, the cost of developing the construction delivery proposal is shown in this element.

4.2.4: Client Supplied Materials and Services

This element contains the costs for items which are part of the construction works scope and which are supplied by the Client. These items would generally not attract a mark-up by the Contractor. Materials commonly supplied by Clients include rail, rail sleepers, special systems and technology while Services may extend to the installation of special components by the Client's own resources.

Table 5: Content of road project elements

Road Projects - Elements	Content
Environmental Works	Environmental measures for temporary environmental works during construction such as erosion control, waste disposal, dust control, treatment of heritage, and fauna and flora requirements.
Temporary Works / Traffic Management	Temporary works and services to support staging and traffic management.
Public Utilities Adjustments	Utility adjustments, including relocation, diversion, protection or replacement.
Bulk Earthworks	Bulk earthworks including disposal of spoil and foundation treatment.
Retaining Walls	All types of retaining walls including reinforced earth, cantilever, crib or interlocking, post and panel, and diaphragm walls.
Drainage	Corridor related drainage, including longitudinal, cross, sub-soil, detention basins, and water treatment.
Bridges	All bridge construction activities including excavation, foundations systems and abutment structures.
Tunnels	Civil works and tunnel services (egress ways, mechanical, electrical, drainage, fire protection etc.) excluding pavement.
Pavements	All sub grades, base courses (layer) and wearing courses, including upgrades to existing pavements.
Finishing Works	Line markings, road barriers, bus stops, footpaths, cycleways, fencing, landscaping, etc.
Traffic signage, signals and controls	Signals, permanent traffic signage, Intelligent Traffic Systems including information and monitoring systems.
Design (if by contractor)	Design undertaken by the contractor where a design and construction service is undertaken.
Supplementary Items	Items that cannot be classified above (e.g. buildings, control centres, transport modal interchanges etc).

Table 6: Content of rail project elements

Rail Projects - Elements	Content
Environmental Works	Environmental measures for temporary environmental works during construction such as erosion control, waste disposal, dust control, treatment of heritage, and fauna and flora requirements.
Temporary Works / Traffic Management	Temporary works and services to support staging and traffic management.
Public Utilities Adjustments	Utility adjustments, including relocation, diversion, protection or replacement. Does not include rail systems such as signaling, communications and traction power etc. (refer respective elements).
Bulk Earthworks	Bulk Earthworks including disposal of spoil. Includes capping layer.
Retaining Walls	All types of retaining walls including reinforced earth, cantilever, crib or interlocking, post and panel, and diaphragm walls.
Drainage	Box and pipe culverts, track related drainage, detention basins and water treatment.
Bridges	Bridges and viaducts, including excavation, foundations systems and abutment structures.
Tunnels	Civil works and tunnel services including mechanical, electrical, drainage and fire services.
Roadwork and Landscaping	External works required as part of the project.
Trackwork	Trackwork including track slabs, turnouts, crossovers etc.
Rail Systems – Overhead wiring	OHW structures, wiring, and return bonds.
Rail Systems – Power Supply and Distribution	Power supply, substations, sectioning, switch rooms, traction power distribution.
Rail Systems - Signaling	Structures, fittings, cabling, trenching, signaling controls, and software.
Rail Systems – Rail Communications	Rail communications systems, including radio, passenger information and Supervisory Control and Data Acquisition (SCADA).
Rail Systems – Combined Services Route	Excavation, backfilling, conduits, pits and markers.

Rail Projects - Elements	Content
Transport Stations, Interchanges, Buildings, Stations, Stabling and Maintenance Buildings	Above and below ground stations, transport interchanges, carparks, stabling buildings and maintenance facilities.
Commissioning and Handover	Testing and commissioning, accreditation costs.
Design (if by Contractor)	Design undertaken by the contractor where a design and construction service is undertaken.
Rolling Stock	Design, procurement, commissioning and delivery of rolling stock.
Supplementary Items	Items that cannot be classified above.

5: Conclusion

This Guidance Note – Base Cost Estimation:

- defined and described the Base Cost Estimate;
- described the methodology to develop a Base Cost Estimate;
- provided an overview and broad description of the typical components of a Base Cost Estimate; and
- explained the value and use of a Standard Work Breakdown Structure and the relationship between a WBS and the Department's PCB template.

Application of the principles and framework outlined in this Guidance Note will assist estimators to develop Base Cost Estimates that are consistent, realistic, traceable, and appropriate at each phase of the project life cycle.

Estimate Input Checklist and Maturity Matrix

The schedule below suggests the level of input that should be provided by the end of each phase of project development. For consistency, the Engineering Documentation categories listed under General Project Data align with the Construction Cost categories of the PCB template. This approach is example only and the Matrix should be adapted as required to suit different applications.

The amount of detailed input at the Development Phase will be influenced by the Procurement Strategy (eg Design & Construct would not require a detailed reference design).

This Matrix only lists inputs for three Projects Phases. From the client's perspective, once a project has entered the delivery phase, no further input is required as contracts will have been signed and further cost estimation is will be unnecessary.

