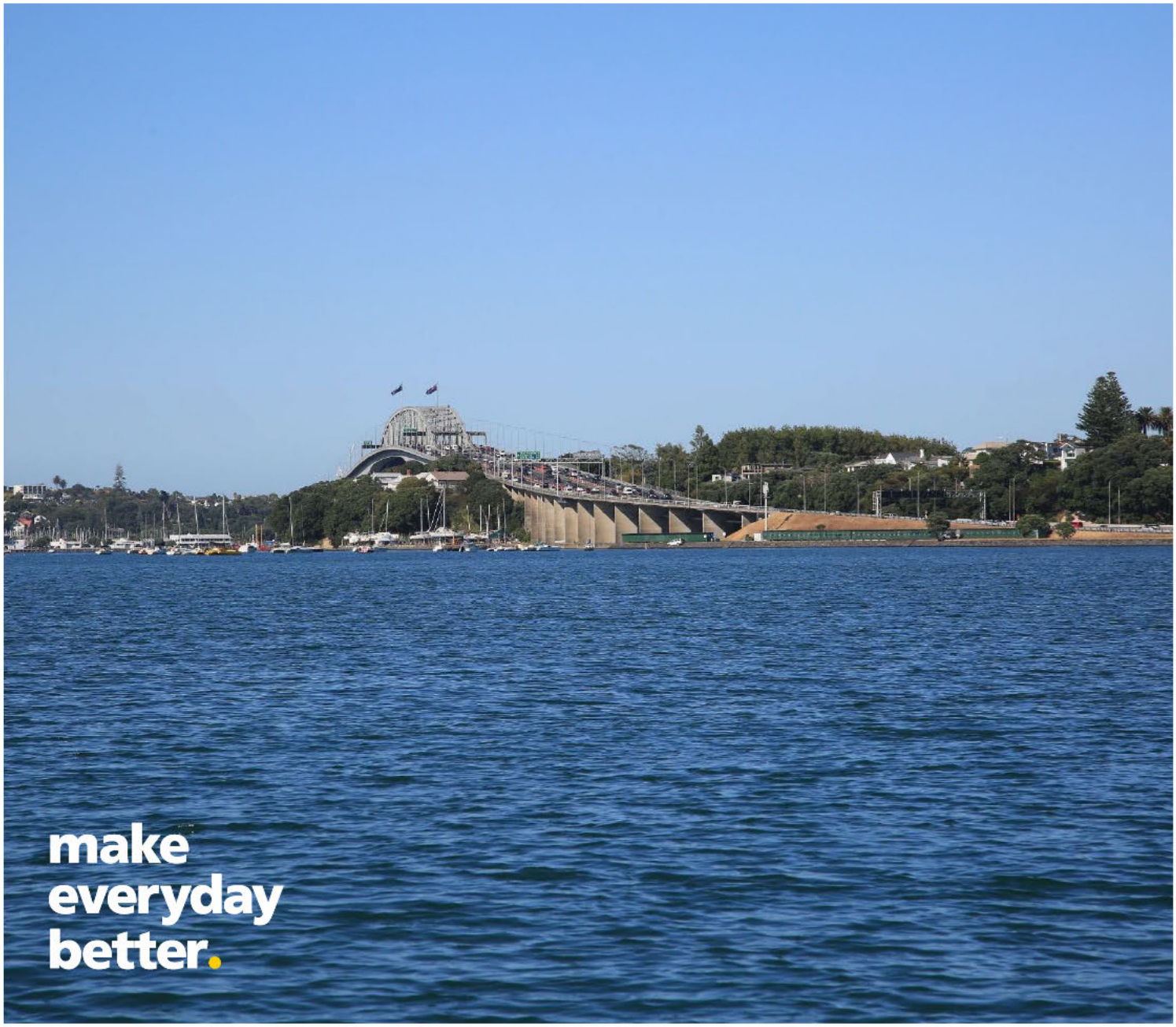
Sensitivity: General

Northern Pathway Westhaven to Akoranga Scope Prioritisation Layers

Prepared for Waka Kotahi NZ Transport Agency

Prepared by Beca Limited

9 September 2020



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Contents

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A	s 9(2)(a) [redacted]		24 July 2020
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on behalf of	Beca Limited		

1 Purpose

The purpose of the scoping review and prioritisation exercise is to provide Waka Kotahi NZ Transport Agency (Waka Kotahi) with a range of options concerning construction scope and costs to enable a funding approval decision to be made by the Waka Kotahi Board (the Board).

