Cost Estimating Guideline

For Public Sector Health Capital Projects

Published 2023

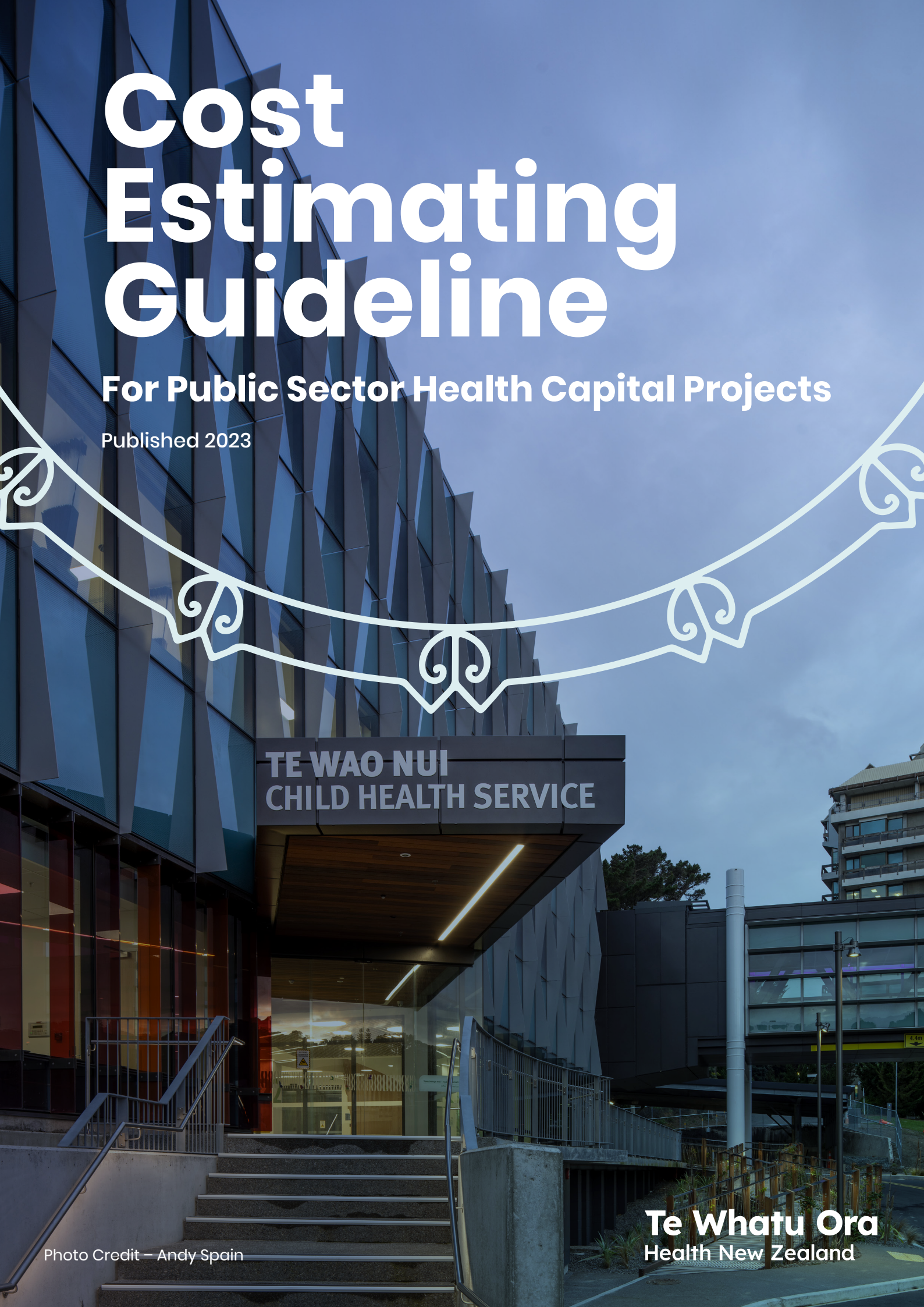


Photo Credit – Andy Spain

Te Whatu Ora
Health New Zealand

Contents

Foreword

Cost estimation for capital projects is fundamental to the investment and commercial management process in the public sector and is a key component of portfolio investment planning and individual asset decision making through a project life cycle.

Recent major global events such as the COVID-19 pandemic and the associated economic impacts help illustrate the types of risks and uncertainties that can influence project finances. These global effects also help reinforce the importance of systematic processes to support capital projects including consistent preparation, presentation and reporting of cost estimates.

The changing focus of health provision indicated in Te Pae Tata Interim New Zealand Health Plan 2022, suggests greater emphasis on investment decisions to meet the needs of flexibility and resilience in our health assets. With this comes increased demands upon technology, services provision and building performance. This places greater importance upon the cost estimation of capital projects, particularly at the outset when strategic investment decisions are being considered.

It is with this in mind that Te Whatu Ora has developed this Cost Estimating Guideline. This guideline is intended to be a live document that evolves in line with Te Whatu Ora requirements, market conditions and cost estimating best practice.

This guideline is also intended to be a working document referenced by stakeholders as required during the project life cycle.

It is anticipated that this document will form part of a suite of documents that provides those working within health sector projects with best practice guidelines. This suite of documents will likely include guidelines related to:

- Health Design and Assurance
- Sustainability
- Whole of Life
- Contingency and Escalation Management
- Financial Reporting
- Value Management.

We must acknowledge the contributions to this document from the following Quantity Surveying Practices:

- Aecom
- Barnes Beagley Doherr
- Beca
- Rawlinsons
- Rider Levett Bucknall Auckland
- WT Partnership.

This document also references the Cost Estimating Guidance from the Infrastructure and Projects Authority of the UK Government.

Document Owner and Review

The owner of this Cost Estimating Guideline is Director, Delivery, Te Whatu Ora Infrastructure and Investment Group.

A review of this Cost Estimating Guideline is scheduled for the 3rd quarter of 2024.

Introduction

There exists a sustained need for investment in health infrastructure and the delivery of health infrastructure projects. This requires cost estimates that are robust, realistic, and reliable to better inform the decision-making process in relation to capital investment.

Delivering large and major capital projects is challenging, and much of the success depends to a great extent on the planning and validation undertaken during the early planning stages.

The UK Infrastructure and Projects Authority – Cost Estimating Guidance document (published 17 March 2021) emphasises that *"Establishing an early and accurate cost estimate is a key factor in selecting the right projects and delivering them on time and on budget."*

Establishing and communicating clear requirements for the development of capital cost estimates will improve the quality of information required for robust decision-making.

This Cost Estimating Guideline (CEG) has been prepared to assist Quantity Surveyors and Cost Estimators in preparing and developing cost estimates for Te Whatu Ora health care facilities throughout the project life cycle. It is also aimed at those Te Whatu Ora personnel involved in the leadership and delivery of projects – to help them understand the principles of the cost estimating processes and their role in the cost estimating process.

Of utmost importance is the need for collaborative and transparent behaviours from all parties involved with the project.

The intention is for this guidance to define the process and roles and responsibilities of all parties involved with the delivery of health infrastructure and to provide an understanding of the importance of planning and validation of the cost estimate alongside the project inputs.

It has been developed to outline the expectations and requirements for the calculation, allocation, and reporting of capital cost estimates.

The Cost Estimating Guideline is not intended to be a manual on how to undertake cost estimation and assumes a level of competency, expertise and proficiency required from those producing cost estimates for the health sector.

Glossary of Terms and Abbreviations

Refer to the table below, it will provide further clarification and definitions around abbreviations and terms used throughout this CEG.

Table 1: Definitions, Terms & Abbreviations

Abbreviation / Term	Definition
ANZSMM	Australia New Zealand Standard Method of Measurement
Approved budget	Budget envelope associated with a project that is typically set through the investment process such as the Business Case and is determined and advised to the project team by the SRO. Whilst the project cost estimate may inform the approved budget, it is not the sole determinant of this figure. In this respect then, the approved budget and the cost estimate may well be different figures.
Base Date	The date at which the costs contained in the cost estimate are deemed to be current (often expressed in quarters – Q1 2023).
Base Estimate	The Base Estimate is the calculation of the expected cost, based upon the sum of the elements and resources that make up the scope of the project at a particular stage of the design, the information available, assumptions and method selected. The Base Estimate does not include risk or contingency.
BoQ	Bill of Quantities (often referred to as Schedule of Quantities)
CBS	Cost Breakdown Structure
CEG	Cost Estimating Guideline

Abbreviation / Term	Definition
CESMM	Civil Engineering Standard Method of Measurement
Contingency - Design and Project Contingencies	This is an allowance added to the estimate to account for Project Steering Group control purposes to fund mitigations for: • Client risks • Design risks • Construction risks. It is only to be expended under approval from the Project Steering Group.
Contingency – Management Reserve	This is an allowance added to the estimate to account for management control purposes to fund mitigations for unforeseen risks. It is to be held and managed centrally by the Te Whatu Ora Infrastructure and Investment Group. The value of the Management Reserve is calculated based upon the difference between the P85 and P50 cost estimate values.
Cost Estimate	The overall prediction or forecast estimate of the capital cost based upon the sum of the elements that make up the estimate at a particular stage of the project design stage, including: • Direct costs (Building Base estimate and separate supply contracts) • Indirect costs (Design & Management fees, consenting) • Client / Administration costs • Temporary buildings and decanting • Contingency risk • Escalation • Foreign exchange risk.

Abbreviation / Term	Definition
Cost estimating	The process of forecasting the financial resources needed to complete a project within a defined scope and timeframe.
DTM	Design Team Manager
ECI/ECE	Early Contractor Involvement / Engagement
Escalation	A financial provision to cover price fluctuation due to inflation and market factors throughout the project life cycle, it is also used to bring historical cost data forward to the current date. Escalation is the anticipated increase in project costs from the baseline position as a result of inflation and market factors. An estimate of Escalation is calculated to fund cost increases across the project life cycle. This is included with the project Base Estimate.
FOREX / FX	Foreign Exchange
GFA	Gross Floor Area as defined by the New Zealand Institute of Quantity Surveyors.
IIG	Te Whatu Ora Infrastructure and Investment Group / Infrastructure and Investment Group
NZ CIC	NZ Construction Industry Council
OH&P	Off-site Overheads & Profit – also known as Contractor's Margin.
P&G	Preliminaries & General – meaning On-Site overheads
Project Execution Plan	A Project Execution Plan (PEP) is a governing document that defines how a project is to be executed, monitored, and controlled.
PD	Project Director – reports to SRO
PM	Project Manager
PMBOK	Project Management Body of Knowledge – Project Management Institute

Abbreviation / Term	Definition
PSG	Project Steering Group
QS / Estimator	Quantity Surveyor / Estimator / Cost Consultant
QRA	Quantitative Risk Analysis process – and risk simulations used to quantify risks to make the financial impact of those risks more explicit to decision-makers when considering the business case. The QRA process is used to calculate and identify the 50th percentile and 85th percentile expected estimate outputs.
50th percentile - P50	The Expected Estimate inclusive of all expected risk. This represents the statistical 50th percentile, where there is 50% confidence that the final out-turn cost will not exceed this value. The 50th percentile is used to define the expected estimate including project contingency.
85th percentile - P85	This represents the statistical 85th percentile, where there is 85% confidence that the final out-turn cost will not exceed this value. This value is used to calculate the Management Reserve.
Risk	An event that may affect the delivery, schedule, or cost of the project, which may or may not occur.
SOA	Schedule of Accommodation is an itemised list of the accommodation facilities by area/ functions specified by Te Whatu Ora. It is informed by the Australasian Health Facility Guidelines and is prepared by expert health planners in conjunction with Te Whatu Ora and architects. It is independently peer reviewed as it is a critical input to the design.
SoP / SoQ	Schedule of Prices / Schedule of Quantities
SRO	Senior Responsible Owner (Officer) – chairs Project Steering Group

Abbreviation / Term	Definition
Te Whatu Ora / HNZ	Te Whatu Ora / Health New Zealand
VM / VE	Value Management and Value Engineering process – Value Management is the process that balances the relationship between satisfying needs and objectives for the project and the resources and financial cost required to achieve them. Value Engineering is the process of systematically examining the functions of components and materials to identify the impact of lowering the cost of those goods while understanding corresponding loss of performance or function [Optimisation]. VE/VM is typically undertaken at each stage of the design to monitor the cost estimate against the budget, as part of a controls process.


Right D
Right D
Right Ti
Betamox
JANUARY
2022

1. Purpose of this Document

1.1
Aim and Objectives

The aim of this Cost Estimating Guideline (CEG) is to define Te Whatu Ora – Health New Zealand expectations for cost estimating in the health infrastructure project environment and provide guidance for project team members involved in the cost estimating process.

> *Cost estimation involves the process of defining and forecasting the project cost for the purpose of capital investment decision-making based upon a defined scope of work, within a defined timeframe.*

The objectives of this guideline are to:

a) increase understanding of the cost estimating process in Te Whatu Ora investment decisions

b) achieve better communication of project costs through consistent, clear, and concise project data

c) ensure that all project costs are captured and consolidated

d) minimise the risk of errors, omissions, and ambiguities

e) provide a robust process to align project risk and uncertainty with contingencies

f) define the roles and responsibilities of those involved in the cost estimating process

g) support future development of the Te Whatu Ora project financial management system e.g., project benchmarking.

1.2
Requirements for Successful Cost Estimating

Successful cost estimating at any point in a project requires collaboration between all the various parties that:

- produce inputs into the cost estimate
- produce the cost estimate
- review the cost estimate, including by the project owner.

The three main steps involved in the production of a cost estimate are noted in Figure 1.

Figure 1: 3 steps to cost estimate production

Define the project requirements

The 'define' stage is in effect collating the intentions of the parties and the expectations of the cost estimate output.

It requires a sound briefing of the project needs and an understanding of the objectives of all parties involved in the project. This may be captured with the original scoping documents including the project execution plan if this is available.

The project briefing documentation should include:

- project scope – an understanding of the strategic case for the project and the required outcomes
- encumbrances or restrictions e.g., site planning restrictions, site physical characteristics, regulatory requirements
- design and delivery solutions
- information required to align to benchmarked data from similar projects.

Establish project costs

The 'establish' stage is about collating the inputs into a cost estimate and capturing the cost data.

This requires the QS in collaboration with the project team gathering any relevant data such as design information (drawings, specifications, schedules of accommodation etc.) and other relevant information. The QS should also understand policy and organisational requirements that may be relevant such as those that are defined and calculated within Te Whatu Ora departments like ICT, Procurement, Finance, etc.

The QS will then combine the defined design information with:

- cost estimate data
- cost allowances based upon benchmark data
- client defined and client undefined unknown items
- undefined information
- provision for design development
- appropriate levels of contingency allowances for risk and uncertainty.

Communicate the output

The emphasis in the 'communicate' stage is based around effective communication and making sure project team members are clear on the reasoning behind certain estimate outputs.

This can be achieved through a clear and concise Cost Estimate Report which explains:

- breakdown of costs
- data used
- difference from previous estimates
- degree of reliance which can be placed upon the estimate risk items and risk allowances
- steps that can be taken to mitigate risk and cost.

Information should be provided in a format that allows easy input into the Business Case process.

The types of information that project team members and in particular an SRO and/or the PSG, may consider when reviewing the cost estimate might include:

Why

a) Why is the cost estimate needed?

b) The purpose for which it is being prepared for e.g., detailed business case

c) The importance of and reliance placed upon the cost estimate output in terms of project governance

What

a) What reliance can / should be placed upon the cost estimate in terms of accuracy?

b) What level of design input has been provided – or may be required to match the required level of accuracy?

c) What are the key project risks and estimate assumption risks?

d) What cost benchmarks are available to help validate the estimate?

e) What other inputs are required (ICT / FF&E / Clinical Equipment and Systems etc)?

f) What are the time constraints applicable to the estimate?

g) What are the risks around escalation and Foreign Exchange movements?

h) What is the expected Project programme?

How

a) How have the design outputs and supplementary information been used?

b) How have the risks been identified and what monetary allowance has been included?

c) How should the estimate and cost reporting be presented to enable decision-making?

Who

a) Has the cost estimate been undertaken by suitably qualified professionals?

b) Has the cost estimate been independently peer reviewed?

When

a) What stage has the cost estimates been undertaken and what level of information is available?

1.3
Application of this Guideline

The cost estimate is an essential part of any project no matter what size or complexity and is normally commissioned as part of:

- long term investment planning
- short term budget planning
- business case (BC) processes
- project stage gate estimates such as at each design stage.

This CEG is to be used for estimating all capital projects commissioned by Te Whatu Ora or on behalf of Te Whatu Ora. It is applicable to all projects that fall within the authority of the Te Whatu Ora Infrastructure and Investment Group.

It applies to cost estimate production across all Te Whatu Ora projects at all stages of the project life cycle.

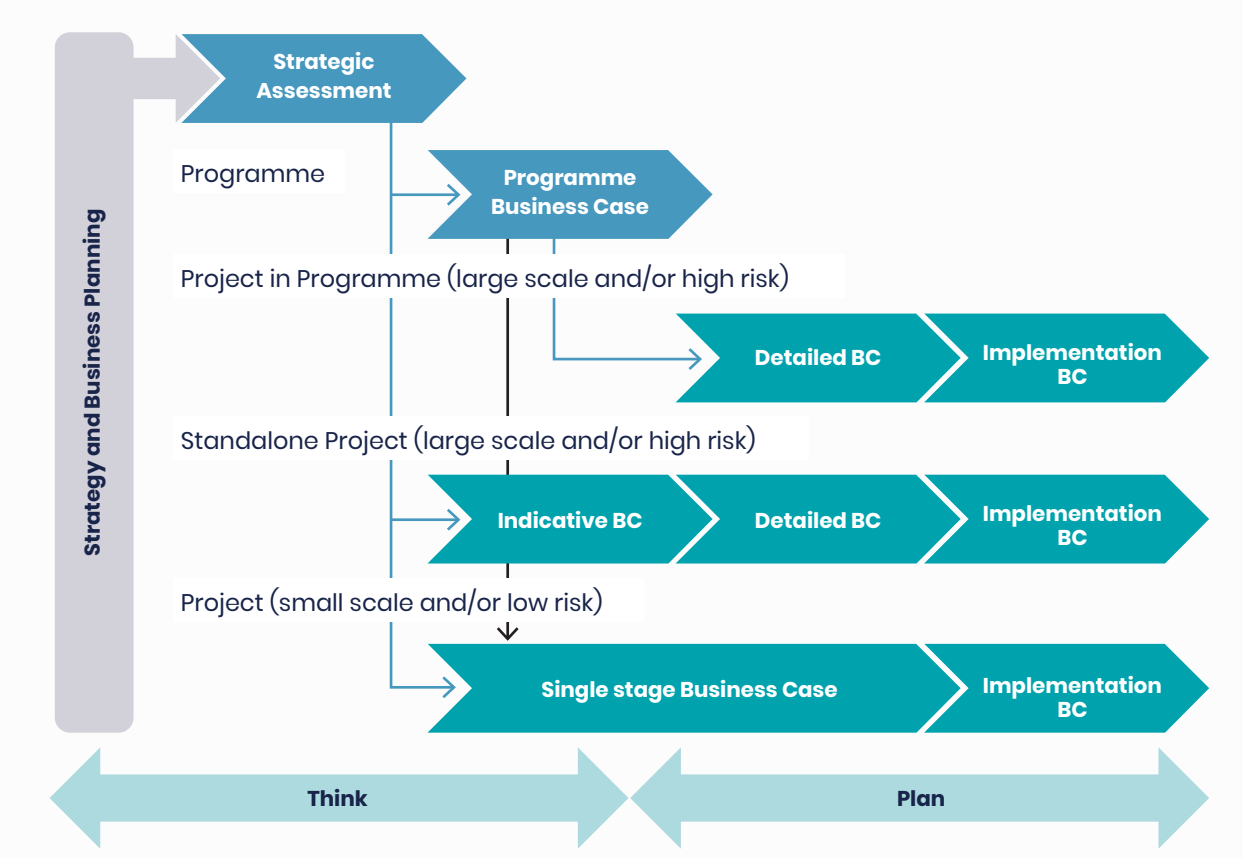


Figure 2: Alignment of Strategy and Business planning

This includes, but is not limited to:

- new build projects
- refurbishments

- re-fits and re-purposing
- extensions
- large capital replacement projects
- infrastructure (site wide infrastructure)
- major asset replacement.

