



PENLINK

Implementation Business Case

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Executive Summary

1.1 Introduction

The Penlink Implementation Business Case (ImBC) has been prepared to support the procurement and delivery of activities associated with construction of the Penlink project, which forms part of the New Zealand Upgrade Programme (NZUP).

The NZUP includes “multi-billion investment in ten transport projects for Auckland to provide more travel choices, help people get where they’re going safely and support the economy”¹.

Penlink will form a vital connection for north Auckland, linking the Whangaparāoa Peninsula with wider Auckland. The new 7km road will offer greater transport capacity and travel choice and support planned growth in Silverdale, Dairy Flat, Wainui and the Hibiscus Coast.

The two-lane road with a shared use path for people walking and on bikes will also provide surrounding communities more sustainable transport choices by supporting better transport access and providing a safer journey.

As shown in Figure 1, Penlink will create an alternative access route to the Whangaparāoa Peninsula and connect to State Highway 1 (SH1) at Redvale². Penlink will cross over East Coast Road and connect to SH1 with a new interchange, including south facing ramps. The overpass at SH1 will accommodate a separated walking and cycling shared path and will allow for future land development in the Weiti area that aligns with growth plans.

The Penlink corridor is located north of the Stillwater settlement and includes a new connection for the community, before continuing towards SH1 (Northern Motorway) just south of Dairy Flat. The corridor will connect to Whangaparāoa Road at Beverly Road with a new signalised intersection before crossing the Weiti River on a new bridge that will also accommodate a separated walking and cycling shared path.

The key benefits of Penlink have strong alignment to the Government Policy Statement on Land Transport (GPS) and include:

- Supporting increased travel choice and reduced vehicle emissions through new separated walking and cycling infrastructure
- Enabling public transport networks to support economic activity by unlocking development potential for north Auckland
- Improved network resilience and access surety in the Weiti area and to the Whangaparāoa Peninsula.

¹ [Auckland package | Waka Kotahi NZ Transport Agency \(nzta.govt.nz\)](#)

² Auckland Transport, Penlink Detailed Business Case, 2019

NZ Upgrade Programme Penlink



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Figure 1 Penlink Overview

1.2 Implementation Business Case Scope

The ImBC has been structured around the Treasury ‘five case’ model and is designed to systematically ascertain that the Penlink investment proposal:

- Is supported by a compelling case for change – the ‘strategic case’
- Optimises value for money – the ‘economic case’
- Is commercially viable – the ‘commercial case’
- Is financially affordable – the ‘financial case’, and
- Is achievable – the ‘management case’.

The Minister of Transport has provided clear direction on the scope of this project to the Waka Kotahi Board Chair as per the letter provided in Appendix A (24th September 2021). The Ministers expectations are drawn from and align with the information agreed by Cabinet (reference CAB-21-MIN-0374.01).

The Ministers expectation is that the ImBC should not fundamentally review the strategic or economic cases outlined in the Penlink DBC³ Addendum.

Whilst the strategic and economic cases have not fundamentally changed since the Penlink DBC Addendum was drafted, where relevant these sections have been updated in this ImBC to reflect the latest available information, including updated cost estimates for the project.

The ImBC provides further details on the options that have been considered in relation to the tolling of Penlink, including a summary of recent public consultation on tolling options. Tolling is an important consideration for the project and forms a key part of the ImBC.

The ImBC also outlines the process that is underway to identify a preferred proponent for the construction of Penlink. It seeks to reconfirm that the project is affordable, optimises value for money and details the management arrangements in place to enable successful delivery.

Information presented regarding the preferred proponent and commercial arrangements is as current as possible, noting that the ImBC has been developed in parallel with the procurement process.

1.3 Work Completed to Date

The need for an alternative route to the Hibiscus Coast Highway and for improved access to Whangaparāoa has a long history dating back to the 1980’s. In June 2019, Auckland Transport (AT) prepared a DBC for a new two-lane road, with tolling.

In January 2020, the NZUP was announced by the Prime Minister, identifying Penlink as one of the projects identified for funding. The NZUP is focused on upgrading transport infrastructure in the six main growth areas of Auckland, Waikato, Bay of Plenty, Wellington, Canterbury and Queenstown.

Penlink was reconfirmed as a priority project in the 2021 NZUP Review as a two-lane tolled road with a separated, shared walking and cycling lane adjacent to the new state highway to provide travel choice for those living or visiting the Whangaparāoa Peninsula.

In April 2020, Waka Kotahi appointed Boffa Miskell as Principal Environmental Advisor to support early work on the consent compliance including freshwater, marine and terrestrial ecology surveys.

3 DBC: Detailed Business Case

In December 2020, GHD were appointed as Principal Technical Advisor for the project. GHD were commissioned to develop the Reference Design, Minimum Requirements and assist Waka Kotahi through the procurement phases. Upon award of the Project Alliance Agreement (PAA) contract, GHD will also assist Waka Kotahi through the detailed design and construction phases.

In April 2021, Waka Kotahi shortlisted two proponents for the project. The proponents (consortia) shortlisted to proceed to the Request for Proposal phase were:

1. *Whanga Huanui: comprising Fletcher, ACCIONA, Beca, and Jacobs*
2. *Team Penlink: comprising HEB, Fulton Hogan, Aurecon, and Tonkin & Taylor*

The project Request for Proposal phase was opened to the shortlisted proponents in September 2021. The evaluation process will be complete by mid-April 2022 with contract award scheduled for June 2022. Construction is expected to be completed by late 2026.

1.4 Strategic Case

The problems and benefits of the Penlink DBC were used to develop problem statements specific to the study area. In line with the Minister's direction (Appendix A), the Strategic Case was not re-evaluated, although it was reviewed to confirm that it is still appropriate for the project. The problem and benefit statements are shown below:

Problems

1. *Poor transport network performance negatively impacts economic activity and quality of life around the Silverdale interchange and on the Whangaparāoa Peninsula*
2. *The Whangaparāoa Peninsula community is vulnerable to physical isolation due to current single road access*
3. *Limited capacity in the transport network is constraining planned urban growth in the area.*

Benefits

1. *Improve travel times and journey reliability through the study area (being the land areas in the vicinity of the Silverdale interchange: Silverdale, Wainui, Dairy Flat, Orewa and the Whangaparāoa Peninsula)*
2. *Improve network performance in order to facilitate economic activity, planned growth and transport mode choice in Silverdale, the Whangaparāoa Peninsula and the surrounding area*
3. *Improve network resilience for the Whangaparāoa Peninsula community.*

There are also several wider benefits expected from investment in Penlink including:

- Supporting provision of housing within planned future urban development areas
- Supporting jobs and employment opportunities across the northern area of Auckland
- Comparative travel times for public transport users compared with general traffic.

The relationship between transport infrastructure requirements and the ability to deliver planned growth has been recognised by Auckland Council. The Auckland Plan recognises Penlink as a key infrastructure project and future element of the strategic road network. Penlink will increase the ability of the network to accommodate the forecast growth in traffic volumes that is expected as part of future commercial and residential growth areas.

1.5 Economic Case

The economic and financial cases have been updated in this document to reflect the latest benefits and cost information available.

The Penlink main alignment connection with State Highway 1 Northern Motorway comprises of direct south facing ramp connections with a new overbridge for the Penlink main alignment over SH1. The interchange has been located to not preclude integration with growth plans for Dairy Flat, or to provide north facing ramps to be added in the future.

The SH1 southbound on-ramp comprises a left turn entry to the on-ramp. The southbound on-ramp provides for ramp metering infrastructure, with two general traffic lanes and a bypass lane giving priority to public transport and high occupancy vehicles. The south facing ramps have been designed so that they can be accommodated within Penlink and SH1 designations.

The Penlink project provides additional travel choice from active mode infrastructure, including a Shared User Path (SUP) alongside the Penlink main alignment connecting East Coast Road to Whangaparāoa Road for pedestrians and cyclists. In the longer-term it is anticipated that the SUP will connect to a comprehensive network of walking and cycling facilities as the wider Whangaparāoa Peninsula, and Dairy Flat area urbanises. There is also potential for the Penlink SUP to be a highly utilised recreational route similar to other separated paths such as Raumati South to Peka Peka SUP that runs adjacent to the Kāpiti Expressway. As the areas along Penlink urbanise this will also provide an excellent active mode facility for people to and from the Whangaparāoa Peninsula.

Tolling is considered for Penlink to cover operations and maintenance costs only. Construction funding is through the NZUP programme. Initially, tolling would only occur at the SH1 on and off-ramps and east of the Duck Creek Road connection. These locations were chosen to provide fair and equitable tolls for road users along the length of the project, and to meet legal access requirements.

The Penlink project is currently in the planning and design phase, with completion expected in late 2026. Tolling the corridor influences the design requirements for Penlink and also provides opportunities to change the function of key existing roads such as Whangaparāoa Road and Hibiscus Coast Highway.

The decision on tolling does not impact the need for a connection from the Whangaparāoa Peninsula to SH1 to enable future development in north Auckland.

A decision to approve the ImBC, a precursor to award of the Alliance contract, will be made by the Minister of Transport and Minister of Finance in mid-2022. This will allow sufficient time for the design to respond to the decision. This may include design amendments if tolling is not approved, or if an Order in Council (OIC) is to be completed for tolling and approved by Cabinet before the opening of the new road. The OIC could take 6 to 18 months to confirm.

The Do Minimum scenario utilised in the economic evaluation of the preferred option is the current network form (without Penlink). Different to previous analyses of Penlink, the Do Minimum option includes assumptions about widening SH1 in this area, and this is included in the modelling with an implementation year of 2048. The economic results for the preferred option versus the Do Minimum scenario are shown in Table 1.

Core economic assumptions include:

- The preferred option includes a tolled and untolled option. For the tolled option, a \$3 AM and PM peak toll and \$2 interpeak toll (end to end) has been preferred
- Toll collection costs of \$0.70 per trip (for tolled option), rather than \$0.70 at each toll gantry location.
- A 4% discount rate and 60 years appraisal period
- The National BCR has been calculated as the transport benefits (excluding the toll costs) divided by the total project costs (excluding the toll revenue but including the toll transaction costs)
- Time zero year of 2022
- Construction start year of 2022, and a five year construction period
- Project expected estimate cost of \$760 million tolled, which includes \$19 million for tolling infrastructure, and \$770 million untolled, which includes \$29 million for intersection, ramp, shoulder, and pavement improvements
- Previous assumptions for agglomeration benefits and other Wider Economic Benefits (WEBs) updated in 2017 have been used, with these increased by productivity growth to 2022. Previously calculated WEBs (with an adjustment factor) were used as these were considered to give a reasonable estimate of WEBs.

Table 1 Preferred Option Economic Evaluation Results

Timing	Option 1: Untolled	Option 2: Tolled
Earliest Implementation Start Date	Construction to start Q3 2022	
Expected Duration of Implementation (includes contingency and is an estimate for economic evaluation purposes)	Construction duration 60 months*	
Economic Efficiency	Option 1: Untolled	Option 2: Tolled
Time Zero	2022	
Base date for Costs and Benefits	2022	
Present Value of Total Project Cost of Do Minimum	\$0	
Present Value net Total Project Cost of Preferred Option (incl. maintenance, capex and toll collection costs) ⁴	\$781 M	\$892 M
Present Value net Benefit of Preferred Option (exc. WEBs)	\$1,156 M	\$1,116 M
Present Value net Benefit of WEBs of Preferred Option	\$171 M	\$157 M
National BCR (exc. WEBs)	1.5	1.3
National BCR (inc. WEBs)	1.7	1.4
Government BCR (exc. WEBs)	1.5	1.3
Government BCR (inc. WEBs)	1.7	1.5
First Year Rate of Return (FYRR)	6%	5%

*Assumed for economic analysis only

⁴ The key difference in the present value net total project cost between the untolled and tolled option is as a result of the 60-year maintenance and opex cost difference between the two scenarios. The capex difference between the two options is \$53m.

1.6 Commercial Case

The Penlink project is being procured utilising a Hybrid Alliance model. The Hybrid Alliance model is preferred based on its ability to engage with the wider supply chain collaboratively on project drivers relating to road safety, journey reliability, stakeholder engagement, environmental and social procurement outcomes.

Following receipt and evaluation of the final Alliance proponent submissions in February 2022, a tender evaluation process will be carried out in March 2022. Following this, approval to notify the preferred proponent will be made in April 2022. This will allow commercial negotiations to conclude prior to approval of the PAA in June 2022 and start of construction in late 2022. It is critical for the project that construction starts to align with the upcoming earthworks season. If decisions are delayed, the project completion date may not be achievable, and additional costs would be incurred on the project.

1.7 Financial Case

Updated cost estimates for Penlink were completed by Alta in May 2021 and updated by Waka Kotahi in February 2022 and were based on a 100 percent Reference Design (GHD). The 100 percent Reference Design follows iterative updates from the previous 20 percent and 60 percent stages.

The 95th percentile project estimate of the Penlink preferred option is \$857 million untolled and \$847 million tolled, including contingencies and estimated property costs⁵.

An estimate level breakdown of this indicative cost is displayed in Table 2.

Table 2 Penlink Preferred Option Cost Estimate

Estimate Level	Untolled Estimate (\$M)	Tolled Estimate (\$M)
Physical Works Estimate	\$539	\$525
Project Base Estimate	\$668	\$654
Project Expected Estimate (P50)	\$770*	\$760**
95 th Percentile Project Estimate (P95)	\$857	\$847

* Includes \$29m for additional mitigation ** Includes \$19m for tolling infrastructure

For economic evaluation purposes, the operations and maintenance costs of Penlink were provided by Waka Kotahi. This cost is expected to cover the routine and periodic maintenance costs of the asset, as well as any refurbishment and replacement costs that may occur over the economic appraisal period.

1.8 Management Case

Penlink is a complex infrastructure project with a wide range of interfacing plans, legacy documents, disciplines and deliverables. A Project Plan has been developed that serves as both a reference point for delivery processes and expectations, and a roadmap for the wider framework of deliverables and documents (provided at Appendix L).

The Project Plan sets out roles and responsibilities within the project and is consistent with the requirements in the letter and cost thresholds provided by the Minister of Transport. The key milestones for the Penlink project are summarised below. Key milestones during the construction phase will be added following contract award.

⁵ Alta, 7 May 2021. *Penlink Project, 100% Reference Design – Cost Estimate Report*. Waka Kotahi.

Table 3 Key Milestones

Milestone	Date
Consultants procured	Mid 2020
Release of Registration of Interest (ROI) shortlisting	Early 2021
Issue request for tender	Late 2021
Award PAA Contract	Mid 2022
Detailed Design and mobilisation	Mid to late 2022
Construction start	Mid to late 2022
Construction completion	Late 2026

Any significant change in the scope of the project is to be managed by the project manager and reported to the NZUP project governance group. Change will be managed within an understanding of the tolerances of the project related to funding, scope, risk, quality, and benefits. The change control register will sit alongside the risk register and will be managed by the project manager. Any risk that results in a change to the project, including adjustment of cost, programme or quality will be subject to approval by the NZUP governance group.

The Penlink project will be managed at all phases in accordance with the Waka Kotahi and NZUP Risk Management Frameworks and Standards. A detailed Risk Register and Risk Management Plan have been developed, which outline key roles and responsibilities, reporting lines, mitigation plans and escalation processes. The Risk Register is regularly reviewed, and the top five risks are included in updates at governance meetings.

As part of ongoing quality assurance for the project, there are internal and external 'gateways' to review the overall project and focus on key elements in preparation for upcoming phases. For Penlink, there are two key gateway milestones, the Treasury Gateway Review 3, 'Investment Decision' and Waka Kotahi Stage Gate 4, 'Readiness for Award'.

The Gateway Review 3 is required to review the robustness of the project, governance and procurement undertaken to date. Passing the Gateway Review 3 is key to progressing the ImBC through to ultimate approval by the Minister of Transport for confirmation of the Investment Decision. The internal Waka Kotahi Stage Gate 4, focuses more on procurement, confirming the documentation and processes are in place for successful engagement, award and delivery of the alliance contract.

The post-implementation monitoring and performance data tracking for Penlink will begin as soon as the road opens. The Penlink Key Performance Indicators (KPIs) will be used to measure the expected performance of the preferred option and will continue to be used in the future to monitor the actual performance of this investment, relative to investment targets.

1.9 Summary and Conclusions

As set out below, tolling Penlink provides advantage in key areas when compared to not tolling. These areas are;

- Public Transport – Tolling Penlink encourages modal shift by offering a lower cost option compared with driving a private vehicle while still providing the same time benefits as others users of Penlink. If Penlink is not tolled, more people will drive as it is quicker than the existing route and cheaper (shorter trips with not additional costs).
- Carbon – Tolling Penlink will result in greater carbon dioxide savings than not tolling Penlink through more sustainable speed profiles on Penlink and existing routes.
- Lower overall costs – Tolling Penlink minimises construction costs as additional lanes are not required. Toll infrastructure costs are to be paid back through the toll.
- Maintenance and Operational costs – M&O costs are fully recovered through the toll, with no demand on the NLTF.

Tolling Penlink is preferred and recommended by Waka Kotahi.

Table 4 Assessment of Tolling Options Against Project Objectives

Project Objective	Tolled Penlink*	Untolled Penlink*
To reduce traffic volumes through the Silverdale interchange, providing transport capacity for housing developments in Wainui, Stillwater West, Silverdale West, and approved development on the Whangaparāoa Peninsula by 2028	2	3
Improve transport connections to support economic activity in Dairy Flat and Silverdale by 2028	2	2
To support improved public transport services between Whangaparāoa-Silverdale, Whangaparāoa-Albany with more reliable journey times by 2028	3	1
To provide new and safer facilities for pedestrians and cyclists between Whangaparāoa and SH1 by 2028	2	2
To provide greater network resilience between Whangaparāoa Road, East Coast Road and/or Northern Motorway by 2028	3	3
Total	12	11

*Using standard MCA scoring criteria from +3 (highly positive) to -3 (highly negative)

In addition, tolling is preferred in the areas of enabled and embodied carbon reduction and overall network management in line with Government GPS 21/22 strategic priorities. Based on Beca modelling, carbon reduction in 2028 is expected to be around 1,000t per annum with the untolled arrangement and around 7,000t with the tolled arrangement. Comparing the carbon impacts using the same MCA scoring philosophy is shown below.

Table 5 Assessment of Tolling Options Against Carbon Impacts

CO ₂ Emissions	Tolled Penlink*	Untolled Penlink*
Reduction in operating CO ₂ emissions	3	1

In conclusion, the ImBC demonstrates that Penlink has strong alignment to the GPS and seeks to enable a transport system that supports growth, reduces emissions and keeps

people safe. Penlink will support Auckland as it grows over the coming decades, providing real transport choice while reducing the impact on the environment. It will form a vital transport link in north Auckland as more people live, work and grow up in Silverdale, Whangaparāoa and the Hibiscus Coast.

The scope of Penlink has been confirmed through the Establishment Report and baseline assessment and proposes a two-lane tolled road. Overall, Penlink enables economic growth to continue in north Auckland, irrespective of tolling. Both a tolled and untolled Penlink align with the project objectives, but tolled offers greater alignment with the GPS, through enabling public transport and improved carbon impacts.

Along with the extension of the Northern Busway to Albany, the new 7km two-lane road and shared walking and cycling path will support connected transport networks in north Auckland. People will enjoy more transport choices and improved travel times between Whangaparāoa and wider Auckland.

While the primary purpose of the proposed toll is to recover operational and maintenance costs, applying a toll also gives the RCA's an ability to manage travel times and operating conditions, not only on Penlink but also on the existing routes of Whangaparāoa Road, Hibiscus Coast Highway and part of SH1.

Network management is not about restricting or controlling access to any part of the Hibiscus Coast. In this unique situation, the geography of the Peninsula relative to SH1 means that significant time savings can be had on Penlink, which if unmanaged will be come immediately congested not because of the capacity of the link, but because of the inability to discharge this traffic onto the existing road network.

As demonstrated in the ImBC, the form of the road and level to which it achieves the project objectives is different between the tolled and untolled scenarios. Overall, the tolled scenario is preferred as it provides better outcomes and alignment to wider strategic priorities such as network management, carbon reduction, and in particular, it will enable more reliable public transport journeys in the future.

2. Introduction

2.1 Purpose and Background

The Penlink Implementation Business Case (ImBC) has been prepared to support the procurement and delivery of activities associated with construction of the Penlink project, which forms part of the New Zealand Upgrade Programme (NZUP).

The NZUP includes “multi-billion investment in ten transport projects for Auckland to provide more travel choices, help people get where they’re going safely and support the economy”⁶.

Penlink will be built, operated and maintained by Waka Kotahi as a state highway. It will form a vital connection for north Auckland, linking the Whangaparāoa Peninsula with wider Auckland. The new 7km road will offer greater transport capacity and travel choice and support planned growth in Silverdale, Dairy Flat, Wainui and the Hibiscus Coast.

