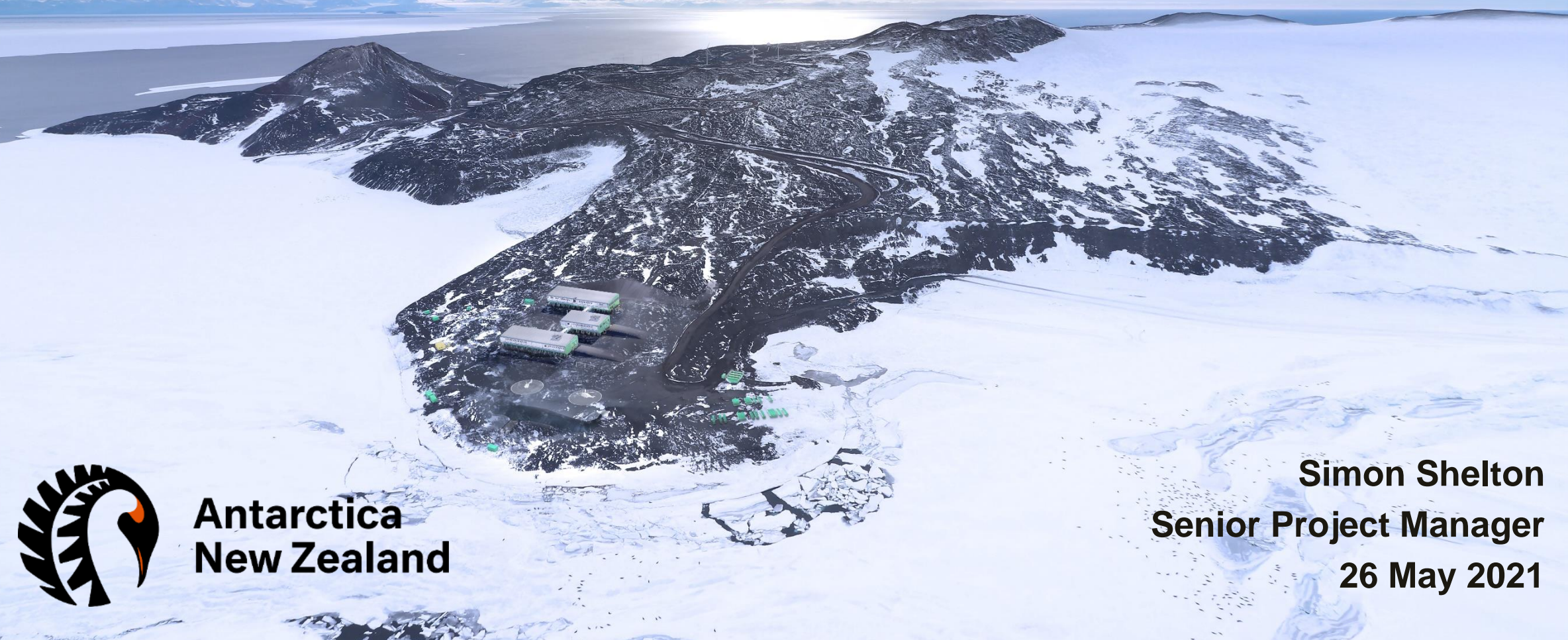


The Redevelopment of Scott Base

Our Approach To Commercial Risk Management



**Antarctica
New Zealand**

**Simon Shelton
Senior Project Manager
26 May 2021**

Overview

- Summary of Scott Base Redevelopment (SBR) project
- Risk Management Fundamentals for SBR
- Complex Risk Management
- Scalability
- Commercial Risk Allocation





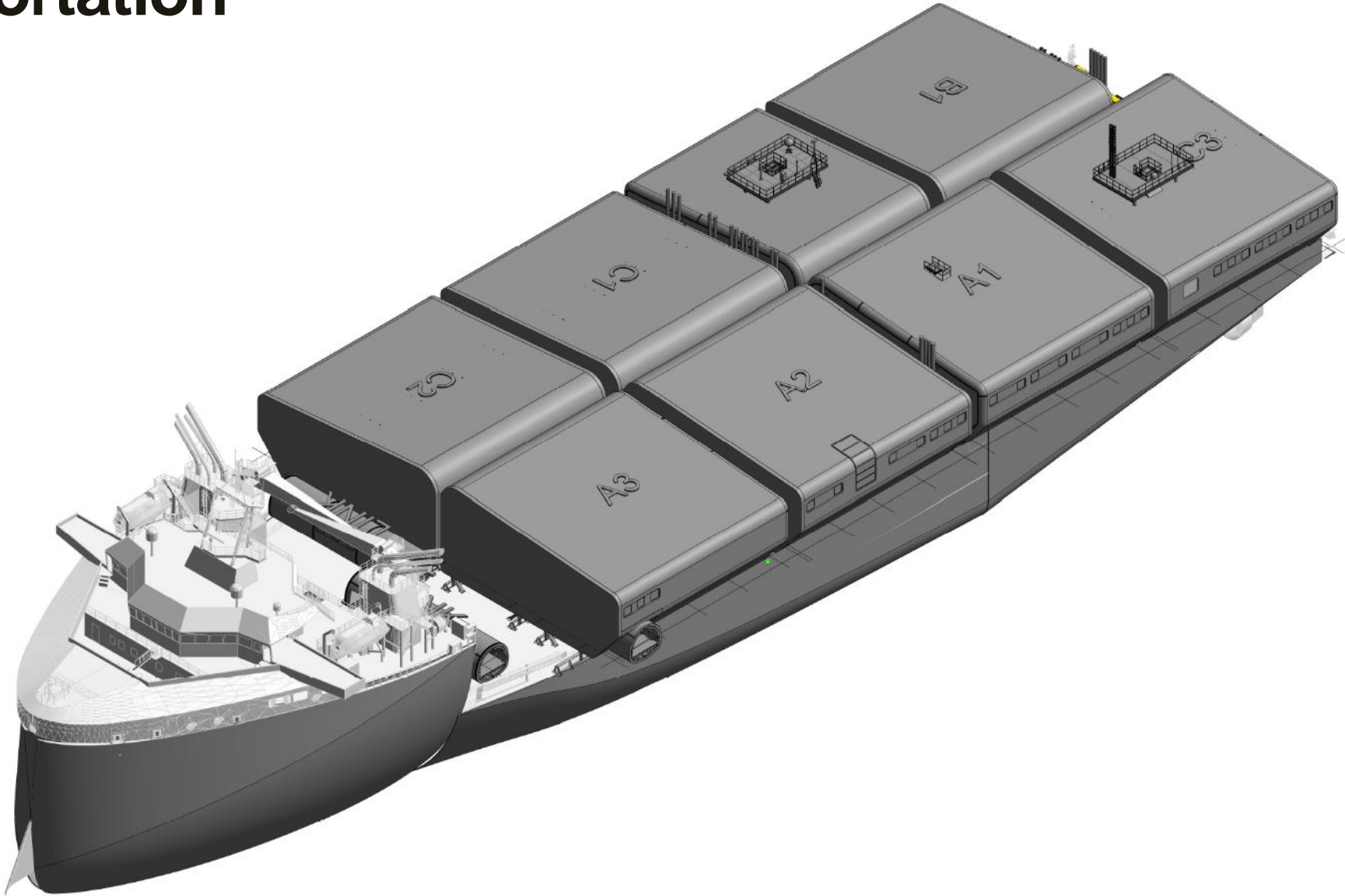
Design of the new base

Construction and logistics methodology

Build the entire base in New Zealand and ship to Antarctica in large modular sections