The CEG is intended as a reference document for employees and external contractors and consultants, including consultants involved in cost estimating for Te Whatu Ora.

1.4
Target Audience

The target audience for this CEG is:

1. **Primarily:**
    a) Te Whatu Ora Board and sub-committees
    b) Te Whatu Ora National Leadership Team
    c) Te Whatu Ora Regional Leadership
    d) Te Whatu Ora IIG
    e) SRO's / PSG's
    f) Estimating entities – Quantity Surveyors, Estimators and Cost Managers
    g) Project and Design Management Entities

2. **Secondary:**
    a) Design Consultant Entities
    b) Contractors as part of an Early Contractor Engagement / Involvement process
    c) Main Contractors
    d) Key Supply Partners

> ***Culture of effective cost estimating***
>
> *Provision of an effective cost estimate process requires good planning, a sound understanding of the project scope and restrictions, (physical and regulatory), maturity of information, availability of adequate and reliable cost data, appreciation of unknowns and uncertainty and robust risk management processes.*
>
> *It also requires ownership, collaboration, and highly effective communications.*

1.5
Out-of-Scope Items

The following are out-of-scope of this guideline:

- Government Broader Outcomes
- Whole of Life Cycle Costing, Cashflows and Monitoring (refer section 6.1).

2. Cost Estimating Process

2.1
Overview

A key guiding document in the production of this CEG has been the UK Infrastructure and Projects Authority (IPA) – Cost Estimating Guidance.

Applying the IPA eight steps of the cost estimating process to Te Whatu Ora projects helps to define the steps to be adopted in the preparation of cost estimates. A detailed explanation of this process is noted in section 3.

This cost estimating process aligns with the three steps to the production of a cost estimate noted in section 1.2 as follows:

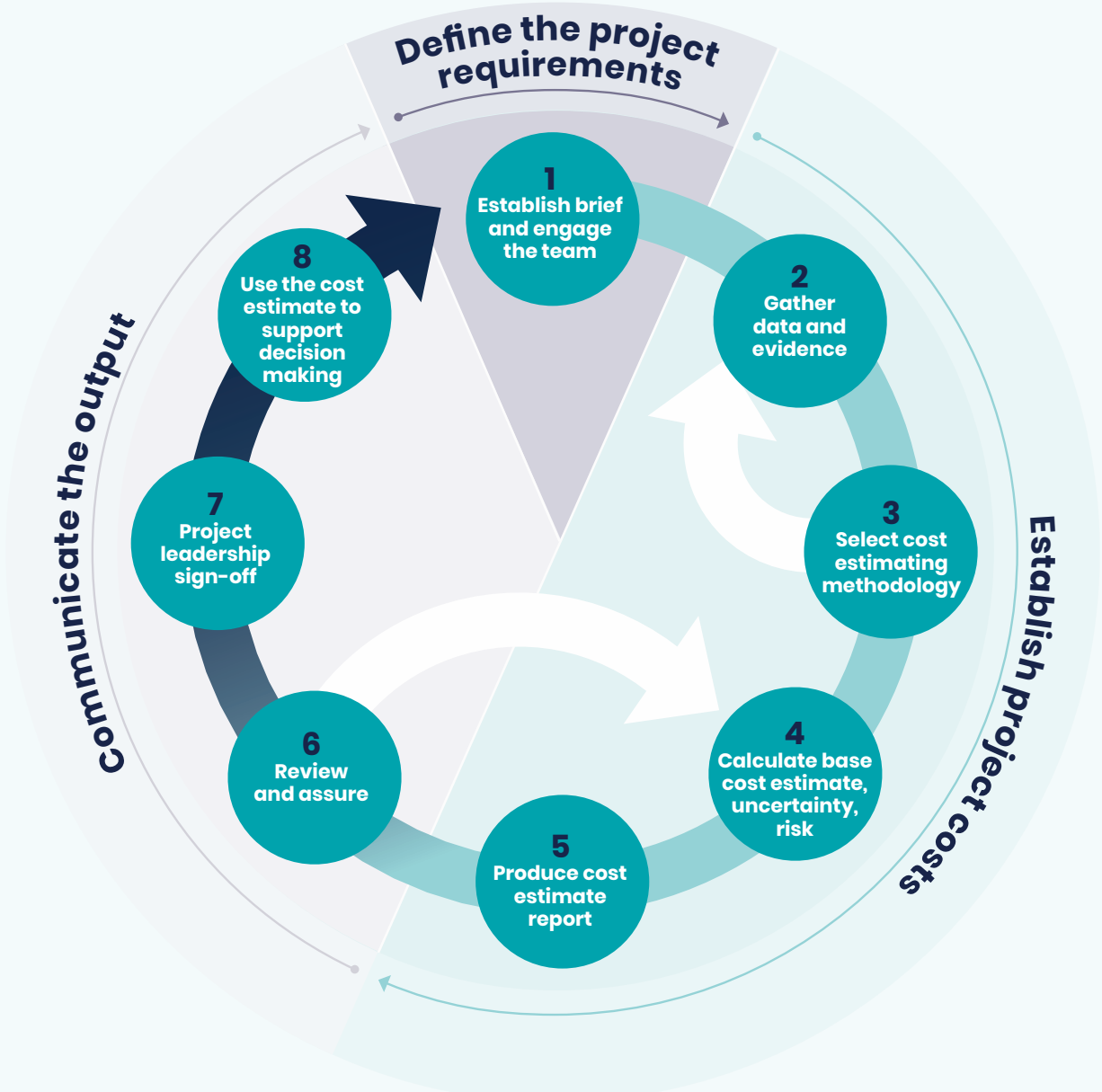


Figure 3: The Eight Steps of the Cost Estimating Process (source IPA Cost Estimating Guidance)

The process, once adopted, will result in a cost estimate that defines the anticipated final cost of a project adjusted to recognise the estimating uncertainty and associated allowances for project contingency.

Note that *Step 4 – Calculate base cost estimate, uncertainty and risk* and *Step 6 - Review and assure* is expected to be an iterative process, where Value Management (VM) and Value Engineering (VE) are reviewed and incorporated as part of the review of scope and cost. The purpose of which is to review the needs and objectives of the project against the financial cost and available funding.

2.2
Principles for Best Practice

Closely aligned with the cost estimating process are the following best practice principles that are vital to the successful delivery of the cost estimating process. These principles are not an exhaustive list of best practice principles and should be read in conjunction with this guidance and sector documentation as a whole.

Clear ownership and accountability	• The Project Manager, in consultation with the Project Director, must own the cost estimate. • The Design team must be aware of impacts of design on the estimate output. • The QS must understand scope, programme, and commercial arrangements. • The SRO is to be accountable for the delivery of the entire project including the cost estimate.
Right skills	• It is important to carefully consider the selection of the team relative to the task at hand. • Suitably experienced project team members must be available at the right time. • All team members must interact, challenge, and collaborate as befits a team environment. • Collaboration, presentation, and review of cost estimates with design team members is vital.
Early planning	• Robust planning and preparation are important. • The ability to impact value is highest at the beginning. • Define clear objectives and options. • Allow enough time and money to develop the best outcome at the early stages.

Appropriate methodology	• A single cost estimate methodology may not be appropriate throughout the project development. • The method should reflect the quality of available information and project definition. • Repeatable design types should have more mature cost data. • A mixture (top down and bottom up) may also be appropriate to help validate the cost estimate.

Risk-adjusted	• Risk should be represented as a range to reflect the level of risk, detail, and certainty.
	• The estimate must include an appropriate allocation for risk and uncertainty, by the use of appropriate QRA Risk Analysis processes.
	• The selection of the risk adjustment process will depend upon:
	  • the value of the investment
	  • the complexity of the scope
	  • the maturity of design and other inputs including cost data.

Evidence-based	• The data sources and processes need to be defined and reported. • Estimate quality is reliant upon data maturity, completeness, and consistency. • Assumptions and exclusions must be easily transparent and identified. • The level of maturity of the cost information must be appropriate to the project stage.
Reviewed and assured	• Costs estimates that are reviewed, challenged, and assured will be more reliable. • The review and assurance process will be defined as part of the project brief.
Continuous improvement	• Capturing lessons learned and cost data from previous projects will help improve the quality of future cost estimates. • At a minimum, lessons should be captured and shared with the project team at each estimate gate and be incorporated as the project develops.

2.3
Roles and Responsibilities

Roles and responsibilities are a key part of any process. This is the case with cost estimating. This section outlines the key roles and responsibilities of those parties involved in the cost estimating process.

The figure below shows a typical governance structure for major projects. It is against this structure that the responsibilities are defined.

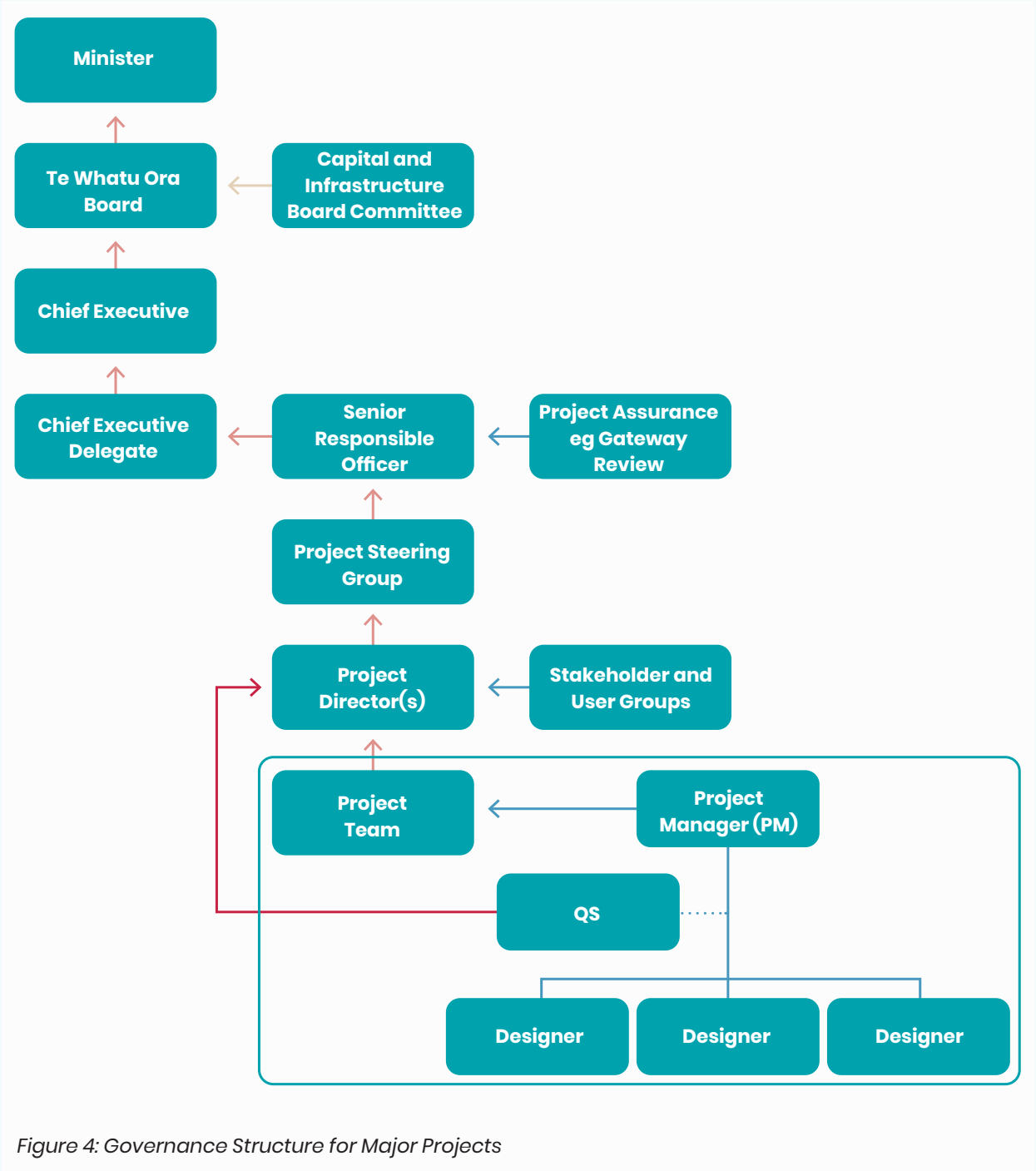


Figure 4: Governance Structure for Major Projects

The roles and responsibilities are defined below:

Senior Responsible Owner (SRO)

The SRO has the role of delivering the business case benefits and outcomes. They have the ultimate accountability for the project and typically would be the highest escalation point for decision-making within the project environment.

This role involves:

- leading and chairing the Project Steering Group
- championing the project among the stakeholders
- defining the outcomes and ensuring they align with the strategic direction
- owning the business case
- managing the strategic risks
- having a final say on project progression
- reviewing and challenging the cost estimate
- managing risk allowances & contingencies with support from the Project Director.

Project Steering Group (PSG)

The PSG is made up of the stakeholders appointed by Te Whatu Ora who oversee the project, and monitor, challenge, advise and support the SRO in fulfilling their role.

Project Director (PD)

The PD is the day to day project lead for Te Whatu Ora and has the role of delivering the project within the agreed time and cost constraints.

This role involves:

- managing the project on a day to day basis
- developing the Business Cases
- tracking delivery against scope, budget, time, benefits, and objectives
- working with the SRO to manage the stakeholders
- creating a successful delivery culture
- challenging and understanding sensitivities around the cost estimate
- ensuring the cost estimate is produced in line with requirements
- reviewing the critical assumptions and uncertainties

- monitoring of the construction cost escalation and transition into the estimate over time
- managing the risks to the cost estimate and overall budget.

Project Manager (PM)

The PM is the day to day manager of the construction and design teams, ensuring all workstreams deliver within scope, time, and cost.

This role involves:

- working with the QS to initiate, develop and co-ordinate the cost estimate inputs from Te Whatu Ora and the design team
- managing change control during the estimating process
- managing the value management process if budget is exceeded at any design stage
- identifying where budget economies can be met within overall budget while having regard to quality considerations
- escalating un-mitigated risks to the cost estimate and overall budget to the PD
- ensuring that any interdependencies both within / outside of the project are identified and managed
- ensuring that information flows in a timely manner to the project team
- working with the QS to manage the payment process
- collating the QS Estimate Report and other documentation to support leadership sign-off and decision-making.

Project Design and Delivery Team

The Project Design (including the Health Planner) and Delivery Team have the role of ensuring the objectives are defined and achieved. They report to the PD via the PM.

This role involves:

- delivering day-to-day design and project activities
- raising and managing risks and uncertainties
- regularly reporting to the PM of progress
- supporting the PM and PD in meeting their obligations
- conveying health planning aspects to the QS such as the schedule of accommodation

- providing clear design inputs and view of assumptions to the QS
- establishing change control measures to ensure changes are considered and reflected in the designs
- endorsing the cost estimate.

Quantity Surveyor (QS)

The QS has the role of preparing the cost estimate ensuring the design inputs and scope are defined and included within the cost estimate. They report to the PD via the PM.

This role involves:

- delivering day to day cost and risk estimation activities
- raising and managing commercial risks and uncertainties
- identifying areas of additional inputs required – i.e., subject matter resources and cost data
- regularly reporting progress to the PM
- documenting the cost estimating process and methodology
- preparing the cost estimate report
- presenting evidence clearly and consistently to the Project Design & Delivery Team, PM, PD, SRO, and stakeholders
- informing and attending to other commercial processes such as business cases (NPV etc.), project risk management and formal QRA
- preparing evidence material for QA purposes.

Responsibilities:

The table below is based upon PMBOK principles and defines the roles and responsibilities of appropriate stakeholders during the estimating process:

Some key responsibility concepts include:

Whilst the SRO and PSG have overall accountability for the successful delivery of a project, the QS has overall responsibility for the preparation of the cost estimate.

The PM has accountability for the project budget performance and must own the cost estimate.

Responsible 'R' – Who is completing the task(s).
Accountable 'A' – Who is making decisions and taking actions on the task(s).
Support 'S' – Who is providing support and assistance with task(s).
Consulted 'C' – Whose advice will be sought regarding decisions and tasks.
Informed 'I' – Who will be updated on decisions and actions during the project.

Table 2: RASCI Roles and Responsibilities

Key Elements	Design Team*	QS	PM	PD	PSG	SRO	IIG
Overall project performance including realisation of benefits	S	S	R	C	C	A	C
Initiate estimating process	I	I	R	A	I	I	I
Client Briefing	S	C	R	A	C	C	I
Estimate Design inputs	R	C	A	S	I	I	C
Inputs from others ICT / Land etc	C	C	R	A	I	I	I
Estimate Preparation	S	R	A	C	C	C	I
Project Contingency allocation	S	R	A	C	I	C	C
Total out-turn estimate	S	R	A	C	C	C	C
Estimate Review and Assurance	S	S	R	A	C	C	I
Estimate Report	S	R	A	C	I	C	I
VM / VE	S	R	A	C	C	C	C
Client Estimate presentation	S	S	R	A	C	I	I
Estimate Acceptance	S	S	S	R	C	A	I

**The Design Team Lead Consultant is responsible for consulting with the wider Design Team and consolidating their comments and input.*

2.4
Client Interface – Additional Cost Inputs

As part of the process for compiling the cost estimate and the report, there is a requirement to obtain additional cost information from the client to inform the relevant parts of the cost estimate (client-side inputs). Typical interactions and requirements for cost estimate financial information are:

- Client / Administration costs (included in estimates, if capitalised):
    - internal management costs
    - legal fees
    - Project Management Office costs
    - seed funding and sunk costs
    - client-side specialist consultancy costs
- Land / Temporary accommodation:
    - land costs
    - interim moves and interim project costs (if applicable)
    - temporary buildings and infrastructure
    - decanting / relocation costs
- ICT costs for activities not normally part of the construction contract
- AV System costs for activities not normally part of the construction contract
- FF&E requirements for items not normally part of the construction contract
- Clinical equipment costs for items and activities not normally part of the construction contract.