The two-lane road with a shared use path for people walking and on bikes will also provide surrounding communities more sustainable transport choices by supporting better transport access and providing a safer journey.

As shown in Figure 2, Penlink will create an alternative access route to the Whangaparāoa Peninsula and connect to State Highway 1 (SH1) at Redvale⁷. Penlink will cross over East Coast Road and connect to SH1 with a new interchange, including south facing ramps. The overpass at SH1 will accommodate a separated walking and cycling shared path and will allow for future land development in the Weiti area that aligns with growth plans.

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- Enabling public transport networks to support economic activity by unlocking development potential for north Auckland
- Improved network resilience and access surety in the Weiti area and to the Whangaparāoa Peninsula.

⁶ Auckland package | Waka Kotahi NZ Transport Agency (nzta.govt.nz)

⁷ Auckland Transport, Penlink Detailed Business Case, 2019

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Figure 2 Penlink Overview

2.2 Implementation Business Case Scope

The ImBC has been structured around the Treasury ‘five case’ model and is designed to systematically ascertain that the Penlink investment proposal:

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- Optimises value for money – the ‘economic case’
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Information presented regarding the preferred proponent and commercial arrangements is as current as possible, noting that the ImBC has been developed in parallel with the procurement process.

2.3 Work completed to date

The need for an alternative route to the Hibiscus Coast Highway and for improved access to Whangaparāoa has a long history as summarised in Figure 3 and detailed below. Further details about the previous work completed to date for this project can be found in the Penlink Business Case Addendum in Appendix B.

⁸ DBC: Detailed Business Case

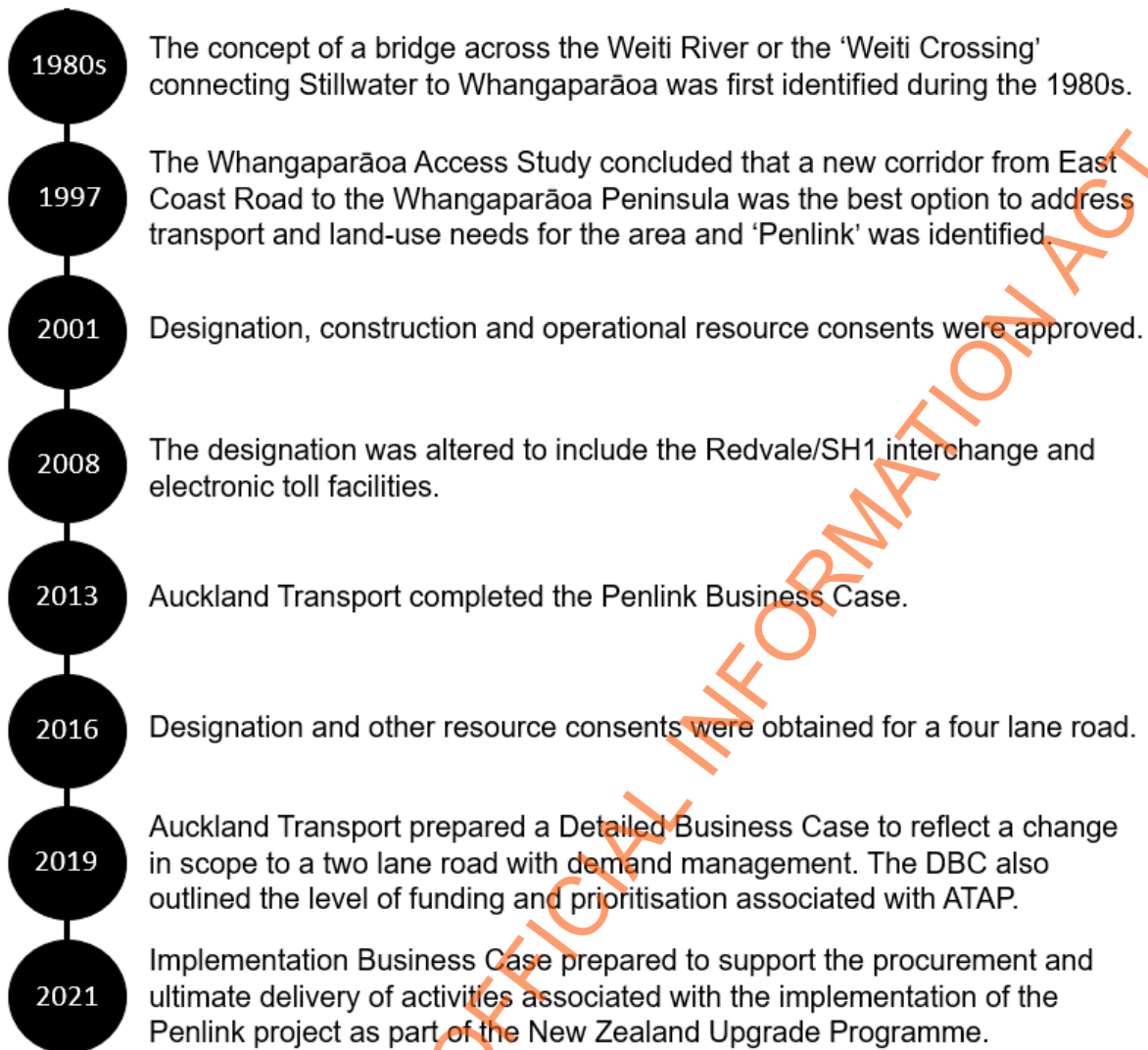


Figure 3 Project Timeline

The concept of a bridge across the Weiti River, or the 'Weiti Crossing', connecting Stillwater to Whangaparāoa was first identified during the 1980's. In 1997, the Whangaparāoa Access Study (prepared for Rodney District Council) concluded that a new access corridor from East Coast Road to the Whangaparāoa Peninsula, Penlink, was identified as the best option to address both transport and land-use needs for the area.

This was followed by scheme design and work to protect the land corridor for Penlink (undertaken over the period 1997 through to 2001). Designation, construction and operational resource consents for a two-lane road were approved in February 2001.

In 2008, the designation was altered to extend Penlink to the Northern Motorway, include the Redvale/SH1 interchange and also electronic toll facilities. The designation allowed for the construction and operation of Penlink and gave the requiring authority the ability to purchase land required for the project, which was undertaken through the 2000s. While the need for the project had been identified, funding constraints delayed the commencement of construction. Land acquisitions were completed in 2007 and various investigations progressed to explore options for tolling revenue for construction/delivery.

In 2013, Auckland Transport completed the Penlink Business Case for Implementation to further progress the project. This updated analysis, using the new land-use growth assumptions of the Auckland Plan at the time, reconfirmed that Penlink was the preferred alternative to address the identified problems and achieve the desired outcomes.

The 2013 business case confirmed that construction of Penlink would avoid the need for further Whangaparāoa Road widening. The business case recommended that Penlink be expanded and proceed as a four-lane arterial road (two lanes in each direction), to cater for the additional usage that was now being projected due to updated growth forecasts once tolling was removed. This was followed by scheme design and work to update the Penlink designation to a four-lane road. Designation and other resource consents were obtained for a four-lane design in 2016.

Following the development of the Auckland Unitary Plan (AUP), Auckland Transport, Waka Kotahi and Auckland Council, jointly developed the Transport for Future Urban Growth (TFUG) Programme Business Case (PBC) in 2016. The aim of the TFUG PBC was to address the transport needs of the future urban growth areas identified within the AUP. This work identified Penlink as one of the critical projects to enable future development in the northern growth area.

The TFUG PBC was subsequently incorporated and progressed through the Auckland Transport Alignment Project (ATAP) into an agreed and funded programme of works for the next decade, the "ATAP Package". The Auckland Regional Land Transport Plan (RLTP) sets out Auckland's transport investments for the next decade (2018 – 2028) and incorporates the ATAP Package. Through this process, Penlink was identified as a high priority, first decade project, required to support Auckland's growth.

In June 2019, Auckland Transport prepared a Detailed Business Case (DBC) that revised the 2013 Business Case for Implementation previously prepared on the basis of a four-lane road being delivered through a Public Private Partnership. It provided an update to address a number of changes in relation to the Penlink project, including a change in scope to a two-lane road based on using tolling for demand management, as well as funding and prioritisation associated with ATAP.

The June 2019 DBC (Appendix C) also considered the ability to bring the project forward from its current planned delivery date. Following this DBC, Penlink was scheduled in the RLTP to commence in 2024/25.

On 29 January 2020, the NZUP was announced by the Prime Minister. The programme is a \$12 billion infrastructure package to improve roads, rail, hospitals and schools around the country with \$8.7 billion allocated for roading upgrades.

The Government's investment in rail and roads seeks to future proof the economy, get New Zealand cities moving, and make roads safer. The transport package provides investment in rail, roads, public transport and walking and cycling infrastructure across New Zealand.

The NZUP is focused on upgrading transport infrastructure in the six main growth areas of Auckland, Waikato, Bay of Plenty, Wellington, Canterbury and Queenstown. Penlink is one of the projects identified for funding by the NZUP. Penlink was reconfirmed as a priority project in the 2021 NZUP Review as a two-lane road with a separated, shared walking and cycling lane adjacent to the new state highway to provide travel choice for those living or visiting the peninsula.

In April 2020, Waka Kotahi appointed Boffa Miskell as Principal Environmental Advisor to support early work on the consent compliance work including freshwater, marine and terrestrial ecology surveys. In December 2020, GHD were appointed as Principal Technical Advisor for the project. GHD were commissioned to develop the Reference Design, Minimum Requirements and assist Waka Kotahi through the procurement phase and during implementation as required.

In April 2021, Waka Kotahi shortlisted two proponents for the project. The proponents shortlisted to proceed to the Request for Proposal phase were:

1. Whanga Huanui: comprising Fletcher, ACCIONA, Beca, and Jacobs
2. Team Penlink: comprising HEB, Fulton Hogan, Aurecon, and Tonkin & Taylor.

The project Request for Proposal phase was opened to the shortlisted proponents in September 2021. Tenders closed at the end of February 2022 and evaluations are taking place during March 2022. The expected date for execution of the alliance agreement is in early June 2022. Construction is expected to take 4.5 years completing the project in late 2026.



Figure 4 Artists Impressions of the Penlink Corridor and Weiti Bridge

3. Strategic Case

As part of defining how the assessment of Penlink would be undertaken, the Minister of Transport confirmed that the strategic case for the project did not need to be revisited. The following section captures the existing information on Penlink and summarises updates through the NZUP programme, reflecting wider improvements and goals, rather than specific changes to Penlink.

3.1 Strategic Context and Investment Objectives

Since the completion of the SH1 Northern Motorway in 1999, the small beach towns of the Hibiscus Coast have experienced rapid growth. In 2018, the Auckland Plan identified a significant proportion of new greenfield growth in north Auckland, which includes large future urban areas in Wainui, Silverdale and Dairy Flat. These future urban areas include residential as well as business and employment growth areas.

In 2019, Auckland Transport and Waka Kotahi released an Indicative Strategic Transport Network to support growth in north Auckland. The network provides the community with:

- Improved access to local destinations
- Reliable access for the movement of people and goods
- Safe and resilient travel choices to encourage a shift to walking, cycling and public transport.

This transport network integrates with Auckland Council's development of a structure plan that identifies the mix and location of industrial land uses in the Silverdale West – Dairy Flat area. The transport network is a 30-year plan for a well-connected system that will deliver safety, accessibility and liveability outcomes in north Auckland. It includes:

- A proposed new rapid transit corridor extending from Albany to Dairy Flat and into Milldale
- Proposed new or improved public transport corridors including bus shoulder lanes from Albany to Silverdale and a high frequency bus route connecting Orewa and Silverdale
- Strategic walking and cycling links, including connections to Penlink's cycling and walking facilities
- Improvements to the Northern Motorway (SH1) including increased capacity and upgraded interchanges at Redvale, Wainui and Silverdale.

Penlink is one of the projects funded by the NZUP, as outlined in the delegations letter from the Minister of Transport. Penlink was reconfirmed as a priority project in the 2021 NZUP Review.

Following a review of the June 2019, the following investment objectives, key performance indicators (KPIs) and measures detailed in Table 6 were agreed⁹. These did not revisit the strategic case but provide measures to help define the project outcomes. It should be noted that although carbon emission reductions are not specifically stated as an investment objective, a reduction of carbon emissions is achieved through reducing travel distances and travel times as well as providing active mode connections and enabling public transport in the future along Penlink.

⁹ Note baseline data provided is based on model outputs only. KPI targets are displayed in Tables 7 – 12 as the tolled and untolled expected performance of Penlink.

Table 6 Investment Objectives

Investment Objectives
1. To reduce traffic volumes through the Silverdale interchange, providing transport capacity for housing developments in Wainui, Stillwater West, Silverdale West, and approved development on the Whangaparāoa Peninsula by 2028
2. Improve transport connections to support economic activity in Dairy Flat and Silverdale by 2028
3. To support improved public transport services between Whangaparāoa-Silverdale, and Whangaparāoa-Albany with more reliable journey times by 2028
4. To provide new and safer facilities for pedestrians and cyclists between Whangaparāoa and SH1 by 2028
5. To provide greater network resilience between Whangaparāoa Road, East Coast Road and/or Northern Motorway by 2028
6. To improve safety outcomes (reduced DSI) for the community by 2028.

The KPIs stated below have specific measures and information provided in Section 5.4 and Section 9.7 of this report as well as in the BC Addendum (Appendix B) such as travel time savings for each of the tolled and untolled options.

Table 7 Key Performance Indicators

Key Performance Indicators	Related Benefits Framework Measure
1.1 Reduced AADT flows through Silverdale interchange by 2028 (on and off ramps)	10.1.8 Traffic - throughput
1.2 Reduced travel times from key locations Whangaparāoa, and Albany to Silverdale interchange by 2028	10.1.9 Travel time
2.1 Reduced average daily freight travel times for key journeys by 2028	10.1.9 Travel time
2.2 Enable development expansion by 2028	6.4 Wider economic benefit (regional economic development)
2.3 Increased employment in Dairy Flat and Silverdale by 2028	6.2 Wider economic benefit (employment impact)
3.1 Reduced average public transport times (minutes per passenger) between Whangaparāoa-Silverdale, and Whangaparāoa-Albany - if buses use Penlink by 2028	10.1.9 Travel time
3.2 Travel time reliability (AM peak variance) on key journeys by 2028	5.1.3 Travel time delay
3.3 Comparative travel times for public transport vs general traffic from Whangaparāoa to Silverdale, and Whangaparāoa to Albany - if buses use Penlink by 2028	5.1.3 Travel time delay
4.1 Increased uptake of cycling between Whangaparāoa and SH1 by 2028	10.1.8 People – throughput (UCP)
4.2 Increased uptake of walking between Whangaparāoa and SH1 by 2028	10.1.1 People – throughput of pedestrians, cyclists and public transport boardings

Key Performance Indicators	Related Benefits Framework Measure
4.3 Improved health benefits from increased active mode uptake by 2028	10.1.8 People – throughput (UCP)
5.1 Improved lane availability between Whangaparāoa Road and East Coast Road and/or Northern Motorway by 2028	N/A
5.2 Improved alternate routes (note there is no current alternate route) between Whangaparāoa Road, East Coast Road and/or Northern Motorway by 2028	4.1.2 Level of service and risk
6.1 Reduced harm (DSi's) for all users by 2028 in line with Road to Zero targets by 2024-28.	1.1.3 Deaths and serious injuries

3.2 Key Government Directives and Policy Alignment

A high-quality transport system is crucial to supporting and improving wellbeing. To help the government and the transport sector take a strategic approach, the Ministry of Transport has developed the Transport Outcomes Framework, which sets a purpose for the transport system centred around the wellbeing of New Zealanders and the liveability of places. It outlines five outcome areas: inclusive access, healthy and safe people, economic prosperity, environmental sustainability, and resilience and security as shown below.

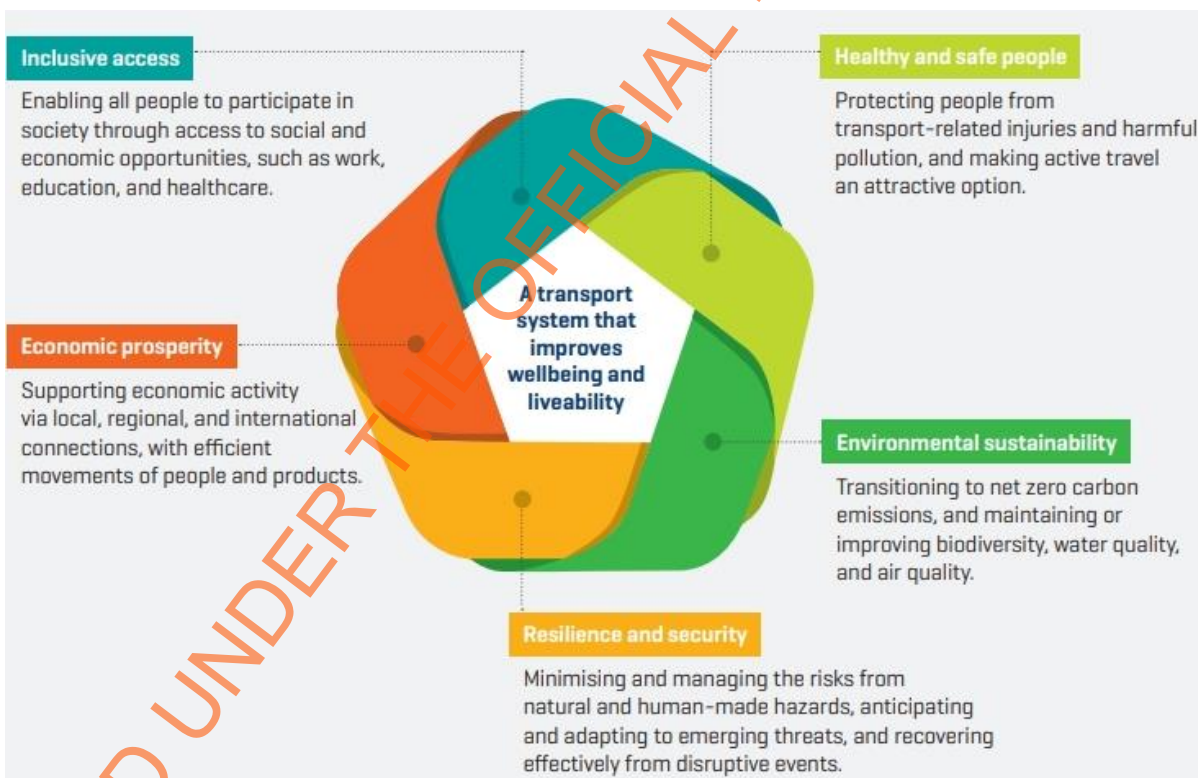


Figure 5 Ministry of Transport Outcomes Framework

The GPS 21/22 provides an overview and guidance to strategic and investment decisions in the land transport system. These were considered against the project specific objectives as part of our initial planning work, see Figure 7 below for alignment between the Penlink Investment Objectives and the Strategic Priorities as outlined in Figure 6 below. The project objectives align with the GPS strategic priorities but does not include a specific objective related to climate change.

Throughout this report, references to CO₂ reductions have been made to help demonstrate alignment with the GPS direction. A separate Climate Implications of Policy Assessment (CIPA) report has been prepared for all NZUP projects, including Penlink (as provided at Appendix P), to provide programme wide alignment with the GPS. The GPS sets out four strategic priorities as shown in Figure 6.