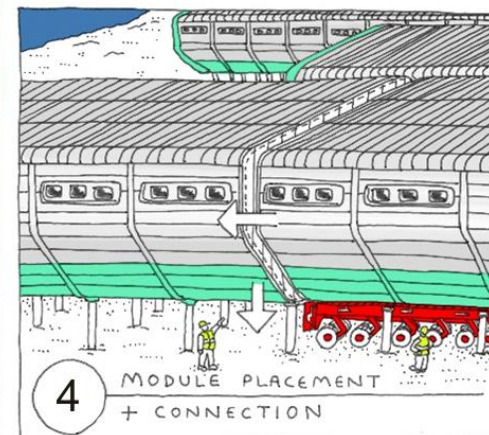
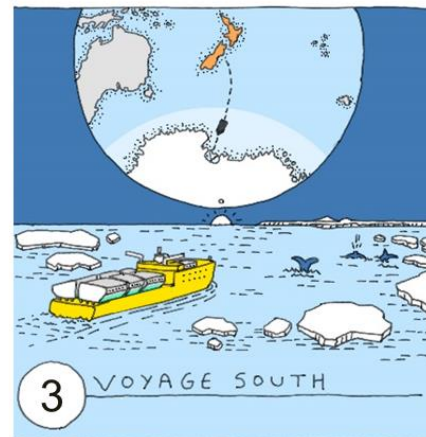
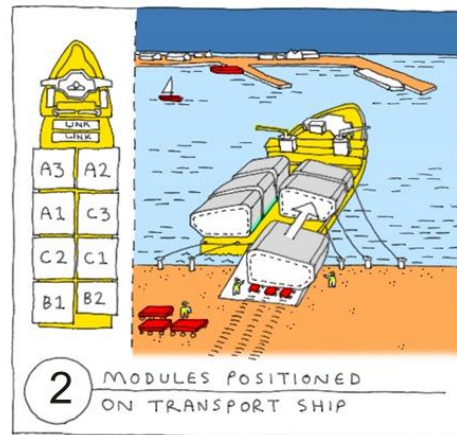
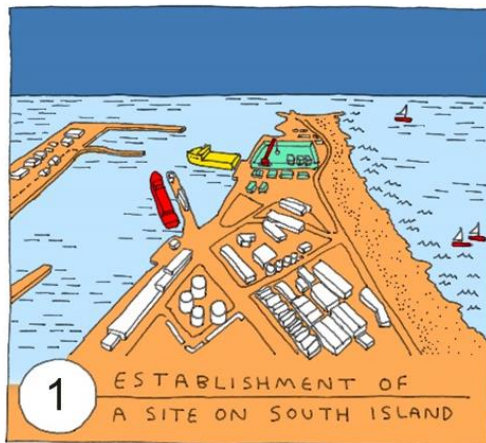
Transportation



Building and transporting the new base

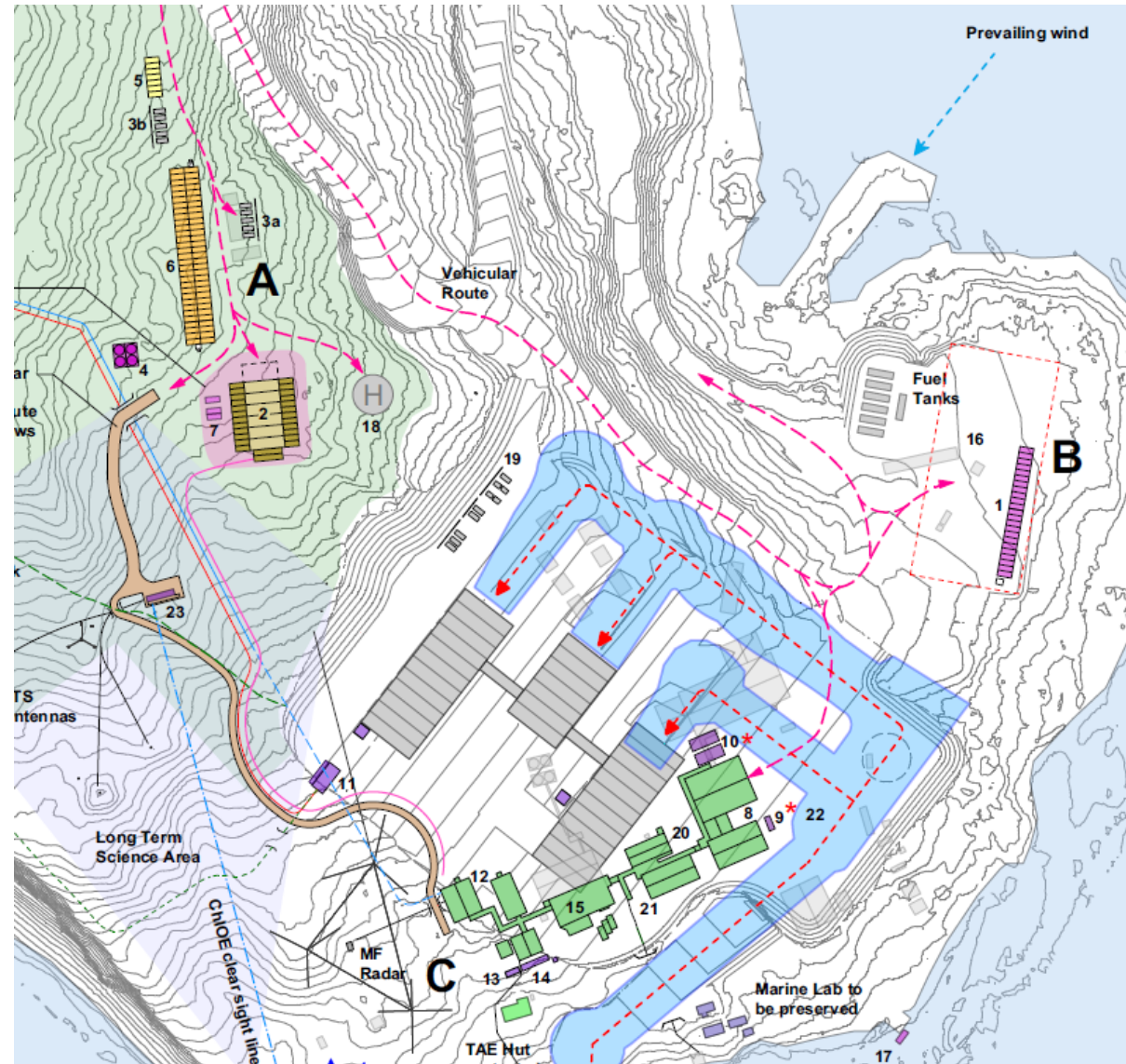
Benefits

- ✓ Reduces health and safety risks of building in Antarctica
- ✓ Reduces number of construction workers on site at Scott Base
- ✓ Allows construction continue year round in normal NZ conditions
- ✓ Allows full commissioning of buildings prior to shipping
- ✓ Allows opportunities to test and train staff on new base operations in New Zealand



Temporary operations during construction

- Temporary base will be required to continue New Zealand's science program and operations throughout the construction phase.
- The existing base will be utilised as much as possible to reduce costs, minimise health and safety risks, and limit infrastructure required.
- Summer and winter operations; summer construction (24hrs)
- Ice shelf options considered but less cost effective.



