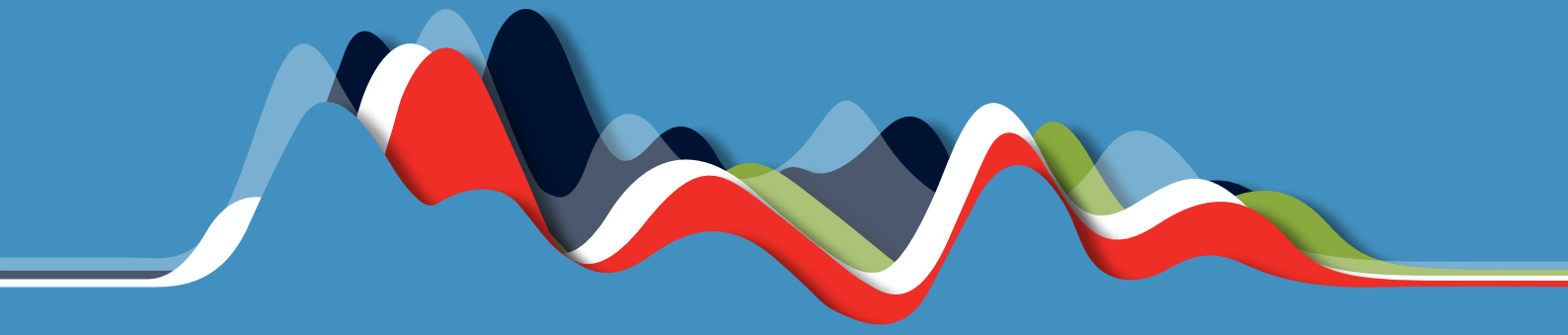

Cost estimation

Developed by:
The Project Management Office,
Integrated Networks, Auckland Transport

Auckland Transport
An Auckland Council Organisation

Change History and Approval

Approval indicates an understanding of the purpose and content described in this document. By signing this document everyone agrees work should be initiated on this project and necessary resources should be committed as described herein.

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DATE:	DATE:	DATE:
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1.0	05/03/2013	Final
2.0	22/07/2020	Complete review and rewrite
2.1	26/01/2023	Complete review and re-write and alignment with NZTA/WK SM014
2.2	20/04/2023	Final acceptance of editorial changes
3.0	12/05/2023	Final layout

The PMO acknowledges
the contributions from all who assisted in compiling
this guidebook.

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1. **Glossary** (in addition to SM014 2.1)

TERMINOLOGY	DEFINITION
Actual Cost at Completion	This is the final actual costs actually incurred in completing all work required to deliver the mandate.
Analogous Estimate	An estimating technique, using historical information from a similar project.
Auckland Transport (AT)	The establishment of AT in 2010 was the first time in Tāmaki Makaurau's/ Auckland's history that all transport functions and operations fell under one organisation. As such, AT is a Council Controlled Organisation (CCO) of the Auckland Council who manages and runs the region's transport network on behalf of Tāmaki Makaurau's/Auckland's ratepayers and taxpayers. AT is responsible for all of Tāmaki Makaurau's/Auckland's transport services (excluding state highways. AT is not responsible for the region's motorways and state highways. That is the role of Waka Kotahi NZ Transport Agency.) - from roads and footpaths, to cycling, parking and public transport. For further details see section1 in the EPMF.
Baseline	A point used for comparisons.
Bottom-Up Estimate	An estimating technique, where the costs of individual elements are identified and quantified to the greatest possible level of detail.
Contingency	As per Waka Kotahi's Cost Estimation Manual SM014 (SM014). The contingency will vary across the project life cycle, but in general terms, is expected to decrease as work progresses. (For further information refer to SM014's section 9 Risk and Contingency Calculation and the Guide to Project Risk Management).
Cost Scope Adjustment (CSA)	This is an application by the Funding and Analysis Team to our funders for extra funds over and above what has already been applied for and approved previously.
Cost Estimator	A role in a project team or a supplier who is tasked to prepare cost estimates for the project or part thereof. This could be an alternative internal or external party where the estimate owner is unable to undertake the estimate themselves.
Enterprise Programme and Project Management Framework (EPMF)	AT's structure of tools, guides, processes, policies, organisation and role definitions associated with delivering a project.
Escalation	An accounting term, for the financial provision to cover for cost fluctuation. It is a forecasted percentage uplift to the project cost estimate to allow for inflationary increases anticipated throughout the life of a project. It is required on AT Estimate Summary Sheets used for funding applications and implementation estimates.
Estimate Owner	The person with overall responsibility for the investment or project for which they have commissioned an estimate. They can be an Investment/Transport planner or a Delivery Project Manager for example, with the functions evolving into the Project Management role as the estimate progresses through its life cycle.

TERMINOLOGY	DEFINITION
Estimated Cost at Completion	This is the sum of the actual costs to date and the forward-looking estimate of costs for all work required to deliver the mandate. Also known as the forecast total project cost.
Funding Application	A document prepared by the Funding Team to acquire funding from NZTA.
Internal Costs / AT Managed Costs	An accounting term: They include costs for internal (and contract) staff, legal advice, Iwi consultation, advertising, and other costs often considered as "overheads". They are quite a substantive and often underestimated cost to the project and must be included in all cost estimates.
Investment	An amount of cash (usually capital) allocated or spent to achieve an expected benefit with a strategic intent. "Investor" shall be taken to mean the AT Board, supported by the Planning & Investment Team.
Management, Surveillance and Quality Assurance (MSQA)	The management, supervision and quality assurance carried out by the Engineer to Contract and their delegates during implementation of physical works projects. This function may be AT internally or externally sourced or a combination of both.
New Zealand Transport Agency (NZTA)	Also, Waka Kotahi NZ Transport Agency. For the purposes of applying this guide, references to Waka Kotahi in SM014 are to be read as Auckland Transport or AT, unless specifically noted otherwise.
Opportunity	A risk that will have a positive impact on a project objective if it occurs.
Out-Turn Cost	This is the final project cost from the beginning of business casing (the EPMF's Start-up/Initiation Phase) right through to the end of the EPMF's Closure Phase. (For further information refer to section 2.6 Relationship with the EPMF). The cost estimates undertaken at the various project phases are: • Programme Business Case Estimate (PBE), • Indicative Business Case Estimate (IBE), • Detailed Business Case Estimate (DBE), o Note: the IBC and DBC combined is referred to as the single stage business case or SSBC and combines the IBE (all options) and DBE (preferred option). The cost estimate produced from a SSBC is a DBE. • Pre-Implementation Estimate 1 (PE1), • Pre-Implementation Estimate 2 (PE2, but typically called the Engineer's Estimate or EE).
Parametric Estimate	An estimating technique, using a rate and quantity e.g. items costs could be scaled using square metre rates. Rates can be taken from historical data.
Phase	The term 'Phase' when used in an 'estimate' or 'business case' context in this guide, is a different application to what is in the EPMF to align with SM014 terminology.
Phase Cost Estimate	An estimate of the costs involved to complete a specified portion of the project's work, for example: project development (business casing), pre-implementation 1, pre-implementation 2.

TERMINOLOGY	DEFINITION
	A specified WBS element represents 100% of the WBS elements below it.
Physical Works Cost	A phase cost estimate of a project's construction works that feeds into the base estimate.
Programme	A collection of projects.
Project Brief	The purpose of this document is to formally authorise a project and provide authority to enable organisational resources to commence project activities. It is provided to the Project Manager to start the project by the authorising business unit. Once issued, a Project Plan will be developed in response to then move the project forward. Prior to this document being issued after Stage-Gate 1 as a handover to Delivery, the strategic value of the investment has been evaluated and there will be an approved business case or funding agreement.
Project Plan	Development of a Project Plan often requires further interactions with the investors to clarify scope and funds. This process may entail resolution of the gap between expectations and available funding. Proposed project budgets can only be approved by the AT Board or the individual with sufficient delegated authority and may depend on a peer review of the proposal. Once the Project Plan is approved, it forms the baseline against which all further changes will be explicitly managed through change control. It is intended to be developed in response to the Project Brief and essentially answers the questions **how** and **when** the project will be managed to achieve the objectives.
Regional Land Transport Programme (RLTP)	The investment commitment of Auckland Transport. It covers a 10-year period refreshed every three years. Historical RLTPs are known as RLTP 2012/RLTP 2015/ RLTP 2018/RLTP 2021.
Residual Risk	The risk remaining after any risk responses have been applied (for more information refer to SM014's section 9).
Risk	An uncertain or unexpected event or set of events that, should it/they occur, will influence the achievement of objectives. Surprises can be positive (opportunity) or negative (threat).
Risk-based Estimate	An estimating technique, that attempts to take uncertainty into account using probabilities and simulations. It produces a range of cost and time results with varying degrees of confidence, which can then be used. A Monte Carlo tool relies on repeated random sampling to obtain numerical results and test thousands of combinations of costs and delays. 5th Percentile: Over thousands of similar projects, only 5% (1 in every 20) projects will be delivered for this cost (this generates the P5). 50th Percentile: Over thousands of similar projects, 50% of projects will be delivered for this cost (this is referred to as the P50 or expected estimate on which funding applications are made).