These interactions will be coordinated with the PD and the PM, but the QS will be responsible for collating and capturing these costs within the cost estimate.

There is an expectation that the interactions in obtaining these costs set clear expectations for the client, and the interactions of all the parties including the client are expected to be proactive, collaborative, and timely.

Other project scope items that may require specialised informed cost inputs from third parties appointed by Te Whatu Ora relate to consenting. These include items such as:

- RMA costs
- development contributions
- infrastructure growth charges.

In the absence of specialist advice, the QS will utilise their own estimated costs for these items.

> ***Total project cost***
>
> *It is important for the financial success of a project, for the QS to include all relevant cost information related to the defined scope and intended function of the project.*
>
> *Often there are cost allowances that are required that do not typically form part of the QS scope. Items such as Internal Management costs, Development contributions, ICT equipment and Clinical Equipment and specialist FF&E for example.*
>
> *It is important that the QS collaborates with the PD and PM and the relevant Te Whatu Ora departments (ICT, Finance) to define some of these cost allowances. It is for this reason that the Cost Estimate Structure is formatted to include these types of cost inputs.*

2.5
Cost Estimate Delivery

The delivery of cost estimates is generally at each applicable design stage (as defined by the NZCIC) of the project by suitably qualified professionals in accordance with the principles contained within this CEG. The Treasury's Risk Profile Assessment and project's scale and complexity will determine the business case pathway (single or two stage process) and the level of design required to support the business case.

2.6
Monitoring of Cost Estimates during the Design Phases

The cost estimate is expected to alter in composition and change as the project progresses through the various design stages reflecting the certainty associated with the development of the defined scope of works, other scope that may emerge and amended contingency provisions for risk.

It is the responsibility of the QS to develop the reasoning behind any changes during the estimating process, engage with project parties to interrogate any movement and if confirmed, record changes in the final Cost Estimate Report.

Because the approved budget and the cost estimate may be different figures, reconciliation back to the approved figure is a key part of the cost estimate process.

The capital cost estimate should also include and summarise the VM / VE that has been included as part of the cost estimate stage gate submission.

All of this information is then to be presented to the project team and project governance in a presentation meeting prior to project governance approval.

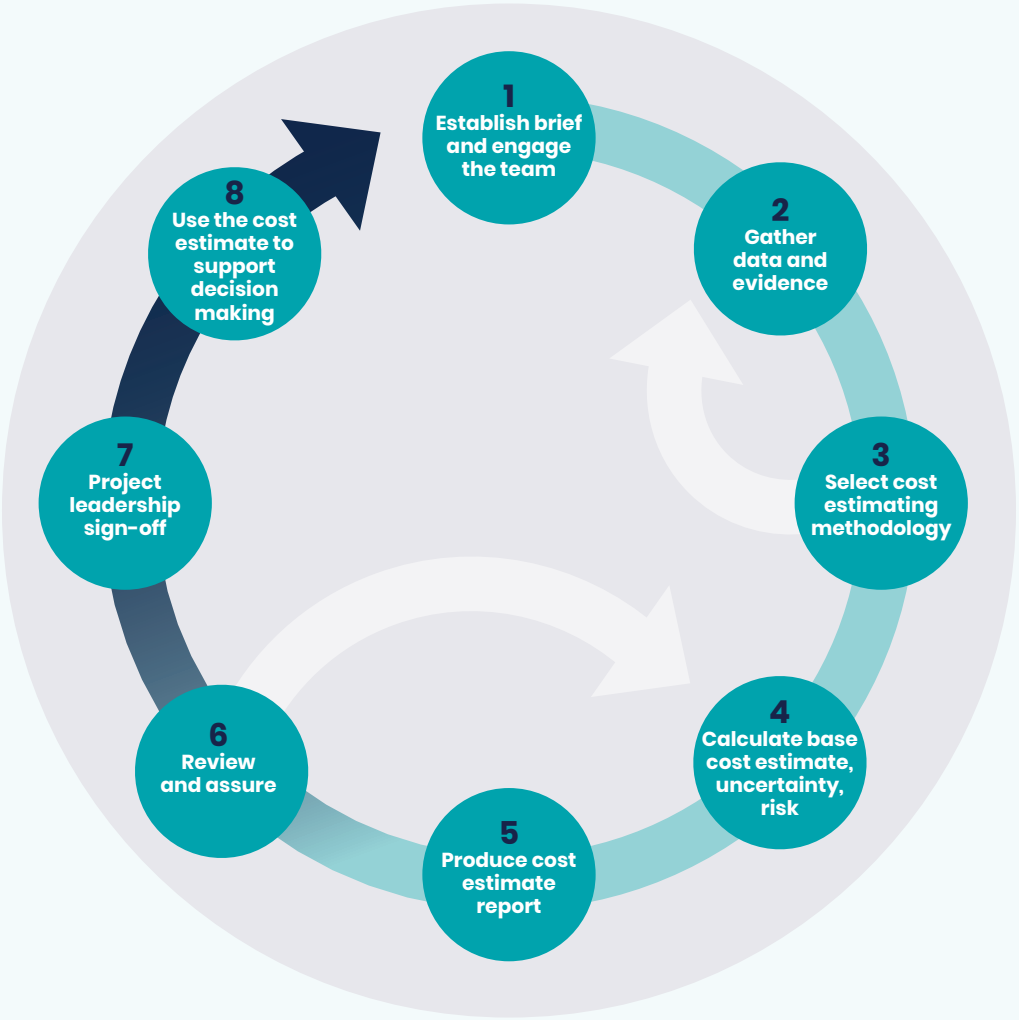
A template format of this reporting is contained within Appendix 4 - (refer to *Appendix 4 – Cost Estimate Change Reconciliation Report Template).*

> ***Reconciliation of cost estimates at each design stage***
>
> *At each cost estimate submission, the QS is to reconcile and provide a summary that shows the change from the previous cost estimate submission and the approved budget. This is to clearly identify the change in the project forecasted cost and show the trends in changes over the main component parts of the cost estimate.*

3. Cost Estimating Process – Methodology and Inputs

3.1
Cost Estimate Process Cycle – Planning the Cost Estimate

The cost estimate process cycle was covered in 2.1. The diagram showing the steps is recreated here.



Cost estimate process

The cost estimate process is focused around developing a shared understanding of the importance of the cost estimate and the anticipated final project value that it provides.

At the early stages of a project, this output can be subject to a high degree of variance depending upon the confidence (level of certainty) of both design and financial inputs upon which a cost estimate is derived.

The component parts of the cost estimate being:

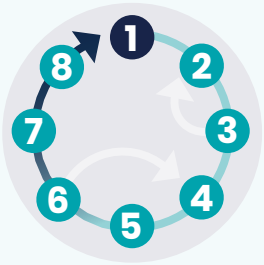
a) **Base cost estimate** – the sum of the most likely cost of each element / component that make up the overall estimate based upon available information at a particular stage of the design.

b) **Uncertainty** – sensitivity around assumptions, linked to the maturity and completeness of the information.

c) **Risk** – acknowledging the impacts of probability and likelihood of events or circumstances and assumptions both known and unknown that may impact the cost output. These should be included in the risk register.

The steps of the process cycle are listed below:

3.2
Step 1: Establish Brief and Engage the Team



The PD is accountable, and the PM is responsible for briefing the QS and the project team.

They must clearly describe the Project and its physical scope and articulate this to the QS via a Client Brief encompassing the estimation requirements stipulated by Te Whatu Ora, as set out in this guidance.

The level of information in the Client Brief depends on the nature of the Project and will be set out in the project briefing and project execution plan, however some key elements of briefing information required include:

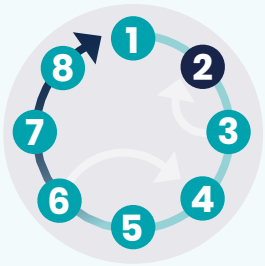
- Project scope:
  - project objectives
  - project functional requirements
  - reference similar developments (with photos where possible)
  - structure (importance level), system life, maintenance requirements, standards (where available)
  - context and programme or portfolio positioning
  - nature of the work
  - project limits, assumptions, overarching exclusions to the project and/or inclusions
  - site factors and constraints
  - sustainability objectives (including carbon reduction and/or sustainability ratings)

    - interfaces with other projects
    - timeframes required / expected for providing cost estimates
    - confirmation of cost estimate stage gates for submitting the estimate and report
    - any previous documentation of relevance.
- Source or reference material to help define project design and delivery information:
    - Design and Specification Information – refer to *Appendix 3 – Expected Design Information Requirements* for the expected information requirements to be provided to the QS at or during each design stage
    - Schedule of Accommodation
    - Project programme / timeline
    - Procurement Strategy
    - Project Execution Plan.

The IIG is developing a coordinated and integrated suite of standardised scope of services. This will include a standardised scope of services for use by projects for when a QS is required to be engaged.

> ***Completeness and suitability of Information***
>
> *Note that there is a requirement that the PM monitors and checks that the required design and other technical documentation at each stage meets the expected information provision for the particular stage gate. Also, the QS should proactively monitor progress of design development to ensure alignment with the project budget during each design stage.*
>
> *The brief should include reference to this CEG and alignment to its purpose and objectives.*

3.3
Step 2: Gather Data and Evidence



3.3.1 Project Information

Gathering the information will enable the QS to prepare an informed Estimate Plan, including classifying the cost estimate for agreement (refer to section 3.5 for classification) with the SRO, all prior to preparation of the cost estimate.

This involves gathering and understanding the following information, if available, for example (however not limited to):

a) Client Brief

b) Project Business Case

c) Any relevant previous Project approval documents

d) Design and engineering plans, drawings, specifications, schedule of accommodation and technical reports

e) Te Whatu Ora project related input costs (finance costs, client / admin costs, ICT, Clinical Equipment costs etc)

f) Appropriate Te Whatu Ora policies, procedures, systems, and tools applicable to the project

g) Site regulations and constraints, including access

h) Resource availability and market conditions.

Following a review by the PM/DM and QS, if any of the above information is missing or incomplete then the QS must ensure that this is identified, and then decide with the PM how this is to be allowed for in the cost estimate (e.g., this could be allowed for in the cost estimate by including a unique Estimate Allowance line item, or in the provision for contingencies).

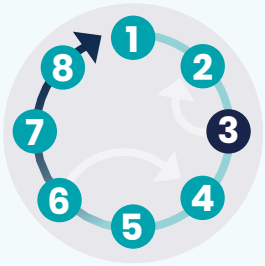
3.3.2 Design and Delivery Information

Prior to commencing the cost estimate, the QS should be formally issued the project information that is available for the design and delivery solution by the PM. The QS will review this information and validate this against the project scope.

Where there are any gaps or missing information needed to derive the cost estimate, the QS will work with the project team to obtain the required information but if the information is not available, the QS and Project team must document the assumptions and make due allowances. After which, the QS is to apply uncertainty and risk.

Any assumptions that are made must be documented in the Cost Estimate Report, (*refer Appendix 1 Cost Estimate Structure* and *Appendix 2 – Cost Estimate Report Template)*

3.4
Step 3: Select the Cost Estimating Methodology



To determine the estimating methodology, it is important for the QS to understand the purpose of design as well as the purpose of the cost estimate, and how the two are linked.

Questions the QS will consider include:

- What is the scope of the work?
- What stage is the design at? – Is the level of information available sufficient to generate a cost estimate?
- What supplementary detail / design is needed to reach the proposed level of accuracy?
- Is the cost estimate needed earlier than design and is this form of delivery appropriate for the level of accuracy required?

There are several methods for developing the estimate.
They are represented in Figure 5.

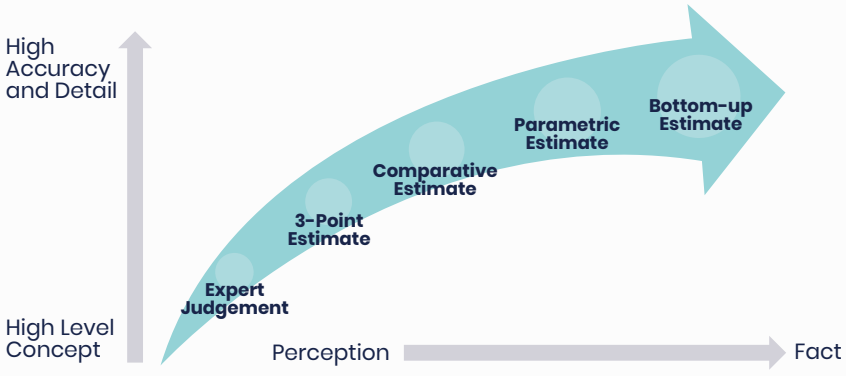


Figure 5: Estimating Methods and Accuracy

The methods of estimating include:

- Top-down methods
- Bottom-up methods

3.4.1 Top-Down Methods

Top-down techniques and approaches are useful at early stages when there is less definition and more missing information and gaps in detail. However, they do have more uncertainty associated with them.

This is because they rely on high-level deterministic benchmarking using all in composite rates and analogous pricing.

Most global methods are based upon top-down – or (high level comparison within similar projects) and include the following techniques:

Expert judgement

This is a very high-level approach, based upon previous knowledge, judgement, and experience. It is subjective by nature and expert opinion can differ.

3-point estimate

The 3-point estimate covers most likely / optimistic and pessimistic outcomes and looks at a weighted range within which the project forecast sits.

Comparative estimate

In the comparative (also called analogous) approach there is a reference to a similar project executed which has correlation with other projects. Expert judgement and historical information of similar activities in referenced projects are then gathered and evaluated to arrive at an estimate of the project. It is appropriate for repeatable projects and can be a useful validation tool. To undertake this method more detailed information is needed about how the project differs from those used for the comparison. As such, this is often used later on in the hierarchy of top-down techniques.

3.4.2 Bottom-up Methods

Bottom-up methods are based on first principles estimating which are typically used when there is more reliable design information and known design outcomes. It involves calculation of costs based upon a detailed understanding of the resources and scope.

Bottom-up methods are usually based on more detailed information and are usually associated with more cost certainty. Associated techniques include:

Parametric estimate

This is a quantitative approach to determine the expected cost based on historic or market data using various parameters in combination with statistical analysis. It is similar to analogous estimating, with the difference being that it considers differences in the sample data types. The determination of an estimate is based on a statistical (or assumed) correlation between a parameter and a cost or time value. This observed correlation is then scaled and adjusted to the size of the current project. Where the sample project data can be broken down into more distinct project specific elements that can also be further dissected - this technique can give a greater accuracy in cost estimation.

Bottom-up estimate

Bottom-up estimating (or First principle estimating) is an estimating technique for determining the overall cost for a project by examining the work at the most granular level of detail, compiling all this information, and then deriving an overall budget. It is the preferred method for the Implementation Business Case (IBC) stage gate. It relies upon complete data and therefore requires high design maturity, and less uncertainty. It requires detailed breakdown and cost data preparation, and therefore is undertaken at the later stages of design.

Method Selection

The likely use of these types of estimating methods is shown in table 3 below.

Table 3: Matrix showing estimate methods and use at design stages

Stage	Expert Judgement	3-Point Estimate	Comparative Estimate	Parametric Estimate	Bottom-up / First Principles
Feasibility	✓	✓			
Masterplan (Indicative BC)	✓	✓	✓		
Preliminary (Detailed BC)		✓	✓		
Developed			✓	✓	✓
Detailed				✓	✓
Implementation BC				✓	✓

3.4.3 Estimate Methodologies

The estimating methodology selection needs to be appropriate and suitable for the maturity and level of design information received.

The QS needs to maintain alignment of the cost estimate based upon:

- the minimum cost estimate class required (as defined under the level of classification in section 3.5).
- maturity and level of design information received based upon the Te Whatu Ora Project Delivery Framework.
- available cost data and benchmarking.

Each method, by default, relies on applying historical data based upon previous projects, to a greater or lesser extent (whether based on a full scheme order of magnitude basis through to detailed individual rates for a first principles estimate).

At a minimum, the following matters must always be considered when transposing historical data to the new estimate (to ensure the data is 'normalised'):

- a full understanding of the proposed project scope
- the level of design information available
- understanding the assumptions, inclusions, and exclusions
- age and makeup of the data
- price fluctuations
- changes in market conditions
- changes in scope
- potential phasing / staging of the work
- overall project size
- any changes to specification, processes, procedures, legislation, and the like
- any changes in the procurement and delivery of the project
- new or imposed constraints, (working in a live environment, etc.)
- any other factors that will materially affect its cost e.g., claims which should be taken out of the source data.

Cost estimation is a complex process, with a balance being struck around the level of design information available; the availability, currency, quality, and provenance of suitable cost data; availability of client derived cost inputs; the expected programme delivery timeframe; uncertainty and risk. Figure 6 below illustrates these influences.

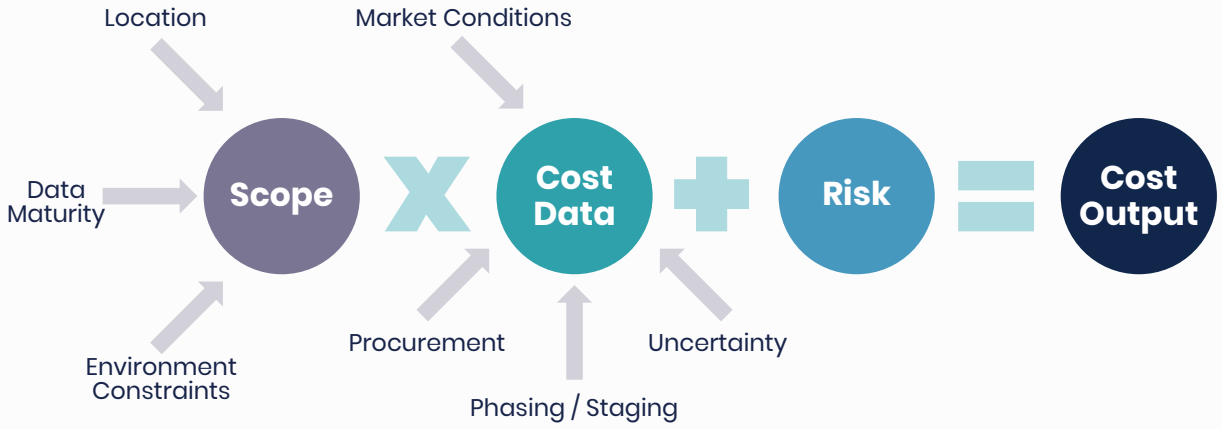
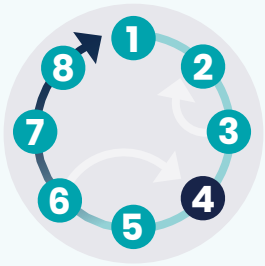


Figure 6: Influences on Cost Estimate

3.5
Step 4: Calculate Base Cost Estimate, Uncertainty, Risk



The preparation of the cost estimate is where the key components of cost are extrapolated and quantitated.