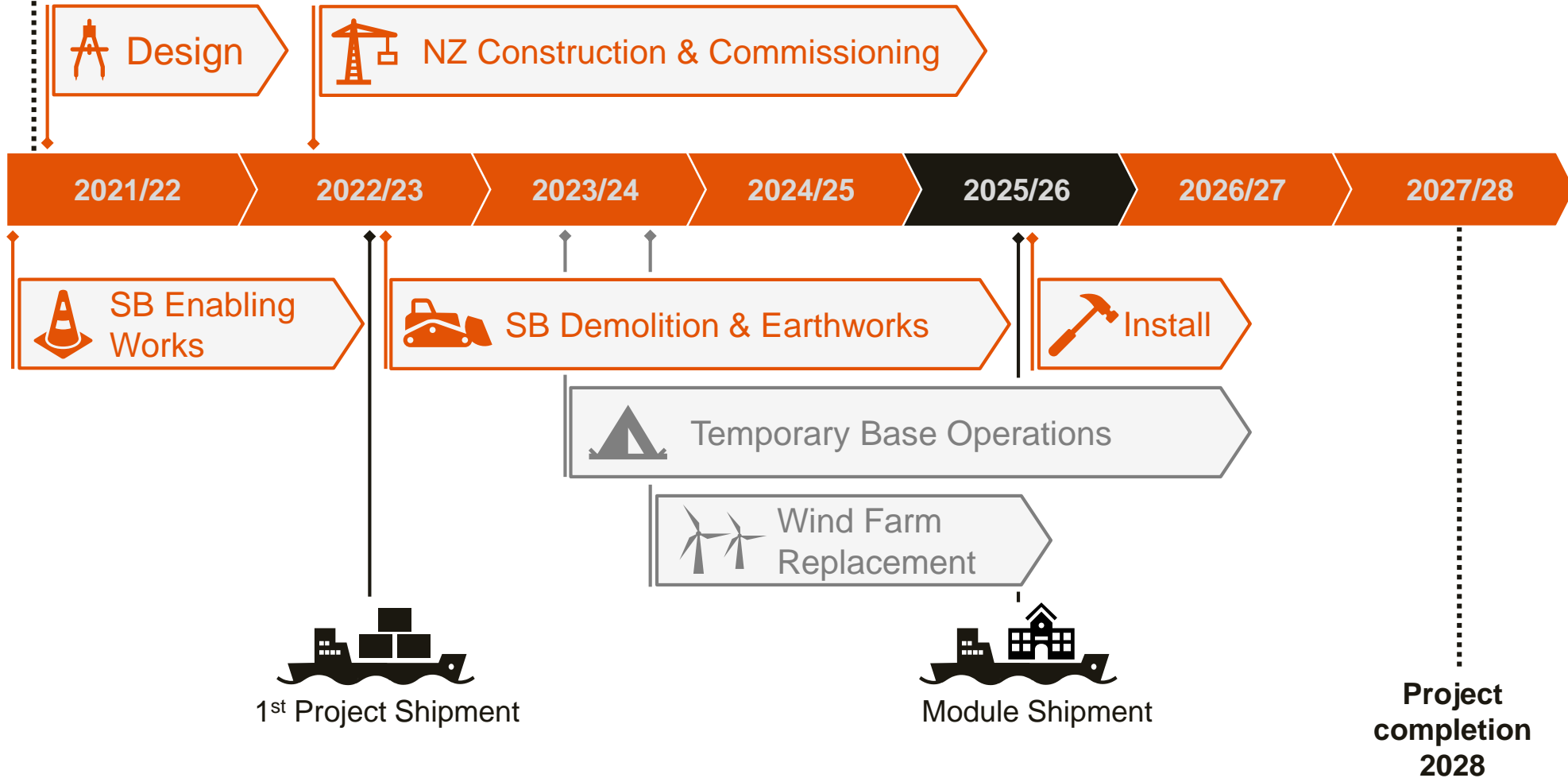
Proposed windfarm upgrade

- The three wind turbines supplying Scott Base and McMurdo Station will come to the end of their design life in 2030 and will need to be replaced.
- The new base will be larger than the existing one and has a higher renewable energy goal.
- We are proposing to install four new larger turbines.
- Solar panels may also be added on the sides of the three buildings.
- We are proposing to provide 97% renewable energy to the new base.



Current Project Schedule

Funding Approval
~ July 2021



Coordinated Risk Management



Vs

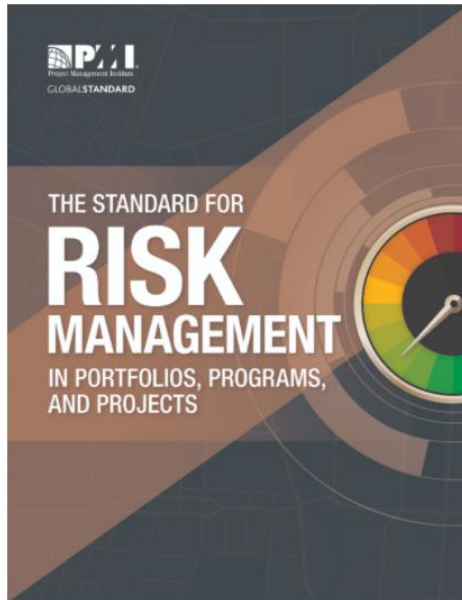


Requires Commitment (time and money)