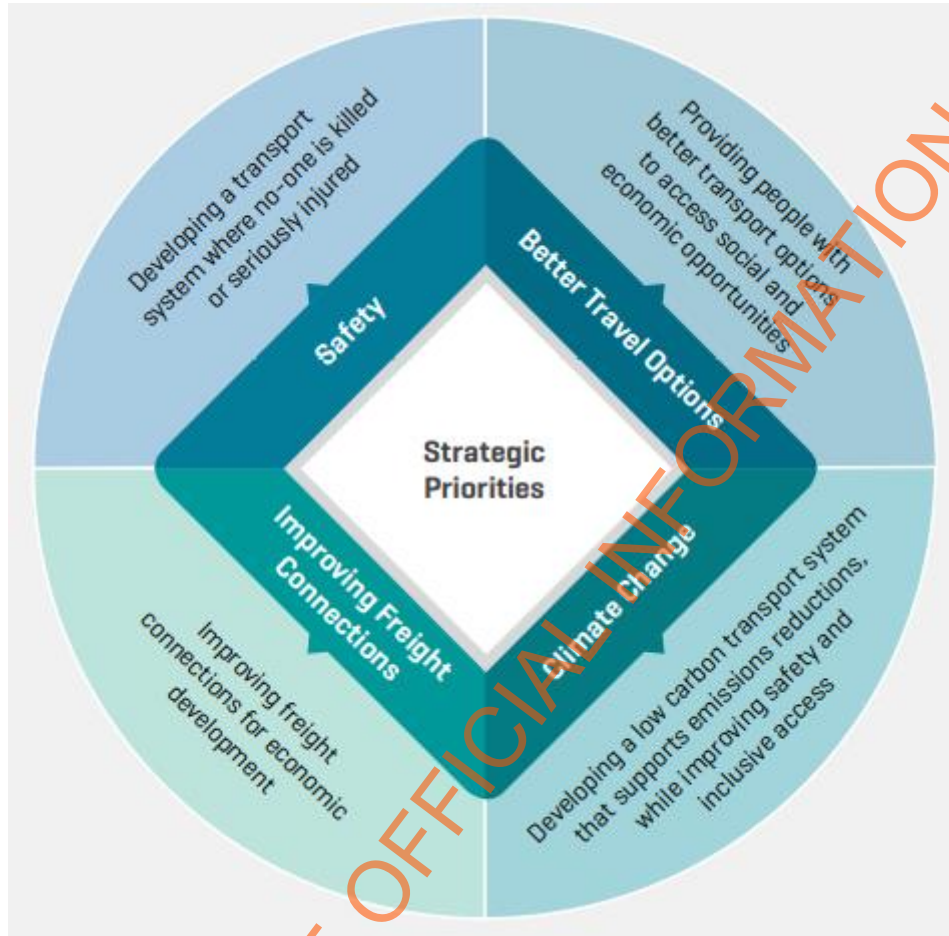


Figure 6 Government Policy Statement Strategic Priorities

3.3 Review the Case for Change

The GPS Strategic Priorities and MoT Outcomes Framework were used to reconfirm the Penlink problem statements, benefits and investment objectives developed in 2020 align with government priorities. The Investment Logic Map (ILM) for this project is provided below and this includes an overview of how the project aligns with the GPS Strategic Priorities.

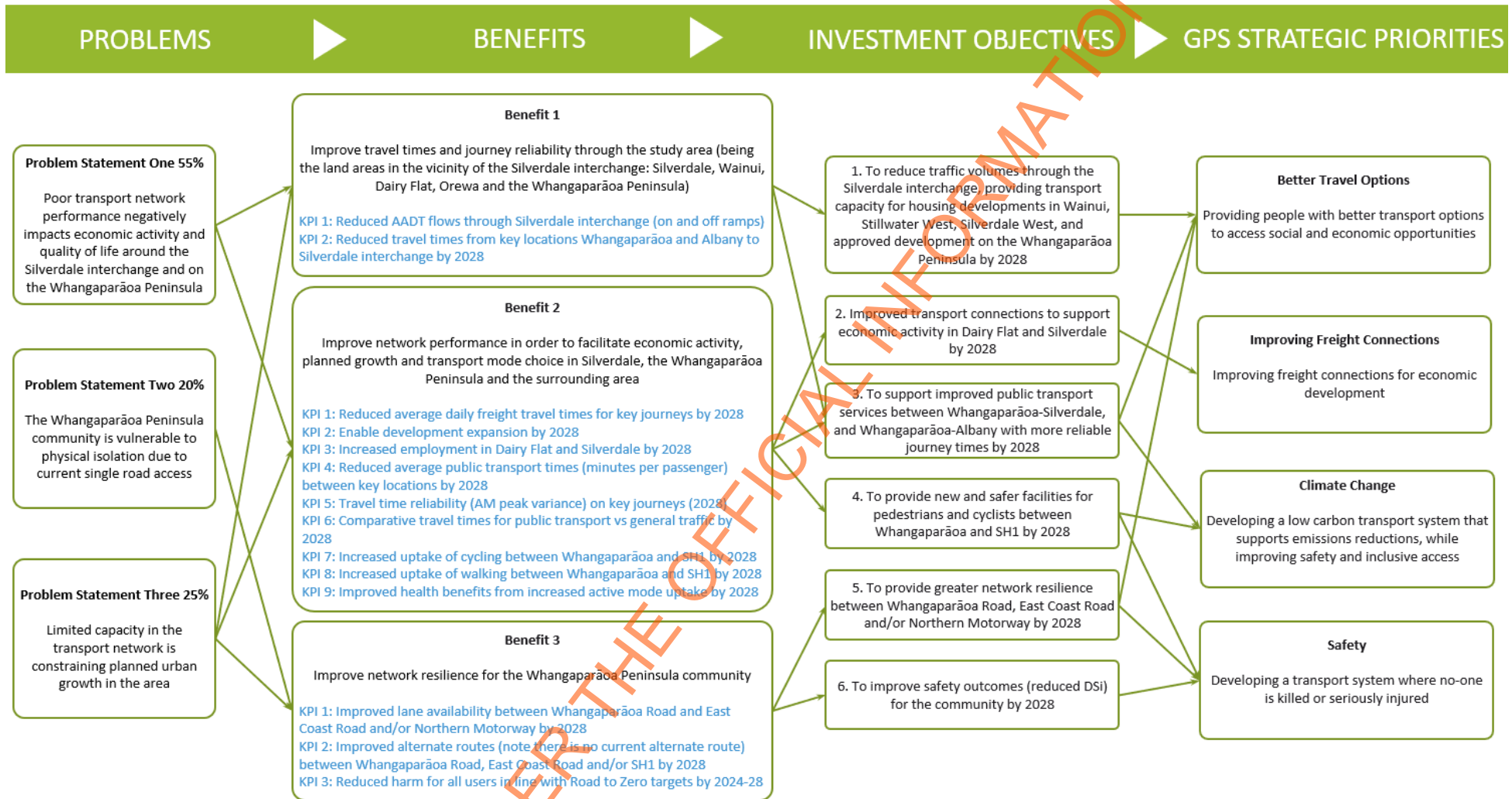


Figure 7 Investment Logic Map

3.4 Problem Definition

The problem and benefit statements from the Penlink DBC 2019 were used to develop problem statements specific to the study area. The idea of a connection across the Weiti river, connecting Whangaparāoa to the wider state highway network has been planned since the 1990s. The issues that were used to inform the early stages of project development were developed over time and remain relevant in the latest consideration of this project.

Problem Statements

The problem statements are shown in Table 8 **Error! Reference source not found.** The Investment Logic Map (ILM), for this project is provided above.

Table 8 Penlink Problem Statements

Problem	Description
Problem One	Poor transport network performance negatively impacts economic activity and quality of life around the Silverdale interchange and on the Whangaparāoa Peninsula.
Problem Two	The Whangaparāoa Peninsula community is vulnerable to physical isolation due to current single road access.
Problem Three	Limited capacity in the transport network is constraining planned urban growth in the area.

Problem Statement One

Poor transport network performance negatively impacts economic activity and quality of life around the Silverdale interchange and on the Whangaparāoa Peninsula – 55%

The Silverdale interchange, Whangaparāoa Peninsula and Hibiscus Coast Highway are all currently subject to regular congestion, particularly during weekday peak periods. In AM peak periods travel times are 38.4 minutes between Whangaparāoa and Albany (2018). The travel time between these two key locations is expected to increase to 40.5 minutes by 2028 without intervention. More severe congestion is experienced when incidents occur. Access between the eastern end of the peninsula and the western end is currently poor, as Whangaparāoa Road is largely a single lane road (50kph) with between 25,000 to 27,000 vehicles per day (7-day ADT) using the route.

In order to travel south from the Whangaparāoa Peninsula (for example to the centres of Albany, Takapuna and the Auckland city centre), traffic must travel along the Hibiscus Coast Highway to the Silverdale interchange (connecting onto SH1). Recent growth occurring in and around Silverdale has resulted in significant congestion being experienced on this section of the network, as evidenced by the high volume of vehicles passing through the interchange (34,900 vehicles in 2018).

With further planned growth in Silverdale, including the Dairy Flat Business Area, it is expected that there will be increased travel demand and delays at the Silverdale interchange and along the Hibiscus Coast Highway. This will result in further congestion at the Silverdale interchange and on both Whangaparāoa Road and Hibiscus Coast Highway corridors. With increasing regularity, queues are impacting on the SH1 corridor at Silverdale, particularly during the evening commuter peak.

For businesses, congestion and delays result in additional costs, through inefficient use of resources. Costs associated with locating a business in an area subject to such congestion are deterrents to business growth, creating lost economic opportunities. Whangaparāoa

Road is a congested route with significant volumes of traffic, which results in safety issues for vehicle users, as well as cyclists and pedestrians.

Problem Statement Two

The Whangaparāoa Peninsula community is vulnerable to physical isolation due to current single road access – 20%

The existing transport connections for residents and businesses on the Whangaparāoa Peninsula are reliant on Whangaparāoa Road and the connection to the Hibiscus Coast Highway from the Silverdale Interchange. In the event of an emergency that causes closure or disruption to Whangaparāoa Road or the Hibiscus Coast Highway, there are limited alternatives for land-based connectivity (means of entry or egress from Whangaparāoa). When considered with the existing congestion on this corridor, the residents and businesses of the Peninsula risk 'severance', effectively being isolated from the rest of Auckland.

Given the capacity limitations of Whangaparāoa Road, there is also limited capacity to accommodate public transport, walking and cycling facilities resulting in reduced mode choices for residents on the Whangaparāoa Peninsula, particularly for vulnerable users (who often have more limited access to private motor vehicles).

The Hibiscus Coast Highway also provides a key access into Silverdale North. A new access to Grand Drive to the north was opened in 1999, and a new motorway connection to SH1 at Wainui Road was opened in 2015. However, even with those additional access points, the Hibiscus Coast Highway remains a key entry point to Silverdale and surrounds.

Problem Statement Three

Limited capacity in the transport network is constraining planned urban growth in the area – 25%

There are a number of areas in and around Silverdale and the wider Hibiscus Coast that have been identified for future growth over the last decade.

Historically, the former Rodney District Council (RDC) has facilitated new urban growth areas in Silverdale North and Silverdale South. More recently, the opportunity for this growth area to be expanded to the areas of Wainui and Dairy Flat has been confirmed in the Auckland Plan, as a key element of the City's overall plan for growth.

There are currently three main traffic capacity constraints to enabling the identified growth:

- The Silverdale interchange
- The turning conflicts at intersections along the Hibiscus Coast Highway (such as the right turns at the Whangaparāoa and East Coast Road intersections)
- The single-lane sections of Whangaparāoa Road (especially west of the Whangaparāoa town centre).

During peak periods (and especially the evening peak), these combined constraints result in variable queuing that regularly extends back through the Silverdale interchange and for some distance on the SH1 main carriageway. These queues and congestion are expected to become more severe and frequent as a result of ongoing growth.

Benefit Statements

The benefits of the Penlink project are summarised in Table 9. These have been developed through previous Business Cases and have been updated through the Business Case Addendum process to reflect current policies and objectives and to incorporate the requirements of the Monetised and Non-monetised Benefits Manual.

Table 9 Penlink Benefits

Benefit	Description
Benefit One	Improve travel times and journey reliability through the study area (being the land areas in the vicinity of the Silverdale interchange: Silverdale, Wainui, Dairy Flat, Orewa and the Whangaparāoa Peninsula)
Benefit Two	Improve network performance in order to facilitate economic activity, planned growth and transport mode choice in Silverdale, the Whangaparāoa Peninsula and the surrounding area
Benefit Three	Improve network resilience for the Whangaparāoa Peninsula community.

In addition to the investment objectives, Key Performance Indicators (KPIs) and measures outlined above, there are a number of wider benefits that are expected from the investment in Penlink including:

- Supporting provision of housing within planned future urban development areas
- Supporting jobs and employment opportunities across the northern area of Auckland
- Comparative travel times for public transport users compared with general traffic
- Increased walking and cycling on high quality, separated, connected routes, especially as the local active mode network develops around Penlink.

The relationship between transport infrastructure requirements and the ability to deliver planned growth has been recognised by Auckland Council. The Auckland Plan recognises Penlink as a key enabling infrastructure project and future element of the strategic road network.

Penlink provides an opportunity to support these growth plans, by providing a more direct route for traffic to the Whangaparāoa peninsular than through the Silverdale interchange. This increases the ability of the network to accommodate the increased traffic that is expected as part of the future commercial and residential growth areas.

The preferred design of the Penlink Redvale/SH1 interchange also provides an opportunity for a connection between Dairy Flat (to the west), which would improve connections to existing and planned future transport infrastructure.

It is important to recognise that Penlink is not primarily to cater for growth along, or at the end of the route, although this will occur. The primary intention is to improve access to growth areas identified in the Auckland Unitary Plan by removing traffic from further north of Penlink.

3.5 New Zealand Upgrade Programme Objectives

The project is also seeking to achieve broader Key Result Area (KRA) outcomes as part of the NZUP programme that reflect improvements in processes and delivery on our values. These are not related to the project specific objectives but are strongly related to the Alliance direction and the philosophies to be taken forward into the future. These KRA areas have been specifically considered and addressed by each proponent. The KRA areas are:

1. Zero harm
2. Customer at the heart
3. Best value solutions
4. Enduring iwi partnership and stakeholder relationships
5. Sustainability
6. Living our project values and behaviours.

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4. Economic Case

This section provides an update to the economic case completed in the 2019 Business Case and is outlined in the BC Addendum (Appendix C) as per the direction of the Delegation's letter. High level optioneering is excluded from this ImBC as the decision on scope has already been made by Government. The NZUP establishment report and announcement specifies the core scope as a new 7km two-lane tolled road linking Whangaparāoa Peninsula to the SH1.

4.1 Option Development and Assessment

The Penlink project has a long history that pre-dates the Business Case approach. However, as summarised below, the project has undergone several iterations of option development that considered a range of alternative design options to best address the problems identified and realise the benefits.

The 1997 Whangaparāoa Access Study concluded that a direct connection from SH1 to Whangaparāoa, 'Penlink', was the best option to address both transport and land-use needs of the area. This was followed by scheme design for a two-lane arterial road (one lane in each direction), and work to protect the land corridor for Penlink. Designation, construction and operational resource consents were obtained in February 2001. In 2013 Auckland Transport completed the Business Case for Implementation to consider a number of additional options to the existing two-lane Penlink option, including:

- Do nothing
- Improved bus and ferry provision
- Widening Whangaparāoa Road
- Improvements to the Hibiscus Coast Highway
- A range of two-lane and four-lane options for Penlink.

The business case was followed by scheme design and further work to update the Penlink designation to a four-lane arterial road (two lanes in each direction based on capacity required once tolls were removed). Designation and the other necessary resource consents were obtained in 2016.

In 2016, as part of the Transport for Future Urban Growth (TFUG) Programme Business Case, updated transport modelling of Penlink was undertaken to reflect the planned future urban zones in the Auckland Unitary Plan and the wider TFUG transport improvements. This analysis showed that greater value for money could be achieved by constructing a two-lane road and utilising tolling to manage demand to acceptable levels.

As noted in the tolling sections of this report, tolling cannot be applied for the specific purpose of demand management, although moderating and balancing travel times across a network is a consequence of applying a toll.

The consented design was refined during 2021 as part of the Minimum Requirements and Reference Design developed to assist with the Hybrid Alliance procurement documentation. This refinement was based on the two-lane tolled option. Both the horizontal and vertical alignment were refined, and the main alignment seeks to follow existing site topography to optimise (reduce where practicable) earthworks volumes and footprint.

The Reference Design update also focused on reducing the size of retaining structures along the main alignment. The Reference Design Report is attached as Appendix D. Overall

retaining wall heights along the alignment have been reduced significantly from the consented design and will be refined further through the detailed design process.

Following on from the Reference Design and as part of the Hybrid Alliance procurement process, each proponent has explored opportunities to optimise the design within established Minimum Requirements. They have each sought departures to the Minimum Requirements to enable a design solution within the established Affordability Threshold (being the Proponent's Limb 1 and Limb 2 costs for the PAA phase).

Once the preferred proponent has been identified, pre-award discussions will be held and any changes to the Minimum Requirements agreed. The PAA will be awarded based on the proponent's offer and outcome from the pre-award discussions. Post award, there is an opportunity to share the unsuccessful proponents Preliminary Concept Design including any innovative solutions for assessment for adoption by the Alliance.

Each proponent has developed a design solution that affects the Minimum Requirements differently. Hence, at this stage it is not possible to identify the specific changes to the Minimum Requirements that will ultimately be adopted.

A Departures Review Committee consisting of Waka Kotahi's Chief Engineer and senior experienced managers have assessed each proposed departure. Only those departures that have not affected scope and outcomes (e.g., safety) of the project have been accepted.

Under the Hybrid Alliance delivery model, an Affordability Threshold is set at a level to drive a value for money outcome. Proponents are required to present a Proposal that meets the Minimum Requirements within the Affordability Threshold.

There is no opportunity to provide a price proposal that is less than the Affordability Threshold. Instead, proponents are encouraged to offer a higher quality proposal for the set threshold.

4.2 Penlink Scope of Works

The Road Connection

The Penlink main alignment connection with SH1 Northern Motorway comprises direct south facing ramp connections with a new overbridge for the Penlink main alignment over SH1. The interchange has been located to not preclude integration with growth plans for Dairy Flat, or to preclude north facing ramps to be added in the future. An overall layout diagram (including proposed tolling points) is provided below.



Figure 8 Map of Proposed Penlink Tolling Points

The ramp terminal for the SH1 Northbound off-ramp to Penlink comprises a single lane connection to the Penlink main alignment, to provide a transition from high speed motorway operating conditions. The SH1 southbound on-ramp comprises a left turn entry to the on-ramp. The southbound on-ramp provides for ramp metering infrastructure, with two general traffic lanes and a bypass lane giving priority to public transport and high occupancy vehicles. The south facing ramps have been designed so that they can be accommodated within Penlink and SH1 designations.

The Penlink main alignment connection with East Coast Road comprises the following:

- Overbridge with the Penlink main alignment going over East Coast Road
- Single Lane Roundabout connection to Penlink main alignment, connecting to East Coast Road. The roundabout incorporates a tear drop configuration that prevents a direct connection from East Coast Road to State Highway 1 (either southbound or northbound unless the tear drop is removed in the future).
- Connection to East Coast road is via the existing at-grade T-intersection.

The Link Road 1 connection comprises the following:

- Overbridge with the Proposed Link Road 1 going over the Penlink main alignment
- Non-signalised at-grade T-intersections between Link Road 1 and connection roads
- Non-signalised at-grade left turn-in from and left turn-out to Penlink main alignment in the east and westbound directions with allowances for requisite deceleration and acceleration lanes
- Consideration of future connections of Link Road 1 to developments north and south of the Penlink main alignment.

The Link Road 2 connection comprises the following:

- Overbridge with the Proposed Link Road 2 going over the Penlink main alignment
- Non-signalised at-grade T-intersections between Link Road 2 and connection roads
- Non-signalised at-grade left turn-in and left turn-out to Penlink main alignment in the east and westbound directions with allowances for deceleration and acceleration lanes
- Consideration of a future connection of Link Road 2 to a development north of the Penlink main alignment
- Connection of Link Road 2 to Ara Weiti Road to south of the Penlink main alignment provided within the local road designation and Penlink designation.

The Duck Creek Road connection comprises the following:

- Overbridge with Duck Creek Road going over the Penlink main alignment
- Non-signalised at-grade T-intersections between Duck Creek Road and connection roads
- Non-signalised at-grade left turn-in from and left turn-out to Penlink main alignment in the east and westbound directions with allowances for requisite deceleration and acceleration lanes.
- Realignment of Duck Creek Road to facilitate appropriate connections being provided within either the local road designation or the Penlink designation.

The eastern tie-in to Whangaparāoa Road is an at-grade signalised cross intersection of the Penlink main alignment, Whangaparāoa Road and Beverley Road. The tie in has been located to allow the works to be provided within either the local road designation or the Penlink designation with work being required outside of the Penlink designation on Beverley

Road, Cedar Terrace and Wiriana Place, as well as to provide accesses to private properties.

It should be noted that the abovementioned access and connections are provided in accordance with the Designation condition 10.1 which states “Safe and efficient two-way access to the Stillwater community (on both sides of the Penlink route) shall be provided, including throughout the construction period.”