Cost estimates can be undertaken at many different stages of the project life cycle. It is important for the stage at which the estimate has been produced to be defined and understood, as this can have a significant impact upon the expected cost and uncertainty / risk allowances.

As noted above, the stage of design and project information maturity is an important consideration. For this reason, the classification of the cost estimate is important.

There are a few classification systems for cost estimates for the various stages of a project. There is no standard format, and many organisations have their own classifications. To provide some form of consistency, this CEG uses the RICS Construction - Cost Prediction Guide. This guide references six levels of cost estimate based upon the design data input maturity.

It is important that the QS clearly identifies the "estimate type" on each cost estimate so that financial decisions are made with a clear understanding of the stage of design and amount of design development upon which the estimate has been prepared.

The QS should be aware of the business case and approval processes and how the estimate will feed into these processes. Table 4 below illustrates how the estimate classification levels generally fit within the project phases.

The Levels run from Level 1 – Planning and Options, with the lowest level of design maturity to Level 7 – Issued for Construction Drawings, where it is expected that there is the maximum level of maturity, and correspondingly a lower level of uncertainty and risk.

> *Early planning and feasibility stages are by their very nature scoped at a very high level, and have little design input maturity. They are therefore subject to a higher level of uncertainty and risk, and the estimate should be produced by a QS with a high degree of experience.*

Table 4: Cost Estimate Classification and Project Phase

Estimate Level	Level of Design Input Maturity	Project Phase
1	<10%	Planning / Options
2	10%	Concept
3	30%	Preliminary
4	60%	Developed Design
5	90%	Detailed Design
6	90%-100%	Tender / Award
7	100%	Issued for Construction Drawings

3.5.1 Scope – Expectations for Level of Design Input Maturity

Prior to commencing the Cost Estimate, the QS must validate whether there is full alignment, between the level of project definition, estimate accuracy and contingency. The SRO and the QS must reach agreement on this. This is to make sure that Te Whatu Ora business expectations for decision-making are met. Where misalignment occurs, there is a real risk of the estimate misrepresenting expectations, and the estimate contingency provisions could be inadequate or erroneously allocated.

Misalignment can also lead to bias in the assembly of the cost estimate. Bias occurs when there are areas of uncertainty that require reasoning to assemble pricing data. There are a few types of bias that are common:

- **Optimism bias** – where there is a tendency to be over optimistic, with estimates overstating the most favourable outcome. To reduce this risk, the review of estimates should be based upon explicit and empirically based adjustments.
- **Unconscious bias** – this is a bias that happens outside of the control of the QS, for example complacency.
- **Confirmatory bias** – this bias occurs where there is a tendency to focus on information that confirms a pre-conception, ignoring or rejecting other information.

To prevent such misalignment, the QS should carefully examine the design inputs and identify areas where information is lacking in maturity, bringing these to the attention of the PM and Design Team. Where this cannot be rectified or defined by the Design Team, the QS should record such issues in the risk register along with any cost data that can inform the magnitude of the risk. This will allow a more detailed QRA risk analysis to be undertaken.

Each QS may have a different approach, based on their understanding of the scope, previous experience of similar projects or other factors. However, there are minimum requirements for the inputs required, and the timing of this input, should be agreed up front. The minimum requirements are set out in *Appendix 3 – Expected Design Information Requirements*. There is an expectation that the design team input will involve collaboration with the QS as part of the cost estimating process.

A site visit should be undertaken by the QS prior to preparing the initial physical works cost estimate. The site visit will provide information which may not be obtained from any other source.

Such information may allow the QS to establish, for example:

- services that need to be protected or moved
- additional constraints that may affect the construction phasing / timing or methodology
- temporary works that need to be allowed for
- costs for plant access
- any work that has been carried out by others which will impact on the project
- further measured work to be understood and priced
- estimate allowances to be made, for project scope not shown in the design and delivery information provided for cost estimation
- productivity implications to be assessed
- cost estimate classification arising out of phase uncertainty and so estimate accuracy
- identification of any specific project or site related risks.

Refer to Table 5 below for more on the expected level of design information at each stage, and the expected estimate level of classification.

Table 5: Classifications of Estimate and Project Expected Data Inputs Minimum Requirements

Estimate Methodology	Order of Magnitude	Functional Area Unit Rates	Elemental Unit Rates (all-in)	Unit Rates	First Principles	First Principles
Estimate Level	1	2	3	4	5	6
Design Deliverables Guidelines	Project Establishment	Concept Design	Preliminary Design	Developed Design	Detailed Design	Procurement
Maturity of Project Definition (Design)	<10%	10%	30%	60%	90%	90%-100%
Scope	Asset re-quirements defined	Functional areas within the asset developed Accommoda-tion schedule	Functional areas within the asset defined	Fully defined scope	Fully defined scope	Fully defined scope

Estimate Methodology	Order of Magnitude	Functional Area Unit Rates	Elemental Unit Rates (all-in)	Unit Rates	First Principles	First Principles
Design	Simple sketches	Block plan areas, limited granular input - Schedule of Accommodation	Basic materials layouts and specifications for each functional area	Developed site plans layout drawings and specifications	Detailed site plans, layout drawings and specifications	All design and engineering information is substantially complete
Delivery Solution	Overall timeline (start and end date)	Timeline with basic preconstruction and post construction milestones Indicative procurement strategy	Pre-contract disciplines and activities shown Post contract elements or trades identified	Pre-contract disciplines and activities shown Post contract elements or trades identified	Detailed procurement plan with project schedule	Project procurement agreed and commissioning plan complete
Basis of Estimate	Very high-level order of costs estimate based on asset areas. No sub functions identified. All-in overall m² and / or Item allowances	High level estimate based on sub-asset functional areas. No composite items All-in functional m² rates and / or item allowances	Cost Plan for a specific design - All in rates for elemental items e.g., structural slabs and frames, roofing partitions and doors, finishes etc.	"Developed design - Estimate" Further Design information. Increased level of cost detail Developed Design Estimate	"Pre-Tender Estimate" Detailed Design Estimate as a review and update of the Detailed Design Estimate	Elemental breakdown [or] Trade breakdown with fixed pricing [or] Full Schedule of Quantities priced competitively by suitable Tenderers
Cost Breakdown Structure	Cost per functional space / NZIQS Elemental	Cost per functional space / NZIQS Elemental	NZIQS Elemental	ANZSMM NZIQS Elemental (coded to allow Trade Tender analysis)	ANZSMM CESMM4	ANZSMM CESMM4

3.5.2 Design Information for each Estimate Stage Gate

A lack of design input can bring into question the maturity of the design data, bring potential bias issues into play and will require additional risk and uncertainty reviews resulting in differing risk contingency provisions.

Design information requirements are broadly defined within the current NZCIC guidelines. This guidance document expands on this in *Appendix 3 – Expected Design Information Requirements*. This defines the main information requirements for key disciplines that are required and expected for each of the main design stages.

The QS will use Appendix 3 as a guide to classify the cost estimate at each project stage. It provides a guide for 'best fit' for aligning the:

- maturity of information available, based upon the Te Whatu Ora Project Delivery Framework
- classification of the estimate confirming the cost estimate accuracy which can be achieved through such maturity of definition
- associated range of contingency provisions to be made for Te Whatu Ora projects.

It is important that the QS clearly identifies and reviews the design information to highlight any missing or incomplete design inputs and brings this to the attention of the PM and PD in the first instance. The PD will escalate any issues of concern as appropriate.

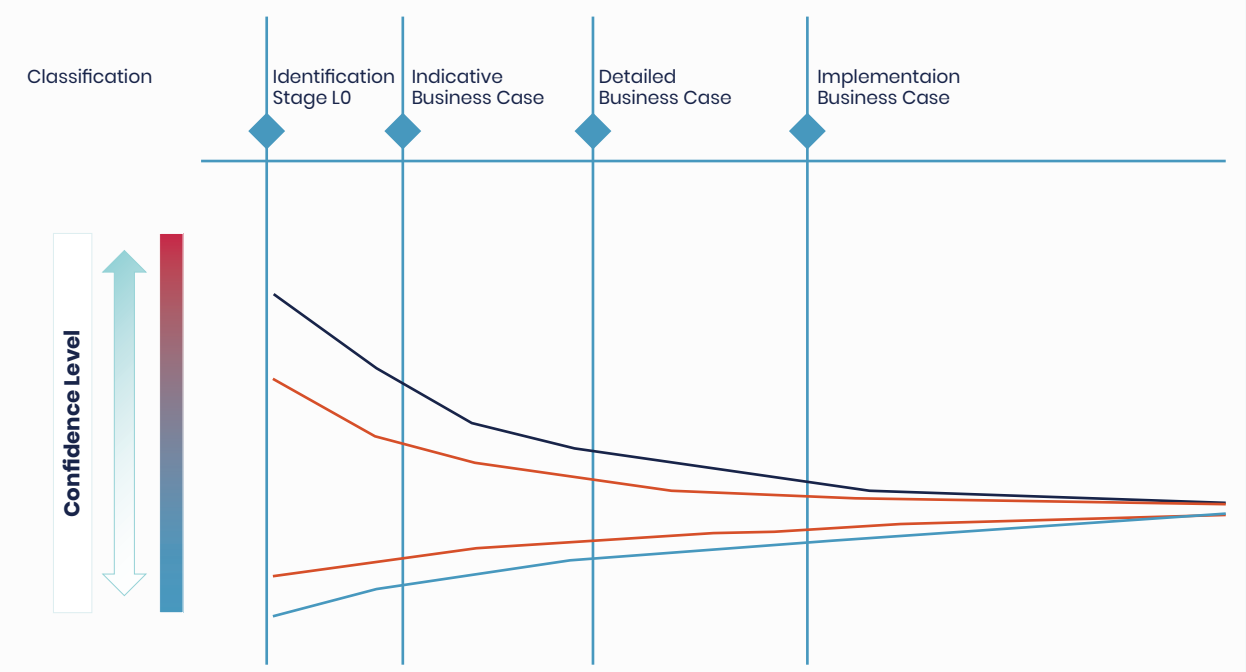
3.5.3 Estimate Accuracy

The accuracy of a capital cost estimate is subject to a number of dependencies:

- stage of design
- completeness
- cost data availability, currency, and provenance
- uncertainty
- risk

All of these dependencies change over time and as more information is defined and made available. This maturity allows the fine tuning of the cost estimate output.

Figure 7 illustrates the Te Whatu Ora Business Case classifications, design stages and probable confidence ranges.



Confidence is determined by reviewing the maturity of key variables that contribute to the completed estimate.

The confidence ranges are a general indication of likely accuracy, based upon the variability of the design and risk profiles. Each project will need to confirm the accuracy range required and develop the plan to support that level with an appropriate level of definition.

Where an expectation of accuracy is specified before an estimate commences, this should determine the amount of effort required, the time duration needed and the requisite source cost data.

Cost data used in compiling the estimate can be variable, and the QS will need to consider and adjust the outputs giving due attention to:

- data currency – base date of the data and whether they are tendered or actual
- locational differences
- level of information available – products / types
- methodology and staging impacts upon the original data or the current project
- data provenance and quality.

The level of confidence can then be expressed by the QS through the levels of contingency provided in an estimate. Contingencies are explored in more detail in section 4 of this document.

3.5.4 Estimate Preparation – Structure of the Estimate

For the purposes of this guideline, a hierarchy of cost estimate levels have been defined – which provide the user with a structure for reporting the costs, allowing for differing levels of granularity to be provided at each level. The first three levels are shown below, with the full level 0 to level 3 breakdown attached at *Appendix 1 - Cost Estimate Structure.*

The base cost estimate must include all of the project costs and sub-components (as noted in Table 6 below) and needs to align with the cost breakdown structure of the L0 to L2 items.

> *It is important for the cost estimate to make provision for all project related costs and must inspire confidence that it is comprehensive, accurate and robust.*
>
> *With health projects, the cost estimate is rarely comprised of just building trade items, there are other costs such as ICT, Specialist Joinery, Clinical Equipment, Artworks, along with design consulting and management fees, client-side project costs, and risk and escalation.*

Table 6: Cost Estimate Elements

Cost Types Level 0	Level 1	Level 2
Direct Costs	Building Estimate	Site preparation and enabling Building foundation and structure External enclosure Fit out and internal works Group 1 Joinery and FF&E* Services (including BWIC) Specialist Services Sundries External Works Design Scope items Commissioning Early Contractor Involvement / Preconstruction Contractors on-site overheads Contractors off-site Services & Profit Contractor temporary and specific designs
	Separate Supply Contracts	FF&E Groups 2 & 3*
		ICT Group 1 Costs
		AV Systems
		Kitchen Equipment
		Clinical Equipment
		Artwork (Cultural and Other)

Cost Types Level 0	Level 1	Level 2
Indirect Costs	Professional Fees and Consenting	Professional Fees Consents and Legal
Client / Admin	Client Costs	Direct Costs Governance Assurance
	Procurement and Business Case	Procurement Business Case
	Site Costs	Site Costs ICT (Group 2-4) Other Seed Funding Client-side Commissioning Temporary Accommodation
Risk	Risk Contingency	Design Contingency Project Contingency Management Reserve
Escalation	Construction Cost Escalation	Escalation allowance to mid-point construction
	Foreign Exchange risk	Forex against defined items
Land/ Property	Land/Property Acquisition	Land although is typically excluded from estimates

**FF&E Group 1 to 3 definitions are as defined in per the Australasian Health Facility Guidelines (AusHFG) Part F: Project Implementation of the AusHFG (healthfacilityguidelines.com.au)*

Cost estimate summaries will be structured as illustrated in *Appendix 1 – Cost Estimate Structure. This provides full detail in line with reporting requirements.*

3.5.5 Structure of Cost Estimate of Contractor's Direct Costs

Elemental estimating is the approach that will be used for the structure of all Te Whatu Ora cost estimates.

The elemental estimating approach involves dividing the project into a suitable Cost Breakdown Structure (CBS).

The format of the Building Estimate is to be in accordance with the NZIQS – Elemental Analysis of Costs of Building Projects.

It is noted that once the project is ready to be tendered – the format should allow for the estimate to be allocated into trade tender breakdowns for easier reconciliation.

3.5.6 Building Construction

All cost estimate summaries for contractor's costs associated with building and property projects, will have to be structured and measured in accordance with NZIQS Elemental Analysis of Costs of Building Projects.

Note that all Schedule of Quantities (SoQ), whichever terminology applies under the relevant contract for building construction projects, shall be prepared generally in accordance with the Australian and New Zealand Standard Method of Measurement (ANZSMM). A Preamble to the SoQ shall also be prepared in accordance with the general and specific preambles provided within the SoQ templates, amended as necessary to reflect the requirements of the specific project.

At post-tender stage, there is most likely to be a reconciliation required between the QS's Detailed Design estimate in elemental format as noted above, with the trade package breakdown costs provided by the successful Contractor or as part of the Tender Analysis process.

3.5.7 ICT Costs

A National Digital Facilities Framework (for Major Facility Redevelopments and New Health Facility Programmes) has been developed jointly by the Infrastructure & Investment Group and the Data and Digital functions of Te Whatu Ora with input and learnings from previous and current New Zealand health infrastructure projects; recent Australian health infrastructure projects; digital, engineering and construction sectors.

The framework is a mandatory guide for all major redevelopments and new health facility programmes which have a digital component but is initially limited to the scope of the facilities within the IIG Regional Hospital Redevelopment programme.

The framework will standardise the digital scope and approach related to capital infrastructure projects across Te Whatu Ora; identifying areas of consolidation, efficiency, and decreasing waste.

Right sizing the technology investment provides an opportunity to ensure prudent use of public funding.

A key consideration is the level of investment of technology into these new health facilities at the following levels:

- **Like for Like:** this option implements the same level of technology the current facility has into the new/redeveloped facility; no new technology.

- **Level 6 Digital Hospital/facility Infrastructure Ready:** this option includes 'like for like' software solutions and also provides an uplift in the digital infrastructure capability and capacity including power, Te Whatu Ora (data points and Wi-Fi), communications systems, (telephony, messaging, video conferencing, telehealth) and devices, (computers, mobile devices) to achieve HIMMS[1] **INFRAM** level 6 or equivalent. This enables the potential future implementation of a HIMMS **EMRAM** and **O-EMRAM** level 6 digital hospital without the need for a disruptive and costly refit.
- **Level 6 Digital Hospital/facility:** this option deploys sufficient technology to enable the Hospital to open at the internationally recognised HIMSS **EMRAM** and **O-EMRAM** level 6 or equivalent.

Healthcare Information and Management Systems Society, the organisation measures maturity of a hospital's implementation and use of technology. INFRAM, EMRAM and O-EMRAM are framework that measure maturity of Infrastructure and electronic medical records for inpatients and outpatients.

Table 7: ICT Investment Levels

Like for Like	
Replicates the existing level of technology into new facility, no new technology. Provides for new base-building infrastructure including cabling, switches etc but no new functionality over existing state.	Est Cost: 10% of Gross Construction Costs
Notes: Lowest cost	
Risks: No additional benefits; likely to increase technical debt/deficit	
Digital Hospital Infrastructure Ready	
Provides 'like for like software solutions and an uplift in digital infrastructure capability and capacity, (power, data etc) to avoid a disruptive and costly future infrastructure retrofit.	Est Cost: 15% of Gross Construction Costs
Notes: Enables simpler implementation of future digital hospital capability with reduced need to decant or to incur increased costs associated with retrofitting facilities.	
Risks: Higher cost than "like for like", benefits are dependent on implementing digital solutions to support service change that is supplementary to the infrastructure investment.	
Level 6 Digital Hospital	
Provides contemporary Digital Hospital capability in line with OECD countries. i.e., HIMMS equivalent Level 6 Digital Hospitals.	Est Cost: 20% of Gross Construction Costs
Notes: Enables new facilities to open as modern contemporary digital hospitals with associated benefits in safety, quality, financial benefits, and care associated with access to the right record, monitoring of assets anywhere, anytime. Provides a driver and funding to enable New Zealand to achieve technology parity within the hospital setting with OECD countries.	
Risks: Highest cost and is dependent on implementing a full suite of digital solutions that deliver EMRAM and O-EMRAM capabilities at the same time as the new facility build. More complex to implement and higher risk. Benefits remain dependent on implementing service change that leverages the digital solutions.	

Te Whatu Ora has decided to invest in all major redevelopments or new facilities using option 2: Digital Hospital Infrastructure ready, whilst aspiring towards option 3 where feasible and viable. Refer to *Appendix 5 – Te Whatu Ora ICT Information Groupings.*

3.5.8 Estimating Indirect Costs

Professional Consultant Services fees

This section addresses the costs associated with standard professional consultant services as listed below:

- Architectural Design Consultant (including Health Planners and associated health services)
- Structural Design Consultant
- Geotechnical Engineering Consultant
- Civil Design Consultant
- Mechanical Design Consultant
- Electrical Services Design Consultant
- Fire Engineer
- Fire Design Consultant
- IT / Comms / Security Design Consultant
- Other Specialist Consultants
- Project Management (PM) including internal and/or Consultant/External PM
- Design Management
- Engineer to the Contract
- Cost Management Consultant (QS)
- Design and Cost Peer Reviewers
- Programmer

Note that these costs should also allow for construction monitoring during the Construction Phase, noting that the level of construction monitoring will be project dependent.