The output of this work is a series of incremental scope elements to be added to a base scope. The combined elements will be presented as “layers” steadily increasing the cost and value provided from a base option (within the current New Zealand Upgrade Programme funding allocation). This layering of cost and value is intended to provide the Board with an understanding of cost versus the additional value provided in terms of consenting, achievement of project objectives, programme, property impacts, procurement process and communications and engagement.

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2 Background

2.1 Scope of Document

This document has been prepared to provide a high-level assessment of the impact of removing various elements from the Northern Pathway Scope to meet the funding allocated within the NZUP. The document provides an outline of the process followed to determine the elements as well as the process followed to re insert the elements at various cost "layers".

The project objectives used for assessment purposes are those used in the Project Establishment Report (PER). The PER is the basis for the approval of the current funding allocation ($360M). The PER objectives are provided in Section 2.2. below.

Additional objectives have been established for the project to comply with consent requirements as well as to inform the procurement process for the Auckland Harbour Bridge (AHB) Alliance. These additional objectives have been considered as constraints (refer Section 2.3 below) and were included as separate assessment criteria for prioritising each of the project scope elements to be removed.

2.2 Project (Establishment Report) Objectives

The objectives of this project, as defined in the NZ Upgrade Programme Establishment Report are to:

a. Increase the number of those walking and cycling to work across the Auckland Harbour Bridge from 0% - 3% of daily trips by 2028.
b. Increase the number of daily walking and cycling recreation and tourism trips across the Auckland Harbour Bridge from 0 to 2,500.
c. Increase the total number of walking and cycling trips between Esmonde Road and the Auckland Harbour Bridge to 1,500 by 2046.
d. Improve transport system capacity.
e. Improve access to community assets and the natural and built environment.
f. Increase the number of households with access to the natural environment and community assets between Esmonde Road and the Auckland Harbour Bridge by walking and cycling.

2.3 Constraints

2.3.1 Consenting Objectives

a. To construct, operate and maintain a direct, and continuous shared walking and cycling path, separated from the roadway, that:
   i. Enables active transport choices and modes between the Westhaven Drive/Curran Street intersection and Akoranga, using the existing Auckland Harbour Bridge to cross the Waitematā Harbour.
   ii. Enables a safe, accessible and efficient user experience for a wide range of users.
   iii. Connects with existing and planned local and strategic transport networks.

2.3.2 Procurement Objectives

a. Provide a new, world-class, walking and cycling facility across the Waitemata Harbour to complete a critical missing link to the wider Auckland walking and cycling network
b. Connect seamlessly to the proposed Northern Pathway Westhaven to Akoranga (land component) project section.
c. Working with our project partners, key stakeholders and neighbours to design and construct an innovative new facility that recognises the social, cultural and environmental values in which it is located.

d. Leverage this contract to achieve broader outcomes i.e. social, economic and environmental benefits (Broader Outcomes) that go beyond the immediate aim of purchasing goods, services and capital works.

Waka Kotahi's key drivers for this project are to align with the Government Policy Statement on Land Transport and to '**get it built as soon as possible'.**

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2.5 Outcomes Sought

2.5.1 Auckland Harbour Bridge Component

For assessment purposes, project background and to provide an understanding of the decisions made to date it is important to refer to the Project Business Case which justified the project. The Business Case also described the investment objectives and problem definitions. The project Business Case was completed in January 2020. The Investment Objectives and Project Description included in the Business Case is provided for reference in Figure 2.1 below.