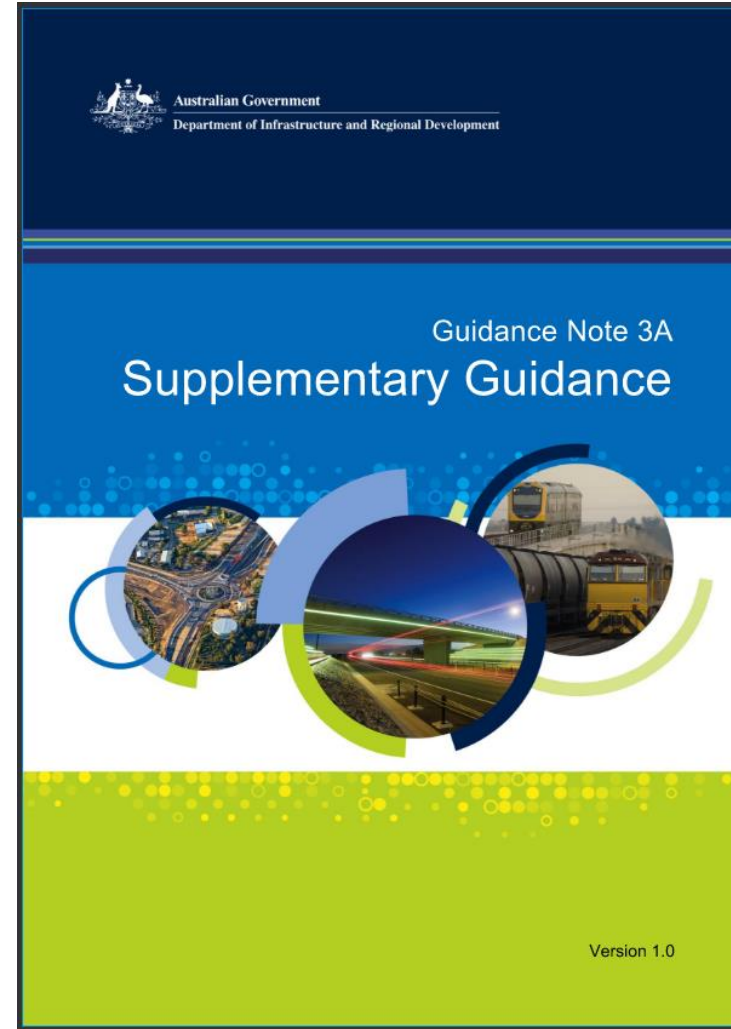
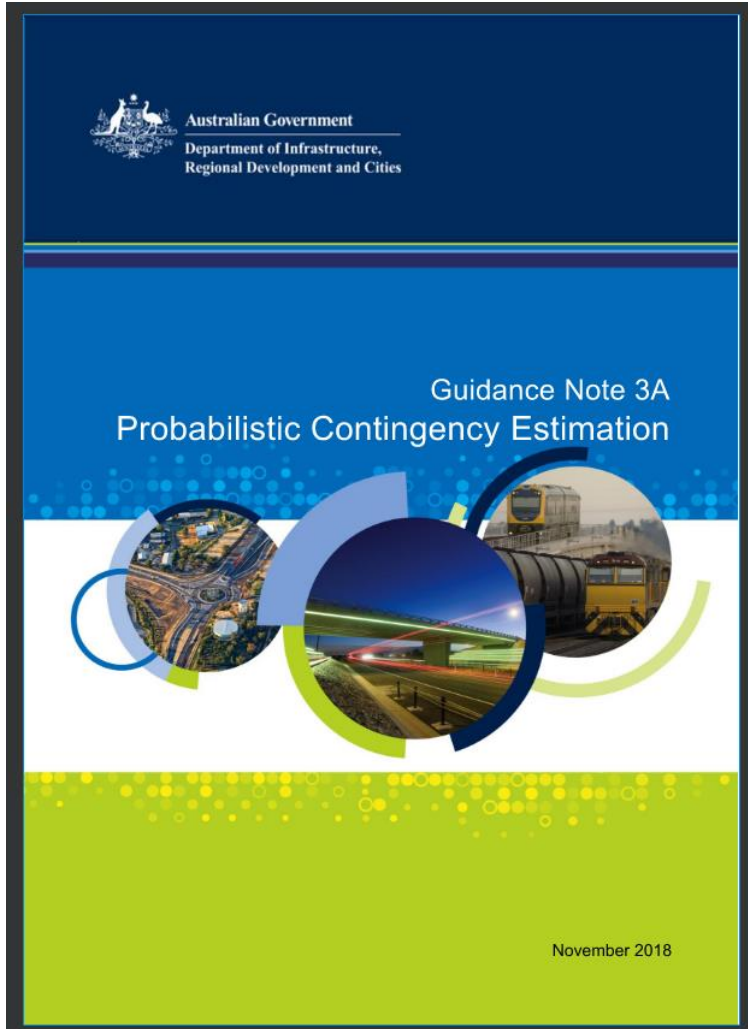
If you don't invest in risk management, it doesn't matter what business you're in, it's a risky business.