Typical Road Project

General Project Data	Project Identification	Project Scoping Phase	Project Development Phase
General			
Performance and Functionality Requirements	General Description	Definition of key requirements	Fully defined
Project Scope Description	General Description	Preliminary Scope of Works	Fully defined
Alignment - Horizontal	Assumed (eg on photo map)	Initial alignment	Confirmed alignment
Alignment - Vertical	Assumptions described	Initial alignment	Confirmed alignment
Property Requirements	Major requirements and assumptions noted	Preliminary schedule of properties prepared	Complete schedule of properties
Geotechnical	Regional Data / knowledge	Limited investigation	Detailed investigation
Survey	Maps / Cadastral boundaries overlaid on photomaps	Preliminary survey, identify problem areas	Detailed survey
Environmental	Assumptions, key issues	Preliminary studies	Detailed studies
Community Consultation	Assumptions, key issues	Preliminary studies and consultation	Full consultation and requirements identified
Noise Studies	Assumptions, key issues	Preliminary studies and consultation	Full consultation
Escalation	Apply factors at overall level	Preliminary cashflow using agency factors	Devellioped cashflow using agency factors
Work Breakdown Structure	Level 1-2	Levels 1-3	Levels 1-4
Contracting Strategy	Assumption	Assumed strategy	Strategy reflected in the estimate
Engineering Documentation			
Environmental Works	Assumption only, key issues identified	Preliminary scope	Detailed scope
Traffic Management and Temporary Works	Assumptions, key requirements identified	Preliminary requirements documented	Confirmed requirements and staging plans
Public Utilities Adjustments	Assumptions and desktop research for major issues	Limited research (Dial Before You Dig)	Detailed research and documentation
Bulk Earthworks	Assumptions, based on experience	Preliminary Cut and Fill quantities, Key Sections	Confirmed Cut and Fill quantities, All Sections
Retaining Walls	Major locations identified, otherwise assumptions	Preliminary locations and extent, assumed types	Confirmed locations and extent, assumed types
Drainage	Key areas identified, otherwise assumptions	Preliminary layout, sizing of major items	Detailed layout, sizing of all items
Bridges	Locations identified (typical solutions assumed)	Assumed solutions, sizes of key elements	Confirmed solutions, sizes of most elements
Tunnels	Locations identified (typical solutions assumed)	Assumed solution and key parameters	Confirmed solution
Pavements	Preliminary types identified	Assumed types and extent	Confirmed types and extent
Finishing Works	Assumption only, key issues identified	Preliminary scope	Detailed scope
Traffic Signage, Signals and Controls	Assumed locations	Preliminary extent	Detailed scope and extent shown

Appendix GN2-2: Indirect Costs Checklist

Main Heading	Sub-Heading (not exhaustive)	Alternatively incl in Direct Costs	Establish & Dis-establish Costs	Recurring Costs
PRELIMINARIES				
Authority Fees & Charges				
	Council Permits and Fees			
	Long Service Levy			
Project Insurances				
	Public Liability			
	Professional Indemnity			
	Contract Works			
	Difference in Conditions			
Bank Guarantee Charges				
	Bank Guarantees			
	Performance Bonds/Securities			
	Retention			
Survey Fees				
	Survey Crew	Alt in DCs		
Temporary Sheds				
	Contractor's Offices			
	Contractor's Change and Amenities Sheds			
	First Aid Sheds			
	Storage Sheds			
	Sub-Contractor's Sheds (if provided by Main)			
Hoardings & Fencing				
	Temporary hoardings and gantries			
	Temporary fencing			
Notice Boards & Signs				
	Site sign board			
	Site signage			
Temporary Roads, Bridges				
	Temporary site roads			
	Temporary site bridges and access			
	Making good to Council footpaths			
Site Communication				
	Computer and IT costs			
	Plan Printing and Photocopying			
	Telephone, faxes			
	Radios			
	Couriers			
	Stationary			
Temporary Electrical				
	Establish Temp connections			
	Power usage charges			
	Maintain and adjust power distribution			
Temporary Hydraulics				
	Establish Temp connections			
	Water usage charges			
	Maintain and adjust water distribution			
Security				
	Site security patrols			
	Watchman			
Site Safety				
	Protective clothing			
	Barriers, Lighting, Safety Signage			
	Safety Precautions			
	Safety Inductions and Training			
	Medicals			
	Nursecall			
Environmental Monitoring				
	Noise	Alt in DCs		
	Hazardous materials	Alt in DCs		
	Sedimentation basins and treatment	Alt in DCs		
Plant and Equipment				
	Forklifts			
	General Site Equipment	Alt in DCs		