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Problem 1	Problem 2
The lack of a cross-harbour cycling and walking connection limits mode choice for trips to and from the North Shore and Auckland's city centre resulting in it not effectively contributing to Auckland's transport system.	The lack of a safe and appropriate cycle and pedestrian connection across the Harbour Bridge is reducing the opportunities for residents and visitors to experience a world class harbour.
Investment Objective 1- Travel to work	**Investment Objective 2 – Recreation/ Tourism**
Increase the mode share of walking and cycling travel to work trips across the Harbour Bridge from 0% to 3% by 2028 by completing the strategic missing walking and cycling link connecting the North Shore and Auckland's city centre.	Increase the number of daily walking and cycling recreation and tourism trips across the Harbour Bridge from 0 to 2,500 by 2028 by completing the iconic walking and cycling link connecting the North Shore and Auckland's city centre.
KPIs	**KPIs**
Cross-harbour people throughput (peak hours): Number of pedestrians, cyclists, public transport boardings and motor vehicles (excl. public transport) multiplied by average number of people per vehicle	**Cross-harbour people throughput (weekday inter peak):** Number of pedestrians and cyclists
Cross-harbour people mode share (peak hours): Number of pedestrians, cyclists, public transport boardings and motor vehicles (excl. public transport) multiplied by average number of people per vehicle, expressed as percentages	**Cross-harbour people throughput (weekends):** Number of pedestrians and cyclists
Cross-harbour people throughput (peak hours): Number of pedestrians and cyclists	
Access – perception: User surveys of perception of safety and ease of walking and cycling	

Figure 2.1: Problem Definition and Investment Object ves

To achieve the Investment Objectives the following design criteria and elements were included in the preferred option description included in the Business Case. (Neil Cree Waka Kotahi NZ Transport Agency, 2020). The description, on which the current design is based, of the preferred option has been reproduced below for reference:

"The Transport Agency's long-term intent is to deliver a transformational, world-class walking and cycling link between Auckland's city centre and Takapuna, with scope to further extend the link to the north. With potential to attract over 3,500 daily cyclist trips and 2,000 daily pedestrian trips by 2046, the link will change how Aucklanders get around the city. It will provide a viable and safe transport choice for people travelling to, from and within Auckland's North Shore, and will offer visitors and residents alike a unique opportunity to explore the harbour and surrounds. In order to deliver the link, a new shared path will be built alongside the Auckland Harbour Bridge, which will connect seamlessly with Westhaven walking and cycling routes in the city and with the future SeaPath route, extending from Northcote Point to Akoranga and beyond. Multiple entry and exit points will be provided at key locations, including Westhaven, Northcote Point, Onewa Road and Esmonde Road in Takapuna.

The Auckland Harbour Bridge section of the shared path will extend from Westhaven in the city to Sulphur Beach (Northcote Point). The shared path will be built on separate pier brackets attached to the east side of the existing Auckland Harbour Bridge piers, and will be positioned at the same level as the car deck of the main bridge. This differs to the original Option 10, which was positioned below deck-level. The decision to relocate the path to Harbour Bridge deck-level was driven by engineering and design factors. This change is expected to have negligible impact on user experience, given the separation of the pathway from live traffic lanes, and the provision of screening from traffic noise and visual distraction. At five metres wide, the recommended option is wider than the four-metre-wide options assessed in the short list. This will allow for

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separation between walkers and cyclists, improving both safety and customer experience. It improves levels of service for customers on the day of opening and provides greater resilience for future demand…

The path includes three observation decks to allow for views of Auckland and the Waitematā Harbour…These decks are up to 100 metres long and at their maximum, 4.2 metres wide. They are terraced down from the shared path to create a safe, sheltered seating area for cyclists and pedestrians alike.

The shared path has been designed with a sculptural form that is broadly aligned with the existing Bridge extension. Architectural lighting will be used at night to highlight key features.

Through option refinement, several landing configurations at the northern end were considered as an alternative to the SkyPath's consented northern landing. Alternatives were required because the decision to relocate the path to deck-level created a number of engineering complexities with the consented design and significantly compromised user experience (due to increased ramp steepness etc).