TERMINOLOGY	DEFINITION
	95th Percentile: Over thousands of similar projects, 95% (almost all) projects will be delivered for this cost (this is referred to as the P95 which generates the funding risk on the funding application).
Risk Management	Refers to the culture, processes, and structures that are directed toward effective management of risks - including potential opportunities and threats that may impact on the achievement of project objectives (for more information refer to SM014's section 9).
Risk Response	Pre-planned actions that are activated when a risk is triggered.
Risk Treatment	Actions that may be taken to reduce the impact of a risk. The goal is to bring a situation to a level where exposure to risk is acceptable to the organisation. These responses could be to avoid, reduce, transfer, accept, share, exploit, enhance or reject.
Scope	As in project scope: The sum total of all work required to deliver the investment, as approved in the Project Plan.
Threat	A risk that will have a negative impact on a project objective if it occurs.
Top-down Estimate	An estimating technique heavily based on assumptions.
Work Breakdown Structure (WBS)	A hierarchical decomposition of the total scope of work to be carried out by the project team to accomplish the project objectives and create the required deliverables. The term is used at AT with primarily a financial focus on WBS codes in SAP or a focus on schedule items.

Acronyms and Terms

For further explanation of acronyms and terms please check the lists of acronyms and the glossary on the Engine Room.

2. Introduction

2.1. Purpose of this Guide

This guide to Cost Estimation (the guide) describes AT's minimum requirements for procedures to produce cost estimates (all estimate types) for projects at various stages of the Enterprise Project Management Framework (EPMF).

The relationship of this guide with the EPMF is outlined in section 2.6. Putting this another way, the point of ***entry*** of the guide is at the beginning of a project (EPMF Stage-gate 0, pre-business case), with the ***exit*** being the commencement of the physical works (EPMF Stage-gate 3) on which the estimate was managed and procured.

The lifespan of a project cost estimate generally applies to "whole of project life", and not for "whole of asset life", as this would include operational and maintenance costs for the asset over its life, which is outside the scope of this guide. However, the cost of operating and maintaining the asset does need to be considered when optioneering at business case phase and monitored during design development to ensure economics do not impact the assessment of value in the business case.

This guide outlines a consistent approach to the preparation and verification of various types of cost estimates to increase confidence in them, enabling AT to make better informed investment decisions. Each estimate type requires slightly different measures of the procedures.

In AT and in estimating generally, the area for heightened focus in the project cost estimate and risk assessments, are the early project life cycle phases that have the least amount of information on which to base the estimate. This is in the Programme, Indicative and Detailed Business Case phases on which funding applications are founded. Casually referred to as the "up front" estimates, these are the most critical to AT. Due to the varying degrees of uncertainty in these phases, there are a number of uncertainty mitigation processes to be followed in this guide.

It is understood that cost estimates will not be 100 per cent accurate as this would simply not be feasible. However, with the processes in the guide being followed, including appropriate project risk contingencies, there is a much better chance that AT will be successful in delivering investments within the funds applied for.

2.2. Background to this Guide.

This guide is based on the Waka Kotahi's Cost Estimation Manual SM014. AT thanks Waka Kotahi for granting permission to include this valuable industry resource.

The guide has been iteratively developed since 2015 to reflect:

- AT's increasing in-house understanding and maturity around cost estimation,
- the need to utilise best practice in the market in which AT operates,
- more effectively communicate with our principal funder, Waka Kotahi and estimating Consultant suppliers in a widely understood language.

This guide is curated in the same way AT's Conditions of Contract for physical works is based using NZS3910:2013 as the basis document, with AT amendments to it by way of special conditions of contract.

The SM014 manual is not bound into this guide and can be accessed via the Waka Kotahi website (NZTA, Cost Estimation Manual, SM014). This guide specifies changes to SM014 in order to account for differences in AT processes and the environment AT works compared to that of Waka Kotahi.

2.3. Objective of Cost Estimation

The objective of cost estimation in general is to determine the costs over a period of time to deliver an intended asset by taking into account:

- understanding the scope of the works,
- risks/opportunities expected to deliver the works,
- contingencies needed to account for scope development and residual risks,
- expected cost fluctuations over time,
- external and internal design and management costs,
- operational and maintenance costs informing the business case/optioneering stages.

The objective of this guide is to ensure consistency and accuracy is achieved and communicated, using the procedures outlined herein and templates for the recording and reporting of cost estimates for each phase. This will enable AT to make sound investment decisions based on well understood cost estimate information.

Effective cost estimating supports essential AT financial, risk and project management processes such as those detailed below.

- Programme & project financial and cost management, planning and monitoring.
- Scheduling.
- Value engineering, option studies and selection.
- Project scope and specification development.
- Funding applications and approvals leading to budget setting.
- Contract management.
- Collection, collation and tracking of historic cost data and cost information.
- Procurement.
- Business casing including economic evaluation.
- The AT Enterprise Project Management Framework (EPMF).
- Project risk management.

2.4. Audience and Scope

- Project Managers: To produce robust cost estimates that take into account the effect of threats and opportunities relating to a proposed project. The Project Manager may also work closely with and in support of Investment/Transport planners during the business case phase.

- **AT Business Technology (BT) Project Managers and project cost estimates:** These are generally outside the scope of this guide, however, the concepts, methodology and components of a robust estimate process can be drawn upon to help inform a robust BT cost estimate for an internal customer or Estimate Owner.
- **Professional Services Consultants** who provide cost estimates.
- **Investment/Transport planners:** to produce realistic business cases. Refer to the Guide to Programme and Project Funding for more information on the funding/investment process.

2.5. Scope, Risk and Optimism bias

Fundamental to all robust cost estimating is having a clear scope as a foundation.

Cost adjustments to account for optimism bias have been excluded from the scope of this guide.

Robust cost estimation will better inform the development of Project Plans and Business Cases to reduce the optimism bias factor by encouraging more thorough consideration of risk, more active risk management and better definition of project scope and objectives. In addition to this, some project costs have historically been over-estimated to establish a budget that has a very low likelihood of being exceeded, thereby reducing the need to seek approval for additional funds (CSAs). This would also have the effect of counteracting any optimism bias.

2.6. Relationship with the EPMF

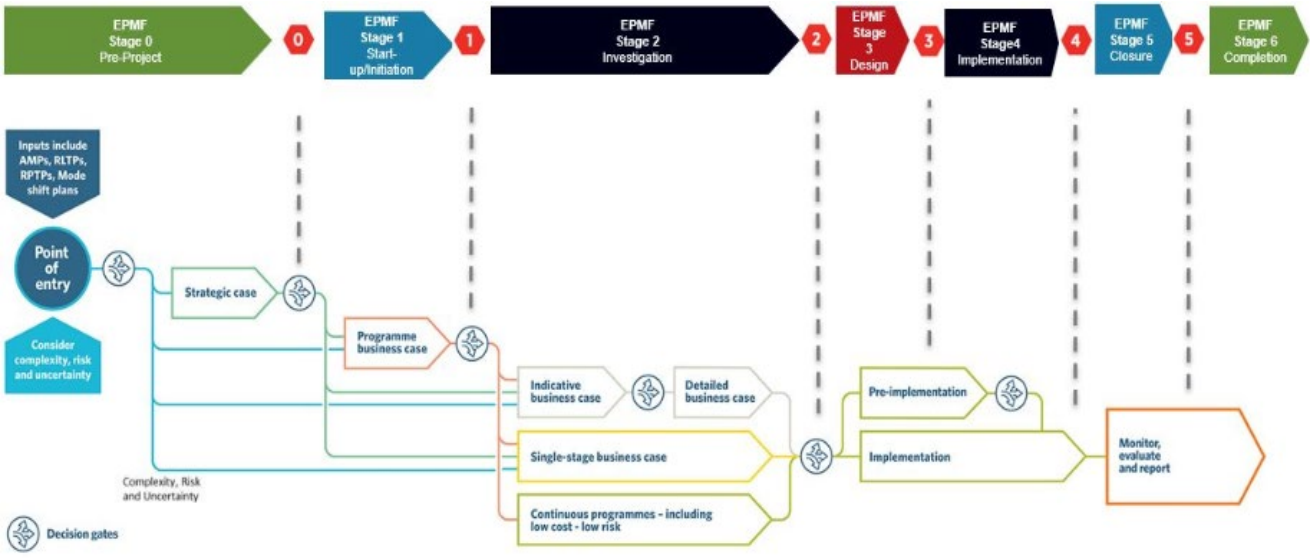


Figure 1: Relationship with the EPMF

3. Roles and Responsibilities

3.1. Levels of Authority

All project team members and stakeholders shall comply with:

- the current versions of organisational policies,
- the AT Effective Governance Framework,
- and the governance and reporting structure described in the EPMF.

3.2. Roles and Responsibilities

The roles and responsibilities regarding cost estimation and cost management for AT projects are detailed below. Please note that these are roles and not job titles, and one person may be assigned more than one of these roles.

3.2.1. Estimate Owner

These responsibilities will vary depending on the Estimate Owner and at which phase activity the estimate is at.

- Ensuring sufficient project information and details are provided to the Cost Estimator (if used) to prepare robust and accurate cost estimates.
- Checking that cost estimates have been prepared in accordance with this guide.
- Implementing cost estimate peer reviews and parallel estimates (in-house or by external cost consultants), as required.
- Preparing and proposing the baseline budget based on cost estimate information.
- Ensuring that the cost impact of the project risks and issues identified from risk management is assessed and analysed.
- Ensuring that relevant stakeholders are consulted and involved in risk management and cost estimation activities.
- Ensuring that an appropriate level of risk-based contingency is included within the project cost estimates. This is to be monitored and maintained to an appropriate level for each estimate activity phase.
- Ensuring that operation and maintenance costs are considered in option selection.
- Seek advice from the Project Manager that all costs are regularly reviewed and updated, particularly at defined gateways identified in the EPMF. This will help inform the following estimate phase activity as to any increased estimate of costs that need to be included for Consultant Fees or AT managed costs for example.

3.2.2. Project or Programme Control Group (PCG/PgCG)

- Authorisation of planned spend based on a budget agreed by the appropriate forum, in line with the project phase boundaries and financial forecast.
- Recommendations and authorisations of future actions on a project, including extensions on budget.
- Signing off any changes in the budget within the group's delegated authority.