— Gary Cohn —

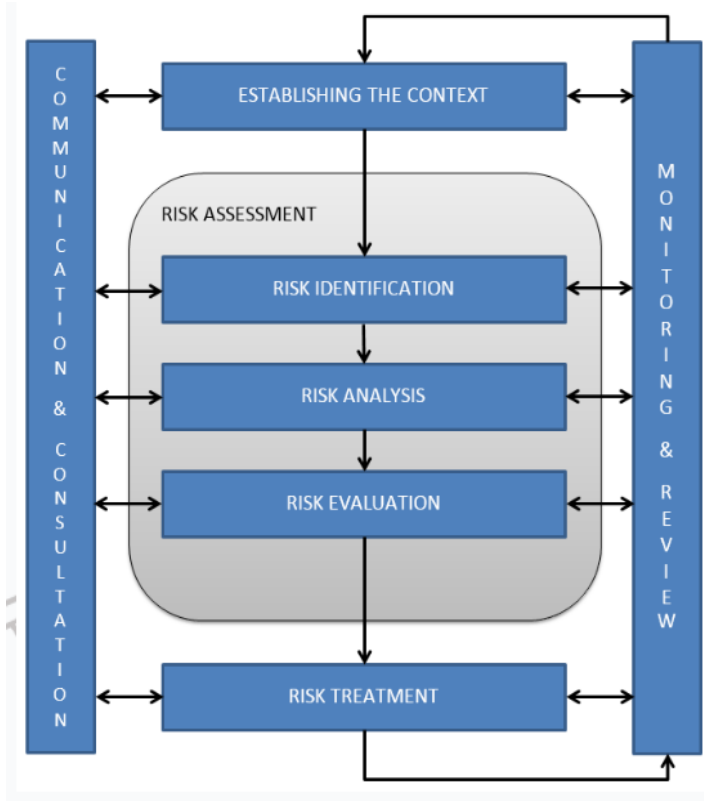
Standards – Consistent Approach



Standards – Consistent Approach

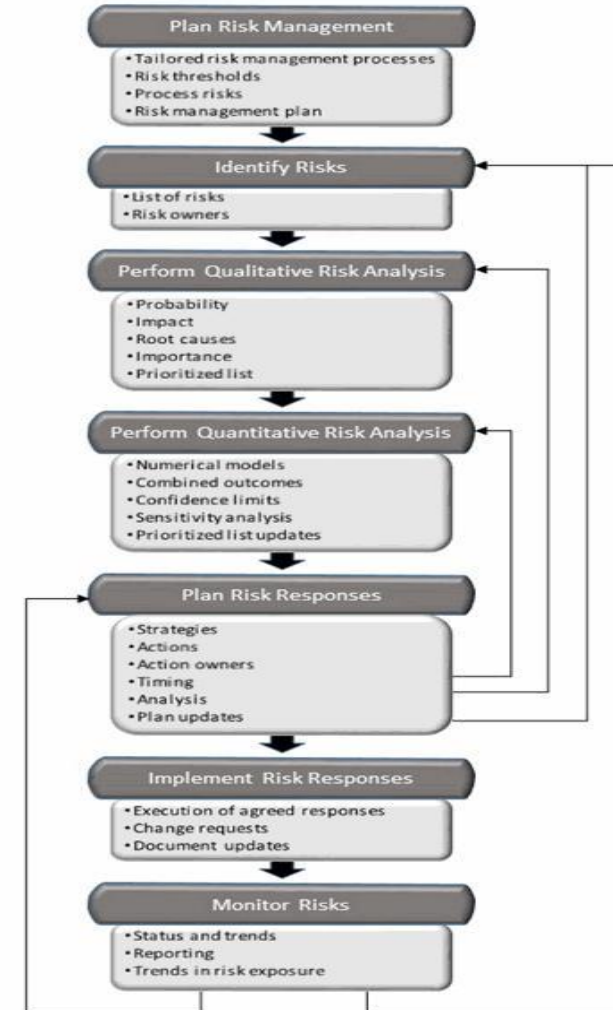


SBR Project Risk Management Framework



AS/NZS ISO 31000 : 2009

Risk Management Methodology



PMI Standard

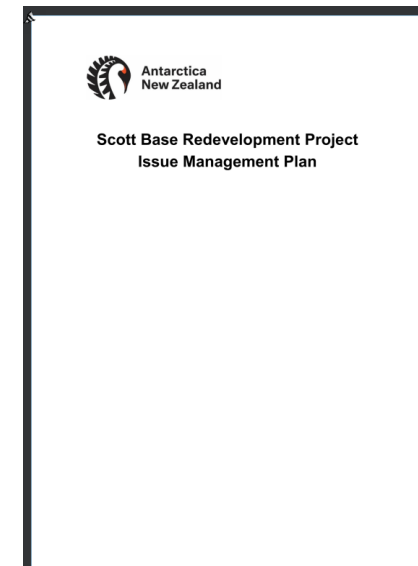
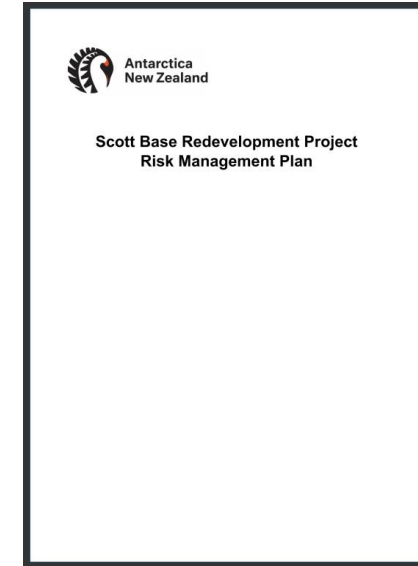
Issues vs Risk

Risk

A risk is an uncertain event or condition that, if it occurs, has a negative impact on a project's objectives.

Issue

An issue is an unplanned event that has happened or condition that has negative consequences for a project, **including risk events that eventuate.**



SBR Project Risk Identification

Risk Identification Guiding Questions:

1. **Event:** What is the event that could happen?
2. **Cause:** What is the identified event caused by?
3. **Result:** What is the result of this event occurring?



Consistent approach

ID	Event	Risk / Opportunity Description			Classification	Project Stage	Impact Category	Raw Risk / Opportunity			Corporate Tolerance / Appetite
		Cause	Result					Consequence / Benefit	Likelihood	Impact	
2.6.20	Practical completion delayed	<ul style="list-style-type: none"> Not having a clear definition of when practical completion is reached Insufficient 	<ul style="list-style-type: none"> Contract disputes Delays Additional cost Low Risk 	Delivery Risk	Stage 5	Schedule Impact, Cost Impact	Moderate	Possible	High	Cautious (limited tolerance)	<ul style="list-style-type: none"> E ad arr An It dis T sta
2.6.21	Delay in starting site works	<ul style="list-style-type: none"> Delay in approving certain documents (SSSP and environmental management plan) Lack of sufficient construction management planning 	<ul style="list-style-type: none"> Schedule delays 	Delivery Risk	Stage 4	Schedule Impact	Major	Possible	Critical	Risk Averse (low tolerance)	<ul style="list-style-type: none"> E del to do E

Risk vs Uncertainty

Risk

- Risks are potential events which **could either happen or not** (with **less than 100% probabilities**) – discrete events.
- Risk events impact (minor, major or catastrophe) and frequencies (one-off, multi one-off, unlimited) throughout the project lifecycle varies depending on the characteristics of individual risk.
- While it is **very unlikely** that all risks identified in the risk register will eventuate, all risks combined will be analysed using statistical probability calculation (Monte Carlo) in order to come up with **just enough** contingency allowance (risks reserve) for the overall project (otherwise we might end up with too much surplus of money at the end of the project).

Risk vs Uncertainty

Uncertainty

- Uncertainties are certain events with **uncertain** impact magnitudes (with **100% probabilities**) - known unknowns.
- The impact of uncertainty will be assessed using impact ranges (3-point) estimate and determine the values depending on our appetite to risks as an organisation (P50, P80 or P90 estimates).
- The sum of simulated 3-points estimate (Monte Carlo simulation) will be adopted as contingency allowance (contingency reserve) to cover the uncertainties in the estimates.

Qualitative vs Quantitative Risk Analysis



- **Subjective** assessment
- Assessing **individual risks** descriptively to establish risks mitigation strategy

- **Objective** analysis
- Analysing **combined risks** effects by performing statistical calculation to predict likely outcome.

Quantitative Risk Analysis (QRA)

Project Contingency

- The sum of **risks reserve** (discrete risks) and **contingency reserve** (uncertainties) will be adopted as the project contingency sum for the overall project.