Walking and Cycling

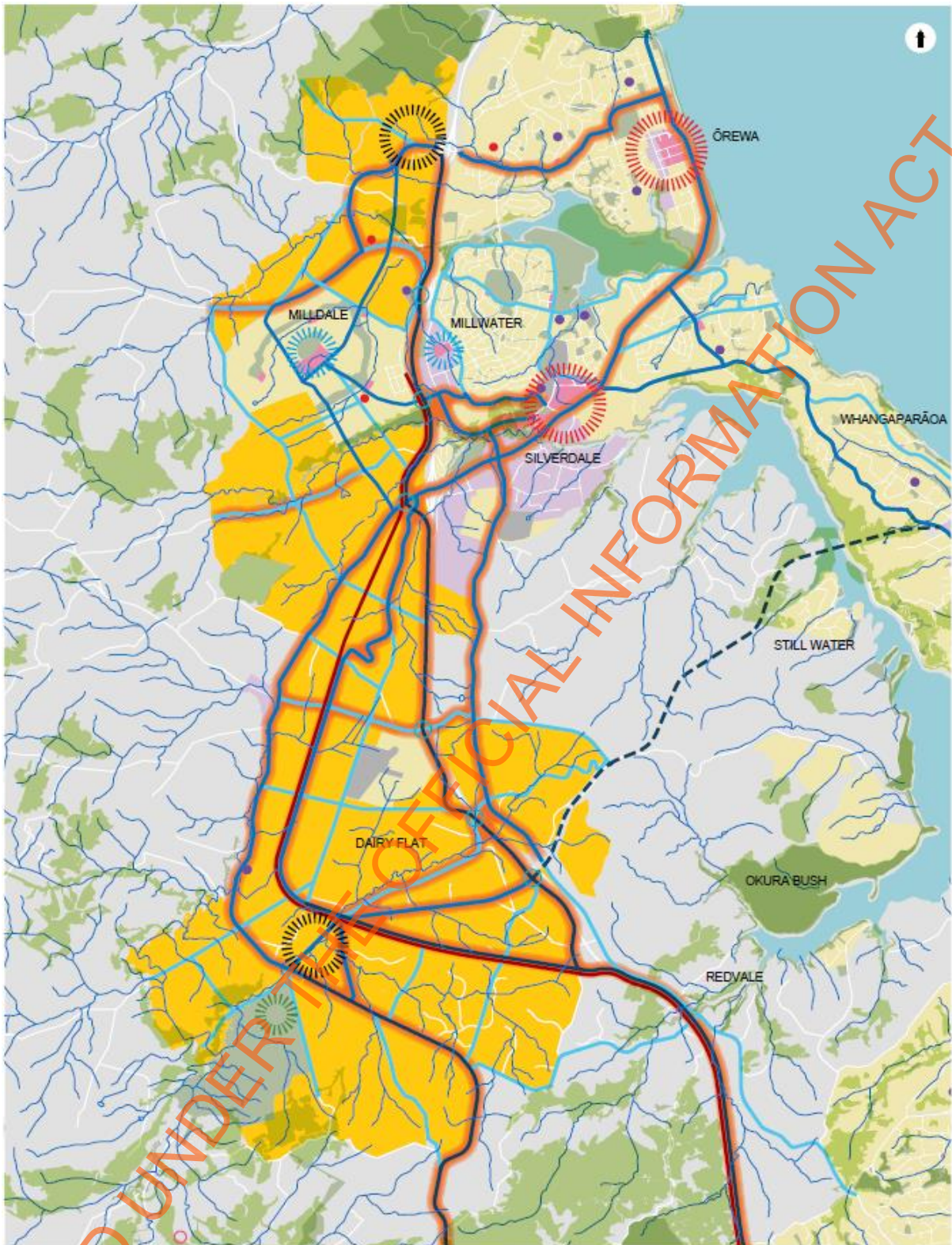
The Penlink project provides additional travel choice from active mode infrastructure, including a Shared User Path (SUP) alongside the Penlink main alignment connecting East Coast Road to Whangaparāoa Road.

SUP connections have been provided to:

- East Coast Road
- Link Road 1
- Link Road 2
- Duck Creek Road
- Penlink, Whangaparāoa Road and Beverley Road Intersection.

The SUP can form the backbone for developing and extending the walking and cycling network, providing long term connections between existing and new growth areas.

At this stage, Auckland Transport has not identified any additional walking and cycling projects that are reliant on Penlink being completed. There are no walking and cycling projects currently proposed for the Peninsula. In the longer-term, it is anticipated that a comprehensive network of walking and cycling facilities will be provided as the wider Dairy Flat area urbanises. An indicative active modes network developed by the Supporting Growth Alliance is shown below.



LEGEND

- Schools (Existing / Proposed)
- Rapid Transit Network
- Regional Network Connection
- Primary Network Connection
- Secondary Network Connection
- Pen Link Connection (Non SGA)
- Town / Metro Centre
- Local Centre
- Indicative Future Local / Town Centre (tbc)
- Future Regional Park
- AUP Employment Zones
- AUP Residential Zones
- AUP Future Urban Zones
- AUP Open Space Zones
- AUP Special purpose zone
- AUP Centres

0 1 2
Kilometres

Figure 9 Supporting Growth – North Cycle Network (draft June 2020)

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Structures

There are a total of six bridges included in the scope, as follows:

- State Highway 1 Northern Motorway Underpass – single span over SH1
- East Coast Road Underpass – single span over East Coast Road
- Link Road 1 Overpass – single span over the Penlink main alignment
- Link Road 2 Overpass – single span over the Penlink main alignment
- Duck Creek Road Overpass – a structure over the Penlink main alignment
- Weiti Crossing – a multi-span bridge over the Weiti River.

Future Proofing

The Penlink RFP included the requirement to develop the design and deliver the physical works in such a manner that future proofing requirements are met. There are several specific future proofing opportunities that Waka Kotahi has requested the Proponents to consider including in their proposals. Specifically:

- Waka Kotahi has made no provision for either an assessment of, or future proofing for, a possible bus interchange in the Affordability Threshold. Waka Kotahi is working closely with Auckland Transport as they develop the DBC over the next few months. A preferred station location has been identified inside the designation, but no funding is currently available for the bus station.
- The Proponent's design would be developed and ultimately constructed so as to 'not preclude' the preferred bus station location.
- Waka Kotahi has made no provision for bus shoulder running in the Minimum Requirements or Affordability Threshold.
- Waka Kotahi has requested the Proponents assess if they are able to provide an earthworks formation sufficiently wide enough to allow the future provision of bus shoulder running within their proposals.
- Waka Kotahi has included an allowance within the Affordability Threshold to undertake future proofing design and associated works as necessary for the provision of a watermain and a wastewater rising main crossing the Weiti River.

An appropriate level of design and associated cost estimate has not been prepared for a 2 lane non-futureproofed corridor and therefore the additional costs to upgrade to the futureproofed (4 lanes with bus priority) option are not available. Failure to implement the future proofing requirements from the outset will result in a higher whole of life cost when additional capacity to accommodate bus priority and lanes along the corridor is retrofitted in future years. This increased cost is a result of a need to widening the corridor and build new structures. There may be a need to essentially rebuild the bulk earth works as a re-designed 2 lane non-futureproofed corridor would require less earthworks and supporting infrastructure.

A re-designed narrower, or non-futureproofed corridor when being upgraded in the future would be such a significant undertaking that it is likely that the corridor or parts of it would need to be essentially closed while the upgrade occurs which would result in significant economic cost and disruption to the communities that it serves.

There could also be additional challenges around consenting, funding availability, additional consultation costs and the need to procure the works in the future.

The future proofing opportunities have been maximised within the agreed affordability threshold funding allocation and form the minimum requirements that have been provided to the proponents.

5. Tolling Penlink

The scope of Penlink was confirmed through the Establishment Report and Baseline assessment. This was for a two-lane tolled road. This section outlines work to refine the analysis on this basis and also consider the implications of not tolling, as the tolling decision is ultimately made by the Minister.

Overall, providing Penlink is a significant benefit to allow economic growth to continue in north Auckland, irrespective of tolling. Tolling is preferred however as it has advantages in terms of network management, increased carbon savings and improved PT services.

5.1 Tolling Locations

Tolling has been long associated with the ability to construct Penlink in a timely manner. With NZUP funding now covering construction costs, tolling is proposed to cover operations and maintenance costs plus the cost of installing the tolling system.

A separate Tolling Report provides more detail on the statutory tolling requirements and consultation outcomes. Overall, 37% approval or qualified approval by respondents was obtained for Penlink. A number of pricing and toll recording points were examined through a toll modelling report carried out by Beca (Appendix E). This has formed the basis for the analysis, but has been updated to reflect:

- A more detailed assessment of maintenance costs
- Operation revenue based on a cost per trip rather than a cost per gantry. This effectively means more of the toll collected can be used for maintenance purposes.
- Increased cost escalation (6% in Year 1, 4% in Year 2, 3% in Year 3 dropping to 2% in future years).

Based on the analysis in the tolling report, the two scenarios preferred (assuming tolling is applied) were a three point and two point toll collection system. The three point system would include toll points at:

- Separate ground mounted cameras at each of the SH1 off and on-ramps. This location is referred to as "R1" in the tolling report
- Separate ground mounted cameras at each of the west facing off and on-ramps to Duck Creek Road (Stillwater). This location is referred to as "Rs" in the tolling report
- A bi-directional full gantry between Duck Creek Road and Whangaparāoa Road. This location is "A"

These locations were chosen to provide fair and equitable tolls for road users along the length of the project. These are shown below.



Figure 10 Penlink Consultation Tolling Options

The two point system would include toll facilities only at R1 and A and is preferred. There are a number of reasons to prefer this scenario including;

- Low volumes at Rs mean the toll revenue is only around 10% of the capital cost of installation (\$9m). This does not represent a reasonable return on capital investment and would be inefficient.
- Most of the traffic from Stillwater towards the west would access SH1, so will pay tolls as R1. They will not be toll exempt but will pay a toll proportionate to the time saved. The benefit for Stillwater traffic is in the order of 2-3 minutes to SH1, whereas savings from Whangaparāoa traffic in the morning peak is around 20 minutes.

5.2 Restrictions on Tolling Locations

One of the key aspects when considering the initial tolling infrastructure layout is the requirement to provide a free alternate route to the tolled road.

For Whangaparāoa and Stillwater, these connections are via existing roads, Whangaparāoa Road and Duck Creek Road.

There is another existing development south-west of Stillwater, known as Weiti Bay. The developers of Weiti Bay, along with some adjoining properties agreed with Auckland Transport to build their access road from East Coast Road on the proposed Penlink alignment. This road is known as Ara Weiti Road.

This agreement between the developers and Auckland transport was conditional upon a toll-free access being provided between this development (and other properties along this access road) and East Coast Road. Irrespective of the enforceability of these agreements, under current legislation the development still requires a toll-free alternative route to the proposed toll road. As the access road is built on the Penlink alignment and will be utilised as part of Penlink (if possible), no other access road currently exists. Hence the section of Penlink between Link Road 2 (Ara Weiti Road) and the East Coast Road access roundabout cannot be tolled at this time.

Legal opinion has been provided to consider if using part of Penlink as a toll free road for some users, while other users pay a toll, meets the requirements for a toll free alternative. The legal advice is that it does meet this requirement.

It is noted that in the future, if as part of development of this area another local connection is built that links Link Road 2 to East Coast Road, then the toll locations could be revisited. Legislation allows tolling points to change in the future on an existing toll road.

5.3 Consultation Feedback

From 17 January to 13 February 2022, Waka Kotahi sought public feedback on its proposal to toll the new Penlink transport connection to offset the costs of maintaining and operating the two-lane transport connection and separated walking and cycling shared path.

The tolling proposal included different toll prices for peak and off-peak hours, to help people make choices about the time they travel and therefore the toll rate they pay. People can still access free, safe alternative routes if they do not want to pay the toll.

Consultation was carried out on the three point toll scheme, which was preferred at that time. Engagement was positive and 3,337 submissions we received from the public and a range of key stakeholders. This is reflective of a highly engaged community. The feedback told us:

- 37% (1,235 people) of respondents support tolling Penlink
- 20.5% (686 people) support tolling Penlink as proposed
- 16.5% (551 people) support tolling, with some changes to the proposal.
- 60% (2,002 people) of respondents think costs for maintenance and operations should be met in other ways
- 42% (1,401 people) told us they do not support tolling Penlink
- 18% (600 people) don't think that tolling is a tool that should be used on the road network
- 3% of respondents (100 people) were unsure about the proposal, or their sentiment couldn't be gauged.

People who support or do not support the tolling proposal shared similar suggestions in their feedback as summarised below.

Table 10 Tolling Consultation Feedback

Theme	Summary
59% of responses came from people who live along/near the Penlink route.	1087 people will use the road to get to work 1068 will use it for recreation 393 will use the shared path to walk or bike along Penlink
11.2% (391 people) believe the road should be built with 3-4 lanes rather than two, to future-proof the road.	161 people would support the toll as proposed if Penlink were built as 3-4 lanes 72 people believe extra lanes would manage current demand due to development on the peninsula 11 people suggested the extra lanes should be specifically for public transit 41 people overall believe there should be a dedicated public transit lane on Penlink
5.75% (192 people) thought the tolls outlined in the proposal should be cheaper.	
4.2% (140 people) stated they believe that there is no viable alternative route out of the peninsula, making Penlink an essential road for local people,	52 people suggested increasing or improving public transport in the area. 33 people believe tolling may encourage people to use public transport rather than private vehicles

Many suggestions were made by respondents about what kind of tolling they would support. 16.5% of all submissions (551 responses) expressed conditional support if changes were made that include:

- Lower and/or flat toll prices
- Fewer tolling points
- Peak and off-peak toll prices changes
- Concession rates for residents and frequent users of Penlink.

The recent Puhoi to Warkworth tolling consultation was commonly referenced in submissions due to its geographical proximity to the Penlink project. Waka Kotahi received more than

double the feedback of that consultation where there was strong community opposition, with 80 per cent of the affected community opposing a toll.

5.4 Network Management

While the primary purpose of the proposed toll is to recover operational and maintenance costs, applying a toll also gives the RCA's an ability to manage travel times and operating conditions, not only on Penlink but also on the existing routes of Whangaparāoa Road, Hibiscus Coast Highway and part of SH1.

Network management is not about restricting or controlling access to any part of the Hibiscus Coast. In this unique situation, the geography of the Peninsula relative to SH1 means that significant time savings can be had on Penlink, which if unmanaged will be come immediately congested not because of the capacity of the link, but because of the inability to discharge this traffic onto the existing road network.

Applying a toll in any situation has a demand response as people decide if they wish to pay a toll or not. While a secondary outcome, balancing flows across new and existing networks produces better overall operating conditions for both roads. The economic analysis shows that at a macro level, overall travel times across the network are similar in the tolled and untolled scenarios. At a micro level however, the travel time impact on the main roads is clearer, as highlighted in the table below.

Table 11 Toll Versus Untolled Comparison

Location	AM peak travel time range	Traffic volume (total)	PM peak travel time range	Traffic volume (total)
2028 existing route (Whangaparāoa Road, Hibiscus Coast Highway, SH1) no Penlink	21.4 – 24.4 mins	7619 (Average)*	21.6 – 31.7 mins	8624 (Average)*
2028 Penlink no toll	6.6 – 10.0 mins	3443	5.9 – 13.1 mins	4083
2028 existing route (Whangaparāoa Road, Hibiscus Coast Highway, SH1) no toll	20.1 – 24.5 mins	5288 (Average)	19.8 – 26.3 mins	6485 (Average)
2028 Penlink tolled	5.8 – 6.2 mins	1931	5.5 – 6.7 mins	2295
2028 existing route (Whangaparāoa Road, Hibiscus Coast Highway, SH1) Penlink tolled	19.9 – 23.4 mins	6197 (Average)	20.3 – 26.2 mins	7357 (Average)

* Volumes on individual roads will vary across time periods due to wider network response

What this table demonstrates is:

- Not tolling Penlink minimises traffic volumes on the existing route, but both tolled and untolled scenarios result in good travel time benefits.
- Once an alternative route is in place, capacity on the existing route (particularly during the evening peak period) is not a determinate for travel times.
- Tolling Penlink results in lower average travel times on the new link, without increasing travel times on the existing route.

- Overall travel time management of traffic on key roads in the Hibiscus Coast area is improved with a toll in place.

One other key point to consider with tolling is that the ability to make these network improvements can only be undertaken as the road is constructed, as current law prevents tolling being applied to existing roads. It is always possible to remove the toll in the future, but it is not possible to put it on, should it be required.

5.5 Revenue/Cost Balance

One of the fundamental requirements for a tolling scheme is that it does not make a profit (i.e., have surplus revenue over expenditure). Hence any money collected from tolls should be put back into Penlink.

The Tolling Report provides more detail of the analysis but as a summary, over a 10 year analysis period the revenue and costs expected on Penlink are:

- Two-point tolling scheme net present value revenue 2027 – 2036 inclusive \$49,442,235
- Net present costs over the same period \$46,672,451
- The Internal Rate of Return (IRR) is 6%

This calculation includes repaying the construction cost of the two-point toll infrastructure over ten years. As the first few years have low outgoing costs, the analysis shows that Penlink should self-fund, i.e., would not require additional NLTF funding which would then be repaid (other than the initial installation costs).

5.6 Tolling Summary

There are a number of unique factors in the design and location of Penlink that influence the tolling scenario proposed to be adopted for this project. A summary of the key findings is given below:

- Under current legislation a toll free alternative route must be available for users, which is available for the Whangaparāoa and Stillwater communities using existing roads
- The Weiti Precinct will have no option but to use Penlink between Link Road 2 and East Coast Road; this section of Penlink will not have a toll applied to it initially. This meets the requirements for a toll-free connection
- Current legislation requires revenue from tolling to be used to recover capital (although not in this case as construction is Crown funded), operations and maintenance costs for new roads
- Tolling can be used to recover costs and manage overall network travel times but cannot primarily be used as a demand management tool
- A two point tolling system (R1 and A) provides the best value for money, along with lower initial capital outlay on tolling infrastructure
- A two point tolling system also reflects the consultation feedback and historical inferences that a toll would not be applied to the community at Stillwater. Stillwater residents would still be tolled at SH1.
- Applying a toll is expected to result in better overall travel times on Penlink and the existing road network.

A final decision on approving the ImBC based on tolling will be made by the Minister of Transport in mid-2022 before the Alliance contract is awarded by Waka Kotahi. This will allow sufficient time for design of the corridor and a tolling Order in Council (OIC) to be

approved by Cabinet before opening of the new road. The OIC could take 6 to 12 months to confirm.

5.7 Implications of Not Tolling Penlink

Tolling of Penlink provides a mechanism to recover operations and maintenance costs. There is also a demand response, as people consider if they want to travel, when they want to travel and what route they are prepared to pay for. Traffic modelling shows that not tolling Penlink results in much higher traffic volumes and increased congestion on Penlink unless the design is altered to provide for this increase in traffic. This would likely require changes beyond the end of Penlink, particularly at the SH1 end. Additional information is provided in the Tolling Assessment Technical Memo provided at Appendix R.

There are implications to a number of areas when considering the tolling of Penlink. These include the following:

- Carbon dioxide emissions
- Traffic volumes
- Pedestrian and cycle safety
- Whangaparāoa intersection
- SH1 on/off ramp queuing
- Public transport
- Induced demand
- Penlink Project Objectives
- Lack of balance – travel times and congestion
- One Network Framework – Weiti Bridge and grade separated local interchanges
- Reduced reliability
- Bus shoulders
- Crash risk
- Additional infrastructure costs.

Carbon Dioxide Emissions

Impacts of CO₂ emissions are considered in Section 6.5 of the Penlink Toll Modelling report prepared by Beca (Appendix E).

Emissions have been estimated using the Vehicle Emissions Prediction Model (VEPM version 6.1). This assessment captures changes in traffic volumes in sensitive environments including Whangaparāoa Road, Hibiscus Coast Highway, Silverdale Ramps at SH1, SH1 at Silverdale, SH1 at Penlink, Dairy Flat Highway, East Coast Road, Spur Road, Penlink Ramps at SH1 and Penlink.

The untolled Penlink option produces an initial CO₂ savings of around 1000 tonnes per year. Compared to the untolled option, tolling Penlink produces the following additional savings in the initial and future years:

- 6,000 tonnes/year CO₂ in 2028 modelled year
- 2,500 tonnes/year CO₂ in 2038 modelled year
- 1,250 tonnes/year CO₂ in 2048 modelled year.

Modelling assumes that due to fleet changes such as an increase in electric vehicle fleet share and increased efficiencies of internal combustion engines, the differential impact

reduces over time. As a result, the expected impact of not tolling Penlink would be increased emissions as compared with a tolled solution.

Traffic Volumes

The modelled 2028 volumes of the two scenarios (tolled and untolled) are shown in Table 12. The implications of not tolling are further summarised in the Beca Traffic Modelling report (Appendix F).

Table 12 Modelled 2028 Traffic Volumes

Location	Daily Traffic Volumes – Tolled	Daily Traffic Volumes – Non-Tolled	Change	% Change
Penlink	18,100	25,500	7,400	29%
Hibiscus Coast Highway (between East Coast Road and Silverdale St)	31,900	28,800	-3,100	-10%
Whangaparāoa Road (between Vipond Road and Marellen Dr)	22,300	18,900	-3,400	-18%
SH1 (at Silverdale Ramps)	66,600	61,700	-4,900	-8%

Pedestrian and Cycle Safety

The pedestrian and cycle facilities and demand are largely unaffected by changes in traffic volumes as the shared user path is to be separated from the main carriageway. Crossing roads could become slightly more difficult for active mode travellers, however overall, not tolling Penlink will not have a significant effect on the safety for pedestrians and cyclists.