- Recommending budget changes outside of the group's delegated authority.
- Managing any risks owned by the PCG that are highlighted in the Risk Register and Issues Register.
- Review and approve the resource plan, schedule, and associated cost in line with the Terms of Reference.

3.2.3. Cost Estimator

- Quantifying the scope of work in consultation with the Estimate Owner or delegate.
- Preparing and checking the estimate is in accordance with this guide.
- Collating estimate elements.
- Preparing base cost estimate.
- Engaging with relevant stakeholders for risk management and cost estimation activities.
- Carrying out internal/external peer review of estimates as may be required.
- Reconciling differences with external peer review and independent estimator as necessary.
- Applying an appropriate level of Contingency (P50 and P95) commensurate with the estimate phase.
- Applying the appropriate professional services fees and AT managed costs commensurate with the estimate phase, value, risk, and scope of the project. The AT Estimate Owner or delegate will provide significant input into these estimated costs based on AT's own actual cost experience in those matters.
- Provision for cost escalation (unless instructed by the Estimate Owner not to) within the appropriate estimate type under this guide.
- Present to the Estimate Owner the estimate summary in the format required in this guide.

3.2.4. Risk Specialist

- Facilitating expert advice to the Project Manager and team when required.
- Coordinating forums for the purpose of escalating risk.
- Responsibility for providing a specialist technical cost risk and schedule risk analysis to the Project Manager when required, with recommendations.
- Providing the templates to use for risk management processes.
- Responsibility for providing advice and expertise on Risk Management Plans for projects.
- Responsibility for making organisational risk definitions accessible to Project Managers.

4. AT usage and amendments to SM014

Details of AT usage and amendments are featured in Table 1 below.

In SM014, rather than multiple clause by clause amendments the following translations generally apply:

- "Waka Kotahi" can be taken relative to context in use, as meaning Auckland Transport.
- "Project Manager" (PM) can be taken to read the Estimate Owner in AT.
- "Consultant" can be taken relative to context as meaning the entity with the Cost Estimating team, preparing the Cost Estimate, engaged by AT.
- "Waka Kotahi's Commercial Team" shall be taken to be AT's QS, Cost and Contract Services team.

SM014 SECTIONS	CONTENTS	AT USING WITHOUT CHANGE	AT ADDED TO, CHANGED OR DELETED CLAUSE.	AT AMENDMENT NOTED AGAINST EACH: A=Added to C=Changed D=Deleted
1.0	Introduction			
1.1-1.9	Purpose, Objective, Manual status, Intended manual users, Manual background, Communication and amendment control, Manual review process, Interrelationships with other manuals, Document availability		X	C: AT has re-written this section, however SM014 may be read in conjunction noting any terminology differences, as they're complementary.
2.0	Terminology and Abbreviations			
2.1	Terminology		X	A
2.2	Abbreviations	X		
3.0	Project phase and estimate types			
3.1	Business cases and estimate terminology	X		
3.2	Project activities and estimate types	X		
3.3	Project hold points		X	C
3.4	Estimate life cycle	X		
4.0	Roles and Responsibilities			
4.1-4.3	Management structure, Estimate ownership, Consultant performance.		X	C
5.0	Purpose of Cost Estimates			
5.1	Cost estimates	X		
6.0	Estimating Procedures			
6.1	General		X	C

SM014 SECTIONS	CONTENTS	AT USING WITHOUT CHANGE	AT ADDED TO, CHANGED OR DELETED CLAUSE.	AT AMENDMENT NOTED AGAINST EACH: A=Added to C=Changed D=Deleted
6.2	Project scope and functionality	X		
6.3	Resource input for estimates		X	C
6.4	Updating of estimates	X		
6.5	Inputs and outputs	X		
6.6	Rounding	X		
7.0	Escalation			
7.1	Escalation calculation	X		
8.0	Land and Property			
8.1-8.3	Property interest purchase, Total property cost, Reporting of property costs		X	C
9.0	Risk and Contingency Calculation			
9.1-9.3	General, Terminology, Risk management approach for calculating contingency and funding risk contingency		X	C
9.4	Addressing likelihood and consequence	X		
9.5	Sensitivity analysis	X		
9.6	Commercial review of contingency and funding risk contingency	X		
10.0	Reporting Estimates			
10.1	General		X	C
10.2	Reporting PBE and IBE	X		
10.3	Elemental breakdown reporting		X	D
10.4	Summary estimate reporting		X	C
10.5	Reporting of estimates for funding applications		X	C
10.6	Waka Kotahi elemental cost database		X	D
11.0	Estimate Audit Trail			
11.1	General	X		
11.2	Estimate updates	X		
11.3	Estimate Tracking	X		
12.0	Peer Reviews and Parallel Estimates			
12.1	General		X	C

SM014 SECTIONS	CONTENTS	AT USING WITHOUT CHANGE	AT ADDED TO, CHANGED OR DELETED CLAUSE.	AT AMENDMENT NOTED AGAINST EACH: A=Added to C=Changed D=Deleted
12.2	Internal peer reviews		X	C
12.3	External peer reviews	X		
12.4	Parallel estimates	X		
13.0	Scope and Cost Control Process			
13.1	General	X		
13.2	Recording forms	X		
13.3	Process flowchart		X	D
14.0	Estimating Guidelines			
14.1	Schedules of prices	X		
14.2	Use and application of historic rates	X		
14.3	Waka Kotahi managed costs and consultancy fees		X	D
14.4	Buildability	X		
14.5	Preliminaries and general		X	D
14.6	Earthworks		X	D
14.7	Utility services	X		
14.8	Temporary erosion and sediment control (ESC)	X		
14.9	Urban design	X		
	Appendices			
Appendix A	Example of Cost Estimation Manual Procedure		X	C – changed to AT estimate summary workbook
Appendix B	Elemental Costings		X	C – changed to estimate input report
Appendix C	Estimate Summary Reporting Forms		X	C – changed to estimate verification form
Appendix D	Funding Application Forms	X		
Appendix E	Cost Reporting and Control Forms	X		
Appendix F	Peer Review Form	X		
Appendix G	Cost Estimate External Peer Review Methodology	X		
Appendix H	Parallel Estimate Methodology	X		
Appendix I	Guidance on Estimating Consultancy Fees	X		

SM014 SECTIONS	CONTENTS	AT USING WITHOUT CHANGE	AT ADDED TO, CHANGED OR DELETED CLAUSE.	AT AMENDMENT NOTED AGAINST EACH: A=Added to C=Changed D=Deleted
Appendix J	Project Property Cost Estimates		X	D

Table 1: Table of Amendments to SM014

Detailed below are the clause by clause AT amendments to SM014 covered in Table 1 above.

- SM014 - 3.3 Project Hold Points.

  DELETE and replace with;

  AT applies various hold points or stage gates through the estimate lifecycle in accordance with the EPMF. At each stage gate, a cost estimate appropriate to the stage gate is required to be undertaken prior to proceeding through the stage gate. It may be that it does not proceed based on the decision of the scheme or project governing body.

- SM014 - 4.1 Management Structure.

  DELETE 4.1.1 to 4.1.4 and replace with;

  4.2 Estimate ownership.

  4.2.1 DELETE and replace with the following;

  The Estimate Owner is responsible for the estimate that they commission for the phase they are responsible for. The Estimate Owner is responsible for ensuring that the estimate is prepared in accordance with this guide and has been subject to the appropriate level of checks in accordance with this guide, regardless of whether it has been outsourced, and the AT checks required at each EPMF stage gate.

  The Cost Estimator is responsible for the estimate in accordance with section 3.2 Roles & Responsibilities (of this guide) that feeds into the overall decision matrix governed by the EPMF. Where an estimate has been prepared by a different Cost Estimator as part of a previous phase, the in-coming Consultant is required to review and update if required, and take over ownership of the Estimate in accordance with the scope under section 3.2 (of this guide).

  4.3 Consultant performance.

  4.3.1 DELETE and replace with the following;

  AT assesses the performance of suppliers using the AT Performance Assessment by Coordinated Evaluation (ATPACE) system.

- SM014 - 6.1 General.

  Note on flowchart in SM014. AT adoption of SM014 as the fundamental basis of this guide means this procedure flowchart essentially mirrors the procedure in AT. However, some of the appendices referred to thereon are not in use by AT. Only appendices A, B and C herein are used. Similarly, name references have changed as advised at the head of this chapter 4.

- SM014 - 6.3 Resource inputs for estimates.

  DELETE clause and replace with;

  6.3.1 Input Review Meeting

  A cost estimate needs to start with an understanding of the scope and the right specialist input. The cost estimate input review meeting shall then be held prior to the development of any project or phase cost estimate. The meeting facilitated by the Estimate Owner or qualified delegate, should be attended by all internal AT stakeholders.

  The objective of this meeting is to review the inputs to be used as a basis of the estimate to ensure they are correct, accurate and well understood by stakeholders, and to identify any missing information. The level of information available will depend on the project phase.

  The Appendix B: Cost Estimate Input Report shall be used to record the outcome of the meeting and it should then be stored in the project site and distributed (preferably electronically) to the appointed Cost Estimator and all stakeholders by the Estimate Owner.

  6.3.2 Asset Management Team

  The Asset Management Team must be included as a stakeholder for all business cases to inform costs associated with asset management. There is more to consider than purely the life cycle cost. AT has put in place Hikina te Wero Environment Action Plan 2020-2030 (EAP). Of particular note in this plan in relation to this guide, it introduces the concept of "maintenance led (bigger than whole of life accounting)".