Ramps located in the vicinity of 9 Princes Street and Sulphur Point Boat Ramp are preferred as they balance addressing resident concerns with maximising safe access to the facility for users…"

2.5.2 SeaPath Component

The design of the SeaPath component is largely in line with the design outlined in the SeaPath Detailed Business Case, however, following input from Waka Kotahi concerning the need to provide an enduring project capable of providing for the needs of users 100 years hence the following changes were made:

a. An option was progressed to provide a connection along the existing coastline between Sulphur Beach Boat Ramp and the existing weighbridge before crossing the motorway adjacent Stafford Park. This option removes most of the potential conflicts with motorists and boat ramp users at Sulphur Beach as well as the need for grade separation at the Stafford Road off-ramp. The option considered can be constructed wholly within the existing motorway reclamation area (i.e. no further incursion into Coastal Marine Area) but will require narrowing the existing motorway shoulders.
b. An option was progressed for the construction of an additional steel bridge crossing the Motorway between the existing weighbridge and Stafford Park. The new section of path will remain within the existing Motorway and footpath reclamation area on the eastern side of the Motorway (i.e. no further incursion in the Coastal Marine Area). The use of the existing Sulphur Beach Road and Tennyson Street underpass will still be possible, but not actively encouraged, with this option.
c. An option was progressed to provide an alternative connection to Onewa Road via a connection under the existing on-ramps This option significantly reduces bridge structure requirements, and increases the amenity for users and reduces the impact on existing trees adjacent the northbound motorway on-ramp at Onewa interchange. The route will require the construction of an underpass below the existing on-ramps.

The proposed changes were reported to Waka Kotahi at a Project Steering Committee (PSC) meeting on date 10 March 2020 and were approved for adoption.

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3.3 Assessment Criteria

Criteria were identified to assess each of the scope elements against. The criteria were identified and agreed upon by the workstream leads. The criteria are outlined in Table 3.3 below.

Table 3.3 Assessment criteria used in scope prioritisation workshop 8 July 2020

Criteria	Weighting	Ref	Assessment	Rating
Objectives	20%		**How does the** element perform against the objectives?	0. Fully meets the objective -1. Partly meets the objective -2. Doesn't meet the objective
		O1	*"Direct, continuous shared walking and cycling path, separated from the roadway"*	
		O2	*"safe and accessible"*	
		O3	*"User experience"* – the form of the pathway	
		O4	*"connects with existing and planned local and strategic road networks"*	
		O5	How does the element perform against the establishment report objectives collectively?	
		O6	Does the element amend the project scope as written in the establishment report?	0. No -2. Yes
Programme /Schedule	20%	S1	Is there a risk the element causes delay to the Establishment Plan milestones listed below (excluding planning milestone which has been missed): ▪ Alliance established mid-late 2020. ▪ Early work begins early 2021. ▪ Construction start 2021. ▪ Construction finish 2024. Note:this is the risk-adjusted date.	0. Reduction in risk or positive impact on the programme, no milestones missed -1. Low or moderate risk/impact, one milestone missed -2. High risk/impact, two or more milestones missed
		S2	Will this element extend the Alliance PAA start and create any risks around escalation?	
Property impacts	20%	P1	Does this element decrease or increase property acquisition risk?	0. Reduction in risk or positive impact on the property procurement, -1. Low or moderate risk/impact, renegotiation of 2 properties -2. High risk/impact, property acquisition strategy needs to be changed
Consenting	20%	C1	Is the element consistent with National Policy Statements?	0. Yes -2. No
		C2	Environmental Effects – any change in effects or is additional mitigation required?	2. Effects can be managed or can be easily mitigated 0. Effects can be partly managed -2. Effects cannot be managed or are costly to mitigate
		C3	What are the effects of the element on cultural values?	

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Criteria	Weighting	Ref	Assessment	Rating
C&E	20%	C4	What is the impact of the element on Waka Kotahi's reputation and relationships?	0. Low or no reputational / relationship risk -1. Moderate reputational / relationship risk -2. High reputational / relationship risk
		C5	Risk of a negative end-user experience - knowing that the end-user experience will be impacted.	