The QS must review alignment with benchmark data and incorporate an appropriate percentage.

Specialist Consultant Services fees

This section addresses the cost of non-standard professional consultant services that are typically required for health infrastructure building projects. These are a few examples:

- Acoustic Consultant
- Facade Design Consultant
- Early Contractor Involvement (ECI) Services
- Lift Consultant
- Medical Gas Consultant
- Clinical Equipment Design
- Landscape Architect
- Arborist
- Seismic Design Consultant
- Environmental Consultants
- Health and Safety Consultants
- ICT (Health specific)

The QS should liaise with the PD and PM to ascertain the costs to be included.

3.5.9 Te Whatu Ora Management Costs

It is important to consider all the elements that will make up the cost estimate such as Te Whatu Ora management costs. The QS should liaise with the Te Whatu Ora PD and PM to ascertain the cost to be included. This can be undertaken through high level resource planning.

Table 8 identifies some of the client-side costs likely to be incurred by Te Whatu Ora. It should not be regarded as an exhaustive list.

Table 8: Te Whatu Ora Management Costs

Client/Admin Costs	Description

Client Costs	Direct Costs may include:
	• capitalised salaries for in-house resources (including contracted and seconded staff)
	• staff travel and accommodation costs
	• planning costs such as legal and consenting fees or fees / council levies linked to the purchase of the site
	• ICT costs for computer equipment and software licences
	• office equipment costs
	• Green Star accreditation fees
	• relocation/decanting costs
	• training cost
	• iwi/stakeholder/communication/event management costs
	• project management office costs
	• Governance Costs may include:
	  • membership fees for the governing bodies (PSG)
	  • secretariat costs to support governance
	• Assurance Costs may include:
	  • Treasury Gateway Review costs
	  • probity fees for audit and advice
	  • independent peer reviews (Cost Estimate, QRA, Design)
	  • independent quality assurance reviews (throughout key project milestones)
	  • financial reviews (financial deep dive at key stages)
	  • Independent Commissioning Agent/Clerk of Works
	  • health and safety audits and advice
	• post occupancy reviews

Procurement and Business Case Costs	This may include consultancy fees for: • procurement advice • running of procurement and market sounding processes including fees payable to evaluation teams • legal fees • drafting of business cases • undertaking economic appraisals (such as third party financing options analysis and Whole of Life cost modelling) • development of client strategies, plans (including change management) and briefs
Site Costs	This may include: • insurance costs • security costs • hoarding /signage costs • waste disposal costs • make good costs • utilities • IT costs (Group 2-4 costs not included in the design or construction budget) • seed funding (historical costs for the early project phases- see below) • client-side commissioning including operational readiness and training • temporary accommodation / car park costs (portacoms)

3.5.10 Historical Costs / Seed Funding

Historical costs and seed funding relates to all capitalised costs related to initial approvals such as pre-feasibility, feasibility, planning, and analysis incurred prior to the commencement of the estimate by the IIG. These costs have already been incurred (or are soon to be) and are therefore not subject to escalation. These costs should be included within the Client / Admin section of the cost estimate.

The QS should liaise with the PD and PM to ascertain the cost to be included.

3.5.11 Property Acquisition / Lease Costs / Compensation Costs / Funding Costs

Property Acquisition, Lease, Compensation and Funding costs are costs that are often either already accounted for by the IIG or fall outside of the typical expertise of the QS.

For this reason, these costs will normally be requested by the QS and provided by the IIG, or its representatives.

Land costs and/or property acquisition would typically include:

- land utilised permanently for the project
- land that might be permanently or temporarily required
- land to facilitate contractor's work and site facilities including provision for site offices, temporary environmental works, traffic diversions and so on
- property acquisition agent's fees
- other professional fees, e.g., legal, valuation, specialists, and survey fees incurred by Te Whatu Ora
- Land Information New Zealand (LINZ) title and other disbursements
- Advertising, e.g., 'Section 23 Notices'
- associated contingency allowance.

Apart from the costs of the land to be acquired for project purposes, there are other associated costs in the land acquisition process which can include:

- compensation paid to landowners due to project impacts on the owners' land
- adjustments to Third Party property access, footpaths, fences, and the like
- costs to relocate tenants.

Other cost headings such as development contributions, specialist ICT and security (Protective Security Requirements), decanting, relocations and business disruption may need to be considered on projects. The QS should liaise with the PD and PM to ascertain the cost to be included.

Development contribution costs – are often assessed by the QS using third party data sources.

3.5.12 Uncertainty

Linked with cost estimate preparation is uncertainty and risk. Both uncertainty and risk improve over time, but it is important that it is understood and identified so that the variability can be assessed.

Uncertainty is defined as a lack of complete certainty or confidence. The outcome of an uncertain event is unknown; however uncertainty is not an unknown risk.

Uncertainty is driven by:

- **Decisions** – lack of detail around key design requirements (often at the early stages), where decisions still need to be defined, and these will be subject to options analysis.
- **Lack of maturity of design and data** – a typical example here would be ground conditions being unknown and based upon generic data. In these instances, the maturity can be improved by further investigation and work. It is important to understand what impact this risk of maturity can have on the estimate so project governance can decide to invest more in early investigation.
- **Bias and error** – Here conscious and unconscious bias and assumptions can move the estimate towards outcomes that are not accurate. Selection of historic reference project data can ignore issues that may have more of a bearing upon the project. The effect of the bias can be due to lack of sample data available, inclusion of only successful projects (ignoring those that did not go so well) and optimism bias. To avoid this optimism bias, it is important to systematically review and understand the assumptions and data being used.

Once completed, the scope and features of the estimate (excluding contingency allowances) should be shared and articulated with the Design Team, PM and PD and the QS can undertake a simple sensitivity analysis to establish boundary conditions for each value. These conditions being whether the values are:

- **Pessimistic** – and higher than would typically be expected.
- **Most likely** – at a point that is reflective of the data available and opinion of the team – which should equate to the Base cost estimate.
- **Optimistic** – Assumptions lean towards higher efficiencies and best-case outputs.

> *Risk Contingency*
>
> *So that an understanding of risk contingency is transparent, all contingencies should be shown separately in the cost estimate including design contingency, project contingency (including construction contingency) and management reserve.*
>
> *It is expected that the value of the design contingency will reduce as the project progresses through design, and visibility of this enables the easy monitoring of this figure.*

3.5.13 Accounting for Risk

Risk is an uncertain event that affects a project's outcome. Risks need to be included and some modelling or validation of the risk allowance is required.

The cause of a risk needs to be analysed to understand its potential effect or impact. It is measured in ***likelihood*** (probability) and ***consequence*** (impact).

Common practice has been to express risk allowances in a deterministic way as a percentage contingency mark-up to allow for unexpected outcomes. But this pre-determined percentage approach does not differentiate the range of uncertainties and influences upon a project, and does not take into account scale and complexities.

For simple projects, or projects at a very early stage of definition, this could be a very basic assessment based upon a high-level review of the risk types defined in Table 9 below.

The risk assessment approach can be improved by undertaking a more defined risk management process using QRA. As the design stages progress

and the design becomes more defined and more detailed inputs are identified, there is the expectation that project risks will reduce.

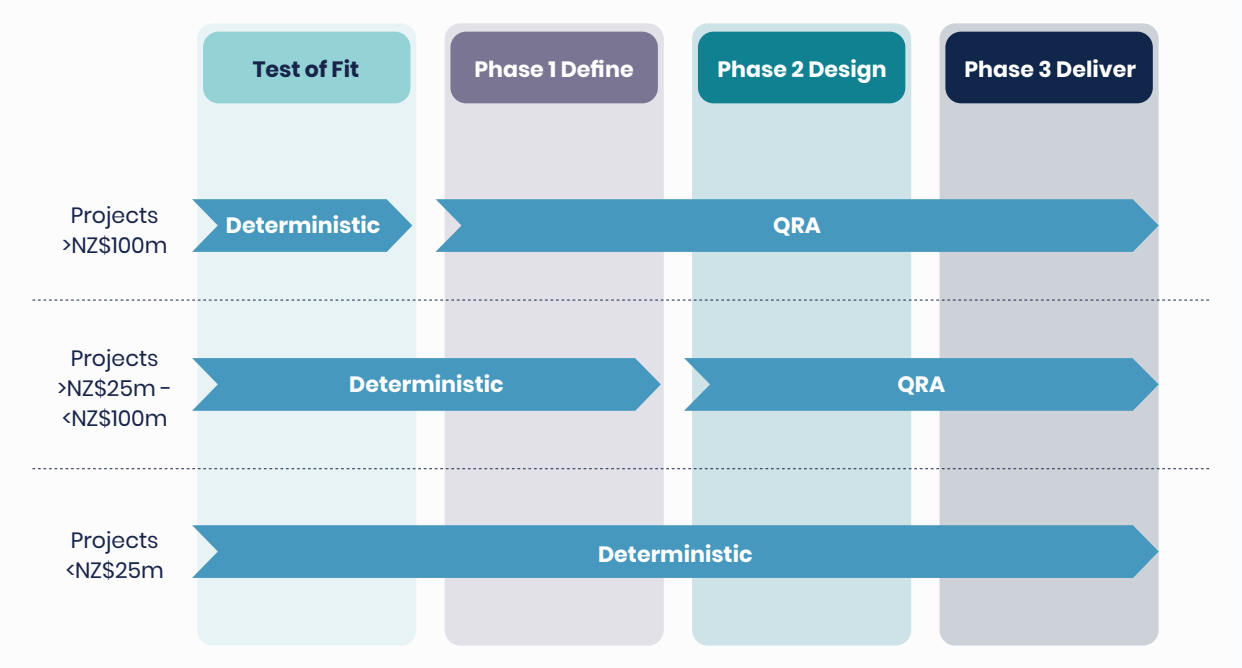
At the early stages of project design maturity there is a need to establish some high-level understanding of the types of risk that exist, and how these can potentially be included as a simple qualitative or probabilistic calculation to inform the likely design risk allowance.

Risk treatment can also be determined through the Treasury's Risk Profile Assessment tool, which all projects will be required to complete from initiation. For example, a project with a high-risk profile may be required to undertake QRA at multiple design stages, while a low-risk project will not.

Table 9: Accounting for Risk

Design Phase	Project Base Estimate < NZ$25m	Project Base Estimate > NZ$25m - < NZ$100m*	Project Base Estimate > NZ $100m*
Test of Fit	Deterministic Methodology	Deterministic Methodology	Deterministic Methodology
Phase 1: Define	Deterministic Methodology	Deterministic Methodology	Deterministic Methodology used for Programme / Indicative Business case
			Quantitative Risk Assessment to be used for Detailed Single Stage / Detailed Business Case
Phase 2: Design	Deterministic Methodology	Quantitative Risk Assessment	Quantitative Risk Assessment
Phase 3: Deliver	Deterministic Methodology	Quantitative Risk Assessment	Quantitative Risk Assessment

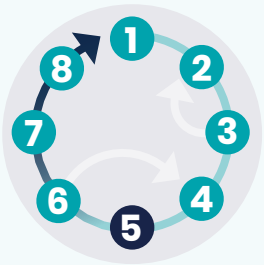
The $100m threshold should be informed by the most recently calculated Base Estimate. Therefore, if a project's budget crosses the value threshold as it moves through the Project Delivery Framework Phases, a change in calculation methodology is required.



Contingency requirements should be regularly reviewed and recalculated at each project stage. This way ensuring that the contingency provisions are aligned to the project's current characteristics.

Refer section 4.0 for guidance on calculating project contingencies and construction cost escalation.

3.6
Step 5: Produce the Cost Estimate Report



This section is intended to set out the procedures to be followed when producing a Cost Estimate Report to allow:

a) A consistent look and feel, across the cost estimating process for all Te Whatu Ora projects.

b) Easy reconciliation between project design stages.

c) Efficient and valuable cost benchmarking which can be recycled into future project estimates providing continuous improvement.

d) Simple, easy to read hierarchy presentation structure.

3.6.1 Cost Estimate Report

The level of detail in the Cost Estimate Report will vary substantially between classifications of cost estimate and from project to project. The QS must use judgement and experience in establishing what is appropriate, but it needs to satisfy the needs of IIG, as it will be used as a document to demonstrate the cost estimate is both robust and defendable.

The Cost Estimate Report should include at a minimum:

- project stage
- estimate classification
- cost estimate summary and detail, together with its calculation methodology and assumptions
- potential cost risks and opportunities
- historical relationships between cost estimates and change throughout the project life cycle together with an explanation of the reasons for change
- a reference to the Client Brief confirming the full project scope
- benchmarking information used to support the cost estimate, where applicable
- a referenced list of the design and delivery solution information aligning to the project scope
- key communications made during the cost estimate preparation.

3.6.2 Cost Estimate Report Layout

The Cost Estimate Report will facilitate the review and validation of the cost estimate and so the layout is key to consistency in cost estimating.

The set out shown below is a simple format for communicating the cost estimate and includes the items to consider in the layout to ensure consistency.

Cost Estimate Report

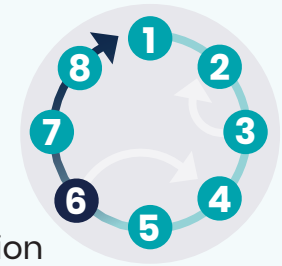
It is always important for the QS Layout to present the estimate to the project team, PM, PD, the SRO, and the Te Whatu Ora capital assurance teams along with clarification around the scope and cost allowances, risks identified, and assumptions described.

This will help establish in collaboration with the PM, PD, SRO and Design Team what cost allowances (such as permit costs, legal fees etc.) are to be included within the estimate or specifically excluded.

Basic project information: project name, address, project identifiers, description, project stage, authors, approvers, estimate classification, GFA's	**Basic project information** - A clear summary that provides basic project information (a draft report style is included in *Appendix 2 – Cost Estimate Report Template).* This is to include the basic dashboard of key project information.
Financial data: overall figure, next level down cost headings and figures, cost per m2 for all figures	**Level 0 / Level 1 financial data** presented in a single table format.
Cost Estimate Executive Summary: list key elements explaining the basis of the cost estimate	A **clear narrative** that demonstrates that the cost estimate is both robust and defendable.
Exclusions: list of exclusions (noting that these should be minimised) and associated cost projection should they be required	A clear **list of exclusions** such as Land costs / capital charges and any other items that have not been included in the pricing. Why can they not be defined? How can they be minimised?
Inclusions: list of inclusions (things that are included which may not be obvious) and associated cost allowance **Assumptions/Pricing notes:** any other elements that may affect the client's understanding of the estimate not noted above	What **assumptions and notable inclusions** are there? How assumptions, inclusions and exclusions will be included, and what are we specifically including in our estimate? And how are they presented?
Risks and issues: narrative on escalation, contingencies, exchange rate and any other issues	**Risks and financial risk allocation** – how has this been derived? Simple calculation / deterministic or QRA? List and identify the key assumptions that could impact the cost estimate, for example ground conditions. **Opportunities** should also be clearly identified, and commentary around the estimate provided.
Financial data: next level down financial data and cost per m2 for all figures	**Detailed financial data** - The next level of cost data is then to be provided – Level 2/3 items. This is to be in a format commensurate with the design stage documentation.

For the basic framework and content, refer to *Appendix 2 – Cost Estimate Report Template.*

3.7
Step 6: Review and Assure:



The QS will consult and collaborate with the PM, the Design Team, and other stakeholders (as directed by the PM), to define the scope together with the design and delivery solution to be captured in the cost estimate. Responsibility for the cost estimate preparation and output always rests with the QS. The QS verifier should conduct a thorough review before sign-off for release of the estimate to Te Whatu Ora.

The QS is responsible for the definition and structure for the cost estimate detail using their experience and best judgement. The use of benchmark cost information is to be used as a comparator to help define confidence levels.

The overall estimate should be reviewed and verified for adequacy and completeness in accordance with the QS's own assurance processes. All take-off, drawings and other documents used to prepare the estimate will be filed with the estimate.

The specific requirements and approach to be taken will be documented within the Client Brief, including collaboration requirements with peer review teams and quality assurance teams. The Client Brief will describe how this can be achieved for agreement with the PD, PM, SRO, and the QS.

The suggested review category responsibilities are provided in Section 5. However, this will be at Te Whatu Ora direction and may vary from project to project and stage to stage.

3.7.1 Estimate Change Reconciliation Requirements

The cost estimate will change as it progresses through the various stages of the project, and the changes will reflect the development of a defined scope of works or scope changes or amended contingency provisions for risk.

It is the responsibility of the QS to record any movement in the Cost Estimate Report, up or down.

In the Cost Estimate Report, the QS should:

- clearly highlight any major differences between the current cost estimate and the project budget (the value assigned to a project) and the last published cost estimate prepared for the project.
- identify the cost impacts due to scope changes, pricing updates, labour productivity adjustments, cost estimate refinement, errors, etc.

- differentiate between scope change and design development of the existing scope. This may require the input and guidance from the PM, PD, SRO and Design Team.
- provide a summary and detail of the Value Management undertaken as part of the current cost estimate.

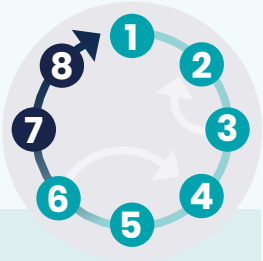
The detail of the reconciliation will align with the cost estimate type. It must be in sufficient detail to justify the cost estimate movement between versions.

The change reconciliation summary will be in a format included within *Appendix 4 – Cost estimate change reconciliation template*. Whatever the detail, there should be a high-level summary so that project governance is informed of the main headings of changes.

For ease of communication and understanding, a graphical representation of the changes in the cost estimate, i.e., a 'waterfall analysis' chart can be included within the Cost Estimate Report to support the tabular cost estimate change data.