  Being maintenance led anticipates how our infrastructure and services will operate and what we can do to make maintenance easier while improving the environmental outcome, costs, and the resilience of our assets. The Estimate Owner shall be familiar with this plan to ensure due consideration of it and any cost implications are allowed for directly in the base estimate or as part of the economic analysis in the business casing. As the project design evolves, any changes to the scope need to be assessed to determine any detrimental effects on the EAP and consequential Opex (see below).

  6.3.3 Maintenance, operation, and renewal costs.

  These costs are often referred to as "Consequential Opex" i.e., costs to maintain, operate and renew that are consequent to the implementation of a project. These costs require estimation and consideration during project initiation, option selection and business case reviews to ensure that whole of life costs are sustainable, affordable, environmental, and economical. These cost estimates should be recorded during business casing and monitored through the design process to identify any variances that may adversely affect investment economics. All Consequential Opex estimates should be created in consultation with the Asset Management Team and be approved by the appropriate operational department(s). Approval indicates that these costs are acceptable to AT and can be budgeted for separately.

  6.3.4 Environmental and Design & Standards Team

  Consideration needs to be made of the impacts of new assets and/or products used in assets on the climate. Design solutions to reduce emissions, including material choices, should

consider the impact on biodiversity and the environment as well as emissions. In some cases, a design or solution may reduce emissions but adversely impacts biodiversity or the environment. The AT Environmental Team or the AT Design & Standards Team are available to assist in the assessment of overall benefit which in turn affects the cost estimate and economic assessment.

6.3.5 Third Parties

Sometimes project funding is received from sources other than Auckland Council/Waka Kotahi. For example, developers may contribute towards a project as part of a consent condition. Any such contributions should be recorded on the relevant elemental breakdown form to which the contribution applies. Waka Kotahi will only fund work **after** any third-party contributions have been deducted from the overall phase cost. For this reason, third party costs are identified separately in the cost estimate elemental breakdowns and summary sheets.

6.3.6 Physical Works (PW) Costs for the Base Estimate.

The scope of this guide is not intended to provide detailed instructions on *how to* estimate costs, rather to provide what AT deems as the minimum ingredients i.e., the *what* in order to provide the most considered and appropriate estimate of costs to inform funding applications and consequent updates to the out-turn cost. To this end, for PW costs the following resources can be utilised to inform the costs. Note that it is assumed the Cost Estimator is suitably skilled and experienced in cost estimation for the particular investment/ asset being estimated at any particular phase. The information obtained shall always be applied appropriately with the estimate being prepared.

Rates for PW costs can be obtained from the sources below.

- AT Ratebook – the AT in-house cost records based on market pricing information from previous projects of a similar nature, curated by the QS, Cost and Contract Services Team. Accessible by AT staff only via the PM Hub's Commercial-QS page.
- CostBuilder – an on-line web-based subscription service facilitated by the QS, Cost and Contract Services Team. This service provides cost information more related to vertical builds than horizontal infrastructure but is still an invaluable source of information. Previously known as QV CostBuilder and before that, Rawlinsons, it is accessible via the PM Hub's Commercial-QS page for AT staff only. Consultants must access this under their own subscription unless they have access to AT systems under the terms of their contract.
- First principle build-up of direct costs such as labour, plant and materials.
- Industry cost paper publications.
- Specialist supplier and/or subcontractor quotations and estimates of specialist equipment and/or items of physical works.
- Where possible, utility company estimates/quotations for services relocations and/or services installations.
- The AT QS, Cost and Contract Services Team.

When establishing the scope where sufficient detail is provided by way of progressed design drawings, AT requires the PW cost estimate to be prepared at the earliest phase possible, as a schedule of quantities (SoQ) with cost rates and with increasing levels of detail as updated through the phases. The final developed SoQ for use as the PE2 should also be able to be used as the tender SoQ such that tenders received can be easily reviewed against the PE2. The PE2 may be used to form a measure and value (M&V) SoQ or lump sum (LS) SoQ as required under the Procurement Plan.

In the compilation of the SoQ, the following shall be referenced:

- Where applicable, measure in accordance with the NZ standard NZS 4224:1983 Measurement of Civil Engineering Quantities or NZS 4202 Standard Method of Measurement of Building Works to produce consistency in the method and units of measurement. Note, NZS 4224 is no longer supported by NZS and is therefore no longer available from them directly. However, as there is no other replacement industry standard method of measurement, AT still endorses NZS 4224 as being a relevant and acceptable methodology.
- Measure all quantities accurately from drawings and specifications (if available); and
- Keep LS items to a minimum in a M&V SoQ and only use where the scope cannot be suitably quantified. In doing this, bear in mind pricing received for LS items will be subject to specific and unpredictable risk loading, skewing the cost away from what may have been estimated at PE2. Ensure LS items are fully described to avoid ambiguity around what the extent of the item was intended to be by the Cost Estimator.

6.3.7 Consultancy Fees and AT Managed Costs.

At earlier "development" phases (PBE, IBE, DBE) it will most likely be very difficult to estimate these costs by way of labour resources and productivity analysis. For very large investments, this may be possible but for the vast majority of estimates, it is unlikely. With estimate updates moving through the phases, estimating more accurately becomes more likely as scopes become more clearly defined. Potentially, estimates directly from consultants may become available and are able to be included, increasing the level of confidence and thereby lowering the contingencies needing to be applied.

AT has undertaken an analysis of these cost categories and has provided the following table of ratios for each type at each phase, based on the physical works base estimate for various PW cost ranges.

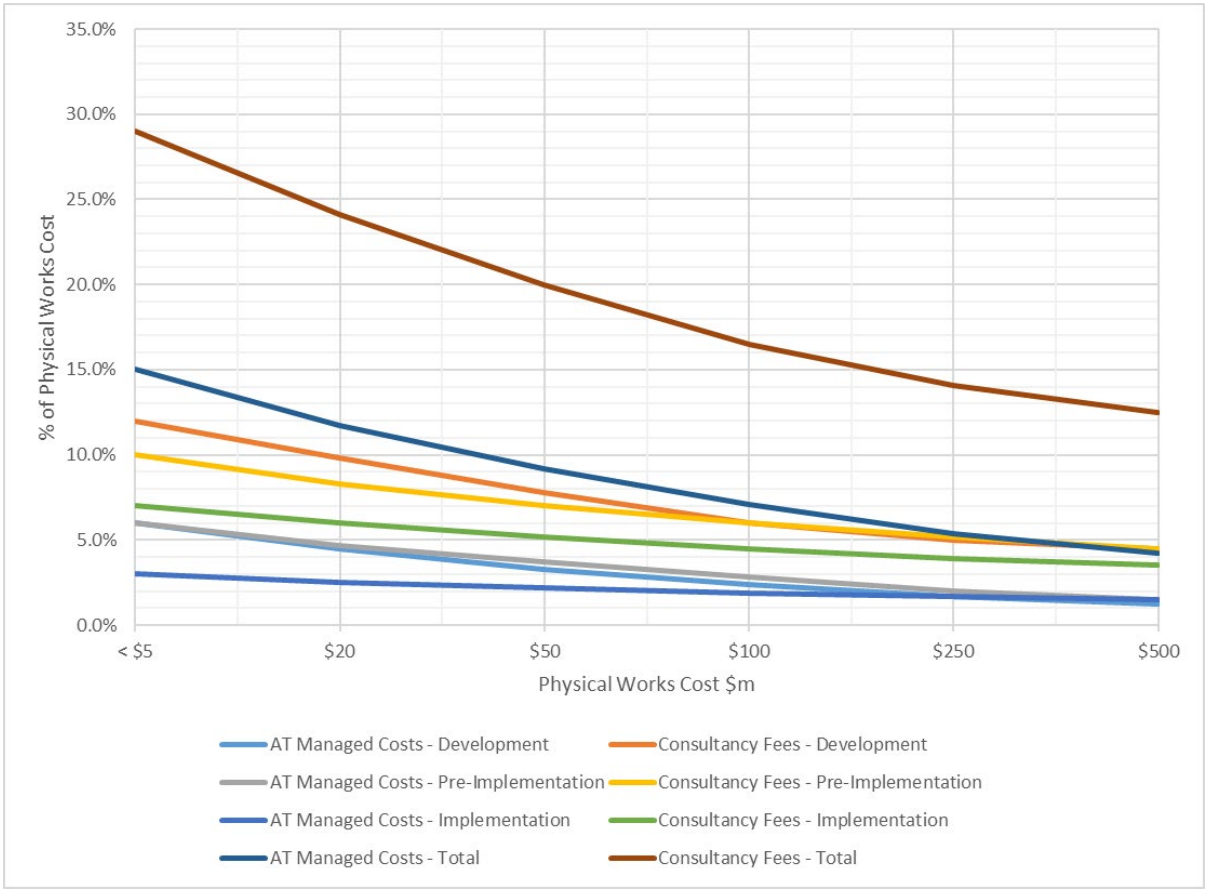


Figure 2: Cost Ratios by Category

	Cost ratios spanning 3 phases: Project development(PBE,IBE,DBE); Pre-implementation(PE1); Implementation(PE2).						
PHASE	**D.2 Physical Works cost($m):**	**< $5**	**$20**	**$50**	**$100**	**$250**	**$500**
DEVELOPMENT	AT Managed Costs - Development	6.0%	4.5%	3.3%	2.4%	1.7%	1.3%
	Consultancy Fees - Development	12.0%	9.8%	7.8%	6.0%	5.0%	4.5%
	DEVELOPMENT SUBTOTAL:	**18.0%**	**14.3%**	**11.1%**	**8.4%**	**6.7%**	**5.8%**
PRE-IMPLEMENTATION	AT Managed Costs - Pre-Implementation	6.0%	4.7%	3.7%	2.8%	2.0%	1.5%
	Consultancy Fees - Pre-Implementation	10.0%	8.3%	7.0%	6.0%	5.2%	4.5%
	PRE-IMPLEMENTATION SUBTOTAL:	**16.0%**	**13.0%**	**10.7%**	**8.8%**	**7.2%**	**6.0%**
IMPLEMENTATION	AT Managed Costs - Implementation	3.0%	2.5%	2.2%	1.9%	1.7%	1.5%
	Consultancy Fees - Implementation	7.0%	6.0%	5.2%	4.5%	3.9%	3.5%
	IMPLEMENTATION SUBTOTAL:	**10.0%**	**8.5%**	**7.4%**	**6.4%**	**5.6%**	**5.0%**
ENTITY SUBTOTALS - ALL PHASES	AT Managed Costs - Total	15.0%	11.7%	9.2%	7.1%	5.4%	4.3%
	Consultancy Fees - Total	29.0%	24.1%	20.0%	16.5%	14.1%	12.5%
	GRAND TOTAL - ALL PHASES:	**44.0%**	**35.8%**	**29.2%**	**23.6%**	**19.5%**	**16.8%**