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4 Elements Considered

4.1 Scope Reduction Elements

Table 4.1: Scope Reduction Element Descriptions

Element	Description of Scope reduction
Pause Point at Pier 4	Omit the Pause Point steelwork terracing, lighting and street furniture. Pier 4 Pause Point is smaller than those at Piers 1 and 2.
Pause Point at Pier 4 Canopy	Omit the canopy over the Pause Point. This element could be implemented as a stand-alone scope reduction giving an uncovered Pause Point
Pause Point at Pier 2	Omit the Pause point as per Pier 4 but noting that Pier 2 Pause Point is larger and more prominently located.
Pause Point at Pier 2 Canopy	As Pier 4 above
Pause Point at Pier 1	As Pier 2 above
Pause Point at Pier 1 Canopy	As Pier 4 above
Remove Anti-Throw Screens (AHB)	Remove the 3m high anti-throw screens on both sides of the pathway from Westhaven down to Sulphur Beach. Retain a 1.4m high pedestrian barrier.
Construct Piers in CMA (Piers 5 & 6)	Piers 5 and 6 are located closest to Westhaven and are the most costly because the piers are quite short and the new pathway bracket will sit partially below water level. As a result, a cofferdam is required during construction.
Construct Piers in CMA (Piers 1 to 4)	Piers 1 to 4 are the tallest piers which results in a cost penalty for moving to a separate substructure solution due to the height of the columns that would be required (approx. 35m) and size of the foundation.
Princes Street access ramp	Delete the Specimen Design ramp with 1 in 20 grades from the scope and have no access/egress at Northcote Point.
Replace Full Princes Street access ramp	Replace the Specimen Design ramp with a smaller triangular ramp in the site of No.9 Princes Street which has an average gradient of 1 in 14.
Amended Skypath ramp	Provide a ramp at Northcote Point which drops users down to ground level at Princes Street and links to an on/off ramp for the continuing pathway to the north. This option has no high-level viaduct connection through Princes Street.
Reduce AHB shared path width to 4m	Reduce usable width from 5m to 4m and revert to a shared path rather than a segregated one.
Remove Stafford Bridge	Revert to DBC alignment with shared path doubling back at Sulphur Beach landing, going under SH1 and continuing along
Reduce Design Life of Tuff Crater bridges	Using a 50-year design life instead of 100 years allows for the deletion of a long bridge to be replaced with a timber boardwalk with a smooth surface. Also, the use of a 50-year design life will reduce the height of the pathway as sea-level rise impacts could be omitted from the design criteria.
Remove Anti-Throw Screens (Land)	Remove from the scope, retain 1.4m high barriers
Reduced scope of Urban, Cultural and Landscape	Reduced budget for the provision of these elements

[redacted]

Element	Description of Scope reduction
Toilets	Remove from scope
Electric Vehicles for emergency services	Remove from the scope. This will increase the access time for attending emergency incidents particularly medical.
Prototype	The prototype is a full-scale portion of the bridge deck and pause point intended to assist in evaluating the materiality of the barriers, deck surface, lighting etc.
Remove architectural bridge lighting	Delete architectural wash lighting and retain only the safety and operational lighting on the pathway.
Reduce ramp width at Westhaven to 4m (from 5m)	This reduces the cost of the ramp itself and reduces the footprint which creates an opportunity to reduce road realignments in that area.
Land Component Bridges designed as Single Super T bridge form (VE, not scope reduction)	The current design has two Super T beams on each bridge. This VE idea is to have a single Super T beam supporting the pathway with no reduction in useable width.
Land Component Bridges design reduce pile diameter from 1.6m to 1.2m (not Stafford, VE)	A value engineering opportunity.
Mild steel Piers 4 & 5	Use mild steel for these piers instead of stainless steel (which was used in the Specimen Design). Although there is a saving in initial physical works costs there is a penalty in ongoing maintenance.

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6 Evaluation

6.1 Scope Prioritisation Ranking

The individual elements were assessed against the nominated criteria at the second Scope Prioritisation workshop attended by members from each of the project workstreams. Following the workshop, the elements were ranked in order of priority for inclusion in the project scope.