Whangaparāoa Intersection

The change between the tolled and untolled scenarios is most evident on the local network at the intersection of Penlink and Whangaparāoa Road. The key differentiator is that more capacity is required between Penlink and Whangaparāoa Road, with less through capacity on Whangaparāoa Road north and south.

While the designs of the intersection under tolled and untolled could be quite different, there is sufficient space within the designation to construct a significant intersection, and costs to construct each should be similar.

SH1 On/Off Ramp Queuing

The on-ramp from Penlink to SH1 is where the impacts of not tolling would be most immediately evident. During the morning peak period an additional 608-631 vehicles is expected to use the on the SH1 on-ramp, likely resulting in queues forming back from the motorway merge at SH1 on-ramp. This queuing has a potentially safety risk although a longer length of two lane approach to SH1 might be required for the metered section to mitigate in part, queues forming back from the signals and spilling over to Penlink.

Approaching the on-ramp, if the queuing extends through the 'tear drop' roundabout with the link road to East Coast Road, there would be reduced visibility of smaller profile users such as cyclists or motorcyclists turning right from Penlink travelling towards East Coast Road.

The High Occupancy Vehicle (HOV)/bus priority lane would also need to be lengthened alongside the on-ramp metered lanes to allow buses to bypass the queues. Similarly in the evening peak, an additional 517-578 vehicles on the SH1 off-ramp would result in lower levels of service at the exit from SH1 and along the Penlink route.

This could result in queueing back towards SH1 and possibly back to the left lane on SH1, depending on downstream impacts, particularly at the East Coast roundabout.

If queuing occurs, there is the possibility for some road users to travel along SH1 northbound in the right-hand lane and then seek to cross the left-hand lane to attempt to merge into the off-ramp traffic at the off-ramp gore area. Such a movement is a crash risk with through traffic in the left-hand lane as well as traffic on the off-ramp. Addressing downstream capacity issues at the East Coast road roundabout could address the queue back risk.

Public Transport

Public transport usage and uptake is affected if Penlink is not tolled. This is because:

- Public transport travel is anticipated to decrease by approximately 150 passengers per day due to the relative attractiveness of car travel.
- Some public transport users are expected to switch to driving to the park and ride station at Silverdale instead of taking the bus directly from Whangaparāoa peninsula and/or across Penlink.
- Greater journey time variability is expected (unless mitigated by bus shoulder lanes full length) for public transport users due to the increase in general traffic on Penlink.

Not tolling Penlink will not respond to one of the project objectives which is to support public transport usage into the future.

Induced Demand

If Penlink is not tolled, it is likely that traffic volumes will increase around the Peninsula and on Penlink itself as increased longer trips to and from Whangaparāoa and Albany and South of Albany are expected due to the enhanced accessibility.

A reduction in some local trips may also occur such as travel within Whangaparāoa in response to those longer journeys.

Applying a toll does reduce the effect of induced demand as people need to make choice about the value of the toll compared to the benefit gained in time.

Additional Infrastructure

A full analysis of the untolled scenario has not been made, as the scope defined in the Establishment Report is a two lane tolled road.

However, as part of considering the implications of not tolling Penlink, certain works have been identified that would be required to provide the necessary capacity at each end of Penlink, improving pavement and constructing bus shoulder running to allow buses to avoid the increased queuing and delays to general traffic. Works include:

- Increasing the earthworks and pavement at the East Coast road/Penlink roundabout to provide additional capacity - \$450 - \$600k
- Alterations to the Whangaparāoa Road intersection - \$200 - \$300k
- Additional storage at SH1 ramps - \$1.5 - \$2m

- Bus shoulder running lanes – \$15 - \$25m (full length)
- Pavement strengthening - \$0.9 - \$1.1m
- Total - \$18 - \$29m

5.8 Tolling Summary

As a project, Penlink has a long history of development through successive Road Controlling Authorities. Consistently along this journey, the location and need for the link to facilitate wider growth in the Hibiscus Coast area has not been questioned. Project cost and delivery timeframe pressures have been responded to by considering a toll on road users to be able to bring the construction of the project forward.

Now that the project is Crown funded, tolling is proposed for the operations and maintenance costs, in line with legislative requirements and Waka Kotahi policy.

Penlink itself does not stand or fall on tolling as there are significant benefits to providing this link. The scope and benefits in respect of the objectives do change to reflect the respective traffic demand and need to provide an appropriate Level of Service (LoS) in each scenario. A timely decision on tolling is however required to allow the project to meet its design and delivery timeframes. Essentially, paying a toll will result in a higher LoS expectation, which is tied to people's willingness to pay. Providing a road with a lower LoS could also have reputational issues. Compared to the project objectives, tolling Penlink is preferred, as below.

Table 13 Tolling Versus Untolled Project Objective Comparison

Project Objective	Tolled Penlink*	Untolled Penlink*
To reduce traffic volumes through the Silverdale interchange, providing transport capacity for housing developments in Wainui, Stillwater West, Silverdale West, and approved development on the Whangaparāoa Peninsula by 2028	2	3
Improve transport connections to support economic activity in Dairy Flat and Silverdale by 2028	2	2
To support improved public transport services between Whangaparāoa-Silverdale, Whangaparāoa-Albany with more reliable journey times by 2028	3	1
To provide new and safer facilities for pedestrians and cyclists between Whangaparāoa and SH1 by 2028	2	2
To provide greater network resilience between Whangaparāoa Road, East Coast Road and/or Northern Motorway by 2028	3	3
Total	12	11

*Using standard MCA scoring criteria from +3 (highly positive) to -3 (highly negative)

It should be noted that the considerable time savings by constructing Penlink result in all scores being positive.

In addition to this, tolling is preferred in the areas of enabled and embodied carbon reduction and overall network management. Based on the Beca modelling, carbon reduction in 2028 is around 1,000t per annum with the untolled arrangement and around 7,000t with the tolled arrangement. Comparing the carbon impacts using the same MCA scoring philosophy is shown below.

Table 14 Tolling Versus Untolled Carbon Emission Comparison

CO ₂ Emissions	Tolled Penlink*	Untolled Penlink*
Reduction in operating CO ₂ emissions	3	1

Overall however, tolling Penlink provides advantage in key areas when compared to not tolling. These areas are;

- Public Transport – Tolling Penlink encourages modal shift by offering a lower cost option compared with driving a private vehicle while still providing the same time benefits as others users of Penlink. If Penlink is not tolled, more people will drive as it is quicker than the existing route and cheaper (shorter trips with not additional costs).
- Carbon – Tolling Penlink will result in greater carbon dioxide savings than not tolling Penlink through more sustainable speed profiles on Penlink and existing routes.
- Lower overall costs – Tolling Penlink minimises construction costs as additional lanes are not required. Toll infrastructure costs are to be paid back through the toll.
- Maintenance and Operational costs – M&O costs are fully recovered through the toll, with no demand on the NLTF.

Tolling Penlink is preferred and recommended by Waka Kotahi.

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6. Network Integration

Penlink's primary purpose is for 'end to end' journeys between Whangaparāoa Road and the Northern Motorway. This reflects the connection's role as a significantly shorter route between the Whangaparāoa Peninsula and the rest of Auckland, as well as the rural nature of the land it passes through.

In order to consider the consistency of the historical designs in terms of current road classification, Penlink was assessed using the 'One Network Framework' (ONF) tool. The ONF is used by Waka Kotahi to define the roles and functions of different parts of the transport network. In turn, this helps to guide design and operational details. The ONF considers two aspects: movement and place. Movement is essentially a road's transport function and varies from a high-capacity motorway corridor to a local road. The place function reflects the use of the road by adjacent developments, residents and other road users. Local roads for instance have a much higher place function than arterial roads. Penlink's movement and place functions are identified below.

Table 15 Penlink Movement and Place Classification

Movement Assessment (M2/M3)	Place Assessment (P5)
<ul style="list-style-type: none"> The corridor will have an important sub-regional role as the primary connection between Whangaparāoa Peninsula and the rest of urban Auckland. The corridor does not play a national role, with the Northern Motorway (SH1) being the primary link between Auckland and Northland. The freight role of Penlink is also expected to be relatively small. 	<ul style="list-style-type: none"> The corridor is primarily focused on 'end to end' journeys between the Whangaparāoa Peninsula and the Northern Motorway, rather than for access along the connection. The corridor passes through rural areas where urbanisation is discouraged due to environmental constraints, excess access points are discouraged to avoid incentivising urbanisation. Some local access points are required as identified by consents.

This combination of movement and place assessments means that Penlink should be considered as a Rural Connector. Rural connectors are defined as:

Rural connectors provide the link between rural roads and interregional connectors. They support an increased level of through traffic, while also providing access from the adjacent land they pass through. Examples include feeder roads into townships and roads to regionally significant tourist attractions.

6.1 Public Transport Integration

The 2018-28 Regional Public Transport Plan guides the delivery of public transport services over the next decade. Auckland's public transport services are delivered through a 'connected network', based around a core 'rapid and frequent network' that is supported by other, lower frequency, services. The current public transport network for the area includes:

- The frequent NX1 and NX2 services, that operate from Hibiscus Coast bus station in Silverdale to Albany and eventually the city centre (via the Northern Busway and the Auckland Harbour Bridge)
- Various local services that link the bus station with the Whangaparāoa Peninsula, Orewa, Millwater and Red Beach
- Relatively low frequency services from the Hibiscus Coast bus station to Warkworth (route 995), Helensville (route 128), and Albany via Dairy Flat Highway (986)
- A weekday ferry service between Gulf Harbour and Downtown Auckland.

The current Regional Public Transport Plan (RPTP) does not show services using Penlink, because at the time the RPTP was finalised it was not clear whether Penlink would be completed before 2028. With construction timeframes now confirmed, Auckland Transport propose to operate the NX2 service on Penlink, but only if funding for new services and a bus interchange are confirmed. Neither of these are currently funded.

This network change, when confirmed, would support a low carbon transport system through reduced travel distances and provides additional resilience through an alternative route to/from the Whangaparāoa Peninsula. Effectively operating this network relies on safe and easy connections for customers between the various local routes on the peninsula with the NX2 service. Furthermore, with the NX2 service terminating on the Whangaparāoa Peninsula, there will be a need for driver facilities, as well as layover spaces.



Figure 11 Map Showing Existing Public Transport Network

A key to the overall success of changes to bus routes and public transport demand is the application of a toll on Penlink. It is proposed that AT Metro buses would not be tolled. Without a toll, the travel time savings will not encourage mode change and will lead to more local and wider network trips due to the relative ease of car usage.

Auckland Transport has recently completed an Indicative Business Case (IBC) to investigate a potential new bus interchange at the eastern end of Penlink to support the desired future public transport network. The IBC explored different options for the interchange, ranging from a basic facility that allows buses to turn around and layover through to a more comprehensive bus station (potentially including a park and ride, to improve access to public transport for those living further away from local bus services, as space allows). The DBC will start in early 2022, with funding to be secured following this.

With a bus interchange in place that enables safe and easy connections between services, Penlink is expected to increase public transport ridership from the Whangaparāoa Peninsula (compared to if Penlink was not in place in 2028). This is illustrated by the diagram below.

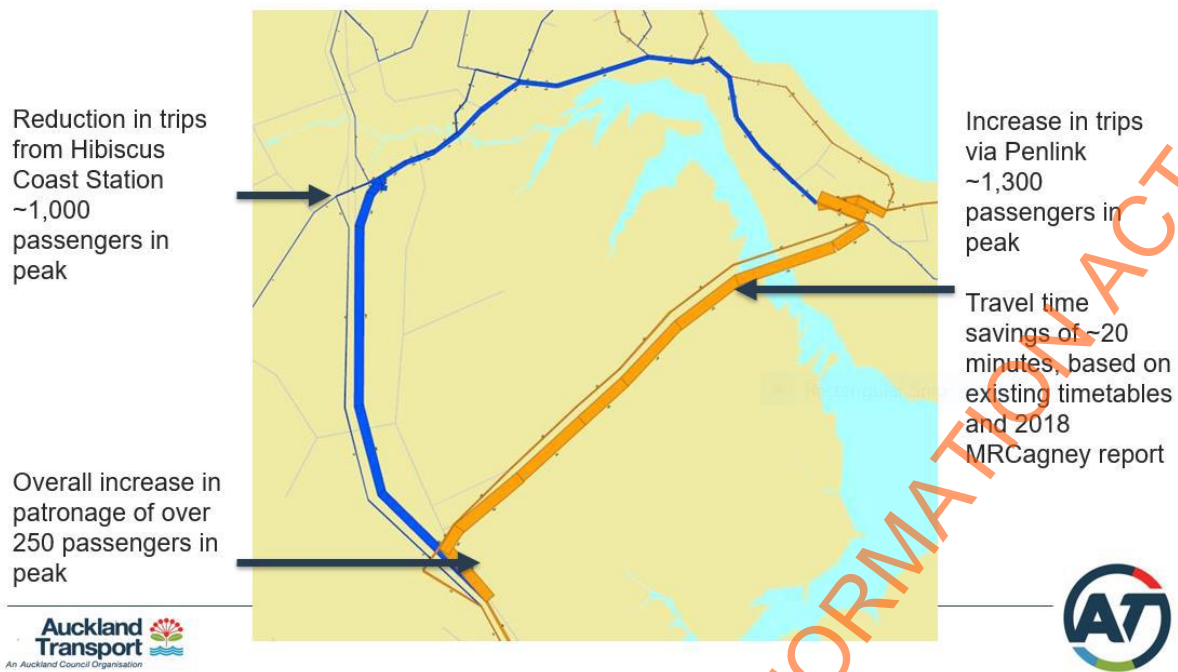


Figure 12 Expected Patronage 2028 NX2 to Whangaparāoa if service is confirmed¹⁰

6.2 The Preferred Option Economic Evaluation

The Do Minimum scenario utilised in the economic evaluation is the current network form (without Penlink). Different to previous analyses of Penlink, the Do Minimum option includes assumptions about widening SH1 in this area, and this is included in the modelling with an implementation year of 2048.

It should be noted that existing and future congestion in the study area means that the benefits produced by this, and earlier economic analysis, are sensitive to the specific assumptions around SH1 widening.

The economic results for the preferred option versus the Do Minimum scenario are based on Waka Kotahi Monetised Benefit and Cost Manual v1.5 guidance. This includes present value costs and benefits and first year rates of return for the tolled and untolled project options.

Core economic evaluation assumptions include:

- The preferred option is a tolled scenario. For the tolled option, a \$3 end to end AM and PM peak toll and \$2 interpeak toll has been determined.
- Toll collection costs of \$0.70 per trip (not per tolling point)
- A 4% discount rate and 60 years appraisal period
- The National BCR has been calculated as the transport benefits (excluding the toll costs) divided by the total project costs (excluding the toll revenue but including the toll transaction costs)
- Time zero year of 2022
- Construction start year of 2022, and five years construction period
- Project expected estimate cost of \$760 million tolled, which includes \$19 million for tolling infrastructure, and \$770 million untolled, which includes \$29 million for intersection¹¹, ramp, shoulder, and pavement improvements

¹⁰ Image taken from Penlink Integrated Planning Guidance, Waka Kotahi, July 2021

¹¹ Based on GHD assessment – see Appendix ?

- Previous assumptions for agglomeration benefits and other Wider Economic Benefits (WEBs) updated in 2017 have been used, with these increased by productivity growth to 2022. Previously calculated WEBs (with an adjustment factor) were used as these were considered to give a reasonable estimate of WEBs
- Annual maintenance, operational and periodic maintenance costs for base infrastructure have been calculated using the assumptions shown below.
- No economic benefit has been claimed for any new development that may be enabled through Penlink.

Table 16 Maintenance Costs

Item	2022	2027
Regular maintenance (\$ per m2, annually)	\$25	\$29
Periodic maintenance (\$ per m2, every 5 years)	\$20	\$23
Bridge inspection (\$ bi-annually)	\$100,000	\$115,000
Bridge heavy maintenance repair (\$ year 10, 20, 30)	\$2,000,000	\$2,300,000
Resealing (\$ per m2, reseal every 8 years)	\$35	\$40
Network length (m)	7,000	7,000
Average width (m, 1.5+3.5+3+3.5+1.5)	13	13

A full list of the economic assumptions can be found in the Recommended Option Economic Evaluation Assumptions Memorandum in Appendix G.

The following analysis assumes that the basic alignment of Penlink is the same for either the tolled or untolled situation. The tolled scenario is two lanes plus future proofing for widening and includes the cost of toll infrastructure. The untolled design excludes any toll costs but includes additional costs to provide a bus shoulder along the full length of Penlink, and additional widening at each end to mitigate the effects of increased congestion created by higher traffic volumes.

The analysis also removes public transport benefits from the Penlink analysis. This is because Auckland Transport have confirmed that without capital and operational funding, no bus services will use Penlink at opening. There is a desire by both Waka Kotahi and Auckland Transport to secure the full funding to allow Penlink and a revised bus network to be simultaneously opened, but this is yet to be confirmed.

Table 17 Preferred Option Economic Evaluation Results

Timing	Option 1: Untolled	Option 2: Tolled
Earliest Implementation Start Date	Construction to start Q3 2022	
Expected Duration of Implementation (includes contingency and is an estimate for economic evaluation purposes)	Construction duration 60 months	
Economic Efficiency	Option 1: Untolled	Option 2: Tolled
Time Zero	2022	
Base date for Costs and Benefits	2022	
Present Value of Total Project Cost of Do Minimum	\$0	

Present Value net Total Project Cost of Preferred Option (incl. maintenance, capex and toll collection costs) ¹²	\$781 M	\$892 M
Present Value net Benefit of Preferred Option (exc. WEBs)	\$1,156 M	\$1,116 M
Present Value net Benefit of WEBs of Preferred Option	\$171 M	\$157 M
National BCR (exc. WEBs)	1.5	1.3
National BCR (inc. WEBs)	1.7	1.4
Government BCR (exc. WEBs)	1.5	1.3
Government BCR (inc. WEBs)	1.7	1.5
First Year Rate of Return (FYRR)	6%	5%

A further breakdown of the monetised benefits and costs that make up the economic evaluation results are shown below. Note, only monetised benefits directly attributable to this project were included in the preferred option economic evaluation.

Table 18 Preferred Option Economic Evaluation Present Value Benefits and Costs Breakdown

Preferred Option PV Benefits and Costs	Option 1: Untolled	Option 2: Tolled
Discounted Benefits		
Travel time reduction PV	\$797 M	\$792 M
Congestion reduction PV	\$100 M	\$119 M
Trip reliability PV	\$52 M	\$51 M
Vehicle Operating Costs (VOC) PV	\$165 M	\$121 M
Crash reduction PV	\$31 M	\$18 M
Active mode users PV	\$10 M	\$10 M
CO2 emissions reduction PV ¹³	\$0 M	\$6 M
Total Discounted Benefits PV	\$1,156 M	\$1,116 M
Agglomeration PV	\$124 M	\$110 M
Other Wider Economic Benefits PV	\$47 M	\$47 M
Total WEB's PV	\$171 M	\$157 M
Total Discounted Benefits incl. WEB's	\$1,340 M	\$1,275 M
Discounted Costs		
Total construction costs PV	\$712 M	\$703 M
Maintenance costs PV	\$69 M	\$69 M
Toll collection costs PV	-	\$120 M
Total Discounted Costs PV	\$781 M	\$892 M
National BCR (exc. WEBs)	1.5	1.3
National BCR (inc. WEBs)	1.7	1.4
First Year Rate of Return (FYRR)	6%	5%

¹² The key difference in the present value net total project cost between the untolled and tolled option is as a result of the 60-year maintenance and opex cost difference between the two scenarios. The capex difference between the two options is only \$53m.

¹³ Based on Beca emissions modelling

The key differences between the tolled and untolled options are summarised below for each benefit stream:

Travel time reduction PV

The untolled option has marginally higher travel time reduction benefits (\$797 M) compared to the tolled option (\$792 M). The presence of the toll is expected to result in some traffic using the longer existing route and avoiding the toll to use Penlink.

Congestion reduction PV

The tolled option has marginally higher benefits (\$119 M) compared to the untolled option (\$100 M) for congestion reduction. This is due to an increased spread of traffic across the network, with some traffic using the existing longer route to avoid paying the toll.

Trip reliability PV

The untolled option has marginally higher trip reliability benefits (\$52 M) compared to the tolled option (\$51 M). The presence of the toll is expected to result in some traffic using the longer route, which means that trip reliability is marginally less in the tolled option.

Vehicle Operating Costs (VOC) PV

The untolled option is expected to result in higher VOC benefits (\$165 M) compared to the tolled option (\$121 M). This is because more people would use the shorter Penlink route if the corridor was untolled, reducing vehicle operating costs, compared to the tolled option, where some traffic would continue to use the longer existing route to avoid paying the toll.