QRA – Real World Example

Discrete Risks - Risk Reserve

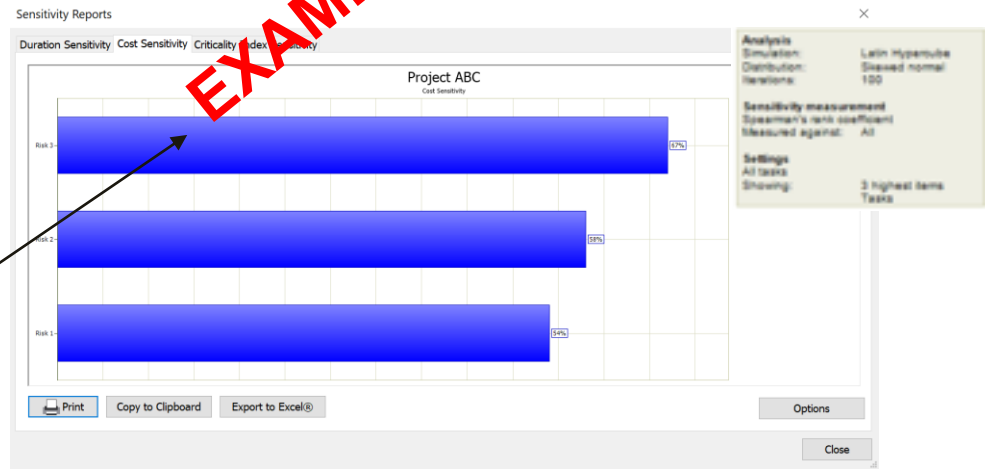
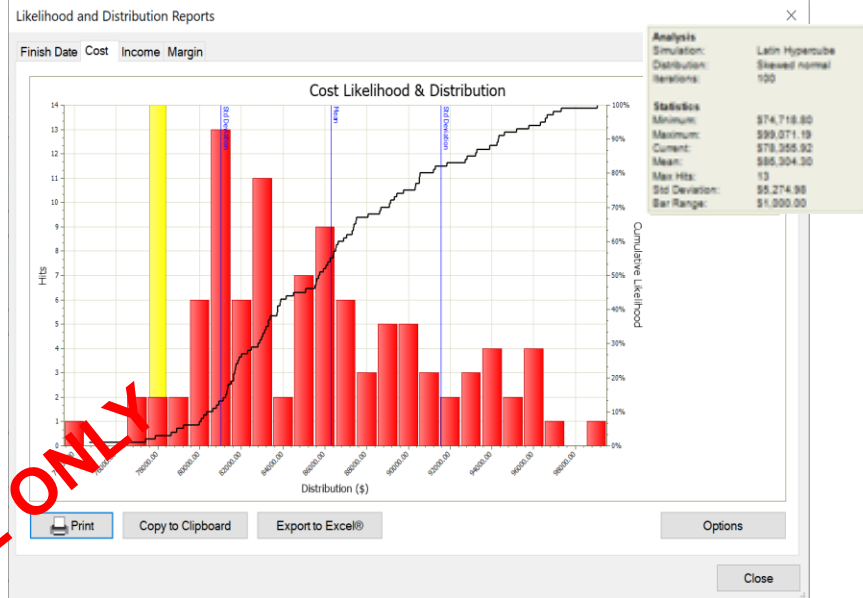
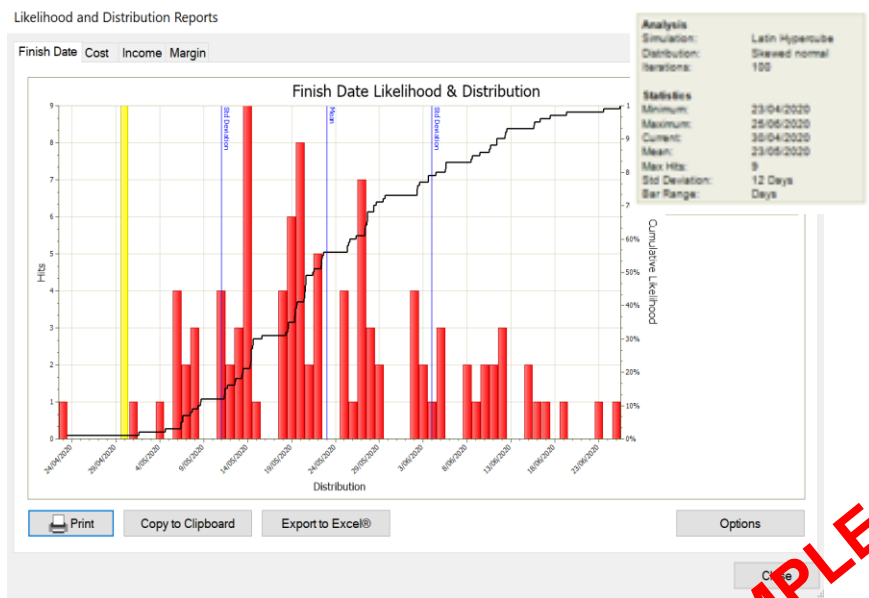
		Qualitative			Quantitative										
Risk ID	Risk Description	Current Risk			Frequency					Cost Impact Ranges			Cost Impact Distribution	Exposure (Simulated Value)	
	Event	Consequence	Likelihood	Impact	Type	N	Mean	Probability	Distribution	Optimistic	Most Likely	Pessimistic			
1.1.2	Poor IT system to support virtual team	Minor	Rare	Low	One-off			5%	Bernoulli	0	\$30,000	\$75,000	\$150,000	80,515.05	\$0
1.2.2	Design exceeding the target budget	Moderate	Unlikely	Medium	One-off			30%	Bernoulli	0	\$0	\$500,000	\$1,000,000	500,000.00	\$0
1.3.1	Scope creep	Moderate	Unlikely	Medium	Multi one-off	2		30%	Binomial	1	\$30,000	\$150,000	\$300,000	155,512.64	\$93,695
1.3.2	Multiple variation due internal	Moderate	Possible	High	Multi one-off	2		50%	Binomial	1	\$30,000	\$75,000	\$150,000	80,515.05	\$80,759
1.4.9	Structural Failure	Major	Rare	High	Multi state			50%	Bernoulli	1	\$100,000	\$200,000	\$500,000	\$268,527	\$268,527
								20%	Bernoulli	0	\$500,000	\$1,000,000	\$3,000,000	\$1,284,274	
								5%	Bernoulli	0	\$1,000,000	\$5,000,000	\$15,000,000	\$6,534,939	
1.5.8	Inaccurate estimates of break bu	Moderate	Possible	High	One-off			50%	Bernoulli	1	\$10,000	\$30,000	\$50,000	30,000.00	\$30,000
2.2.6	Delay in making key design decisions	Major	Rare	High	Multi one-off	3		10%	Binomial	1	\$0	\$30,000	\$100,000	37,362.69	\$11,235
2.2.10	Management override	Moderate	Unlikely	Medium	Multi one-off	1		30%	Binomial	0	\$0	\$150,000	\$300,000	150,000.00	\$45,291
2.2.11	Changing design decisions	Moderate	Unlikely	Medium	Multi one-off	2		30%	Binomial	1	\$30,000	\$60,000	\$120,000	65,518.17	\$39,369
2.2.14	Systemic failure	Moderate	Possible	High	Multi one-off	1		50%	Binomial	1	\$0	\$50,000	\$100,000	50,000.00	\$25,159
4.2.1	Contracting dispute(s)	Moderate	Unlikely	Medium	Multi one-off	1		30%	Binomial	0	\$100,000	\$300,000	\$500,000	300,000.00	\$90,391
4.5.10	Event flight delays	Minor	Possible	Medium	Multi one-off	2		50%	Binomial	1	\$10,000	\$30,000	\$50,000	30,000.00	\$30,127
5.2.3	Changes to government policies	Minor	Unlikely	Low	One-off			30%	Bernoulli	0	\$100,000	\$300,000	\$500,000	300,000.00	\$0
5.3.1	Adverse weather	Major	Likely	Critical	Unlimited		1		Poisson	1	\$300,000	\$500,000	\$1,200,000	594,213.52	\$592,448
											\$4,240,000	\$8,500,000	\$23,020,000	Output:	\$1,307,000

* Time (delay) cost risk to be developed in the schedule risk model.