> *The QS should consult with the PD and PM to determine any critical and priority reconciliation issues, at the time of drafting the Cost Estimate Report, so other cost estimate reconciliation detail can be produced as required.*

3.8
Step 7: Project Leadership sign-off and Step 8: Use the Cost Estimate to Support Decision-Making

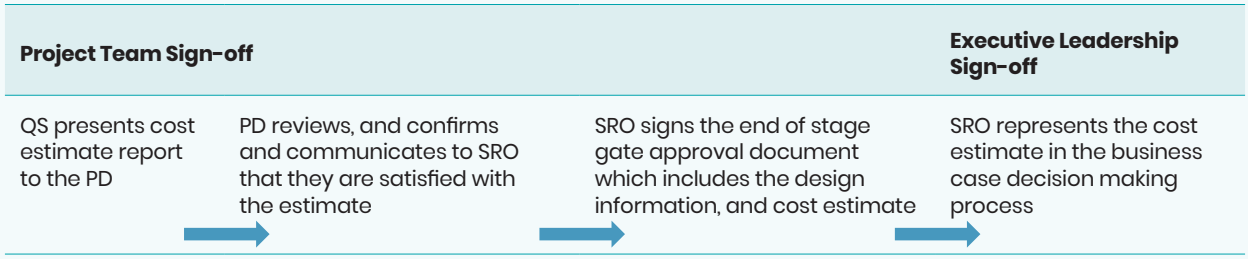


> ***Quality Assurance***
>
> *Assurance is particularly important leading up to leadership sign-off and decision-making on the cost estimate at each gate. Quality Assurance may be undertaken by an independent reviewer appointed by the SRO. It is one of the recommended approaches to mitigate against Optimism Bias.*
>
> *There are three separate types of independent review and verification of a cost estimate that can be undertaken: Internal Self-Assessment; External Peer Review or External Parallel Estimate.*
>
> *Their use depends upon the scale, cost, complexity, stage, and importance of the Project.*

The purpose of the sign-off process is to provide a platform for project governance, such as the PD, PSG, and SRO, an opportunity to clarify and challenge the cost estimate data, understand it, and formally acknowledge their acceptance. The SRO is ultimately accountable for project performance in line with the cost estimate.

At a high-level overview the sign-off process is:

Figure 8: Project Leadership Sign-Off



To enable the SRO to signoff the cost estimate, the following documents at a minimum are required:

Table 10: Documentation Required for Sign-Off

Document	Responsibility
Total Project Cost Estimate – anticipated final cost broken down to at least Level 1 Reporting Structure	Quantity Surveyor
Risk Register	PM
Risk Contingency evaluation including QRA	QS
Assumptions Register	PM
Project Brief – confirmation of scope and or scope changes	PM
Project Schedule – confirmation of schedule or any changes	PM
Independent quality assurance / peer review or QRA reports	PM

The entire project cost estimate report must be retained both physically and electronically in the project record and be made available on request.

The sign off process defines:

- **Acceptance** – The SRO accepts the cost estimate from the project team, QS, PM, and PD.
- **Consistency** – The cost estimate aligns with the project objectives and outcomes required.

- **Alignment** – It aligns with the approved scope.
- **Robustness** – The cost estimate follows the requirements of the guidance and methodology is appropriate.
- **Completeness** – The cost estimate is complete and reflects the approved project scope.
- **Accuracy** – The confidence level around the cost estimate reflects the stage of the design.
- **Assurance** – The required quality assurance has been undertaken.
- **Controls** – The processes for project financial controls are in place with regard to contingency drawdown, progress reporting and reconciliation.
- **Management** – The required management reporting requirements are set up.

The formal sign-off of the cost estimate must be documented in writing as part of the project stage gate approval process. Refer *Appendix 6 - Te Whatu Ora Cost Estimate Checklist*.

3.8.1 Supplementary Reporting Information

If there is a need for supplementary reporting information to be included within the Cost Estimate Report to assist in the leadership sign-off and decision-making process, this must be agreed with the PM, PD and SRO prior. This is to ensure that decision-making is streamlined, and that supplementary information is relevant and required.

> *It is only once these steps have been completed that the Project leadership, governance and Investment teams can use the cost estimate to inform the strategic decision-making process.*
>
> *The Cost Estimate Report should provide the core financial data and information that informs the scale, level of design maturity, uncertainty, confidence levels and risk allowances that have been considered as part of the cost estimate preparation.*

4. Project Contingency

This section provides guidance on how to calculate the appropriate level of contingency for a project and its subsequent allocation for ongoing management within Te Whatu Ora.

As noted in Section 3.5.13 the cost estimate will include an allowance for Risk. This allowance is in the form of a Contingency provision. The contingency provision is used to address levels of uncertainty associated with risk including:

- expected project specific risk items that cannot be easily quantified e.g., ground contamination
- unexpected risk items that may be encountered in a project e.g., ground conditions, archaeological finds.

The contingency provisions are typically expressed in three contingency categories which are:

- Design Contingency
- Project Contingency
- Management Reserve.

Note that cost escalation contingency is addressed separately to the project contingency.

Table 11 identifies types of risk and uncertainties that inform the contingency calculations. The QS must clearly state the method of determination of the contingency provision within the Cost Estimate Report and state specific project uncertainties against the contingency types. The table also reflects the contingency headings that are used to establish the contingency reserve on a project. In practice, it is acknowledged that the project contingency reserve will be managed by the project team in aggregate. Despite this, Te Whatu Ora may require reporting of cost pressures against the contingency headings noting that this reporting should not be a barrier to project progression.

Table 11: Risk Types

Contingency type	Examples of risk
Design contingency	Incomplete or inadequate design
	Scope change within bounds of design brief
Project contingency	Project type e.g., refurbishment
	Project complexity
	Project constraints e.g., live site, noise, vibration etc.
	Construction risk
	Unknown risks e.g., ground conditions
	Professional fees risk
Management reserve	Strategic risk
	Change risk and change monitoring
	Stakeholder interfacing and integration
	Scope change outside bounds of design brief
	Funding risks

4.1
Design Contingency

Design contingency is a measure of the level of maturity of the design information upon which the estimate is based. The QS must clearly state the method of determination of the contingency provision within the Cost Estimate Report.

Whilst design contingency will be calculated against each element based upon the level of design for that element, the overall design contingency level must be expressed as one figure in the Cost Estimate Report to ensure transparency.

As the maturity of the design inputs improve, there is an expectation that the value of design contingency will reduce.

4.2
Project Contingency

This risk contingency allowance sits outside of the Base Cost estimate and is an allowance to cover the non-design elements of risk, such as pricing risk, local economic impacts, constrained resource availability, health and safety, methodology risks and construction risks.

4.3
Management Reserve

These risks fall outside of the design and project risks and relate to more high-level risks.

This type of allowance is more typical on larger projects and is usually determined by a Quantitative Risk Assessment.

The contingency amounts are held outside of the project environment and fall outside of the control of the project team.

The utilisation of the management reserve can only be drawn down by the appropriate delegated authority within Te Whatu Ora.

4.4
Calculation of Contingency Values

There are several approaches available for calculating the value of the Contingency for a project, each with their inherent calculations and risk profile. They vary in complexity and resources required to define the values.

It is important that the approach used is suitable and appropriate to the project design stage and expected out-turn cost.

The approaches to defining risk contingency calculation and assessment are:

a) Deterministic – a percentage mark-up value

b) Qualitative Assessment – assessing the likely occurrences and impacts

c) Quantitative Risk Assessment (QRA)

Refer table 9 for the suggested methods of calculation of contingency.

4.4.1 Deterministic Approach

When applying a deterministic approach, a fixed percentage is applied to the Base Cost Estimate (construction, P&G, margin).

The base cost estimate should be free from any embedded risk provisions to mitigate double counting i.e., there should be no additional allocation within items, rates or quantities to accommodate for estimating uncertainty.

The contingency provision is determined by the QS utilising their expertise, skill, and judgement. These percentage applied sums need to be carefully reviewed by the QS, PD and PM set against the indicative contingency level benchmarks noted in table 12 below. These percentages are broadly based on a typical mid-sized, traditional new-build construction project and should not be used for projects of significant scale (e.g., New Dunedin Hospital), small BAU projects or site-wide infrastructure projects.

> *These percentages are provided to prompt review and discussion with the project team and should not be considered mandatory.*

The assessment should draw upon the status of the design, maturity of information and the scale and scope of the work. Where the suggested provisions are not considered suitable (either too high or too low), the QS must provide reasoning and rationale for the difference.

Table 12: Indicative Contingency Benchmarks

Contigency type	Feasibility	Concept Design	Prelim-inary Design	Devel-oped Design	Detailed Design	Construc-tion	Post Comple-tion
Design	QS determined	10%	7.5%	3%	0%	0%	0%
Project	QS determined	15%	12.5%	10%	10%	5%	0%
Total Indicative Contingency Benchmarks		25%	20%	13%	10%	5%	0%
Management reserve	Subject to QRA	Subject to QRA	Subject to QRA	Subject to QRA	Subject to QRA	Subject to QRA	Subject to QRA

4.4.2 Qualitative Assessment

Qualitative assessments look at the likelihood of occurrence and the expected impact of the consequence. It assigns a likelihood, impact and consequence against each risk item using professional judgement and experience to derive an expected outcome.

A simple example of this approach would be to assign an expected rating – "Unlikely"; "Low", "Medium", "High", "Very High" to assess the likelihood of the risk, and then applying an expected cost impact to each risk.

4.4.3 Quantitative Risk Assessment (QRA)

Quantitative Assessment requires a more in-depth estimation for projects typically exceeding $100m in value.

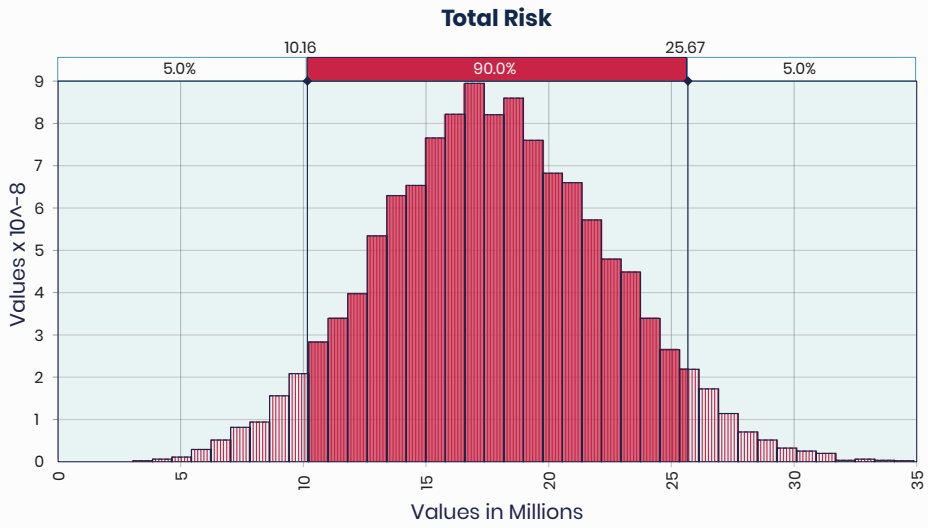
The method combines the probability of a risk occurring, with modelling of the costs on an assessment of a Best Case, Most Likely and Worst-Case scenario. These are then run as a Monte-Carlo simulation to test the expected outcomes based upon selected statistical analysis.

The simulation process provides a probability distribution of expected costs, based upon the range of the expected outcomes and probability of occurrence.

This approach is considered more robust than other techniques but does require more resources and information to compile and evaluate the risk register. It does have the advantage of being able to rank the risks to allow for better management and mitigation during the design and construction phases. It also can be adjusted and re-run as risks evolve.

The other benefit to a QRA approach is that the simulations provide a distribution of costs that have expected probability allocations based upon percentiles allowing a graphical representation of the analysis. An example of this is shown in Figure 9 on page 76.

Figure 9: QRA Output Distribution Graph



	Total Risk
Cell	Pert Model! P58
Minimum	3,053,348.76
Maximum	34,883,974.13
Mean	17,798,183.29
90% CL	± 76,827.41
Mode	16,357,179.65
Median	17,723,691.25
Std Dev	4,670,342.24
Skewness	0.0902
Kurtosis	2.8579
Values	10000
Errors	0
Filtered	0
Left X	10,159,806.39
Left P	5.0%
Right X	25,673,311.73
Right P	95.0%
Dif. X	15,513,505.34
Dif. P	90.0%
1%	7,371,643.91

4.5
Construction Cost Escalation

Construction cost escalation is the amount of inflation that is attributable to constructions costs. The escalation provision is normally expressed separately from the other contingency provisions and is often derived from indices that show the historical trends in price fluctuations for various sectors published by the likes of Stats NZ and NZIER.

The suggested indices for use in health projects is the "*Other non-residential buildings*" section of the Capital Goods Price Index published as part of the Business Price Indices by Stats NZ.

Stats NZ have defined "*Other Non-residential buildings*" as:

"*...new construction, alterations, and additions to commercial, industrial, and other non-residential buildings such as schools, **hospitals**, libraries, and farm buildings.*"

However, it is acknowledged that there is a divergence in opinion about the best method to calculate the prediction of future cost escalation in construction projects between experts. The key point is that any figure for construction cost escalation should be noted in the Cost Estimate Report along with calculation method, source data and associated time periods.

One suggested methodology for calculating the escalation amount is as follows:

a) confirm the cost estimate base date.

b) determine the months over which the escalation is to be allowed for – this will generally be to the end point of construction according to the master programme.

c) decide upon the escalation indices that are to be used in the escalation calculations.

d) calculate the monthly cumulative escalation percentage.

e) discount the escalation allowance during the construction period by 50% to take into account the mid-point of construction.

f) cumulative escalation percentage is applied to the un-escalated cashflow (i.e., Net amount) for that month.

Information that will be needed to support the escalation calculation process includes:

- total cost estimate (un-escalated) including contingencies
- cashflow forecast of Project's Base Estimate Total (Un-escalated)
- current agreed / proposed project schedule (programme)
- date the cost estimate was prepared (Base Date)
- forecast quarterly escalation cost indices used including the index reference codes and values.

5. Quality Assurance

A key part of the cost estimating process is the quality assurance (QA) process. These processes will be provided in two ways:

- **Internal QA processes** – the process by which the Quantity Surveying firm engaged on a project will review and approve its own work to enable the issue of cost estimate information.
- **External QA processes** – review of issued cost information by an external QS expert as part of a peer review or, a cost estimate developed in parallel with the cost estimate produced by the Quantity Surveying firm engaged on a project by an external QS expert.

The complexity and scale of a project will dictate the type of QA process that is required. The Project Execution Plan should detail the QA strategy that is to be employed on the project. However, the following provides a general guide of the appropriateness of QA processes on projects based on project value.

Table 13: Responsibility for Cost Estimate Quality Assurance

Project size	QA Requirement
Projects < $25m	Internal review by QS only
Projects > $25m to <$100m	External peer review by independent QS
Projects > $100m	External parallel estimate by independent QS

An essential concept of any quality assurance process is that it be collaborative involving all project team members and project governance with the sole intention of exploring opportunities and risks of a project.

Other considerations of the QS process include:

- *continuity* of any external review team to ensure consistent advice and build trust
- *independence* of the external review team from that of the Quantity Surveying firm engaged on the project
- *timing* of QA processes and in particular the relationship to project governance approval milestones and decision-making key dates

> *Since the SRO and PSG have overall accountability for the successful delivery of the project, the purpose of a Quality Assurance review is to increase the confidence level of the cost estimate by validating the inputs and outputs provided by the QS.*

5.1
Internal Estimate Review and Verification

The review of the cost estimate must give an independent view of the validity and accuracy of the cost estimate for a project.

The provision of a comprehensive and well documented Cost Estimate Report will provide or reference all of the supporting information required and significantly speed up the review and verification process.

Some questions to consider as part of the review process include:

- Has the cost estimate been subject to internal verification and QA sign-off processes?
- Is the methodology / approach adopted appropriate?
- How reliable are the inputs to the cost estimate? Has the status of the inputs been clearly described? Have the inputs themselves been subject to QA processes?
- Have the inputs been benchmarked? Have changes against benchmarks been articulated?
- Are in scope / out-of-scope items clearly described?
- Do the assumptions underpinning the estimate appear well-founded?
- Do the assumptions reflect the current project stage and have regard to the current environment?
- Do the risk allowances / escalation rates look reasonable having regard to the current environment?
- Is there any indication of optimism bias within the cost estimate?
- Is there a clear reconciliation to previous cost estimates / approved budgets? Are any changes adequately described?
- Are risks and issues clearly articulated with recommended mitigations?
- Are there any conclusions as to whether the project is still affordable?
- Is the basic arithmetic and calculations used in the cost estimate correct?

5.2
Internal QA Review

This will be the most common type of review and often undertaken by a senior experienced practitioner within the QS practice (often a Director). The task of the reviewer(s) is to examine the project data carefully and recommend amendments, if and when required, in order to verify a complete and accurate cost estimate.

The key requirements of a cost estimate review are as follows:

- it must provide an unbiased viewpoint. The review of cost estimates should avoid any possible conflict of interest
- in the initial stages of the project, when the scope is not yet fixed, the emphasis should be on the scope of work, to confirm the total intended scope has been included in the cost estimate irrespective of the design and delivery solution at that point
- clear presentation of the findings should be provided within a Cost Estimate Review Report. The Cost Estimate Review Report should provide specific recommendations to remedy any shortcomings or rectify any mistakes in the overall cost estimate and prove an assessment of the effort and time required to remedy them.

The following elements should be included as part of a cost estimate review and sign-off:

- Project scope
- Design and delivery solution
- Cost Estimate Report
- Cost Estimate Summary

Appendix 1 – Cost Estimate Structure provides the structure and content for a review checklist. It is to be used by the QS as part of their Quality Assurance process and is used by the Cost Estimator / QS to review estimates.

It is important to note that all company specific verification and quality assurance should be carried out by the QS in conjunction with the above-described process.

5.3
External Peer Review

This will be a specifically commissioned review with a team appointed by the SRO supported by the PM and PD. It is a more in-depth review of the cost estimate than an internal review and will generally have an audience in the project team, project governance and Te Whatu Ora leadership.

The Independent peer review and sign-off is aimed at providing an enhanced and in-depth focus on the following:

- major quantities
- method of measuring items (i.e., items have quantities, not just a lump sum)
- rates and their relevance to the project (economies of scale, etc.)
- estimating methodology (i.e., first principles, historic, etc.)
- review of reconciliation with previous estimates where possible (i.e., check to ensure that the cost estimate has not been reduced or scope omitted in order to keep to previous budget)
- design development uncertainty allowance
- development and delivery uncertainty allowance.