Crash reduction PV

The untolled option is expected to have higher crash reduction benefits (\$31 M) compared to the tolled option (\$18 M). In the untolled options there are expected to be fewer vehicles using the existing route, which has a lower safety rating than the new Penlink corridor. It should be noted that these benefits relate only to the existing and new Penlink routes. Some benefits of crash reduction were identified through the modelling on the wider network; however, this was not included in the economic assessment.

Active mode users PV

Both the untolled and tolled options are expected to deliver the same active mode benefits. The presence of a toll does not influence the uptake and use of active modes.

CO2 emissions reduction PV

For emissions in the untolled option, there are two competing elements: a shorter route (reducing emissions) and induced traffic (increasing emissions). For this comparison, these two elements almost cancel each other out, generating limited benefits (\$0 M).

For the tolled option, tolling results in some additional trips on the longer route (increased emissions) while still providing a shorter route for those that choose to pay (reduced emissions), but it also results in a minor reduction in total trips (reduced emissions). The tolled option therefore results in a higher level of emission reduction benefits (\$6 M).

Agglomeration PV

The untolled option results in expected agglomeration benefits of \$124 M, compared with \$110 M for the tolled option. Previous assumptions for agglomeration benefits and other Wider Economic Benefits (WEBs) reported in 2017 have been used, with these updated by productivity growth to 2021.

The wider economic benefits for this project represent the benefits beyond conventional transport benefits such as agglomeration effects and changes in land use. The project enhances the transport network and supports the urban growth expected in this critical part of Auckland City. No specific assessment has been undertaken in relation to housing or development uplift as a result of Penlink.

Sensitivity analysis on the economic evaluation results has been undertaken to demonstrate how the preferred option performs if costs, benefits or economic parameters vary.

Cost benefit sensitivity analysis results are provided in Table 19. The cost and benefit variabilities tested include changes in capital cost estimates.

Table 19 Preferred Option Cost / Benefit Sensitivities

Sensitivity Analysis	Option 1: Untolled		Option 2: Tolled	
	Net Benefits \$M (NPV)	BCR	Net Benefits \$M (NPV)	BCR
20% capital cost increase	\$1,156	1.3	\$1,116	1.1
P95 capital costs increase (11%)		1.3		1.1
20% capital cost decrease		1.8		1.5

Discount rate/evaluation period sensitivity analysis results are displayed in Table 20. The results of two different discount rate scenarios and a shorter appraisal period have been calculated.

Table 20 Preferred Option Cost / Benefit Sensitivities

Sensitivity Analysis	Option 1: Untolled		Option 2: Tolled	
	Net Benefits \$M (NPV)	BCR	Net Benefits \$M (NPV)	BCR
3% discount rate	\$1,487	1.8	\$1,425	1.5
6% discount rate	\$748	1.0	\$733	0.9
40 year appraisal period	\$930	1.2	\$912	1.0

These cost benefit and discount rate/evaluation period sensitivity results demonstrate the Penlink preferred option represents a value for money investment for stakeholders.

6.3 Economic Benefits

Climate Change and Emissions Reduction

As noted in the Government Policy Statement on Land Transport, climate change is a key strategic priority for the government. This includes transforming to a low carbon transport system that supports emissions reductions aligned with national commitments, while improving safety and inclusive access. In addition, the Auckland Council Climate Plan sets a goal for a low carbon safe transport system that delivers social, economic and health benefits for all.

One of Penlink's most significant benefits is how it reduces traffic volumes on Whangaparāoa Road and Hibiscus Coast Highway, enabling those roads to become safer and support a variety of wider urban outcomes.

Transport related emissions accounted for approximately 44 percent of Auckland’s total emissions in 2016. The June 2021 Penlink Toll Modelling Report indicates that Penlink would induce some traffic. However, the travel time and trip length to the south of the Whangaparāoa peninsula will be reduced by approximately 5.8km via Penlink, and existing congestion points with stop-start movements will be reduced, thereby saving fuel and CO₂ emissions.

The Waka Kotahi vehicle emissions model (VEPM) has been used to determine the emissions for different toll scenarios. The VEPM assumes a vehicle fleet mix and uses the vehicle kilometres travelled to determine the level of emissions.

Figure 13 summarises the annual emissions for the core toll scenario level tested. The graph shows the change in annual vehicle CO₂ emissions compared to the untolled scenario, both in terms of tonnes and dollars. The total emissions in the untolled scenario within the study area is 843,560 tonnes, equivalent to approximately \$54.8m. An untolled Penlink results in a reduction of around 1,000t per annum relative to the ‘no Penlink’ scenario compared to 7,000t saving if Penlink is tolled.

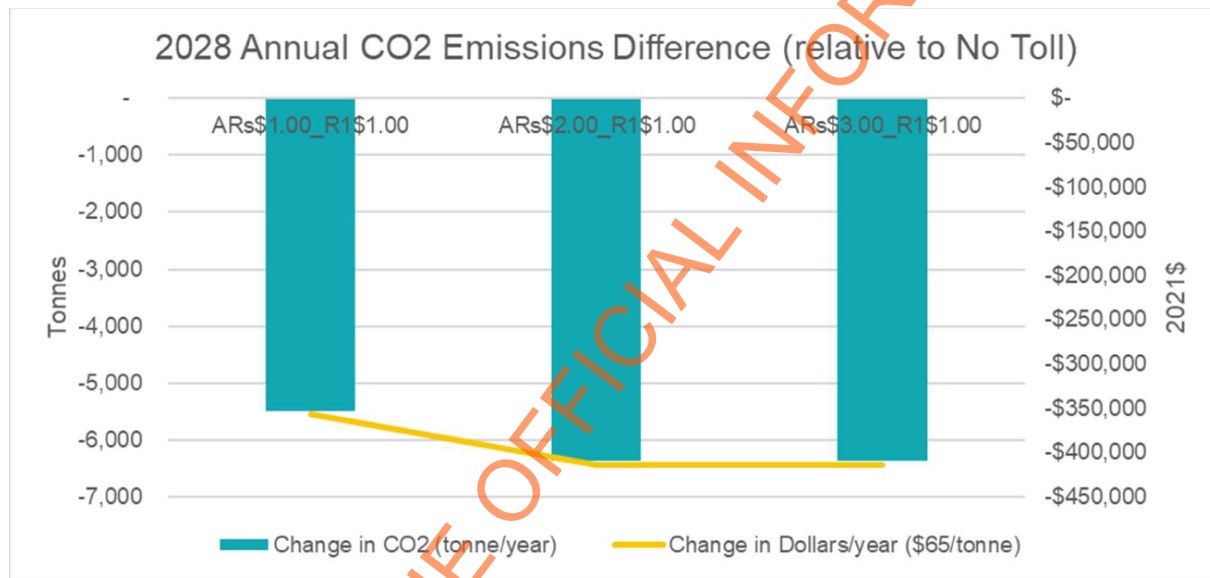


Figure 13 2028 Annual CO₂ Emissions Difference (relative to No Toll)¹⁴

Improved Travel Choices

In the longer-term it is anticipated that the SUP will connect to a comprehensive network of walking and cycling facilities as the wider Whangaparāoa Peninsula, and Dairy Flat area urbanises. There is also potential for the Penlink SUP to be a highly utilised recreational route similar to other separated paths such as Raumati South to Peka Peka SUP that runs adjacent to the Kāpiti Expressway. As the areas along Penlink urbanise this will also provide an excellent active mode facility for people to and from the Whangaparāoa Peninsula.

Penlink provides an opportunity to play an important role in the public transport network once completed, with Auckland Transport planning to operate the NX2 bus service along Penlink to efficiently connect Whangaparāoa with Albany as long as funding can be secured for this service. Penlink offers the potential for significantly faster public transport journeys for Whangaparāoa Peninsula residents.

To deliver on this potential, there is a need for high quality and efficient connections between the NX2 bus service and local services along the peninsula. Auckland’s public transport system is based on ‘connected network’ principles, where connections between core routes

¹⁴ Penlink Toll Modelling Report, Beca, June 2021

and feeder routes enable higher frequencies to be provided efficiently. Good facilities to enable and encourage these connections are a critical part of making such a network successful.

AT has recognised the need to enable and support connections between local buses and the NX2 through undertaking initial work on a 'Whangaparāoa Bus Station'. The intention of such a facility would be to:

- Enable safe, easy and efficient connections for passengers between NX2 buses and local bus services
- Providing for bus layover at the beginning and end of trips, including facilities for drivers
- Creating a high-profile 'bus hub' for the Whangaparāoa Peninsula that raises awareness and use of public transport
- Providing bike parking facilities, to encourage people to cycle to public transport
- Potentially providing park and ride facilities, to encourage greater use of the NX2 bus service, especially for people who live in areas further away from feeder buses.

AT have completed the Indicative Business Case that has identified a preferred location, on the south-west corner of the connection between Penlink and Whangaparāoa Road. The DBC is due to be procured in early 2022. The detailed design of the bus station can therefore be integrated with the Penlink detailed design.

The proponents have been required to consider how a bus station would integrate with their designs, with AT providing basic design parameters. Waka Kotahi and AT are working closely on the design and integration of the bus station and following the AT DBC being completed, funding and delivery will be discussed with the alliance.

Penlink also includes a separated walking and cycling shared path, which in the longer-term will be connected to a comprehensive network of walking and cycling facilities as the wider Whangaparāoa and Dairy Flat area urbanises.

Supporting Wider Growth Plans

Significant growth is planned for the wider Silverdale/Dairy Flat area over the next 30 years. Penlink has an important role to play in supporting these growth plans, particularly by reducing traffic volumes on existing roads around Silverdale.

Penlink provides a major opportunity to accommodate more urban development in urban areas that will have significantly enhanced access due to the project. If the proposed Whangaparāoa bus station is delivered, areas within walking distance of this facility will have excellent access to a high-quality public transport service, making these locations potentially suitable for higher density development.

Investment Outcomes

The tables below compare the anticipated performance of the preferred option against the Do Minimum in relation to the investment objectives and KPIs. Note, many of the Penlink investment objectives and key performance indicators described below were brought forward from the 2019 Penlink DBC and measured with available information and analysis. The expected performance of those that could be measured with available data or are not considered directly attributable to this investment have been noted in the tables.

Table 21 Investment Objective 1: Silverdale Interchange Improved

Key Performance Indicators	Do Minimum (2028)	Untolled (2028)	Tolled (2028)
KPI 1.1: Reduce AADT flows through Silverdale interchange (SH1 on and off ramps) by 2028	44,600 vehicles	31,100 vehicles	36,100 vehicles
KPI 1.2: Reduced average travel times from key locations to Silverdale interchange (minutes per vehicle) by 2028	11.3 minutes Orewa-Silverdale	9.6 minutes	9.8 minutes
	21.5 minutes Whangaparāoa - Silverdale	19.5 minutes	19.2 minutes
	19.1 minutes Albany-Silverdale	18.2 minutes	18.3 minutes
	40.5 minutes Whangaparāoa-Albany	35.1 minutes	33.4 minutes

Table 22 Investment Objective 2: Support Economic Activity

Key Performance Indicators	Do Minimum (2028)	Untolled (2028)	Tolled (2028)
KPI 2.1: Reduced average daily freight travel times for key journeys (minutes per vehicle) ¹⁵ between Orewa-Silverdale, Whangaparāoa -Silverdale, Albany-Silverdale, and Whangaparāoa-Albany by 2028	11.3 minutes Orewa-Silverdale	9.6 minutes	9.8 minutes
	21.5 minutes Whangaparāoa - Silverdale	19.5 minutes	19.2 minutes
	19.1 minutes Albany-Silverdale	18.2 minutes	18.3 minutes
	40.5 minutes Whangaparāoa-Albany	35.1 minutes	33.4 minutes
KPI 2.2: Enable development expansion by 2028	To be confirmed, data not available at the time of drafting this report		
KPI 2.3: Increased employment in Dairy Flat and Silverdale by 2028	To be confirmed, data not available at the time of drafting this report		

Table 23 Investment Objective 3: Improved Public Transport Services

Key Performance Indicators	Do Minimum (2028)	Untolled (2028)	Tolled (2028)
KPI 3.1: Reduced average public transport journey times between key destinations (Whangaparāoa-Silverdale, Whangaparāoa-Albany), if buses use Penlink (minutes per passenger) by 2028	61.6 minutes Whangaparāoa-Silverdale	53.4 minutes	54.3 minutes
	68.2 minutes Whangaparāoa-Albany	61.4 minutes	551 minutes
KPI 3.2: Reduced travel time reliability (AM peak variance) on key journeys by 2028	To be confirmed, data not available at the time of drafting this report		

¹⁵ Unable to isolate freight vehicles in the current modelling, so general traffic travel times have been used to monitor this KPI

Key Performance Indicators	Do Minimum (2028)	Untolled (2028)	Tolled (2028)
KPI 3.3: Comparative travel times for public transport vs general traffic from Whangaparāoa to Silverdale and Whangaparāoa to Albany if buses use Penlink by 2028.	Bus travel is 2.9 times that of general traffic Whangaparāoa to Silverdale	Bus travel is 2.7 times that of general traffic	Bus travel is 2.8 times that of general traffic
	Bus travel is 1.7 times that of general traffic Whangaparāoa to Albany	Bus travel is 1.8 times that of general traffic	Bus travel is 1.6 times that of general traffic

Table 24 Investment Objective 4: Improved Active Mode Provision

Key Performance Indicators	Do Minimum (2028)	Untolled (2028)	Tolled (2028)
KPI 4.1: Increased uptake of cycling (additional cyclists per day) between Whangaparāoa and SH1 by 2028	0		69
KPI 4.2: Increased uptake of walking (additional pedestrians per day) between Whangaparāoa and SH1 by 2028	0		137
KPI 4.3: Improved health benefits from increased active mode uptake by 2028	\$0		\$281,695

Table 25 Investment Objective 5: Improved Network Resilience

Key Performance Indicators	Do Minimum (2028)	Untolled (2028)	Tolled (2028)
KPI 5.1: Improved lane availability between Whangaparāoa Rd, East Coast Rd and/or Northern Motorway by 2028	To be confirmed, data not available at the time of drafting this report		
KPI 5.2: Improved alternate routes between Whangaparāoa Road, East Coast Road and/or Northern Motorway (note there is no current alternative route) by 2028	A single access road between Whangaparāoa Road, East Coast Road and/or Northern Motorway that is at risk from unplanned events/closures	Alternative route via Penlink for both vehicles and active modes	

Table 26 Investment Objective 6: Improved Road Safety Outcomes

Key Performance Indicators	Do Minimum (2028)	Untolled (2028)	Tolled (2028)
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KPI 6.1: Reduced harm for all in line with Road to Zero targets (detailed assessments were undertaken for tolled and untolled) by 2024- 2028	20 DSI's estimated over five years (2024-28)	19 DSI's estimated over five years (2024-28)	19 DSI's estimated over five years (2024-28)
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6.4 Sunk Costs

Sunk costs include those costs already incurred, or those committed to be incurred before the end of the financial year. The table below sets out these costs.

Table 27 Sunk Costs

Item	Cost (\$m)
Property	37
Stipend Payment to Proponents	10
Advanced purchase of Vector materials	2
NZTA Managed Costs	15
Total	65

7. Commercial Case

The Commercial Case outlines the processes used to select the preferred proponent and the proposed contract arrangements required to implement the Preferred Option.

The Penlink project is being procured utilising a Hybrid Alliance model. The Hybrid Alliance model is preferred based on the model's ability to keep competitive tension during the procurement phase whilst preserving the Owner Participant's (Waka Kotahi) ability to influence project specific decisions throughout the delivery phase, within a collaborative contracting model.

An assessment of alternative delivery models including the recommendation and selection of the Hybrid Alliance model for Penlink is detailed in the Penlink Procurement Plan (see Appendix H, section 4). The procurement strategy allows for pre-award negotiation focusing on clarification of proposals. Design and other innovations are imbedded in the proposals as part of the selection process, with a fixed price through the Affordability Threshold. Design innovations that may be adopted from the unsuccessful proponent, will be dealt with post award. Contract terms have been negotiated as part of the procurement process, except for final placement insurance policies, which can only be done post nomination and approval, but before signing the commercial agreement.

The key features and benefits of the Hybrid Alliance approach are:

- Time to sod-turn will be minimised
- Key risks are managed / mitigated in partnership with the delivery team
- Key risk mitigations are embedded in the construction methodology and programme
- A high degree of cost certainty
- An overarching governance and management structure enabling the agency to mitigate and manage reputational risks.

This section provides a high-level overview of the procurement approach, based on the current stage of the project. The Penlink process will require the following key processes and deliverables:

1. Procurement of key consultants to support the procurement phase in accordance with the methods outlined in the Penlink Procurement Plan. This will include:

- Principals Technical Advisor (PTA) – Reference design, business case update, tender support and cost estimate
- Principals Environment Advisor – Compliance with various consents prior to implementation. This may involve several specialised consultants (such as archaeologists and ecologists)
- Principals Project Management Support – project management, procurement support and interface coordination
- Legal advisory – support in property acquisition completion and contract formation
- Property advisory – support in final property acquisitions and title changeovers.

2. Preparation of tender documents sufficient for a Hybrid Alliance Request For Proposals (RFP), including:

- Minimum Requirements
- Draft PAA Agreement
- Reference Design
- RFP Document

3. Establishment of a Tender Evaluation Team (TET):

- A Tender Evaluation Team will consist of four members, consisting of Project, Procurement and Commercial members.
- The TET will be supported by ad hoc advisors, consisting of SME's, the Principal's Technical Advisor and external consultants

4. RFP and Tender Process

Key activities and dates for the RFP and Procurement Process include:

- Issue of RFP 27 September 2021
- Inception Meeting for Proponents 5 October 2021
- Four Interactive Meetings per Proponent between October 2021 and February 2022
- Four Technical Interactive Meetings per Proponent between October 2021 and February 2022
- Escorted Proponent site visits, 8 No in November.
- Proponent Requests for Information (RFI) and departures process underway October 2021 to February 2022
- PAA contractual comments received by 26 October 2021 with response to Proponents 2 November
- PAA Commercial interactive per proponent in November
- Further geotechnical investigations September 2021 to December 2021 with weekly data supply to Proponents
- Release of draft insurance policies to Proponents 1 December 2021
- Closing date for Certificate 'A' submission 4pm, 22 December 2021
- Certificate 'A' responses to Proponents 3 February 2022
- Road Safety Audit (RSA) briefing by Proponents 18 and 19 January 2022 Section, RSA Verbal debrief 25 January 2022, RSA report to Proponents 3 February 2022
- Closing date for submission of departure requests 4pm, 11 February 2022
- Closing date for RFIs 4pm, 17 February 2022
- Close of proposals 4pm, 25 February 2022
- Insurance presentations week of 28 February 2022
- Interview referees (if required) 7 to 18 March 2022
- Proponent interviews (if required) 22 and 23 March 2022
- Target date for notification of a preferred proponent 15 April 2022
- Target date for commencement pre-award discussions 18 April 2022
- Target start of PAA phase 10 June 2022
- Target PAA practical completion. Date to be nominated by proponent.

7.1 Selection of Preferred Proponents

Approach to the Market

The Procurement Plan provides more detail on the procurement process and evaluation methodology used (Appendix H). The procurement process for the Hybrid Alliance will be conducted in up to four phases:

- Advanced Notice (two preferred Proponents for the RFP phase)
- Registration of Interest to shortlist to two proponents
- RFP to select the preferred Proponent from the shortlist
- Entering into Project Alliance Agreement involving Waka Kotahi and preferred Proponent.

Evaluation of Proponent Offers

Waka Kotahi will select the delivery partner (Proponent) through the following tender phases:

- Advanced Notice Phase – initial notice of procurement model and request for indications of interest and conformation of prequalification from entities
- Registration of Interest Phase – requiring comprehensive submissions with sufficient information against defined response criteria to inform the shortlisting to two consortiums.

The physical works proponents are prequalified to Level 3A (Bridge Construction) and Level 4A (Construction) under the Waka Kotahi prequalification system and have the required Health and Safety pre-qualification.

Proposals received during the RFP phase will be evaluated using the Quality Method against a set of alliance-based criteria typically used in Waka Kotahi procurement. These include mandatory criteria around health and safety, Waka Kotahi strategic objectives and delivery improvement areas, and the Construction Sector Accord.

The NZUP has set its focus to transform the way Waka Kotahi projects are delivered. This will require a transformation in the way Waka Kotahi think and operate and how they select and reward partners. Penlink is the first project under NZUP to take this approach.

Waka Kotahi has developed a Balanced Scorecard (Figure 15 **Error! Reference source not found.**) for NZUP and has tailored this for Penlink. The Balanced Scorecard provides a framework which links Waka Kotahi organisational strategic objectives to key focus areas, to the NZUP objectives and Delivery Improvement Outcome, and to the outcome Key Result Areas (KRA) and KPIs.