Risk Sensitivity Analysis



Integrated Schedule-Cost Risk Analysis Output



Project ABC
Cost Sensitivity

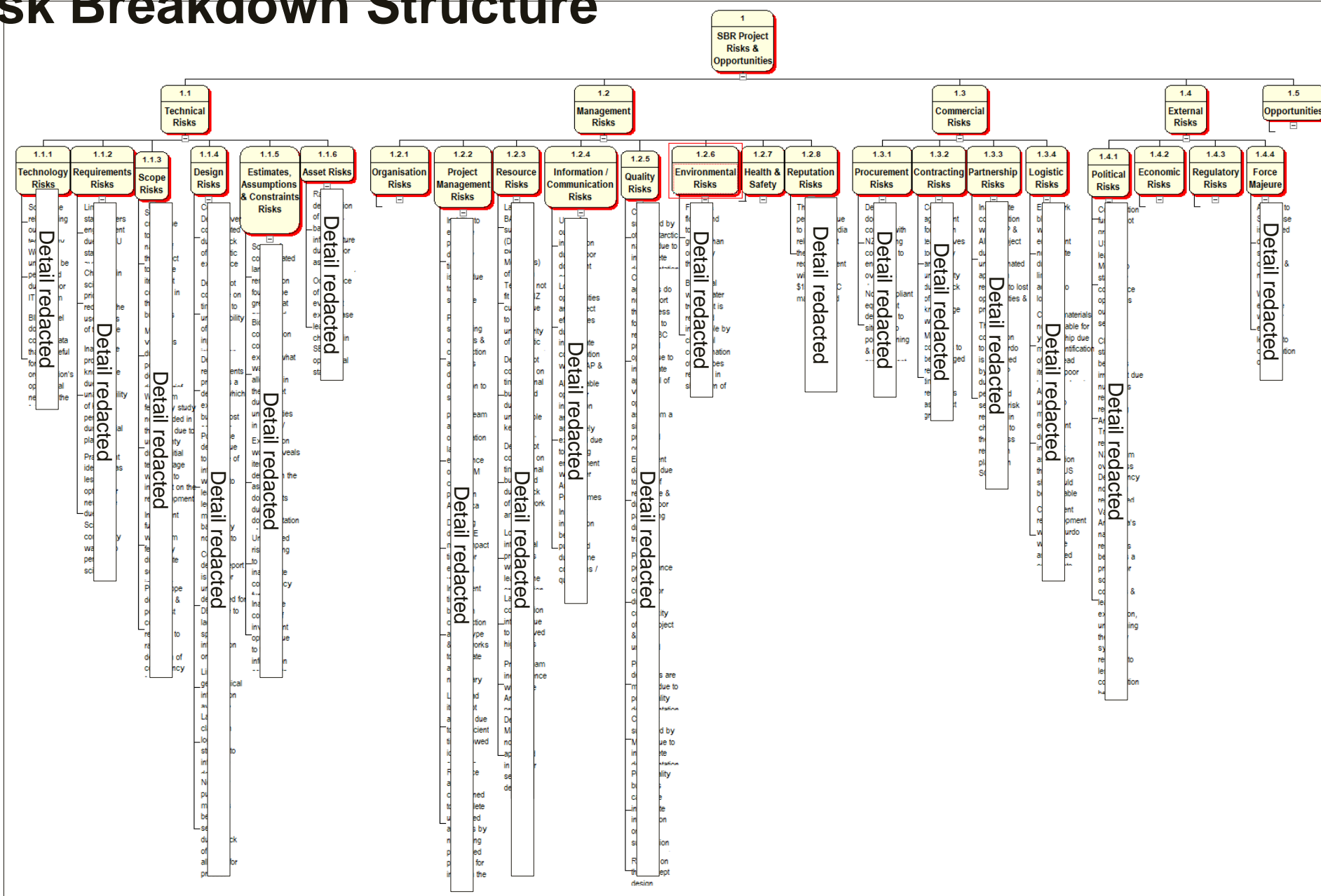
Analysis
Simulation: Latin Hypercube
Distribution: Skewed normal
Iterations: 100
Sensitivity measurement
Spearman's rank coefficient
Showing: 3 highest items
Tasks

Risk 3 67%
Risk 2 58%
Risk 1 54%

EXAMPLE ONLY

The main benefit of calculating the costs with the same assumptions that drive schedule dates is that **cost uncertainty is determined by uncertain time (delays).**

Risk Breakdown Structure



Scalability – ensure it's fit for purpose

Risks

⊕ Risks – list top 5 risks to the project ranked in order of criticality to project this month

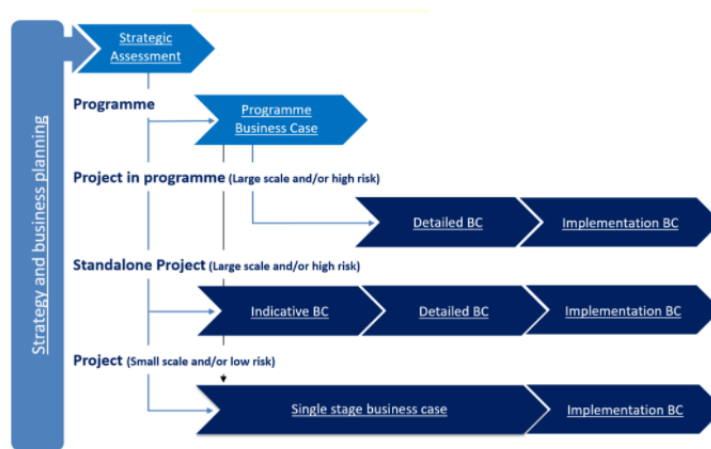
Risk name, description and impact	Key Controls	Owner	Consequence	Likelihood	Rating	Status
<i>Describe risk and impact to project delivery</i>	<i>What action are you taking to control this risk?</i>	<i>Who</i>		<i>Rare, unlikely, possible...</i>	<i>Ranked in order 1 – 5</i>	<i>Green, amber or red</i>
Constrained funding (ref 3.1.2. 3.1.3. 4.3.1)	xxxxx	PSG	xxxx	Possible	1	Red
Late requirements change – SBR delay, design cost overrun. (ref 1.2.1)	xxxxxx	TB PM PSG	Schedule delays, Design cost escalation	Possible	2	Orange
Temp. Base not delivered when required – SBR delay (ref 2.2.3, 2.6.1, 2.6.2)	Robust planning with float. Confirm final budget/ occupant numbers. Robust Scope Control.	TB PM	Budget overrun, delay SBR	Possible	3	Red
Slow finalisation xxxxxx – SBR delay (ref TBC)	Early SLT engagement Fast track production of file note/PSG paper	TB PM	Design cost escalation/ delay SBR	Possible	4	Orange
Covid related supply chain issues – SBR delay, cost overrun (ref 4.2.2)	xxxxxxx	TB PM	Budget overrun, delay SBR	Possible	5	Orange

Commercial Risk Allocation

BBC guidance

The Better Business Cases™ framework spans the Think and Plan phases of the investment management lifecycle. A project or programme's pathway through the framework depends on the decision being sought, the nature of the initiative and its scale, risk and uncertainty.

[When is a two-stage Business case process required?](#)



In this section

- Financial management and advice >
- State sector leadership ▾
- State sector performance
- Public Finance System
- Guidance >
- Investment management ▾
- Think: Investment Possibilities >
- Plan: Investment Choices >
- Do: Investment Implementation
- Review: investment reviews >
- Investment management

Commercial Risk Allocation

) | 45

46 | Better Business Cases: Detailed Business Case (DBC)



<Agency name>: <Project Name>

Annex 6: Detailed risk allocation table

[<back to template>](#)

*Mandatory for projects considering a PPP.
Delete this annex if not required*

Commercial Risk Allocation

The purpose of this action is to consider **how the risks may be balanced between the public sector purchaser and the private sector supplier(s)**, in the design, build, funding and operational phases of delivery.