The independent peer review process shall proceed as follows:

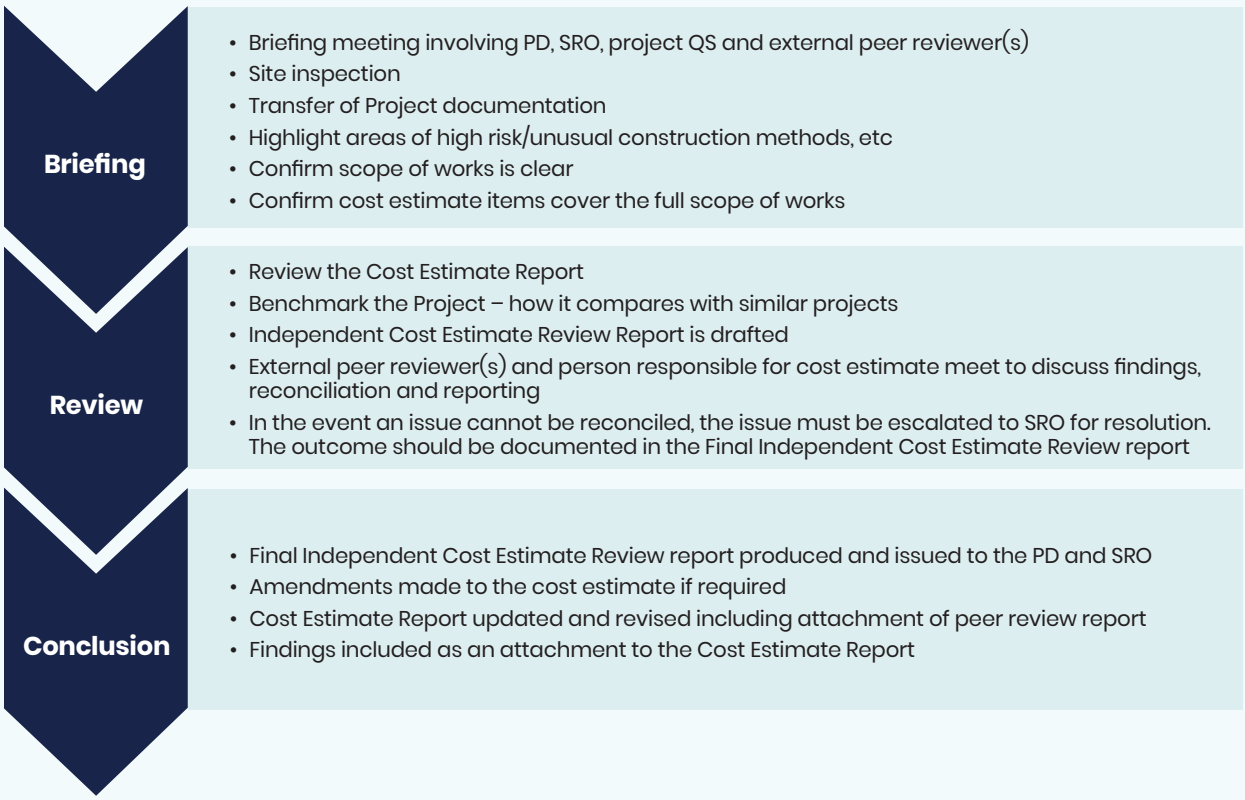


Figure 10: Independent Peer Review Process

5.4
Parallel Cost Estimate Process

The requirement for a Parallel Cost Estimate may be required for very large and complex projects >$100m.

The Parallel Cost Estimate would be undertaken at the same time as the primary cost estimate, using the same information and with alignment of the input and output information and structures to ensure a comprehensive reconciliation.

The objective of the Parallel Cost Estimate process is to establish a high level of confidence in the estimated project cost. This is achieved by establishing confidence that:

- the scope of the works has been adequately defined and translated into the cost estimate items
- the cost estimate items are complete, and quantities are correct
- the rates are applicable to the scale and nature of the project
- the risk assessment is complete and robust
- the construction methodology is suitable considering the scale and nature of the project.

The process for the parallel estimate will be similar to the peer review except for the following:

Table 14: Peer Review Compared to Parallel Estimate

Peer Review Step	Parallel Estimate Step
Review the Cost Estimate Report	Undertake a full elemental estimate without further input from the project QS
Independent Cost Estimate Review Report is drafted	Independent Cost Estimate is drafted
External peer reviewer(s) and person responsible for cost estimate meet to discuss findings, reconciliation, and reporting	External parallel estimator and person responsible for the project cost estimate meet to discuss findings, reconciliation, and reporting

6. Emerging Challenges

The construction sector is a complex environment that is subject to changing requirements.

These requirements present as emerging challenges that also affect the way that cost estimating of construction projects may be addressed.

The items identified below are iterative and not an exhaustive list and are likely to change as the QS role evolves in response to these challenges.

a) Whole of Life Impacts

b) Carbon and Sustainability – The Green Transition

c) BIM

d) Seismic Restraint of Services

6.1
Whole of Life Impacts

Whole of life costs are used to compare investment options over time (including the status quo), in order to determine relative value for money. Capital costs are a key input into whole of life cost calculations.

According to the NZ Treasury, whole of life costs are defined as:

'The present value of total cash costs of the investment over its life cycle, calculated using the relevant Public Sector Discount Rate'.

Whole of Life Costs include those costs associated with planning and design, purchase or construction, maintenance, operating, and decommissioning of the asset. In the health context, operating costs means the costs of running and maintaining the building and the cost associated with providing care to patients such as clinical and non-clinical staff, IT, and clinical equipment costs including replacements and consumables, etc.

This can be translated into three main elements:

- **Capital costs** – namely the cost to purchase the site, design, tender and construct a facility. It includes capital replacement costs forecast to be incurred within the life of the asset. It also includes the fittings and equipment included within the asset.

- **Operational costs** – these relate to the costs of maintaining and operating the facility over a discrete term. These are often broken into soft services, hard services, and energy/infrastructure.
    - Soft services are operating costs which can include property management, cleaning, security, landscaping, IT, concierge facilities, insurances, rates etc and often relate to provision of people to manage and run the facility effectively.
    - Hard services consist of building maintenance works (preventive and corrective), servicing equipment, fit out works and alterations, furniture, and equipment. Energy and fuel related to the operational cost of heating and cooling the building and providing water / sanitary and special services. Staff costs – in running the facility and providing clinical services.
- **Disposal and removal** – these are end of life costs. For a new build facility these would occur after 50 – 100 years.

Whilst the QS will develop inputs into the Whole of Life Assessment, the assessment itself is currently seen as an investment process undertaken by Te Whatu Ora using tools and guidance developed for this purpose. The Whole of Life Assessment is updated as required relative to any cost estimate movement.

The current requirement for the QS is to provide the Capital Cost Estimate for the project. The format of which will be the Cost Estimate Report identifying the Basic Project Information and the Financial Data across levels 0 to 2 (as noted in Section 3.1.4 and 3.1.5)

6.2
Carbon and Sustainability – The Green Transition

In May 2022, the New Zealand Government released (Aotearoa) New Zealand's first Emissions Reduction Plan, which outlines the actions to be taken across all sectors to reduce our GHG emissions.

This is the first step toward New Zealand transitioning to meet its 2050 net-zero carbon emissions goal and the Building and Construction sector has a large part to play.

Emissions produced over the life cycle of a building are generally placed into two groups:

- Operational emissions. These only occur during the operational use of the building and are from the energy and other resources used when operating the building.

- Embodied emissions. These are from the materials and products that form the building and can occur right across the building's life cycle.

Why building and construction is important

In 2018, nearly 9.4 per cent of domestic emissions were building-related. These emissions are largely accounted for in the energy and industry, transport, and waste sectors. For example, they include:

- Emissions from the energy and other resources used when operating a building
- The carbon emitted in Aotearoa by the manufacture, transport, use and disposal of the materials and products in a building across its life – including construction, maintenance, and deconstruction.

As we reduce our emissions and build Aotearoa New Zealand's circular economy and bioeconomy, we can expect healthier homes, less reliance on global supply chains for construction materials and more sustainable living.

What the Plan Means for the Construction Sector

The Emissions Reduction Plan sets out a series of staged targets towards 2050, by allowing gradual transition to a low-emissions future in a way that allows a considered approach that is both achievable and affordable.

Under the plan, building and construction initiatives have five key focus areas.

Key actions

- Reduce the embodied carbon of construction materials by supporting innovation and regulating to promote the use of low-emissions building design and materials.
- Accelerate the shift to low-emission buildings by promotinggood examples, providing incentives, and supporting the use of low-emissions practices.
- Improve building energy efficiency by amending the Building Code and measuring energy performance to ensure buildings are designed, and retrofitted, to use less energy for heating and cooling.
- Shift energy use from fossil fuels by developing a gas transition plan and understanding the impacts of transition for households and communities.
- Establish foundations for future emissions reduction by improving emissions data for buildings and materials, building relationships with Māori, and progressing behaviour change and workforce transition programmes.

However, at the time of drafting these Guidelines, it must be recognised the Emissions Reduction Plan remains in its infancy, with wider public consultation on the regulatory proposals yet to be solicited.

Nevertheless, the Building for Climate Change Committee is progressing proposed changes to the Building Act to include a series of initiatives that meet the medium and long-term objectives of the Emissions Reduction Plan. This commenced with MBIE updating various acceptable solutions under the Building Code to make new-builds warmer, drier, and healthier.

Reference material:

https://environment.govt.nz/assets/Emissions-reduction-plan-chapter-12-building-and-construction.pdf

https://www.building.govt.nz/building-code-compliance/annual-building-code-updates/2021-building-code-update/#jumpto-outcome-of-the-2021-building-code-update

Meeting the Objectives

In providing the cost estimate, the QS should price design embodying Te Whatu Ora briefed objectives and have an awareness of the actions to reduce emissions across the building and construction sector and achieve the two key objectives.

1. Reduce operational emissions
    - Introduction of changes to the Building Code and compliance pathways specifically around energy efficiency.
    - Managing the phase-out and reliance on fossil fuel use for energy.
2. Reduce embodied carbon of buildings
    - Reduced embodied carbon of construction materials selected including opportunities with prefabrication, recycling and repurposing, freight, and transportation.
    - Innovation via new design techniques and selection of materials for use.

This is likely to necessitate discussions at the very early design stages to help Te Whatu Ora understand the impacts that these two objectives have upon the design and selection of products within the building and fit out and to ensure early budgets capture elements of the above.

Embodied carbon calculators are being developed industry wide to assist large asset portfolio owners in selecting different materials and to understand how the carbon values differ across these materials.

The outputs provided by the QS will help inform these calculations and help asset owners understand the options and costs associated with achieving these objectives.

6.3
Building Information Modelling (BIM)

The advent of BIM has provided opportunities for the standardisation of drawn information and cost data.

Table 15: BIM LOD

Cost Estimate Level	BIM Level of Detail LOD	Content
1	100	Block Model with performance requirements, site constraints
2	200	Concept or massing model including basic areas and volumes and orientation
3	300	Generalised systems with attributes defined – size, shape location and orientation
4	400	Technical design model. Accurate and co-ordinated modelled elements that can be used to develop estimated costs
5	500	Model suitable for fabrications and assembly, with accurate requirements and specific components

The advantage of BIM modelling is that data can be relatively easily extracted from the BIM model without detailed effort in measuring each assembly component. However, not all of the extracted data follows the current accepted methods and standards of measurement used by a QS.

Counts and areas are generally reliable, but careful validation and checks are required. Care should therefore always be taken to validate any extracted quantities from BIM models, with cross checking undertaken for all significant measures.

It should be noted that even when using BIM, it is the responsibility of the QS to ensure that the quantities used are accurate and the QS must not place total reliance on the BIM model.

Other advantages of BIM include rapid identification of revisions and updates, easier development of design options for informing options analysis.

The QS should produce a "BIM Requirements" document in line with the "Australia and New Zealand BIM Best Practice Guidelines" published by the AIQS and NZIQS, for issue to all designers and the project's BIM manager and in line with the BIM Management / Execution Plan.

6.4
Seismic Restraint of Services

Safe, fit for purpose health facilities, sites and equipment are essential for a well-functioning health system, and the seismic stability of our infrastructure is an ongoing challenge to be met.

With an improved understanding of our health estate, we can invest in, design, and build infrastructure that will provide safer environments for our healthcare workers, patients, and their whānau in the event of an earthquake, and allow us to continue to provide the best levels of care post-shake.

This requires the QS to be cognisant of matters that may not be covered in the structural, architectural and services drawings. In particular, cost allowance for seismic restraint of services requires careful consideration and specific provision as often this is not fully detailed in the concept design drawings at the time the detailed business case is prepared.

The cost allowance also needs to take into account physical fixings and the time and costs to undertake the significant engineering inspection and sign-off requirements, performed by both the project's engineer and contractor's engineers.

Equipment seismic qualification for plant and major medical equipment comes with the equipment, but this needs to be validated by the project's engineer as this could also lead to additional costs.

7. Summary

By defining the approach to Cost Estimation within this document, Te Whatu Ora is establishing a more consistent, robust, and transparent approach to the preparation, validation, reporting and assurance of cost estimates within Health Infrastructure projects.

There is a clear need for more expert evidence-based cost estimates to help inform investment decisions at early stages and reduce the risk of project cost over-runs.

Although only a part of the process in providing successful project outcomes, cost estimates are a tangible performance target that can be monitored throughout the life cycle of a project. The outcomes of which, when carefully documented can play a part in providing good cost benchmarking data across the health sector.

Appendix 1 – Cost Estimate Structure

Appendix 1 – Cost Estimate Structure

The first three levels are shown below, with level four determined as per NZIQS Guidelines.

Level 0	Level 1	Level 2	Level 3	Notes
Direct Costs	Building Estimate	Site Preparation and Enabling	Enabling Work Services Infrastructure Modifications / Relocations Demolition Hazardous Waste Removal Ground Improvements	Site clearance, bulk excavation and filling, ground retainment, underpinning, support to existing structures, diversion / termination of existing services, water courses etc.
		Building Foundation and Structure	Foundations / Basements Seismic Bearings Slab Frame Structural Walls Intermediate / Upper Floors	Including secondary framing aspects
		External Enclosure	Roof External Walls Facades Windows Doors	Including hardware
		Fit Out / Internal Works	Internal Walls Internal Doors Stairs Floor Finishes Wall Finishes Ceiling Finishes Embedded Artwork	Including frames, hardware, vision panels etc Including balustrades / rails etc Split into materials / types

Level 0	Level 1	Level 2	Level 3	Notes
Direct Costs	Building Estimate	Group 1 Joinery and FF&E - Supplied and Installed by Contractor	Group 1 Fixed Joinery Laboratory Joinery	
		Services (including BWIC)	HVAC Plumbing and Sanitary Drainage Electrical Data Cabling Security Systems Communications Systems - Nurse Call; Other; Specialist Ventilation PC Labs / Fume Cupboards Fire Services Passive Fire Tracks and Hoists Lifts and Escalators Solid and Waste Management	
		Specialist Services	Medical Gases Stand-by Generation UPS Active ICT Network Equipment Pneumatic and Vacuum Tube Systems Refrigeration Systems Disposal Systems Laboratory Equipment	

Level 0	Level 1	Level 2	Level 3	Notes
Direct Costs	Building Estimate	Sundries	Helipad Car Parking Systems BMU - Maintenance Access Systems Signage	Statutory and wayfinding
			Shielding Systems – Radiology Faraday Cage Around Scanners Pendant Structures / Lighting for Operating Theatres Flagpoles / Statues Window Cleaning Systems / Access Systems	Internal and external
		External Works	Infrastructure Services (to Building) Hard Landscaping Soft Landscaping Landscape Maintenance Boundary Interfaces with Public Paving and Highways Verandahs Canopies Small, Isolated Structures	Pump houses, specialist buildings for equipment
		Design Scope Items	Design Development Risk Staging / Phasing Site Complexity Greenstar / Environmental	
		Commission-ing	Contractor Commissioning	

Level 0	Level 1	Level 2	Level 3	Notes
Direct Costs	Building Estimate	Early Contractor Involvement / Preconstruc-tion	ECI Contractor	
		Contractors On-site Overheads	Preliminary and General (P&G)	
		Contractors Off-Site Services and Profit	Margin	
		Contractor Temporary and Specific Designs	Design Costs for Seismic (Fee)	
	Separate Supply Contracts	FF&E Groups 2 and 3	FF&E Group 2 (Dispensers / Toilet) Free to Issue Items FF&E Group 3 (Office Equipment, Furniture, MRI)	Supplied by Te Whatu Ora and installed by Contractor Supplied and installed by Te Whatu Ora
		ICT Group 1	ICT Costs (Group 1)	
		AV	AV Systems	
		Kitchen Equipment	Kitchen Equipment	
		Clinical Equipment	Clinical Equipment	
		Artwork	Cultural and Other	
Indirect Costs	Professional Fees and Consenting	Professional Fees	Design Fees Management Fees Additional Specialist Consultants	Including disbursements e.g., cultural narrative; specialist facades etc
		Consents and Legal	Rma Consents Building Consents Other Consents (Demolition) Legal Town Planning Traffic Engineering Urban Design Development Contributions	

Level 0	Level 1	Level 2	Level 3	Notes
Client / Admin	Client Costs	Direct Costs	IIG Project Staff and Contractors IIG Travel and Accommodation Project Management Office Marketing / Specialist Advertising / Website Hosting Management Systems and IT (e.g., Procore/Aconex) Construction Bonds and Insurances Stakeholder Engagement Change Management – Innovation and Business Improvement	
		Governance	Governance Governance Travel and Accommodation	
		Assurance	Gateway /IQA Peer Reviews (e.g., Cost Estimate) Design Assurance Reviews	
	Procurement and Business Case	Procurement and Business Case	Probity Procurement Panels Legal Technical Experts Disbursements	
		Business Case	Business Case Consultant Market Sounding	
	Site Costs	Site Costs	Archaeologist / Heritage Rates Security Utilities Contract Works Insurance Site Insurance Costs Insurance (Other) Revenue - Sub Leasing Other (e.g., Hoarding, Signage For Site)	

Level 0	Level 1	Level 2	Level 3	Notes
Client / Admin	Site Costs	Other	Service Planning Legal Fees / Consultancy Operational Readiness / Soft Landing	
		Seed Funding	Sunk Costs	
		Client Side commission-ing	Client Commissioning and Acceptance Migration Manager Software Licences (e.g., Drofus) Storage	
		Temporary Accommoda-tion	Decanting	Including movers, temporary storage, and migration
Risk	Risk Contingency	Design Contingency		
		Project Contingency		
		Management Reserve		
Escalation	Construction Cost Escalation	Escalation Allowance to Mid-point Construction		
	Foreign Exchange Risk	Forex against Defined Items		
Below the line				
Funding	Below Line	Funding Costs	Capital Charges	

Note: Land / Property Acquisition Costs are typically excluded from the estimates.