The higher a negative ranking, the more important it was seen for the element to remain as part of the project scope. That is, elements with a higher negative ranking were generally added back into scope in earlier "layers" than elements with a lower negative ranking.

The elements, ranked by priority, are listed in Table 6.1 below.

Table 6.1 Scope Prioritisation Ranking

Element	Total
Remove Princes Street access ramp (no access point at all)	-15
Construct Piers in CMA (Piers 5 & 6) (Remove from existing AHB)	-14
Construct Piers in CMA (Piers 1 to 4) (Remove from existing AHB)	-14
Remove Stafford Bridge (revert to DBC design)	-13
Remove architectural bridge lighting	-11
Replace Full Princes Street access ramp with a triangular ramp at No. 9 Princes Street	-9
Reduce AHB shared path width (reduce to 4m)	-8
Remove Anti-Throw Screens (Bridge)	-7
Remove all Pause Points & Canopy (Steelwork & ancillaries)	-6
Reduce landscaping and ULDF requirements	-6
Reduce ramp width at Westhaven to 4m (from 5m)	-6
Remove all but 1 Pause Points & Canopies (Steelwork & ancillaries)	-4
Remove Anti-Throw Screens (Land)	-3
Remove all but 2 Pause Points & Canopies (Steelwork & ancillaries)	-2
Remove Toilets from the scope	-2
Do not provide or accommodate Electric Vehicles for emergency services	-2
Stainless steel Piers 4 & 5 (revert to mild steel)*	-2
Reduce Design Life of Tuff Crater bridges (50 yr design life for material and height to accommodate predicted sea-level rise)	-1
Delete Prototype construction requirement	0
Land Component Bridges design as Single Super T bridge form (VE, not scope reduction)	0
Land Component Bridge design reduce pile diameter from 1.6m to 1.2m (not Stafford, VE)	0

*Mild steel brackets are considered a significant engineering/maintenance disbenefit so replacement with stainless steel appears earlier in layering than the ranking above would suggest.

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6.2 Safety in Design

The implications of applying each cost-saving element in terms of safety in operation or maintenance was considered during a process of moderation after the ranking table above was established and initial layering developed. The elements to which additional priority was given were as follows:

- Use of stainless steel for the Pier 5 and 6 brackets to reduce ongoing maintenance requirements.
- Reduction/retention of the 5m width pathway over the bridge and at Westhaven ramp.
- Provision of the anti-throw screens.
- Configuration of the ramp at Princes Street.

[redacted]

6.3 Layering Outcomes

The table below has been generated using the elemental costs from Table 5.1 and the Scope Prioritisation Rankings from Table 6.1. The procedure for generating the layers was as follows:

- Apply all non-mutually exclusive cost-saving elements to the Project estimate of $443M to determine whether enough cost savings have been identified to bring the project estimate below $360M.
- Having established that the minimum cost is below the $360M threshold add back in the scope the items noted as bullet points in below Table 6.2.
- Elements were then added back into the scope of Layer 0 based upon their ranking with the elements with the highest negative score added in first. These elements were considered the least desirable to omit from the project scope.
- Elements are coloured green where they are a change from the layer below.
- The final mix of elements within each layer was then subject to moderation based on qualitative judgements including safety and amenity to give the proposed layering in Table 6.2 below.

Table 6.2 Proposed Layering

Layer	Cost								
0	$358M	Piers 5 & 6 on piles in CMA.	Safety and operational lighting only. No architectural lighting.	No pause points	No ramp at Princes Street	4m path width on AHB bridge	No Stafford Bridge	No anti-throw screens (land or bridge component)	50-year design life north of Tuff Crater
1	$400M	Piers 5 and 6 on AHB brackets	Safety, operational and architectural lighting provided.	One Pause Point without canopy provided*	Triangular Ramp at Princes Street	Increase to 5m width on the bridge	Stafford Bridge included	No anti-throw screens (land or bridge component)	50-year design life north of Tuff Crater
2	$427M	Piers 5 and 6 on AHB brackets	Safety, operational and architectural lighting provided.	Three Pause Points without canopies provided	Ramp at Princes Street (full 1 in 20)	5m width on the bridge	Stafford Bridge included	Throw screens on AHB and Land component	50-year design life north of Tuff Crater
3	$439M	Piers 5 and 6 on AHB brackets	Safety, operational and architectural lighting provided.	Three Pause Points with canopies provided	Ramp at Princes Street (full 1 in 20)	5m width on the bridge	Stafford Bridge included	Throw screens on AHB and Land component	100-year design life north of Tuff Crater