Main Heading	Sub-Heading (not exhaustive)	Alternatively incl in Direct Costs	Establish & Dis-establish Costs	Recurring Costs
	Man and Material Hoists	Alt in DCs		
	Small Tools			
	Site Vehicles			
Craneage				
	Fixed craneage (dry or wet hire)	Alt in DCs		
	Mobile craneage (to run the site compound)	Alt in DCs		
Scaffolding				
	General Scaffolding	Alt in DCs		
	Access Stairs and Walkways	Alt in DCs		
Testing				
	Testing	Alt in DCs		
Sundry Operating Expenses				
	Sundry Expenses			
	Petty Cash			
	Freight and Transport	Alt in DCs		
	Carparking			
	Entertainment			
	Training and Development			
Cleaning				
	Maintenance of Site establishment			
	Interim site clean ups	Alt in DCs		
	Final clean	Alt in DCs		
Maintenance Period				
	Attendant Labour	Alt in DCs		
	Consumables	Alt in DCs		
LABOUR AND SUPERVISION				
Labour				
	Gateman			
	First Aider			
	Nipper			
	Storeman			
	General site labour (non-direct)			
Labour Accomodation				
	Labour Camp			
	Per diem accommodation rates			
	Other labour expenses			
	Relocation costs			
	LAFHA			
Labour Travel				
	Allowance (for above)			
	Travel Costs			
	R&R Trips			
	Vehicles			
Supervision				
	Project Director			
	Project Managers			
	Engineers			
	Planners			
	Contract/Commercial/Admin			
	Safety Managers			
	Quality Assurance			
	Specialist Engineers/Environmental/Community			
	General Foreman			
	Foreman			
	Superintendent			
Supervision				
	Supervision Camp			
	Per diem accommodation rates			
	Other supervision expenses			
	Relocation costs			
	LAFHA			
Supervision Travel				
	Allowance (for above)			
	Travel Costs			
	R&R Trips			
	Vehicles			

Appendix GN2-3: Road and Rail PCB Templates

Application of the PCB Templates

The PCB for Road and Rail projects is a key foundation for providing Project Proposal Report (PPR) cost summaries that can be assessed more objectively and efficiently by the Department. The discipline should be applied through the Scoping, Development and Delivery Phases of projects to project completion.

Full compliance with all parts of the PCB template requires projects to be estimated in sufficient detail to complete all elements; this is not an issue for many major projects. One exception however, is where projects, generally the less complex or less major projects, are estimated at “all up” rates that contain the contractor’s mark-ups. In these cases the costs would be assigned as best as possible to the Direct Cost schedule and noted that they include Contractor’s mark-ups.

Most project estimates contain a level of detail far greater and may be more granular than the PCB structures described in this guidance material. The NOA lists the additional documentation which must be provided as part of a Project Proposal Report. The PCB template is the cornerstone for reliable reporting and provides strategic benefits for agencies and the Department by enabling more consistent and effective communication and interpretation of key financial data on projects.

The PCB template lists cost items in three tiers or levels (Project Cost Breakdown Levels 1 to 3) as shown in the Road and Rail PCB structures on the following two pages.

PCB Level 1	PCB Level 2	PCB Level 3
Client Management & Oversight Cost		
	SCOPING	
		Project Management-Scoping
		Design & Investigation-Scoping
	DEVELOPMENT	
		Project Management-Development
		Design & Investigation-Development
	DELIVERY	
		Project Management-Delivery
		Design & Investigation-Delivery
		Client supplied Insurances, Fees, Levies - Delivery
	PROPERTY ACQUISITION	
		Purchase Price
		Transactional Cost & Other costs
		Business Compensation
		Environmental Offsets
Construction Cost		
	CONTRACTOR	
		Environmental Works
		Traffic Management and Temporary Works
		Public Utilities Adjustments
		Bulk Earthworks
		Retaining Walls
		Drainage
		Bridges
		Tunnels
		Pavements
		Finishing Works
		Traffic Signage, Signals and Controls
		Design (if by contractor)
		Supplementary Items
	CLIENT	
		Client supplied Materials and Construction Services - Delivery
TOTALS		

Figure GN2-3-1: Road PCB Template

PCB Level 1	PCB Level 2	PCB Level 3
Client Management & Oversight Cost		
	SCOPING	
		Project Management-Scoping
		Design & Investigation-Scoping
	DEVELOPMENT	
		Project Management-Development
		Design & Investigation-Development
	DELIVERY	
		Project Management-Delivery
		Design & Investigation-Delivery
		Other Clients Costs
	PROPERTY ACQUISITION	
		Purchase Price
		Transactional Cost & Other costs
		Business Compensation
		Environmental Offsets
Construction Cost		
	CONTRACTOR	
		Environmental Works
		Traffic Management and Temporary Works
		Public Utilities Adjustments
		Bulk Earthworks
		Retaining Walls
		Drainage
		Bridges
		Tunnels
		Rolling Stock
		Rail Systems - Overhead wiring
		Rail Systems - Power Supply and Distribution
		Rail Systems - Signalling
		Rail Systems -Rail Communications
		Rail Systems - Combined Services Route
		Roadworks, Landscaping, Fencing
		Transport Stations, Interchanges, Buildings, Stations, Stabling and Maintenance Buildings
		Trackwork
		Commissioning and Handover
		Design (if by contractor)
		Supplementary Items
	CLIENT	
		Client supplied Materials and Construction Services
TOTALS		

Figure GN2-3-2: Rail PCB Template