The Delivery Improvement Outcome has been translated for Penlink into six specific outcomes focused KRAs. The outcome KRAs have in turn been developed into 13 KPIs. In this way, the Delivery Improvement Outcome is embedded via the outcome KRAs and KPIs within all aspects of the Balanced Scorecard.

For Penlink, Waka Kotahi is offering a higher level of incentivisation to achieve breakthrough performance achievement of the Delivery Improvement Outcome than has been traditionally seen in New Zealand Alliances. In line with international best practice, to truly drive delivery improvement, the non-cost performance pool under Limb 3 of the PAA has been increased to \$15M. Waka Kotahi is also introducing an intentionally targeted approach that aims to focus and consistently lift performance in each year of the delivery lifecycle.



Figure 14 Six Outcome Focused Key Result Areas



Figure 15 Penlink Balanced Scorecard

Waka Kotahi is experienced in establishing performance frameworks on Alliance contracts designed and implemented to deliver outstanding performance. Typically, performance frameworks are co-developed between the Alliance Participants including Waka Kotahi during the Interim Project Alliance Agreement phase.

For Penlink, the initial thinking and design has been undertaken by Waka Kotahi to enable greater clarity and focus on achieving the NZUP outcomes. The specific KPIs will be co-developed during the initial period of the Alliance and will be led by Waka Kotahi. The outcome KRAs and potential KPIs have been discussed with proponents during the interactive procurement process and proponents' will submit their ideas through their submissions and evaluated by Waka Kotahi. This thinking will be used when developing the KPI measures within the Balanced Scorecard.

Learnings from Penlink will be shared within the NZUP.

Following receipt and evaluation of the submissions in March/April 2022, this section will be updated to demonstrate how the two proponents addressed the opportunities in this area.

7.2 Proponent Contract Arrangements

Following receipt and evaluation of submissions in March/April 2021, this section will be drafted.

During the RFP phase, proponents have been engaged in workshops to agree the commercial terms of the contractual arrangement.

At the conclusion of the evaluation process, Waka Kotahi and the preferred proponent will agree the final commercial terms.

Risk Transfer and Allocation

All risks, unless specified otherwise in the risk allocation table below, are assumed to be owned by the Alliance and shared between the Non-Owner Participants and Waka Kotahi as the Owner Participant.

Table 28 Risk Allocation Table

RISK	WAKA KOTAHI	THE ALLIANCE
Non-exclusive right of occupancy of the land required to allow construction of the permanent works	Limited to cost and programme risk associated with complying with private property agreements that have not been included in Appendix I of this RFP.	All other cost and programme risk associated with complying with the property agreements including access and tie ins required by the Minimum Requirements.
Property Agreements	Cost and programme risk associated with complying with the property agreements that have not been included beyond 01/09/23 for properties identified in Appendix I of this RFP in the Deferred Acquisition Register.	All other cost and programme risk associated with complying with the property agreements including access and tie ins required by the Minimum Requirements.
Archaeological and waahi tapu finds	Cost of engaging iwi representatives.	All other costs, risks and programme risks.
COVID-19	Cost and programme risk associated with government mandated Alert Levels 3 and above.	Cost and programme risk associated with government mandated Alert Levels below Level 3, as set out in the Government Health Order related to Covid current at the time of close of tender.
Pavement Design	Client instructed changes to pavement design.	All other costs, risks and programme risks.
Alterations to the Designation or resource consents		All risks and costs associated with any amendment to the Designation or resource consent conditions.
Cost Fluctuation	Initial Target Cost adjustment in accordance with the indexation formula in Schedule 19 of the PAA.	Any potential escalation risk considered not covered by the indexation formula in the PAA

8. Financial Case

The financial case outlines the potential funding arrangements and the overall affordability of the project. Potential funding sources have evolved over time, therefore this ImBC does not seek to document previous financing options, instead it presents the current case for funding, as agreed by the Government through the NZUP.

8.1 Funding Sources

The design, property purchase, pre-implementation works and main construction of the Penlink infrastructure is funded as part of the NZUP. The tolling infrastructure (\$19.474 million), if confirmed by the Minister, will be funded through the National Land Transport Fund. Any future public transport infrastructure (such as the proposed bus interchange at Whangaparāoa) and services, as well as active mode connections to Penlink will be subject to successful business cases led by AT and subject to NLTF approval and co-funding by Waka Kotahi. The current intent, subject to public consultation and ministerial approval, is for maintenance and operations of the new section of State Highway will be funded through tolling.

Waka Kotahi has been allocated \$740 million for Penlink with total approved funding of \$830 million which includes \$90 million of Joint Ministers' tagged contingency, as set out in the Delegation's letter. Waka Kotahi are confident that the P50 contingency, that represents 9.5% of the current P50 estimate is sufficient in context of the hybrid alliance procurement model.

There is risk provision within the Affordability Threshold and our construction cost exposure is further mitigated by the profit, and thereafter 50% pain share, of our Alliance Partners. It is also noted that the Alliance Partners have been encouraged through the procurement process to identify further opportunities for innovation. Cost management is incentivised through the hybrid alliance model for the bid phase as well as through the delivery of the project.

8.2 Financial Profile of Costs

Following receipt and evaluation of the submissions, this section will be updated to display a profile of costs over time including whole of life cost implications.

Table 29 Financial Costing Table Summary – Tolled Scenario

	\$m	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	Total
<u>Proposed investment:</u>								
Capital from baseline*								
Capital required								
Opex from baseline								
Opex required^								
Total Investment								
<u>Changes to revenues and ongoing operating costs:</u>								
Revenue baseline#								
Revenue other								

Operating costs								
Dep'n & Cap. Charge [∞]								
Net Operating Change								

Table 30 Financial Costing Table Summary – Untolled Scenario

\$m	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	Total
Proposed investment:							
Capital from baseline*							
Capital required							
Opex from baseline							
Opex required^							
Total Investment							
Changes to revenues and ongoing operating costs:							
Revenue baseline#							
Revenue other							
Operating costs							
Dep'n & Cap. Charge [∞]							
Net Operating Change							

*From capital reserves. ^Project time-limited funding. #Crown revenue excluding time-limited project funding. Costs include all contingencies. Project Opex includes project-related costs including independent quality assurance, quantitative risk analysis, Gateway reviews, any decommissioning. [∞]Depreciation & Capital charge

8.3 Project Cost Estimate

The Alta reconciled cost estimate report is provided in full at Appendix I.

- A cost estimate was completed in March 2021, as part of the baselining process. This estimate was based on a 60% level Reference Design. The P50 estimate used in the baselining process was \$739M resulting in a funding allocation of \$740M at P50. All estimates assume the road will be tolled but excludes tolling infrastructure capital costs as that would be funded separately outside of the NZUP.
- There have been a number of updates to the cost estimate including in May 2021, when the Reference Design had been completed. A reconciliation process was undertaken on the 100% Reference Design in August 2021, resulting in a higher P50 estimate at \$845M.
- Estimates to date have been based on the Reference Design, however, it is not intended that the Reference Design will be constructed. Rather it is used to demonstrate that there is a viable option, and as such, is not optimised.
- An expert panel of senior Waka Kotahi internal and external subject matter experts reviewed the Reference Design and identified opportunities to optimise the design and deliver significant savings enabling the project to be delivered within the funding

allocation of \$740M (Affordability Threshold). The identified savings were shared with the NZUP governance group and relate to the physical works and include:

- Improved vertical/horizontal alignment and a reduction on the cross section resulting in reduced cut and fill quantities and extent of retaining walls
 - Reuse of soils to buttress the structural core of embankments
 - Reduction of quantities for ground improvements (deep soil mixing)
 - Reduction in the Importance Level of Weiti Bridge
 - Change from concrete to wire rope barriers between the alignment and SUP
 - Elimination of fencing adjacent to the SUP.
- There are a number of base assumptions when the budget of \$740M was set during the baselining process, these include:

- Base year of 2020/2021
- A (P50) risk allowance of approximately 19.9 percent of the Project Base Estimate (26.4 percent of physical works excluding tolling)
- Estimated property costs of \$40 million¹⁶
- An estimated physical works start year of 2022/2023, and end year of 2026/2027
- 2% escalation

Escalation is currently higher than the 2% and Waka Kotahi may need to request access to tagged contingency in accordance with the delegations letter from Joint Ministers to the Waka Kotahi Board Chair should escalation exceed 2% during implementation.

Early warning will be provided to the Ministry of Transport and Treasury should the escalation threshold of the project Estimate At Completion (EAC) exceed Waka Kotahi's allocation for Penlink.

In addition, under the Hybrid Alliance delivery model, an Affordability Threshold is set at a level to drive a value for money outcome. Proponents are required to present a Proposal that meets the Minimum Requirements within the Affordability Threshold.

There is no opportunity to provide a price proposal that is less than the Affordability Threshold. Instead, proponents are encouraged to offer a higher quality proposal for the set threshold.

8.4 Key Changes to Baseline Estimate

There have been a number of key changes to the baseline estimate. As additional information has become available there has been greater opportunity to better determine costs and assess risk. There have been additional cost pressures not foreseen when undertaking the baselining in March 2021, however, these have been offset by other opportunities and reduction in risk. The table below shows at a high level baseline costs versus the current cost estimates.

Table 31 Cost Comparison Between Baseline Costs (2021) and Current Costs (2022)

¹⁶ Note: Property costs provided by Waka Kotahi.

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8.5 Implementation Costs

Implementation includes all costs during delivery of the Alliance e.g., detailed design, physical works and Waka Kotahi managed costs.

Although the current estimate for Implementation is similar to the baseline estimate there have been movement in costs in a number of areas as more detail is known and risks understood. There have also been additional costs not included in the baseline estimate.

The physical works and preliminary and general costs have reduced through driving innovation and value under the overall Affordability Threshold as part of the procurement process.

In September 2021, an expert panel of senior Waka Kotahi internal and external subject matter experts reviewed the Reference Design and identified opportunities to optimise the design and deliver significant savings. Based on this assessment, an Affordability Threshold was established that provided cost tension during the procurement process.

The Affordability Threshold has been increased during the procurement process in response to both consortia signalling that the figure stated in the RFP may not be achievable. The threshold was increased by \$35M including \$15M to allow for escalation between setting the Affordability Threshold and PAA commencement and \$20M from the P50 risk contingency. During the procurement process there was an increased understanding of the risks including

geotechnical, earthworks and temporary works. This enabled a transfer of risk contingency into implementation. Risk contingency is discussed in more detail below.

There were a number of additional or increased Implementation costs compared with baselining. These included an increase in the stipend paid to both consortia from \$2.9M each to \$5.2M recognising additional effort during the procurement process and development of their Preliminary Concept Design (PCD) since the Interim Project Alliance Agreement (IPAA) had been removed. This additional cost is included in the current P50 estimate.

There is a non-cost performance pool (Limb 3) to drive non-cost outcomes on the project (see Commercial Case section). To incentivise the Alliance to achieve these programme and project specific outcomes the Limb 3 has been increased to \$15M. The quantum has been benchmarked internationally by Waka Kotahi Procurement Services and the value of \$15M was at the lower end of best practice but higher than typically used on Alliances in New Zealand (typically \$3-5M for a project of this scale). This higher level of incentivisation will have wider programme benefits. There was no allowance for the non-cost performance pool in the baseline estimate. The allowance now made in the P50 estimate is \$11M, recognising that it is unlikely the Alliance will achieve 100% performance in all Key Result Areas. This additional allowance is included in the current P50 estimate.

There has been an increase in percentage TIO administration costs since baselining resulting in an increase of \$3.5M. This additional cost is included in the current P50 estimate.

During baselining a 2% escalation was included in the estimate, in accordance with forecasting information available at the time. Escalation has increased significantly since March 2021 and is forecast to stay higher than typically expected for the next three years then decrease. Escalation is discussed in more detail below, while thresholds reporting is also outlined in the Management Case.

8.6 Risk Contingency

The baseline estimate included a P50 risk contingency amount of \$107M, approximately 20% of base estimate. During the reconciliation process and setting of the Affordability Threshold during August / September 2021, the project P50 risk contingency was increased to \$125M due to uncertainty, particularly relating to lack of geotechnical information, earthworks quantities and temporary works amongst others.

The current estimate includes a P50 risk contingency of \$103M, recognising that as more information is known and greater certainty attained, there is a transfer of risk to implementation as risks are realised and the costs are quantifiable.

An example of this was lack of geotechnical information when setting the baseline estimate. During the procurement process, additional geotechnical testing has been undertaken and provided to the consortia. The consortia also provided technical feedback on their proposed PCD including their view on the key risks.

An independently facilitated Quantitative Risk Analysis (QRA) process was undertaken in November / December 2021, as provided in Appendix J. This included workshops with the relevant project team members (internal staff and external design consultants GHD and their cost consultant Alta). The Monte Carlo analysis resulted in a P50 risk allowance of \$50.6M resulting in a median project value of \$744M (excluding TIO costs) and a P95 of \$94M and project value of \$788M (excluding TIO costs). Although the build-up of the estimate is different (the QRA was based on the reconciled 100% Reference Design not the Affordability Threshold), it provides confidence to the team that the budget allocation at P50 and P95 are appropriate to deliver Penlink.

8.7 Escalation

Escalation of capital costs remains one of the greatest uncertainties and is not within the project's control. In line with forecast information at the time, a 2% escalation per annum was included in the baseline estimate in March 2021, totalling \$34M. There has been significant increase in escalation since this estimate and this is likely to stay high or increase for a significant part of the project's duration. The Waka Kotahi team has forecast the following escalation during implementation:

- Year 1 (2022) – 6%
- Year 2 – 4%
- Year 3 – 3%
- Years 4 & 5 – 2%

By applying the above escalation rates, this results in an escalation amount of \$69M, which is \$35M above the escalation amount allowed for in the baseline P50 estimate. It is unlikely that the project's P50 risk contingency sufficient to fund this increase in forecast escalation. This is because risk contingency sums have been allocated to remaining risks, which are being actively managed and mitigated. Therefore, it is likely that any additional escalation over and above allocated \$34 million will need to be funded from the tagged contingency set aside for the project.

Under the PAA, the risk of increase in escalation is retained by Waka Kotahi / Crown. The decision to do this was to prevent the consortia building in risk allowance into their pricing that may be conservative, affecting their ability to meet the Affordability Threshold and put the project at risk of being unaffordable.

As a check to the economic viability of the project there has been a number of sensitivity tests undertaken in relation to capital cost increases. The increase in capital costs for the escalation is \$35 million which is less than 5% of the estimated capital costs. Two relevant sensitivities (see Section 6.2) have been undertaken which reflect a 20% increase and an 11% increase in capital costs. These increases in costs have a 0.2 and 0.1 reduction on the BCR, respectively. Therefore, the estimated additional escalation outlined above will have approximately a 0.05 reduction on BCR.

9. Management Case

Penlink is a complex infrastructure project with a wide range of interfacing plans, legacy documents, disciplines and deliverables. A Project Plan has been developed which serves as both a reference point for delivery processes and expectations and a roadmap for the wider framework of deliverables and documents.

The Penlink project delivery framework is consistent with Waka Kotahi standards, and NZUP PMO plans and strategies hierarchy including governance, reporting and general assurance.

9.1 Governance

Penlink’s delivery approach is consistent with the Waka Kotahi role and delegations as detailed in the delegations letter from Joint Ministers to the Waka Kotahi Board Chair. This letter also sets out the Minister’s role in the decision making and approval process.

Figure 16 provides more detail of the broader NZUP governance framework and shows the decision pathway framework, which summarises the different roles and responsibilities.

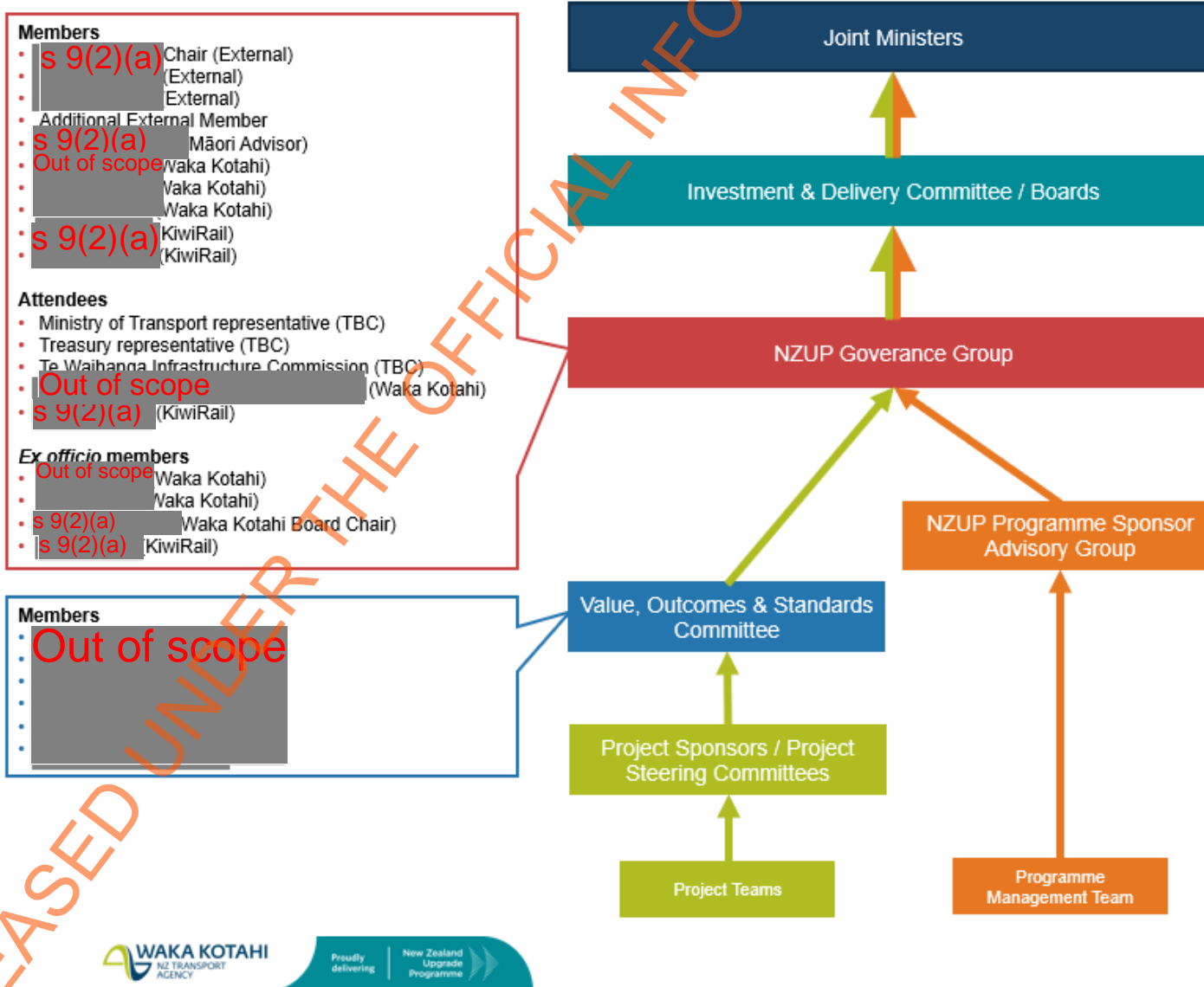


Figure 17 details the NZUP governance system membership, including key personnel responsible for providing oversight of the NZUP investment programme.

At a project level, a Project Steering Committee (PSC) consisting of the Project Sponsor and senior representatives from Waka Kotahi and AT provides oversight of the project. It is guided by a documented Terms of Reference. The PSC meet monthly to review progress, discuss key risks including scope, cost and schedule. Minutes are taken at the meetings and actions are recorded and tracked. It is noted that whilst the named members of the PSC may change over time, the intention is that the PSC will be retained for the duration of the project.

The PSC will also provide regular updates to the NZUP Governance Group as part of the overall programme. This includes programme and cost summaries, risks and issues so NZUP has a comprehensive summary of project progress. Project updates are provided to Ministers via regular NZUP briefings.