Table 2: Cost Ratios spanning three phases

AT managed costs include the following "Top 10" costs, which make up 97 per cent of the internal costs incurred by AT in the process of managing projects. The actual costs landing on any particular project ledger will vary depending on the scope, however, what is provided for under the percentage ratio applied here, will cover most costs expected under normal circumstances. As an estimate allowance for funding application purposes informing the project budget, this is sufficient. The tabulated cost ratios are applied to the PW base estimate costs to establish the AT managed costs.

AT staff costs	76.9%
s66 Costs (PWA) - disturbance costs	7.7%
Legal Fees & Disbursements	4.2%
Public Transport Consultation	2.4%
Contract staff	1.5%
Infrastructure Repairs	1.2%
Maori Consultation	1.2%
Public Transport Access Fees	0.7%
Advertising	0.6%
Printing	0.5%

Table 3: AT Managed Costs

Consultancy fees are estimated in the same way as AT managed costs. They can be estimated by applying the ratios provided in the graphic/table at each phase, depending on the value of the PW. This shall be applied in lieu of any other more substantive estimate of costs, which may be possible in or after the PE1 phase.

The AT Cost Estimate Calculation and Summary Sheet incorporates these ratios, which can be overwritten as may be appropriate.

6.3.8 KiwiRail related costs.

All costs AT would incur for projects whose scope involves any interaction with KiwiRail, be it work in, on, over or adjacent to the rail corridor, need to be included in the unique line item provided on the estimate calculation/summary sheet Appendix A.

All costs not included in the physical works contract scope are to be allowed for.

Costs include permit to enter, block of line costs, Overhead Line Equipment (OLE) related costs, protectors, disruption costs to KiwiRail such as freight diversion, KiwiRail Project Management, and other supervision/oversight costs.

These costs can only be identified on a case-by-case basis and generally only be provided by the Estimate Owner after interaction with KiwiRail. Contrary to costs calculated in 6.3.7 above, a percentage ratio approach is not recommended unless a robust rationale for doing so is presented in the estimate.

- SM014 - 8. Land and Property

  DELETE section and replace with;

  ## 8. Property (Land) Estimates

  ### 8.1 Background and application.

  8.1.1 Projects enabling physical works construction, often depend on purchasing land (full or partials) in a timely manner to meet project timeframes. Property purchase is an important project consideration both in terms of programme delivery and cost.

  8.1.2 The AT Property Team provide solutions to enable capital infrastructure programmes to be delivered in the quickest possible time with minimum risk. Key to providing greater certainty to the delivery of the physical works construction programme is ensuring the Integrated Property and Planning Programme (Integrated Programme) is incorporated by the business into the overall project programme.

  8.1.3 All property purchases and property cost estimates must be undertaken through the AT Property Team. The AT Property Team can be contacted on propertyacquisitions@at.govt.nz.

  8.1.4 As projects are progressed through the different project stages, an increasing level of risk assessment and cost detail will be provided for the property cost estimates.

  ### 8.2 Property Cost Estimates

  8.2.1 The Public Works Act 1981 (PWA) is the guiding statutory framework for purchasing land and other property interests required to deliver a public work. Purchase requirements vary, for example full, partials, easement interests and temporary occupation rights for construction purposes.

  8.2.2 The Integrated Property and Planning Programme confirms the time necessary to achieve both acquisition of the property interests together with the Resource Management Act (RMA) for achieving a notice of requirement and/or resource consents required for the project. It is strongly recommended that the project team use the Integrated Programme to guide the construction programme, to mitigate delivery risks and ensure greater certainty of project timeframes.

  8.2.3 For property purchases, generally AT endeavours to reach a negotiated agreement, on a willing seller/willing buyer basis, before or contemporaneously with making use of the PWA compulsory acquisition processes. Acquisition programmes typically extend over multiple years, particularly where PWA compulsory acquisition (section 18, 23 and 26 actions) relies on robust RMA statutory processes to achieve the land purchase programme. The Integrated Programme is flexible and can vary depending on the complexity of the project.

  8.2.4 Generally, where the whole property is being purchased matters are more straightforward. Assessment of compensation when only part of a property is being purchased is more complicated. This introduces not only compensation for the land and improvements, but other issues such as injurious affection, partial reinstatement, demolition,

or relocation of existing buildings/businesses, other elements of damage and business loss and in some cases potential betterment claims.

8.2.5 The property cost estimate and Integrated Programme take all these factors into consideration. The property cost estimate should be reviewed and updated during the business case development phases and the advancement of the design, consenting and land purchase programmes. All property cost estimates are as at present dollar value.

8.2.6 The total property cost estimate for inclusion in the overall project estimate includes:

- Associated costs for both AT and the landowners
- Stage one compulsory acquisition costs for the issue of section 18 PWA Notices of Desire to Acquire Land, if necessary
- A risk based contingency allowance.

Betterment is a matter for an independent registered valuer to assess during the purchase implementation of the project.

Costs of Land Valuation Tribunal (LVT) proceedings are excluded from the property cost estimate, as it is difficult to determine how many acquisitions will be taken to the LVT.

8.2.7 Various other cost elements, that are a cost to the physical works budget, may be identified but not included in the property cost estimate, such as:

- Business relocation/purchase costs.
- Detailed investigation costs, for example, topographical and geotechnical.
- Demolition and relocation of improvements to enable the works construction.
- The annual temporary occupation rental, which is an Opex cost, not a Capex cost, payable for the construction duration, funded from the project budget.
- Cost of reinstatement works.
- The cost of mitigation works undertaken as part of the project physical works contract.
- Mitigation, where possible, of the potential effects of road construction, noise, dust, and privacy issues etc.
- Potential business loss claims.

8.2.8 An early and ongoing understanding of the level of funding required to purchase the property identified for the project is critical. This enables budgets to be allocated for the property phase, in alignment with the programme.

8.2.9 The property cost estimate should be reviewed and updated during the business case development phase and the advancement of the design, consenting and land purchase programmes.

- At the Indicative Business Case (IBC) phase, only a high-level preliminary property cost estimate would be undertaken. This reflects that the project only provides indicative cost inputs for an IBC, no landowner contact will have occurred, and it is an appropriate level of information to help develop the case for preferred options and a recommended

approach going forward. Higher contingencies are applied to the estimate, given the higher risk factors at this stage of the project. All assumptions relating to the property cost estimate will be clearly identified.

- At the Detailed Business Case (DBC) phase, a more detailed property cost estimate can be undertaken. This reflects that the inputs received from the project are further developed enabling the property risk to be better understood and a more detailed assessment of the cost estimate and programme. The level of contingency applied to the cost estimates at the DBC can be reduced.
- As the project develops, an updated risk assessment and cost estimate can be provided commensurate with the growing level of design confidence and progress with negotiations.

8.2.10 It is not always possible to purchase only the portions of property required for a project. Sometimes an entire property must be purchased when only a small strip is required to implement the proposal. In this instance, the entire property value must be budged for. The property not required for the project will at some stage be declared surplus and sold. The realisable value of any surplus property is not credited back to the project, but sale proceeds go directly to Auckland Council. The main point here is that projects cannot rely on disposal income to offset project costs.

8.2.11 Sometimes work may be carried out by AT's contractors but paid for by the landowner as part of property purchase agreement. In this instance, the "landowner accommodation works" and associated landowner payment should be credited to either the property or construction phase of the project.

- SM014 - 9. Risk and Contingency Calculation.

9.1.3 ADD at end of clause;

AT advises holding risk workshops with project team members and key stakeholders, as well as people who are able to speak for previously delivered projects of similar scope, to identify areas of risk in the project. From this, cost of treatment (mitigation) can be determined.

ADD 9.1.5;

Project risk management in AT is described in considerable detail in the Guide to Project Risk Management and is not to be covered in this guide. This guide describes how to incorporate risk and contingency in the Estimate.

Contingency management in AT is described in full detail in the Contingency Management Policy, which is applied more broadly across AT, not just in projects. The Estimate Owner must be familiar with the requirements set out in the Policy in terms of how the contingency is captured and used in projects in AT.

ADD 9.1.6;

Accuracy of Cost Estimates

Any cost estimate prepared will provide a single point number, to a particular degree of accuracy. We, therefore, expect the cost to fall between a range of values either side of that point.

The degree of accuracy and certainty around total investment cost, increases as work progresses through the phases - the scope becomes more clearly defined and the residual risk profile of the project reduces. The degree of accuracy also helps inform the levels of contingencies to be applied to the base estimate commensurate with the phase. Table 4 below shows an indicative percentage range of cost estimate accuracy in relation to the phase.