* Could be either a full pause point or some localised widening at several points

All layers have:

- A 5m wide ramp at Westhaven.
- Stainless for Piers 5 and 6 brackets (NA to Layer 0).
- Full Urban, Cultural and Landscape budget.
- Toilets.
- Electric vehicles for emergency services.

7 Discussion

Table 7.1 below provides commentary on the assessment criteria for each of the layers. The comments are an amalgamation of individual comments on each of the elements contained in each layer. The commentary was provided by each of the workstream leads during or after the final scope optimisation workshop.

Table 7.1 Comments on assessment criteria

Layer	Layer description	Comments on Assessment Criteria and Value Associated with the elements contained in each layer		s 9(2)(g)(i)
		NZ Upgrade Programme Project Objectives	Programme	
0	▪ Piers 5 & 6 on piles in CMA. ▪ Safety and operational lighting only. No architectural lighting. ▪ No pause points. ▪ No ramp at Princes Street. ▪ 4m path width on AHB bridge. ▪ No Stafford Bridge. ▪ No anti-throw screens (land or bridge component). ▪ 50-year design life north of Tuff Crater.	Meets objectives A through C, only partly meets objective D (due to 4m wide path not improving transport system capacity as much as intended, only partly meets objectives E & F (connection to the community).	High risk that NZUP Establishment Report dates not met. ▪ Although there may be some decrease in construction programme duration due to a simpler construction methodology, the high risk of consenting and & stakeholder engagement delays will likely add 6 months or more to the critical path programme. ▪ The high risk that construction completion in 2024 is not achievable.	[redacted]
1	▪ Piers 5 and 6 on AHB brackets. ▪ Safety, operational and architectural lighting provided. ▪ One Pause Point without canopy provided* . ▪ Triangular Ramp at Princes Street. ▪ Increase to 5m width on the bridge. ▪ Stafford Bridge included. ▪ No anti-throw screens (land or bridge component). ▪ 50-year design life north of Tuff Crater.	Meets all objectives.	A moderate risk that NZUP Establishment Report dates not met. ▪ The increasing risk of consenting, property, & stakeholder engagement delay could add several months (3 – 4) to the critical path programme. ▪ A moderate risk that construction completion in 2024 is not achievable.	
2	▪ Piers 5 and 6 on AHB brackets ▪ Safety, operational and architectural lighting provided.	Meets all objectives.	A low risk that NZUP Establishment Report dates	

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Layer	Layer description	Comments on Assessment Criteria and Value Associ	
		NZ Upgrade Programme Project Objectives	**Programme**
	▪ Three Pause Points without canopies provided. ▪ Ramp at Princes Street (full 1 in 20). ▪ 5m width on the bridge. ▪ Stafford Bridge included. ▪ Throw screens on AHB and Land component. ▪ 50-year design life north of Tuff Crater.		not met (except consent lodgement). ▪ Bridge visualisations will require updating – these could be progressed asap to help mitigate delay but it is expected that any delay would only be on the order of 1 month. ▪ C&E and consenting risk may add 1 – 2 months to the critical path (i.e. consenting becomes critical rather than IPAA period). ▪ A very low risk that construction completion in 2024 is not achievable.
3	▪ Piers 5 and 6 on AHB brackets. ▪ Safety, operational and architectural lighting provided. ▪ Three Pause Points with canopies provided. ▪ Ramp at Princes Street (full 1 in 20). ▪ 5m width on the bridge ▪ Stafford Bridge included. ▪ Throw screens on AHB and Land component. ▪ 100-year design life north of Tuff Crater.	Meets all objectives.	NZUP Establishment Report dates can be met (except consent lodgement).

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