Appendix 2 – Cost Estimate Report Template

1. Project Information		
Programme/Project Name		
Region		**District/Location**
Project Description	[Insert a short description to sufficiently describe the project any key features, no more than 3-4 lines]	
Project Stage		**Design Stage**
Building Type		**Project Type**
Programme Period		**Completion Date**

Total Outturn Cost Estimate		
Estimate Level	[insert cost estimate classification level e.g., Level 1]	
Degree of Certainty	[insert degree of certainty of cost estimate e.g., P50, P90]	
Cost per m2		**Gross floor area (GFA)**

2. Financial Data – high level summary

Cost headings:		**Refer para**	**($000s)**	**Cost per m2**
Direct Costs	Building Estimate			
Other Direct Costs	Separate Supply Contracts			
Indirect Costs	Professional Fees and Consenting			
Client / Admin	Client Costs, Procurement and Business Case, Site Costs			
Risk	Risk Contingency			
Escalation	Construction Cost Escalation			
	Foreign Exchange Risk			
TOTAL OUTTURN COST ESTIMATE				

3. Financial Data - detail				
Direct Costs:		**Refer para**	**($000)**	**Cost per m2**
Building Estimate	Site Preparation and Enabling			
	Building Foundation and Structure		$	
	External Enclosure		$	
	Fit Out and Internal Works		$	
	Group 1 Joinery and FF&E (Furniture, Fittings and Equipment)		$	
	Services (including BWIC)		$	
	Specialist Services		$	
	Sundries		$	
	External Works		$	
	Design Scope Items		$	
	Commissioning		$	
	Early Contractor Involvement / Preconstruction Services		$	
	Contractors on-site overheads / Contractors off-site Services & Profit		$	
	Contractor Temporary and Specific Design		$	
Total Building Estimate				$
Separate Supply Contracts	FF&E Groups 2 and 3		$	
	ICT Group 1		$	
	AV (Audio Visual) Systems		$	
	Clinical Equipment		$	
	Artwork (Cultural and Other)		$	
Total Other Direct Costs				$
Total Direct Costs				$
Indirect Costs:				
Professional Fees and Consenting	Professional Fees		$	
	Consents and Legal		$	
Total Indirect Costs				$
Client / Admin:				
Client Costs	Direct Costs		$	
	Governance		$	
	Assurance		$	

Procurement and Business Case	Procurement		$	
	Business Case		$	
Site Costs	Site Costs		$	
	ICT Group 2-4		$	
	Other		$	
	Seed Funding		$	
	Client-side Commissioning		$	
	Temporary Accommodation		$	
Total Client / Admin Costs				$
Base Estimate				$
Risk				
Risk Contingency	Design Contingency		$	
	Project Contingency		$	
	Management Reserve		$	
Total Risk Contingency				$
Escalation				
Construction Cost Contingency	Escalation Allowance to mid-point Construction		$	
Foreign Exchange Risk	Forex against defined items		$	
Total Escalation				$
TOTAL OUTTURN COST ESTIMATE				$

4. Cost Estimate Executive Summary

[Use this section to demonstrate that the cost estimate is both robust and defendable. At a minimum explain:

- *the calculation methodology adopted,*
- *any differences between the current cost estimate and previous estimates / project budget. Append a cost estimate change reconciliation report, Appendix 4, if necessary.*
- *any scope changes from the project scope set out in the Client Brief,*
- *any value management undertaken*
- *any quality assurance activities undertaken. Attach any findings to this report.*
- *benchmarking information used to support the cost estimate*
- *the method of determination, source data and time periods for the contingencies including cost escalation and any uncertainties and include a referenced list of the design and delivery solution information aligning to the project scope]*

5. Exclusions

[list of exclusions (noting that these should be minimised) and associated cost projection should they be required, e.g., such as land costs / capital charges and any other items that have not been included in the cost estimate and why]

6. Inclusions

[list of inclusions (things that are included which may not be obvious) and associated cost allowance, e.g., what are we specifically including in our estimate?]

7. Assumptions / Pricing Notes

[any other elements that may affect the client's understanding of the estimate not noted above]

8. Risk and Issues

[narrative on risks, escalation, contingencies, exchange rate and any other issues including how these have been derived e.g., simple calculation / deterministic or QRA (Quantitative Risk Analysis)]. Opportunities should also be clearly identified.

This Cost Estimate Report has been prepared by:

(Insert name of Quantity Surveyor)

(Insert name of Quantity Surveying Firm)

[List attachments]

Appendix 3 – Expected Design Information Requirements

1. Architectural

Project Phase	Required Design Deliverables
Concept Design	• Bulk and Location Study • Conceptual drawings including: – overall site plan – floor plans – elevations – sketches – sections (indicative sufficient to illustrate overall concept) • Model • Accessibility requirements • Floor areas / Schedule of Accommodation • Concept materials / finishes
Preliminary Design	• Overall site plan • Preliminary grids and levels • Floor plans to scale • Elevations to scale • Sections to scale • Sketches / perspectives exterior • Sketches / perspectives interior • Model(s) • Preliminary fixtures, fittings, and hardware • Materials and finishes presentation • Other defined marketing material • Incorporation of preliminary structural options • Incorporation of preliminary building services options • Incorporation of recommended fire protection and egress requirements • Façade and thermal envelope options • Accessibility requirements • Floor areas / Schedule of Accommodation • Integrate building maintenance options

Developed Design	• Overall site plan including parking / landscaping • Floor plans (dimensioned) • Elevations (confirmed floor-to-floor heights) • Sections • Details of critical and typical construction details • Perspective • Typical reflected ceiling plans • Finalised fixtures, fittings, and hardware • Integrated structural design • Integrated building services design • Floor areas / Schedule of Accommodation update
Detailed Design	• Site plan including datum, boundary definition and orientation associated earthworks, landscaping, and car parking, inground and overhead services, drainage, and all statutory legal title information • Key plans to building zoning • Floor plans at each level • Reflected ceiling plans at each level including coordinated lighting and services fixtures • External elevations • Interior elevations • Cross sections and longitudinal sections • Roof plan with falls, gutters, rainwater heads and downpipes • Electrical / lighting outlet and switching plan • Plumbing layout and schematics • Construction details at all typical and atypical locations cross referenced to plans and sections • Plans, sections of access stairs, ramps, balustrades, barriers, and handrails, including plant access • Interior fitout including wall elevations and joinery details

2. Structural

Project Phase	Required Design Deliverables
Concept Design	• Sketch drawings (may comprise 'marked-up' architectural drawings)
Preliminary Design	• Drawings outline primary members as mark-ups of architectural drawings (1:200) • Proposed primary framing • Preliminary sizes of primary members only with reinforcing as kg/m 3 and steel as kg/m • Preliminary foundation layout • Indicative structural connection types • Outline system for secondary elements • Outline durability/coating systems • Indicative surface finish for exposed concrete • Critical details that may have significant cost implication • Proposed primary elements of strengthening for existing buildings (where appropriate)

Developed Design	• Drawings (1:100 plans) defining all primary framing members, with reinforcing as kg/m 3 • Layout and size of secondary framing members (e.g., lift, stairs, canopies, and platforms) • Generic reinforcing details for typical primary elements • Typical connection details for primary elements • Define elements covered by proprietary design (e.g., precast floor and piling)
Detailed Design	• Drawings defining all structural elements, including plans, elevations, sections, and details, with adequate cross-referencing • Define all connections by either defining specific connection details or referencing to industry standard connection details (e.g., HERA connection details) or specifying forces for a propriety connection system • Construction sequences and positions of control / construction joints • Includes stairs, plant platforms and façade system support • Reinforcing details defined • Precamber / set established for members • Include seismic and gravity support of ceiling / partition systems (optional)

3. Mechanical

Project Phase	Required Design Deliverables
Concept Design	• Sketch drawings (may comprise 'marked-up' architectural drawings) including preliminary plant room requirements and services routes
Preliminary Design	• Schematic drawings outlining services concepts • Layout drawings locating plant rooms, risers, and primary services routes • Preliminary plant room layouts • Thermal envelope options
Developed Design	• Single line pipework and ductwork layouts • Major plant concepts and layouts • Sections as necessary • Piping and air flow schematics • Reflected ceiling plans, preliminary co-ordination
Detailed Design	• Completed schematic and layout drawings defining requirements for services, including plans, elevations, and sections • Detailed pipe work and duct work layouts for mechanical services • Plant room layouts including detailed sections • Piping and air flow schematics

4. Hydraulic

Project Phase	Required Design Deliverables
Concept Design	• Sketch drawings (may comprise 'marked-up' architectural (drawings) including preliminary plant room requirements and services routes
Preliminary Design	• Schematic drawings outlining service concepts • Layout drawings locating plant rooms, risers, and primary service routes • Preliminary plant room layouts
Developed Design	• Single line pipework layouts • Major plant concepts and layouts with sections as necessary • Piping schematics
Detailed Design	• Completed schematic and layout drawings defining services requirements, including plans, elevations, and sections • Detailed pipework duct work layouts for hydraulic services • Plant room layouts including detailed sections • Piping schematics

5. Electrical

Project Phase	Required Design Deliverables
Concept Design	• Sketch drawings (may comprise 'marked-up' architectural drawings) including preliminary plant room requirements and services routes
Preliminary Design	• Single line diagram showing major plant and major distribution (breakers and cables unsized) • Layout drawings indicating plant room locations, risers, and primary service routes • Typical area lighting (reflected ceiling plan) and power layouts or schedules
Developed Design	• Single line diagram showing connections to all equipment and boards (breakers and cables sized) • Layout drawings indicating plant room locations, risers and service routes, and main cable trays • Lighting and power layouts • Reflected ceiling plans with preliminary co-ordination
Detailed Design	• Single line diagram showing connections to all equipment and boards (breakers and cables sized) • Layout drawings indicating plant room locations, risers and service routes and main cable tray routes • Plant room and riser outline layouts • Lighting and power layouts including switching and circuiting • Lighting control zoning and specification • Distribution schedules with final circuit breakers and cables sized

6. Electrical Ancillary

Project Phase	Required Design Deliverables
Concept Design	• Sketch drawings (may comprise 'marked-up' architectural drawings) including preliminary equipment room and riser requirements, services entry points, and services routes, including general areas of coverage
Preliminary Design	• Single line diagram showing system architecture for each service and interconnections with indicative capacities for each node • Layout drawings indicating coverage and indicating equipment room locations, risers, and primary services routes
Developed Design	• Single line diagram for each system showing the entire network with cables and major equipment selected, including connections to external networks • Updated layout drawings indicating equipment room locations, risers, and services routes, including cabling methodology to final outlets (skirting trunking, etc.) • Layouts including locations of devices and major consolidation points
Detailed Design	• Complete single line diagram showing all equipment, cables, and consolidation points. All equipment specified • Layout drawings indicating all field devices, and control panels • Equipment room outline layouts

7. Other

Project Phase	Required Design Deliverables
Concept Design	• Geotechnical report • Site inspection • High level development programme • Initial risk, opportunities, and contingencies analysis • Initial procurement options and strategy • Initial contractual arrangement options
Preliminary Design	• Updated development programme • Updated risk, opportunities, and contingencies analysis • Confirmed procurement methodology • Confirmed contractual arrangements

Project Phase	Required Design Deliverables
Developed Design	• Agreed cost model conditioning, typically: **Information** • Full project-specific listing **Estimating methodology** • Benchmarked $/m2 GFA, or • Rated approximate quantities **Inclusions** • Construction • Professional fees • Principal's Direct Costs e.g., FF&E, internal capitalised costs, consents, legal costs, marketing etc. • Project Contingency, covering design, estimating and construction • Escalation • Forex (noting currency pairings) **Exclusions** • Operating expenditure • Goods and Services Tax **Assumptions** • Project-specific listing
Detailed Design	• Completed schematic and layout drawings defining requirements, including plans, elevations, and sections • Detailed layouts • Plant room layouts including detailed sections • Construction details at all typical and atypical locations cross referenced to plans and sections • Topographical and levels data • Schematics

Appendix 4 – Cost Estimate Change Reconciliation Report Template

(e.g., Indicative Business Case to Detailed Business Case) as of XX

1. Project Information	
Programme/Project Name	
Region	**District/Location**
Project Description	[Insert a short description to sufficiently describe the project any key features, no more than 3-4 lines]
Project Stage	**Design Stage**
Building Type	**Project Type**
Programme Period	**Completion Date**
Total Outturn Estimate	
Degree of Certainty	[insert degree of certainty of cost estimate e.g., P50, P90]

[Example only]

2. Financial Data – Summary			
	Indicative Business Case as of [insert approved date]	Detailed Business Case as of [insert date]	Change
Gross Floor Area (GFA)	$tbc	$tbc	$tbc
Cost per m2	$tbc	$tbc	$tbc
Total Outturn Costs	$tbc	$tbc	$tbc

3. At a Glance

[example only]

Since the Indicative Business Case was approved in [insert date], the following activities [insert activities] have been progressed. This has led to an increase (decrease) from [insert GFA] to (insert GFA) for the Detailed Business Case. An increase (decrease) of [insert].

The key drivers of this increase (decrease) are (list):

a. Change in the foundation strategy arising from further geotechnical investigation.

b. Changes in the ICT strategy to accommodate changes arising from the national data and digital strategy

The full reconciliation between the Indicative Business Case and Detailed Business Case together with the reasons for such changes follow in the next sections.

4. Reconciliation		**$**
Cost Estimate Overall Variance		
A - Cost estimate number xx	Cost estimate date xx/xx/xx	$tbc
B - Cost estimate number xx	Cost estimate date xx/xx/xx	$tbc
C – Variance (A – B)		$tbc

Cost Estimate Detail Variance (any main item over $20k)			
Item #	Description	Commentary	$
1.01	tbc	tbc	$tbc
1.02	tbc	tbc	$tbc
1.03	tbc	tbc	$tbc
1.04	Miscellaneous	Items under $20k	$tbc
Variance (equal to item C above)			$tbc

Notes

5. Summary of key changes between the IBC and DBC

Highlight the reasons for the change since the last published estimate, e.g., due to scope changes, pricing updates, labour productivity adjustments, cost estimate refinement, etc. Differentiate between scope change and design development of the existing scope

(1) The GFA for the site preparation and structure increased by 100m2 is due to geotechnical issues now being fully investigated and leading to a change in the foundation strategy. The specific change relates to [etc]

6. Summary of the value management undertaken as part of current cost estimate

Describe any value management activities undertaken and options considered to optimise the quality and cost of the project.

7. Assumptions

Any other elements that may affect the client's understanding of the latest estimate not noted above.

This Cost Estimate Change Reconciliation Report has been prepared by:

(Insert name of Quantity Surveyor)

(Insert name of Quantity Surveying Firm)

Appendix 5 – Te Whatu Ora ICT Groupings Information

Below are the Group 1 items, (main contractor budget) as well as Group 2 and 3, (digital budget). Note Group 4 contains all of the applications and is also part of the digital budget.

Group	System
Group 1	**Passive Communications Systems including:** • WAN Links – Pit and Pipe Infrastructure and coordination with Carriers for WAN cabling infrastructure to Entrance Facility (includes all works associated with boundary pits) • Structured Cabling (fibre & copper) • Backbone Cabling (fibre & copper) • Horizontal Cabling (fibre & copper) • Field Outlets • Supply of all fly-leads and patch-leads (includes patching in the Comms Rooms) • Cabling Support Systems (dedicated cable trays for independent ELV systems) • Equipment racks and supporting infrastructure (power rails, rack monitoring, rack shelves, etc.) **RF Systems including:** • Distributed Antenna System (DAS) • Whole of Government Radio - Network Next Generation Critical Communications, Poutama Whai Tikanga Pāpāho, (NGCC) • Paging System • 2-Way Radio System (Security & FM) **Electronic Security Systems including:** • Security Management System / Platform • CCTV • Access Control • Intercom • Fixed Duress **Clinical Systems including:** • Master Clock System • Nurse call system (cabling and call points) **Engineering Systems including:** • Building Management System • Electrical Systems • UPS and Power Back-up Solutions • Mechanical Systems including Mechanical Control System • Hydraulic and Plumbing Systems • Fire Protections Systems (Wet and Dry) • EWIS and Public Announcement Systems System • Medical Gases • Pneumatic Tube Systems

Group	System
Group 2/3 – Digital Systems & Services	**ICT Infrastructure including:** • Wide Area Network (WAN) • Local Area Network (LAN) • Wireless Local Area Network (WLAN) **Compute & Storage Services including:** • Local On-site Servers and storage • Hosted / Cloud Services (IaaS) • Operational Monitoring Compute and Storage **Directory & Identity Services including:** • Compute and Storage Virtualisation • Active Directory & Domain (Identity Management) • Active Directory Configuration • Single Sign-on / Rapid Access Systems • Secure Vendor Remote Access • File / Print Services • Identity Services Engine **End User Computing including:** • Virtual Desktop Infrastructure (VDI) • Desktop PCs and Laptops • Tablets and Handheld Devices • Point of Care Terminals • Workstations on Wheels • Printers, scanners, and Multifunction Devices (MFDs) • Peripherals (handhelds scanners, label printers, desktop printers) **ICT Security Solutions including:** • Firewalls and Security Appliances • Network Security Controls / Implementation • Cyber Security Controls Development (Project Wide) • Cyber Security Reviews (Operational Technology including Group 1) • Penetration Testing & Validation Services **Unified Communications Technology including:** • Integrated Unified Communications Platform • Conferencing • VOIP Telephony System (including wired & wireless handsets) • Softphones • Mobile Clinical Handsets • Hands Free Voice Activated Devices

Group	System
Group 2/3 – Digital Systems & Services *Continued*	**Clinical Solutions including:** • Nurse Call • Check-in kiosks & Queueing System • In-Patient Engagement Solution • Message Integration Engine (MIE) • Patient Information Display (Electronic Bed Cards) • Electronic Patient Journey Boards • Patient Observation Systems • Virtual Care Telehealth **Specialist Technology / Facility Systems including:** • Real Time Location System (RTLS) (including asset tags and wireless duress) • Patients and newborn babies monitoring system • Visitor Management System • Electronic / Digital Wayfinding Solution • Room Booking Panels • Distributed Antenna System (DAS) – Carrier Headend Equipment Only **Audio Visual Technology including:** • Audio Visual System includes: • Meeting Rooms • Training Rooms • Simulation Rooms • Breakout Areas, etc. • Background Music System • Digital Artwork • Multimedia Streaming System / IPTV Headend • Digital Information System • Digital Displays • Digital Signage • Hearing Augmentations Systems • AV Resource Management System **Systems Integration including interface development for:** • Group 2/3 to Group 1 • Group 2/3 to Group 4 • Group 2/3 to FF&E • Group 2/3 to MME **Professional Services associated with Group 2/3 System including:** • Technology Project & Program Management • Vendor Management • Logistics Management (including storage) • Procurement Management • Coordination Group 1 Systems integrating on to ICN • Prototype and Staging Lab development

Group	System
Group 2/3 – Digital Systems & Services *Continued*	• Prototype and Staging Lab development • Prototype and Staging Lab leasing and on-going support • Documentation • Testing and Commissioning • Operational Configuration • Go-Live Support
Group 4	• Integration Platform (for Clinical Systems) • Clinical Systems (including Electronic Health Records, Patient Administration Systems, etc.) • Corporate Systems

Important to note the digital budget does not contain MME, (bio-medical devices) or FFE.

Appendix 6 – Te Whatu Ora Cost Estimate Checklist

This is to confirm that the SRO and PD are satisfied that the core requirements have been completed at [insert design phase / business case stage] and that the project has sufficient evidence to support the estimate.

Area	Assurance	Check (✓ ×)
Acceptance	The SRO has accepted the cost estimate from the project team, QS, PM, and PD.	
Consistency	The cost estimate aligns with the project objectives and outcomes required.	
Alignment	It aligns with the approved scope.	
Robustness	The cost estimate follows the requirements of the guidance and methodology is appropriate.	
Completeness	The cost estimate is complete and reflects the approved project scope.	
Accuracy	The confidence level around the cost estimate reflects the stage of the design.	
Assurance	The required quality assurance has been undertaken.	
Controls	The processes for the project financial controls are in place with regard to contingency drawdown, progress reporting and reconciliation.	
Management	The required management reporting requirements are set up.	

Role	Name	Signature	Date
SRO			
PD			

Te Whatu Ora
Health New Zealand