PHASE ACTIVITY IN WHICH ESTIMATE IS PREPARED		EXPECTED LEVEL OF ACCURACY
Indicative Business Case	(IBE Prelim design options Estimates)	-40% to +70%
Detailed Business Case	(DBE Preferred Preliminary Design Estimate)	-30% to +50%
Pre-Implementation 1	(PE1 Detailed Design Estimate)	-25% to +25%
Pre-Implementation 2	(PE2 or Engineer's Estimate)	-5% to +10%
Implementation	(IE)	-5% to +10%

Table 4: Indicative Cost Estimate accuracy by phase

9.2.1 Replace figure with the below;

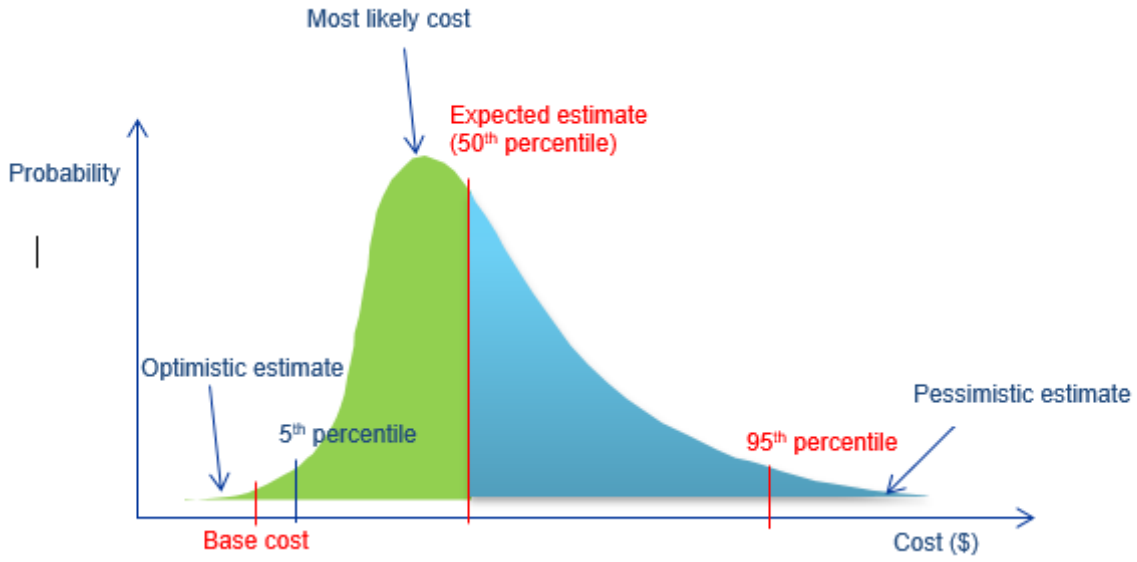


Figure 3: Risk adjusted Cost Estimates

9.3.6 ADD at end of clause;

With the general approach, AT advises the use of the below table of contingency ranges to inform/establish both P50 and P95 contingencies commensurate with estimate phase activity and scope of the project.

COST ESTIMATE AT PHASE ACTIVITY	CONTINGENCY RANGE	
NOTE: 1. P50 contingency is added to the base estimate. 2. P95 contingency can be added to the base estimate, or the difference between P95 and P50 added to the P50 expected estimate (as done on the AT estimate summary excel sheet). In either case the funding risk contingency is the difference between the P50 and P95 figures and reported as such on the Estimate Summary Sheet.	**50TH PERCENTILE (P50 Expected Estimate)**	**95TH PERCENTILE (P95)**
Programme Business Case (provides budgets)	+40 to 60%	+70 to 150%
Indicative Business Case (based on multiple options)	+30 to 50%	+50 to 70%
Detailed Business Case (based on preliminary design for preferred option)	+30 to 50%	+50 to 70%
Pre-Implementation 1 (include preliminary design updated with Notice of Requirements/Resource Consents conditions)	+20 to 40%	+40 to 60%
Pre-Implementation 2 (also called the Engineer's Estimate. Based on detailed design for the Implementation Phase)	+15 to 20%	+20 to 30%
Implementation Phase Estimate (based on preferred tender price). AT does not do these estimates.	+15%	+15-20%

Table 5: Cost Estimate at Phase Activity

Note: the percentages are the subject of continued research by AT of out-turn costs vs phase activity estimates generated and may be revised at any time. The estimator is always required to use suitable skill and care in the selection or calculation of appropriate contingencies and to qualify those used.

9.3.9 ADD to end of clause;

The probabilistic distribution represents the residual risk as the 50th percentile (P50) and 95th percentile (P95) probabilities that the costs will fall within that number, calculated through Monte Carlo analysis, or other appropriate modelling software. The P50 contingency provides the expected estimate on which funding applications are made and the P95 provides the funding risk contingency which is maintained by AT's funding partners.

The contingency needs to be reported at every stage-gate, and therefore it is expected that risk review workshops would be held at each stage-gate. Any changes to contingency requirements at any point in the estimate life cycle should be reported to Programme Managers to enable the excess to be redistributed into AT's programme of works or Auckland Council's Long Term Plan (LTP), to maintain AT's forward workload.

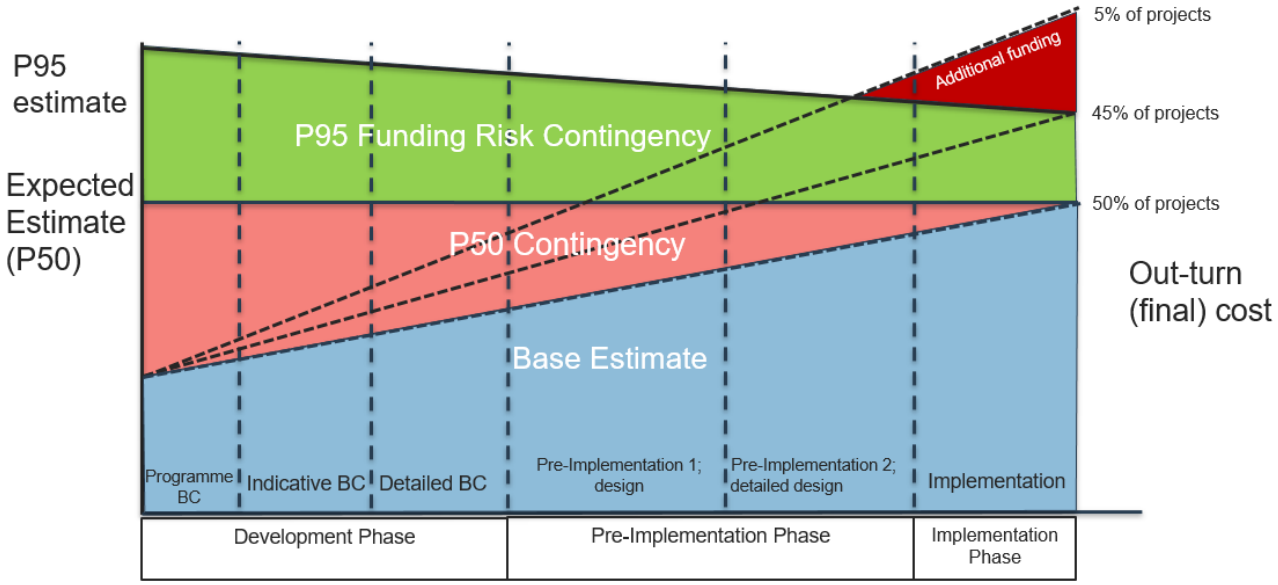


Figure 4: Risk adjusted Contingency

ADD 9.3.11

Statistical approximation/three-point estimating (semi-quantitative)

Another way to determine the expected (E) estimate is to apply the "weighted average" method. The risk register would need to be analysed to see which risks would impact on which cost elements/phases and use this as a basis to judge the optimistic (O) or minimum likely cost, pessimistic (P) or maximum likely cost and most likely cost (M) values recorded for a project or project element.

To determine the expected estimate of a cost element, phase or project, a simple formula can be used where:

$$E = (O + 4M + P) / 6$$

An additional contingency will need to be applied to the expected estimate to determine the 95th percentile. This can be approximated using the standard deviation (SD) as follows:

$$SD = (P - O) / 6$$

95th percentile = E + (1.96 x SD)

- SM014 - 10.1 General

  10.1.1 DELETE "A to I in Appendix C."

  10.1.3 Replace "Consultants are" with "The Estimate Owner and Cost Estimator is".

10.1.5 ADD bullet points:

- cost estimate input review report with an outline of the project's scope and function;
- list of information used in the preparation of the cost estimate (e.g., list of drawings);
- reference to the applicable version of the project programme or the project's key dates.

10.1.6 Replace sm014@nzta.govt.nz with "Estimate Owner".

- SM014 – 10.3 Elemental breakdown reporting – DELETE.
- SM014 - 10.4 Summary estimate reporting

  10.4.1 DELETE and replace with;

  The Estimate Owner must use the appropriate estimate summary sheet at each phase activity. The link to this is found in Appendix C. Unlike SM014, the excel based spreadsheet can be set to any one of the five phase activities.

  SM014 - 10.5 Reporting of estimates for funding applications

  DELETE and replace with;

  During the Implementation Phase any significant differences between the Engineer's Estimate and the tender price should be reported to the RLTP team to determine whether a cost-scope adjustment should be prepared. This is also the case on completion of the implementation contract once all actual costs are known or at any point during the contract where significant cost increases are known or anticipated.

  Any known or anticipated changes to the cost of a phase, outside of the agreed cost tolerance should be discussed with the Project Sponsor and reported in accordance with the AT Effective Governance Framework. Changes to the project budget may require a cost-scope adjustment to be prepared for NZTA. Please see AT's Funding Team or RLTP team for advice on this matter.