The governing principle is that **specific risks should be allocated to the party best able to manage it**. The intention is to optimise the allocation and sharing of risk, not to maximise the number of risks to be transferred to potential service providers.

A fair and transparent approach to risk transfer is required. This includes:

- Specific risks should be allocated to the party best able to manage it, subject to the risk premium.
- An understanding of the balance of risk between designer and contractor
- The value of risk transfer and acceptance that is must be budgeted for and priced
- Risk transfer should be fully assessed and signed-off at the appropriate executive level
- The adoption of an appropriate form of contract.

Commercial Risk Allocation



Scott Base Redevelopment Project Commercial Risk Allocation Plan



2 Purpose

2.1 Principles of risk allocation

The principles of risk allocation are intended to be objective 'rules of thumb' with the interest of maximizing the efficiency of resources within project by all of the participants. The dangers of short-sighted risk transfer or inadvertent risk retention can jeopardize the success of any project, including cost and time implications for the Client and Contractor.

2.2 Assigning risks

Once risks are identified, each risk must be clearly assigned to the respective parties to the contract who are best positioned to control or mitigate the risk. To do so, each party's role in the project must be clearly defined; only then can the individual risks be properly allocated. It is essential that any exposure to risk must be commensurate with the benefits derived from participation in the project, and the participant who can best control the outcome of an event or task be assigned responsibility for any associated risks.

2.3 Allocation of unavoidable risks

The Contractor should bear all risks over which they can exercise reasonable control. These include all matters relating to selection of construction methods, equipment and execution of work, except where this control is impaired by the action of third parties.

Truly unpredictable risks (natural disasters, force majeure, etc) are properly allocated to insurers. Antarctica New Zealand may in some cases choose to be a self-insurer, particularly as Antarctica New Zealand are in the position to understand the local natural environment in greater detail than any insurer could.

In the area of third-party effects, risks should be allocated to those best able to deal with the third party. This principle would assign to Antarctica New Zealand the risks related to government agency regulations for example. Risks associated with labour and subcontractor agreements and disputes should be assigned to the Main Contractor.

The allocation of risks due to general economic factors (material, labour price escalation, foreign exchange rates, etc) will need to be considered in the construction contracts due to the long construction programme. The client may assume part of these risks through rise and fall of costs clauses, and other relief provisions.

The general guidelines for risk sharing include:

1. If a risk is imposed upon a party, an opportunity for reward to the party should exist for properly dealing with the risk.
2. A risk should be allocated to the party which is in the best position to control.
3. A risk should be allocated to the party in whose hands the efficiency of the system is best promoted.
4. A risk should be allocated to the party which is best able to manage it financially.
5. Steps should be taken to assure that risks are actually allocated as intended.
6. Allocate sufficient risk to participants to motivate them to perform properly.
7. Consider the degree of control over the risk to be allocated when assigning risk responsibility.
8. Consider the participant's risk appetite.
9. Consider the participants' ability to control risks allocated to them.
10. The client is likely to retain risks of a national or international character, such as foreign currency devaluation or trade sanctions.
11. Share mutually dependent risks on a preselected, rational basis, rather than overlapping them. This action will prevent conflict and inadvertent assumptions of loss because of inability to determine fault.

Following allocation, all parties involved must continue the risk assessment process and work through risk mitigation measures.

Commercial Risk Allocation



3 Draft Commercial Risk Allocation

Category	Risk	Risk Allocation				Comments
		Client / Ant NZ	Consultants / Designers	Logistics Contractor	Main Contractor	
External / Force Majeure	Force majeure event results in additional cost and time.	100%	0%	0%	0%	Definition of force majeure to be clearly defined and agreed due to severity of regular weather events.
External / Weather	Weather event results in construction delays over one month	100%	0%	0%	0%	The Main Contractor needs to be aware of the working conditions at Scott Base and plan accordingly. Project schedule contingency to be allocated appropriately.
External / Economic	Exchange rate movements and cost increases results in changes to the cost of the project.	100%	0%	0%	0%	Review potential construction cash flow against project schedule and timing of funding availability. Optimal procurement options to be generated for on-site and off-site work, particularly those impacted by foreign exchange.
Technical / Scope	The project scope and associated budget as set by Antarctica New Zealand are exceeded by the designers (i.e. designers fail to design to budget) caused by scope creep resulting in adverse value management outcomes or cost increases.	33%	33%	0%	33%	Designers to design to scope and budget. Early Contractor Involvement (ECI) contractor input for cost estimates.
Technical / Scope	Design phase project scope changes caused by Antarctica New Zealand instructions results in adverse value management outcomes or cost increases.	100%	0%	0%	0%	Consultants to advise Antarctica New Zealand of the implications of scope change. Project Controls Manager to review and manage all change requests.
External / Economic	Poor business case caused by incomplete or inaccurate content results in insufficient funding.	100%	0%	0%	0%	
Technical / Design	Poorly coordinated design and documentation caused by Consultant non-performance results in cost and schedule increases.	0%	100%	0%	0%	Allow specific coordination activities in design schedule. Ensure Design Lead consultant owns design coordination activities. Antarctica New Zealand to consider contract management across Consultants.
Technical / Design	User requirements not incorporated into the design and documentation (i.e. brief not met) caused by Consultant non-performance results in expectations not being met over the life of the project and project outcome not fit for purpose.	0%	100%	0%	0%	Ensure design brief is clear and is updated to meet evolving project requirements. Allow specific coordination activities in design schedule. Ensure Design Lead consultant owns design coordination activities.
Commercial / Procurement	Building materials, equipment and/or labour not available when needed, resulting in a delay and possible cost increases to the project.					The contractor is responsible for ensuring that materials, equipment and/or labour are at the appropriate staging points (port, airport, etc). Antarctica New Zealand responsible for delays that occur in transit (breakdowns, weather, etc).
	Caused by late delivery / logistics issues Caused by poor planning/procurement	100% 0%	0% 0%	0% 0%	0% 100%	

EXAMPLE ONLY

Group Exercise

Add header

Subject	Risk	Risk Allocation				Possible Management Mechanisms	Comments
		Client	Designers	PM	Main Contractor		
Design	Lump Sum Tendered Contract (off detailed design) Poorly coordinated design caused by consultants results in cost and schedule increases						

Group Exercise

Subject	Risk	Risk Allocation				Possible Management Mechanisms	Comments
		Client	Designers	PM	Contractor		
Design	<p>Design & Build Contract (off written brief and concept design) Poorly coordinated design caused by contractor results in cost and schedule increases</p>						
	<p>Design & Build Contract (off Developed Design and specifications) Poorly coordinated design caused by original consultants results in cost and schedule increases</p>						

Group Exercise

Subject	Risk	Risk Allocation				Possible Management Mechanisms	Comments
		Client	Designers	PM	Main Contractor		
<p>Site Conditions</p>	<p>Site conditions differ from prior investigations.</p> <p>This results in additional time and cost. Caused by varying:</p> <p>1.Site contamination</p> <p>2.Unknown/unidentified services in the ground</p>						
<p>H&S</p>	<p>Fatality or serious harm caused by H&S incident on site results in project delays, possible additional costs, reputational damage and potential prosecution for an entity.</p>						