- SM014 - 10.6 Waka Kotahi elemental cost database - DELETE.
- SM014 -12 Peer reviews and parallel estimates.
- 12.1 General

  DELETE and replace with;

  Cost estimates shall be reviewed and verified prior to sign-off and approval by the Estimate Owner. For most cost estimates* in AT, the review and verification process is to be undertaken in the first instance by AT's QS, Cost and Contracts Services Team, or as may be delegated by them, to other experienced AT staff or a suitably qualified external consultant (section (a) below describes when an external peer review is required). The reviewer should be independent from the project team and have had experience in cost estimate peer reviews.

  *Notes:

  1. Particularly funding application estimates, and updates thereto over the estimate life cycle. Larger programmes of work $100m+ will be of such a scale and complexity that

they would have appointed a specialist reviewer, in which case the AT internal reviewer will be involved as an observer and reviewer of process robustness.

2. Excluding Road Corridor Maintenance (RCM), Business Technology (BT), Facilities Maintenance (FM) estimates where specialists in those areas will need to be engaged.

12.1.2 DELETE.

- SM014 - 12.2 Internal peer reviews

DELETE and replace with;

Project cost estimates must be reviewed and verified before the start of each phase of the project life cycle and for each cost update during these phases. Record the result of the review on the Appendix C: Cost Estimate Verification Form.

The review and verification include the following activities to varying levels of detail commensurate with the estimate phase activity:

- Establish an understanding of the overall project.
- Check cost estimate encompasses all identified scope.
- Check adequacy of rates, prices, and allowances against any available AT records.
- Undertake bulk quantities check where applicable.
- Check appropriateness and quantum of provisional sum allowances.
- Check all external price enquiries included within the estimate correctly.
- Review drawings to ensure all scope has been captured within the estimate.
- Confirm arithmetical check has been undertaken.
- Review allowances for temporary works, environmental management, traffic management are appropriate.
- Review allowances for contractor on-site overheads and where separately provided, offsite overheads and profit.
- Review identified risks are included in the base estimate.
- Review cost escalation provision.
- Review level of P50 and P95 contingencies applied.
- Review and test the exclusions and assumptions made ensuring the Estimate Owner is aware so adequate allowances can be made for those in some shape or form.
- Benchmark project with similar projects (if they exist).
- Verify consequential operation, maintenance and renewal costs have been obtained from the Asset Management Team and are factored into the business case economics.

AT provides the following table to inform ranges of expected cost ratios for some of the key review items. Values outside these ranges may not necessarily be unacceptable, rather, the table highlights they should be the subject of further scrutiny to provide comfort that they are appropriate for the project scope.

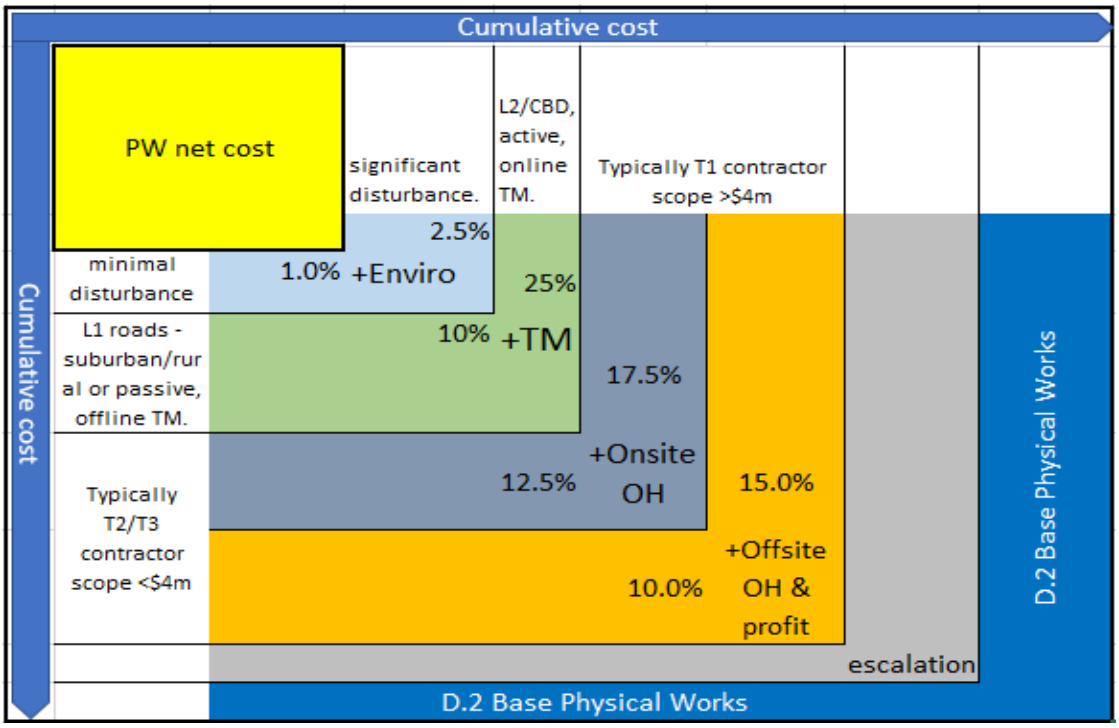


Figure 5: Expected Cost Ratios

Definitions:

"Enviro": Environmental management implementation.

Following completion of the review and verification of a cost estimate, the verifier shall complete the Cost Estimate Verification Form (Appendix C) summarising the findings of the review and verification. The verifier will then sign the estimate summary sheet to record that verification has taken place.

The review and verification of the cost estimate does not remove the responsibility for the estimate from the Estimate Owner.

It is also important to note the degree to which the review interrogates the activities listed above. At earlier phases (i.e. IBE, DBE), the effect of the levels of consultant fees, AT managed costs, escalation and contingencies applied has far greater effect than focussing on minor differences in quantities and rates in the base estimate, for example. As estimates approach PE2 the opposite generally applies as the scope becomes more clearly defined/quantified with identified risks (threats and opportunities) treated (mitigated) in the base estimate and thereby reducing the residual risk treatment via contingency.

- SM014 – 13.3 Process flowchart – DELETE.
- SM014 – 14.3 Waka Kotahi managed costs and consultancy fees – DELETE.
- SM014 – 14.5 Preliminaries and general – DELETE.
- SM014 – 14.6 Earthworks – DELETE.
- SM014 – Appendix J Project Property Cost Estimates – DELETE.

5. Referenced Documents

TITLE	LINK
NZTA, Cost Estimation Manual, SM014	https://nzta.govt.nz/resources/cost-estimation-manual/
Code of practice for Measurement of Civil Engineering Quantities (NZS 4224:1983)	Please email askPMO@at.govt.nz for access to the Standards NZ online version.
Standard Method of Measurement of Building Works (NZS 4202:1993)	https://aucklandtransport.sharepoint.com/sites/NewPMO/Standards/NZS%204202-1995%20-%20Standard%20method%20of%20measurement%20of%20building%20works.pdf
ISO 31000:2009 Risk Management Principles and Guidelines	Please email askPMO@at.govt.nz for access to the Standards NZ online version.
AT Standards Library	https://aucklandtransport.sharepoint.com/sites/NewPMO/Standards/Forms/AllItems.aspx
AT Enterprise Programme and Project Management Framework (EPMF)	https://aucklandtransport.sharepoint.com/sites/NewPMOGen/PM%20Framework/AT%20Enterprise%20PMF.pdf
Guide to Project Risk Management	https://aucklandtransport.sharepoint.com/sites/NewPMOGen/PM%20Framework/Guide%20to%20Project%20Risk%20Management.pdf
AT Effective Governance Framework	https://aucklandtransport.sharepoint.com/sites/NewPMO/SitePages/Effective%20Governance.aspx
Guide to Programme and Project Funding	https://aucklandtransport.sharepoint.com/sites/NewPMOGen/PM%20Framework/Guide%20to%20Programme%20and%20Project%20Funding.pdf
Contingency Management Policy	https://aucklandtransport.sharepoint.com/sites/NewPMOGen/PM%20Framework/Contingency%20Management%20Policy.pdf
PM Hub's Commercial – QS page	https://aucklandtransport.sharepoint.com/sites/NewPMO/SitePages/Commercial%20-%20QS.aspx

Note: External consultants will need to send a request via askPMO@at.govt.nz for access to any internal documents noted above.

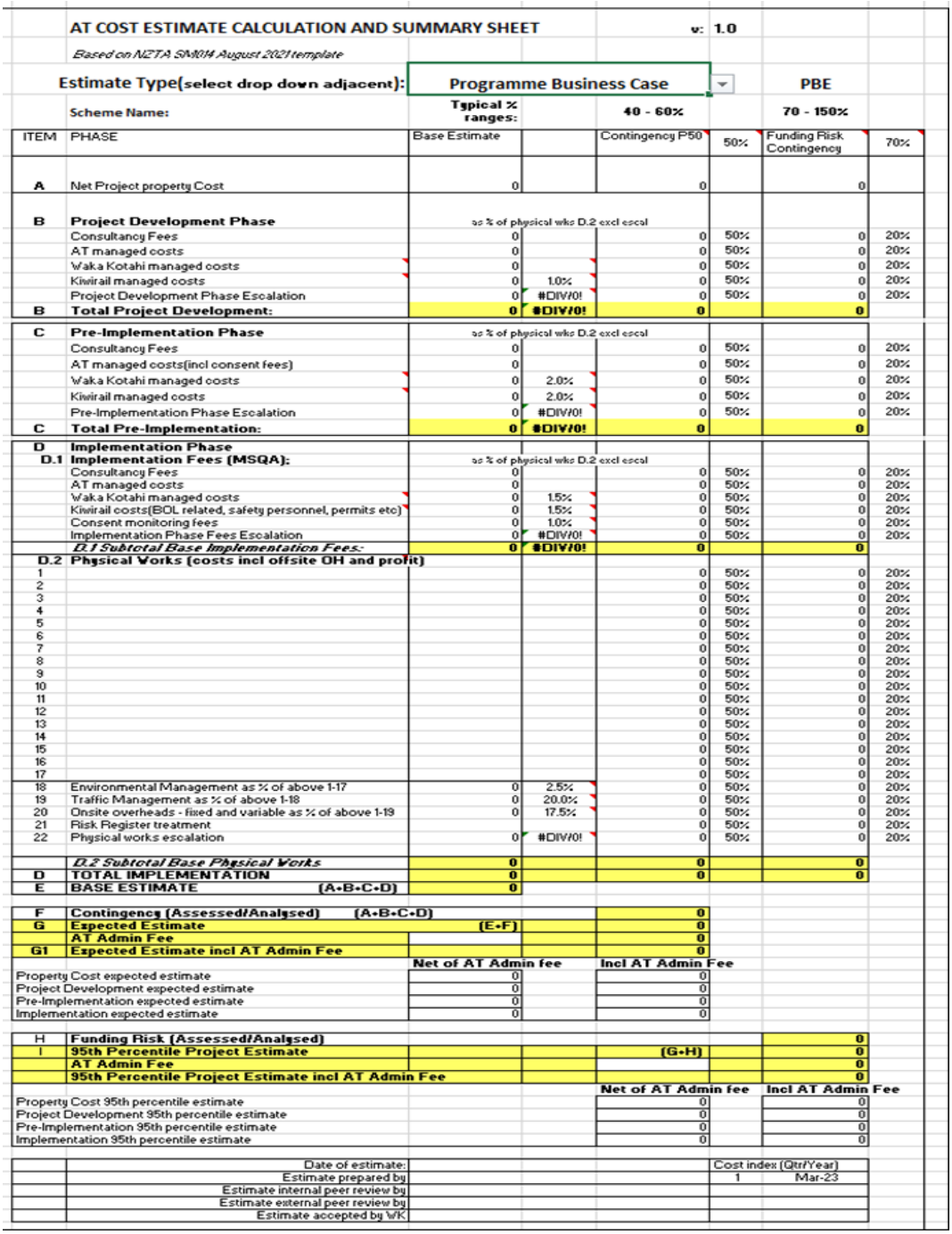
Appendices

Appendices below are additions to or replacements of the same appendix in SM014 and read in conjunction with the amendments table in section 4.

Appendix A: Cost Estimate Calculation and Summary workbook

Presents the cost estimate information in a consistent format and language for use by the estimator.

Download Appendix A from AT.govt.nz/costestimationguide.



AT COST ESTIMATE CALCULATION AND SUMMARY SHEET — v: 1.0

Based on NZTA SM014 August 2021 template

Estimate Type(select drop down adjacent): Programme Business Case — PBE

Scheme Name: — Typical % ranges: — 40 - 60% — 70 - 150%

ITEM	PHASE	Base Estimate		Contingency P50	50%	Funding Risk Contingency	70%
A	Net Project property Cost	0		0		0	
B	**Project Development Phase**	as % of physical wks D.2 excl escal					
	Consultancy Fees	0		0	50%	0	20%
	AT managed costs	0		0	50%	0	20%
	Waka Kotahi managed costs	0		0	50%	0	20%
	Kiwirail managed costs	0	1.0%	0	50%	0	20%
	Project Development Phase Escalation	0	#DIV/0!	0	50%	0	20%
B	**Total Project Development:**	**0**	**#DIV/0!**	**0**		**0**	
C	**Pre-Implementation Phase**	as % of physical wks D.2 excl escal					
	Consultancy Fees	0		0	50%	0	20%
	AT managed costs(incl consent fees)	0		0	50%	0	20%
	Waka Kotahi managed costs	0	2.0%	0	50%	0	20%
	Kiwirail managed costs	0	2.0%	0	50%	0	20%
	Pre-Implementation Phase Escalation	0	#DIV/0!	0	50%	0	20%
C	**Total Pre-Implementation:**	**0**	**#DIV/0!**	**0**		**0**	
D	**Implementation Phase**						
D.1	**Implementation Fees (MSQA):**	as % of physical wks D.2 excl escal					
	Consultancy Fees	0		0	50%	0	20%
	AT managed costs	0		0	50%	0	20%
	Waka Kotahi managed costs	0	1.5%	0	50%	0	20%
	Kiwirail costs(BOL related, safety personnel, permits etc)	0	1.5%	0	50%	0	20%
	Consent monitoring fees	0	1.0%	0	50%	0	20%
	Implementation Phase Fees Escalation	0	#DIV/0!	0	50%	0	20%
	D.1 Subtotal Base Implementation Fees:	**0**	**#DIV/0!**	**0**		**0**	
D.2	**Physical Works (costs incl offsite OH and profit)**						
1				0	50%	0	20%
2				0	50%	0	20%
3				0	50%	0	20%
4				0	50%	0	20%
5				0	50%	0	20%
6				0	50%	0	20%
7				0	50%	0	20%
8				0	50%	0	20%
9				0	50%	0	20%
10				0	50%	0	20%
11				0	50%	0	20%
12				0	50%	0	20%
13				0	50%	0	20%
14				0	50%	0	20%
15				0	50%	0	20%
16				0	50%	0	20%
17				0	50%	0	20%
18	Environmental Management as % of above 1-17	0	2.5%	0	50%	0	20%
19	Traffic Management as % of above 1-18	0	20.0%	0	50%	0	20%
20	Onsite overheads - fixed and variable as % of above 1-19	0	17.5%	0	50%	0	20%
21	Risk Register treatment			0	50%	0	20%
22	Physical works escalation	0	#DIV/0!	0	50%	0	20%
	D.2 Subtotal Base Physical Works	**0**		**0**		**0**	
D	**TOTAL IMPLEMENTATION**	**0**		**0**		**0**	
E	**BASE ESTIMATE (A•B•C•D)**	**0**					
F	**Contingency (Assessed/Analysed) (A•B•C•D)**			**0**			
G	**Expected Estimate (E•F)**			**0**			
	AT Admin Fee			**0**			
G1	**Expected Estimate incl AT Admin Fee**			**0**			

	Net of AT Admin fee	Incl AT Admin Fee
Property Cost expected estimate	0	0
Project Development expected estimate	0	0
Pre-Implementation expected estimate	0	0
Implementation expected estimate	0	0

H	**Funding Risk (Assessed/Analysed)**					**0**
I	**95th Percentile Project Estimate**			**(G+H)**		**0**
	AT Admin Fee					**0**
	95th Percentile Project Estimate incl AT Admin Fee					**0**

	Net of AT Admin fee	Incl AT Admin Fee
Property Cost 95th percentile estimate	0	0
Project Development 95th percentile estimate	0	0
Pre-Implementation 95th percentile estimate	0	0
Implementation 95th percentile estimate	0	0

	Date of estimate:	Cost index (Qtr/Year)	
	Estimate prepared by	1	Mar-23
	Estimate internal peer review by		
	Estimate external peer review by		
	Estimate accepted by WK		

Appendix B: Cost Estimate Input Report

For recording the outcome of the 'Input Review Meeting' under clause 6.3.1. This records all the inputs used to formulate and substantiate the estimate.

Download Appendix B from AT.govt.nz/costestimationguide.

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COST ESTIMATE INPUT REPORT	
Project Name	
Date Issued	
Estimate Phase	
Type of Project	
Completed By	
Attachments	
1. Information Used (Inputs)	
2. Scope of Phase/Project	
3. Estimating Assumptions	
4. Estimating Allowances	
5. Estimating Exclusions	
6. Threats and Opportunities affecting Out-turn Cost	
7. Maintenance and Operations Costs (OPEX)	

Appendix C: Cost Estimate Verification Form

For use by the estimator responsible for peer reviewing the cost estimate. It includes a checklist of all the components essential to a fully considered estimate prepared in accordance with the guide.

Download Appendix C from AT.govt.nz/costestimationguide.

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COST ESTIMATE VERIFICATION FORM			
Project / Scheme Name			
Date Issued			
Estimate Phase Activity			
Type of Project			
Completed By			
Attachments			
Verification Headings	**Yes**	**No**	**Verifier's Comment**
Correct Cost Estimate Summary Sheet used	☐	☐	
Elemental breakdown to appropriate level of detail based on information available	☐	☐	
Cost estimate encompasses all identified scope	☐	☐	
Cost estimate calculations/formulae/totals have been checked	☐	☐	
All rates checked and verified	☐	☐	
All included prices checked and verified	☐	☐	
All lump sum allowances checked and verified	☐	☐	
Drawing/information reviewed	☐	☐	
Drawings/information capture all identified scope	☐	☐	
Exclusions & assumptions list reviewed and checked	☐	☐	
Appropriate Consultancy Fees, AT Managed costs, WK, KR (and/or other stakeholder) cost ratios or other calculation method reviewed	☐	☐	
Physical Works risk register sighted, reviewed and included in D.2 Base Physical Works subtotal	☐	☐	
Cost escalation provisions reviewed	☐	☐	
P50 and P95 contingency levels reviewed	☐	☐	
Consequential OPEX has been considered in the Project Development phase. If in the Pre-implemenation phase, has OPEX been negatively impacted thereby affecting economics?	☐	☐	

If the estimate has been benchmarked against similar projects, provide commentary below.

BENCHMARK PROJECT/S	RESULTS OF BENCHMARKING PROCESS

Verifiers signature: _____

Name: _____

Date completed: _____