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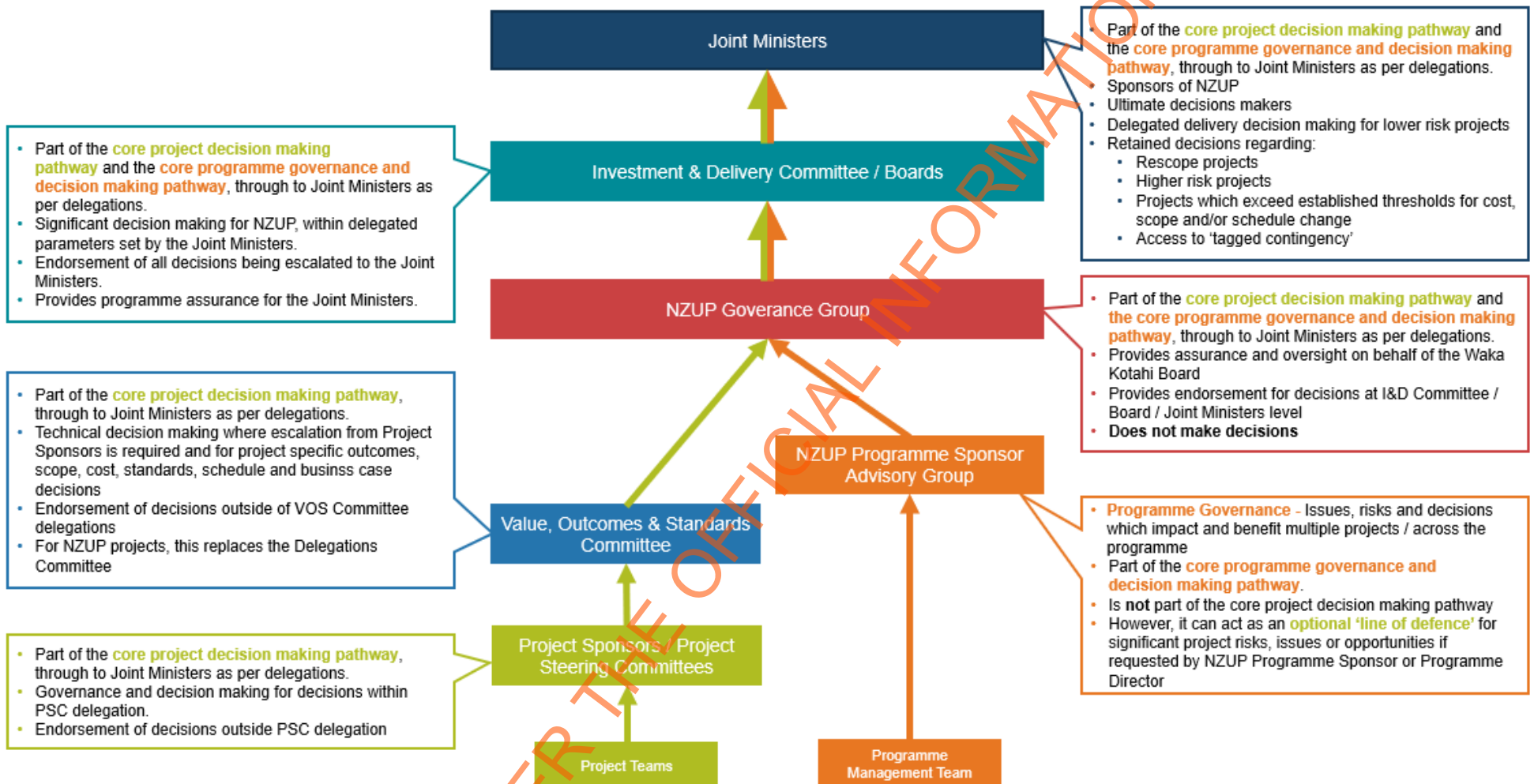


Figure 16 NZUP Governance System Decision Pathways

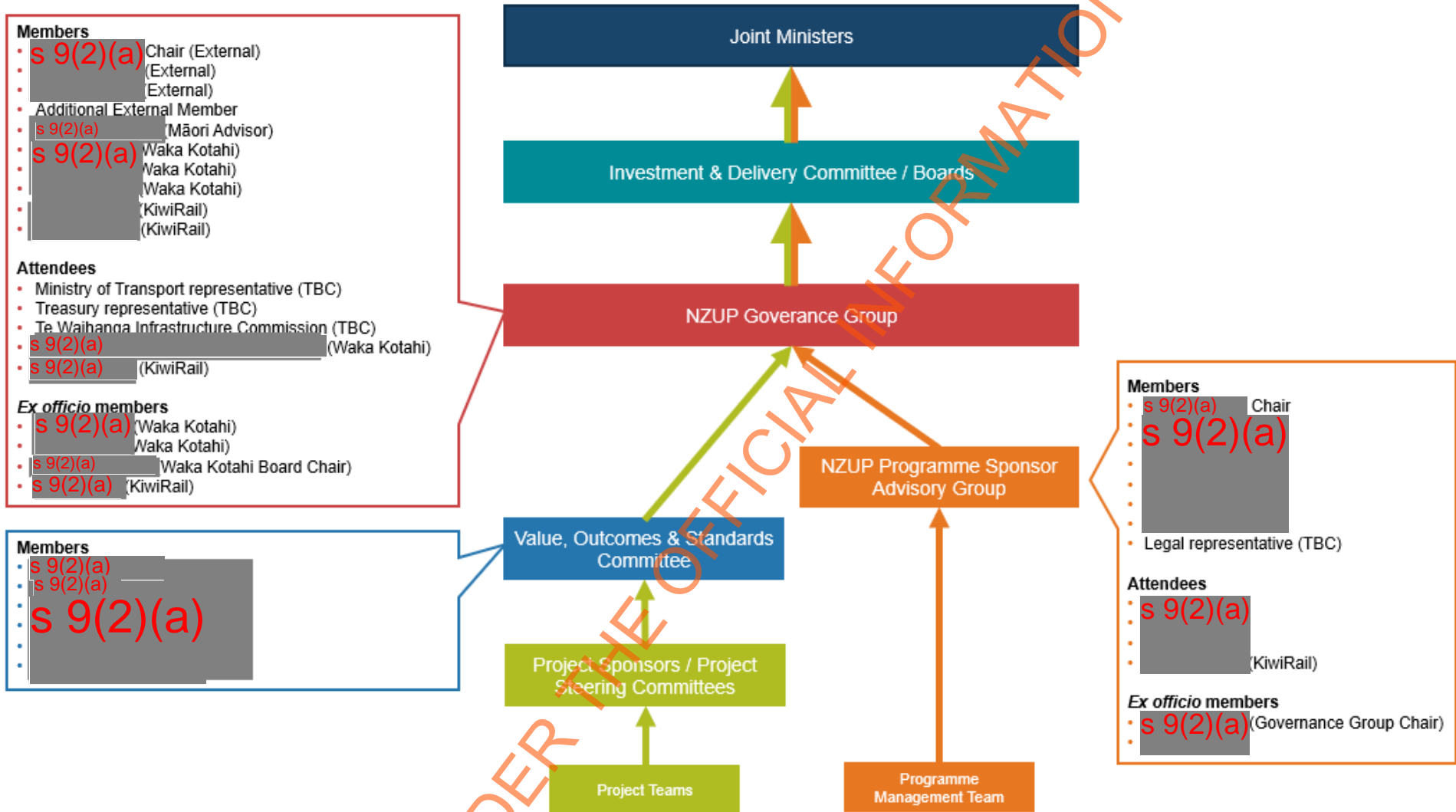


Figure 17 NZUP Governance System Membership

The table below sets out the governance team for the procurement phase only. This will be replaced with an Alliance governance board and structure upon engagement of the successful consortium.

Table 32 Governance Approach

Role	Responsibilities
Project Sponsor	Alignment of the project with organisational drivers. Ownership of project benefits from business case
Project Steering Committee	Decisions on scope change, risk and major variations. Ownership of step-change drivers
Project Alliance Board	To be established upon establishment of the Alliance

9.2 Project Roles and Responsibilities

The table below sets out the roles and responsibilities within the project. This table does not include external suppliers.

Table 33 Roles and Responsibilities

Role	Name	Responsibilities
Project Sponsor	Out of scope	Sponsorship of project as part of NZUP / interface between Project and NZUP Programme Governance
Project Director	Out of scope	Project leadership taking whole of project lifecycle view
Deputy Project Director	Out of scope	Supports and oversees the project delivery team during development and review of key documentation for project implementation approval
Owner Interface Manager	Out of scope	Responsible for achieving an effective interface between the Alliance and their owner organisation, represent the client interests on the Alliance as well as also being part of the Alliance team.
Project Controls Lead	Out of scope	Manage, administer, and report on project controls (financial management, risk management, schedule management, project registers). Support the Project Director and Deputy Project Director with Implementation Business Case development and approvals process
Project Controls Specialist	Out of scope	Support Project Controls Lead
Project Administration	Out of scope	Provide administration support and coordination for project management activities
Senior Project Manager	Out of scope	Ensuring appropriate resourcing and interfaces managed (internal/external)
Project Controls Specialist	Out of scope	Support Project Controls Lead
Design Lead	Out of scope	Project and procurement management, project establishment, controls establishment. Preparation of design and Minimum Requirements
Transport Planning / Business Case Lead	Out of scope	Review of CoC's/design from traffic planning perspective. Technical review of Alliance tenders from TP perspective. Support 'Supporting Growth' Interface

Role	Name	Responsibilities
Delivery Improvement Lead	Out of scope	Deliver broader delivery improvement outcomes as part of the NZUP programme
Property Lead	Out of scope	Undertake handover with AT on property acquisition obligations. Support process of title handover and reporting on risk and program of property acquisition
Stakeholder and Iwi Engagement Lead	Out of scope	Support PM/PDM in engaging with key stakeholders (Mana Whenua, Local Boards, Residents etc)
Environmental and Consents Lead	Out of scope	Lead engagement with local community and stakeholders
Environmental Project Manager	Out of scope	Technical leadership on consent satisfaction and consenting activities. Project management of early works activities for site investigation and environmental works.
Legal Lead	Out of scope	Provide advice and review throughout tendering process and on side agreements.
NZUP PMO Interface	Out of scope	Provide guidance to and act as a conduit with the wider NZUP programme team, including MoT and Treasury.
Commercial Lead	Out of scope	Lead the preparation of Draft Alliance Contract and tendering process.
Engineering Lead	Out of scope	Coordination as / when required of interfaces between NZUP and the NZUP Penlink project
OPPP Technical Lead	Out of scope	Contractual and commercial support in appointing consultants / procurement processes
OPPP Environmental Lead	Out of scope	Overview of technical outcomes related to environmental design and compliance
ASM Lead	Out of scope	Lead technical team inputs into tender documentation including operations and maintenance interfaces, particularly with AT.
Toll Lead	Out of scope	Lead tolling evaluation and reporting team. Liaising with the Minister over tolling issues.
Procurement Lead	Out of scope	Lead the overall procurement process.

9.3 Timeframes

The key milestones for the Penlink project are summarised below, with a project timeline and critical path developed by the Alliance provided in Appendix K and are also detailed in the Project Plan provided in Appendix L. Key milestones during the construction phase will be added following contract award.

Table 34 Key Milestones

Milestone	Date
Consultants procured	Mid 2020
Release of ROI shortlisting	Early 2021
Issue request for tender	Late 2021
Award PAA Contract	Mid 2022
Detailed Design and mobilisation	Mid 2022
Construction start	Mid to late 2022
Construction completion	Mid to late 2026

9.4 Resource Management

The Project Director and workstream leads regularly review resource requirements to ensure appropriate resource is in place for the current and upcoming phase of the project. The team structure will change when the Alliance is established. Key members of the team will be embedded in the Alliance. These roles have been identified and signalled to the consortia in the tender documents. Other workstreams will be less involved than in the current procurement phase.

A key role during the implementation phase is the Owner Interface Manager (OIM). For Penlink, an experienced OIM has been identified and has been involved as an observer in the procurement phase to ensure familiarity with the project.

The Project Director will likely be on the Project Alliance Board (PAB), thereby influencing resourcing of the Alliance as well as maintaining overall responsibility of resourcing the wider team. In addition to the resources assigned to the project, Penlink interacts with a number of Waka Kotahi teams as summarised in the table below.

Table 35 Power of Networked Teams

Team Name	Input Required and When	Accountabilities
Infrastructure Delivery – Auckland/Northland	Project management of procurement, design, construction and operational handover phases between 2020-2025	Project Management
Engagement and Partnerships	Provision of stakeholder management and communications initiatives to the project. Input into the Minimum Requirements for these elements. Stakeholder engagement to provide insights on the public needs and concerns	Stakeholder Management
System Design and Delivery	Conditions assessment and conditions satisfaction support prior to construction phase. Input into Minimum Requirements relating to consent conditions	Planning and Consents
Transport Property	Finalisation of property acquisitions as required for the designation and management of handover from AT to Crown	Property Acquisition

Team Name	Input Required and When	Accountabilities
Specialist Project Delivery Advisors	Provision of commercial and engineering guidance relating to key decision making on commercial procurement	Commercial and Engineering
OPPP Safety and Environmental Team	Provision of technical support and input into Minimum Requirements as relates to (but not limited to) the following: <ul style="list-style-type: none"> - Bridge structure - Quality assurance - Pavements - Design standards 	Technical Engineering Inputs
Safety and Wellbeing Team	Provision of input from a wider safety and wellbeing outcomes perspective into Minimum Requirements and project plans	Safety Excellence Inputs
ASM and ATOC Teams	Provision of input into operational requirements and handover expectations from operator perspective. Input into maintenance requirements. Support in development of Minimum Requirements	ASM and ATOC Teams
NZUP PMO Team	Provision of guidance and structure relating to reporting, governance and consistency of the project as relates to the objectives of the broader NZUP	PMO Support
I&F Investment Assurance	Inputs are pending further consultation with the NZUP PMO team on potential requirements relating to business case	Investment Assurance
Tolling Team	Preparation and implementation of the NZUP Toll Implementation Plan	Tolling Support

Communications Plan

The Penlink Communications and Engagement Plan included at Appendix M, outlines the approach to communicating with specific stakeholders at project junctions and the messaging approach. The Project Plan provided at Appendix L also contains information related to Iwi engagement and consenting.

Communications and engagement will be led by a Waka Kotahi Engagement and Partnerships Advisor who will be a member of the project management team and will report to the Project Manager and Engagement and Partnerships (E&P) Practice Manager Area 1.

The communications and engagement objectives for the Penlink project are to:

- Explain the background to the project and why it is required
- Provide partners, stakeholders and the community with an accurate understanding of the project features, scope and timeline
- Receive feedback from those parties and consider implications on the project
- Engage constructively with partners, stakeholders and the community
- Provide consistent information and minimise uncertainty and dispel misinformation
- Maintain and enhance existing relationships
- Enhance stakeholders' awareness of the outcomes of NZUP. The outcomes include safer and reliable journey experience, improved travel choices to reduce environmental impacts, improved access, boosting productivity

- Explain how Penlink contributes to the expected outcomes of NZUP.

Many communities and businesses in north Auckland have supported Penlink for decades and have a sense of ownership of the project concept. Waka Kotahi will identify opportunities to connect and engage with stakeholders, businesses and the community to communicate project benefits that Penlink will bring. These benefits include a safer journey experience, more travel choice and regional growth.

To develop constructive engagement with the community and key stakeholders, Waka Kotahi will regularly and consistently communicate and seek engagement opportunities.

As part of NZUP, Penlink will align with a wider Auckland infrastructure narrative around supporting growth, getting Auckland moving and contributing to economic development. Penlink will also include the government's priorities on a safer transport system, Road to Zero principles, accessible and affordable transport and reduced emissions.

It will be important to provide clear messaging to the public on the rationale for tolling Penlink. Previous communications referenced the need for tolling to enable construction to be brought forward. The current proposed approach is to toll the corridor to contribute to maintenance and operational costs, and therefore engagement on this aspect of the project is required with the public.

9.5 Stakeholder Reporting and Communications

Waka Kotahi will communicate and engage with partners, stakeholders and community groups to achieve the communications and engagement objectives of the Penlink project, as detailed in Appendix M.

All stakeholder engagement including emails, meetings and phone calls will be recorded in our management software, Consultation Manager. Meeting minutes are to be documented and, where appropriate, agendas provided. Meeting notes will be assigned to the relevant stakeholders in Consultation Manager and, where further actions are required, these are to be logged and appropriate action taken to close them out.

A summary of current engagement activities are summarised below:

- Monthly engagement with 11 iwi partners commenced in April 2020. Waka Kotahi has worked with iwi partners to form the values, principles and narratives of the project
- The project team has provided regular updates to elected members of Auckland Council and presented project progress to List MP Marja Lubeck following her request
- The project team has also engaged with environment groups which include Forest and Bird (Hibiscus & Bays) to capture their views and ideas as part of the planning process
- Waka Kotahi are working with Auckland Council and Auckland Transport to confirm that the project aligns with relevant consent conditions and local road connections
- Engagement with residents in Whangaparāoa, Stillwater and Weiti Bay has been undertaken, including providing regular project updates via e-newsletters
- Engagement with developers such as Hugh Green Group is underway to enable the Penlink project to enhance future residential developments in the area
- From 17 January to 13 February 2022, Waka Kotahi will undertake public consultation to understand people's views on the tolling proposal. The consultation process will involve online engagement and offline drop-in sessions.

9.6 Change Management Arrangements

At the outset of each phase of the project, it is critical that the scope of work is clearly defined and agreed between the project partners and consultant/contractor. This will enable the clear identification of change during the project development, ideally before it has an impact.

There is a hierarchy of controls dependent on the level of change. At a project level, if the change does not trigger a change to the baseline scope, cost and schedule then this is managed within the project and the PSC informed.

Should a change affect (or potentially affect) scope, cost, schedule, risk, benefits or the project objectives as defined in the baseline report, the Project Director raises this with the Sponsor via the PSC. It is then escalated to NZUP Governance Group and dependent on the level of change raised to the Waka Kotahi Investment and Delivery Committee / Board as appropriate.

Escalation to Joint Ministers is consistent with the escalation thresholds as defined in the delegations letter to the Waka Kotahi Board Chair. An early warning will be provided should there be a risk of an escalation threshold being triggered.

Project Change is to be managed in accordance with the process provided in the Waka Kotahi Project Management Manual, Part 2 Processes, Chapter 9.5 Change Control. This includes establishing a change control register enabling interdependencies of change to be managed appropriately.

Change will be managed within an understanding of the tolerances of the project related to funding, scope, risk, quality, and benefits. The change control register will sit alongside the risk register and should be managed by the project manager. Any risk that is realised will result in a change to the project, including adjustment of cost, programme or quality that will be subject to approval by the NZUP governance.

The below table provides an overview of key steps, but change must be managed in a Change Control Register and managed in full accordance with the Project Management Manual.

Table 36 Change Management Approach

Change Process Step	Document
Project manager identifies an issue and its priority or severity	Logs in issues and change register. Notifies Project Director by email and updates Planview
Project Director assesses impact on project objectives and risks. Then identifies, evaluates and recommends options	Recommends and outlines the change within Planview
Project Director either accepts or rejects the option. If the degree of change is outside project delegations as outlined in the Waka Kotahi Project Management Manual the request will be escalated to the governance owner	If necessary, the Project Director sends an exception memo to the Project Sponsor
When a change is agreed, the Project Manager updates plans and records	Updates register, business case, and other documents as required

9.7 Benefits Management Arrangements

Benefits Realisation Plan

A Benefits Realisation Plan has been developed and is included at Appendix N. The plan is based on the investment objectives and quantitative key performance indicators for the purpose of being able to demonstrate how the objectives will be achieved by the project. It enables the benefits that are expected to be derived by the project to be planned for, tracked and realised.

It is noted that the expected public transport travel time benefits included in KPI 3.1 have not been included in the economic assessment (BCR) of the Penlink project. Public transport benefits are expected to be captured through parallel work that is currently being progressed by Auckland Transport to provide supporting public transport infrastructure and services as a result of the Penlink project.

Table 37 Penlink Investment Objectives and Quantitative Key Performance Indicators

KPI	Measure	Source	Baseline
KPI 1.1 Reduced AADT flows through Silverdale interchange by 2028 (on and off ramps)	AADT flows through Silverdale interchange	Transport model	34,900 vehicles in 2018
KPI 1.2 Reduced travel times from key locations Whangaparāoa and Albany to Silverdale interchange by 2028	<ul style="list-style-type: none"> Average vehicle travel time in minutes Orewa to Silverdale Average vehicle travel time in minutes Whangaparāoa to Silverdale Average vehicle travel time in minutes Albany to Silverdale Average vehicle travel time in minutes Whangaparāoa to Albany 	Transport model	<ul style="list-style-type: none"> 10 minutes Orewa to Silverdale in 2018 21.4 minutes Whangaparāoa to Silverdale in 2018 • 18.3 minutes Albany to Silverdale in 2018 • 38.4 minutes Whangaparāoa to Albany in 2018
KPI 2.1 Reduced average daily freight travel times for key journeys by 2028	<ul style="list-style-type: none"> Average vehicle travel time in minutes Orewa to Silverdale Average vehicle travel time in minutes Whangaparāoa to Silverdale Average vehicle travel time in minutes Albany to Silverdale 	Transport model	<ul style="list-style-type: none"> 10 minutes Orewa to Silverdale in 2018 21.4 minutes Whangaparāoa to Silverdale in 2018 • 18.3 minutes Albany to Silverdale in 2018 • 38.4 minutes Whangaparāoa to Albany in 2018

KPI	Measure	Source	Baseline
KPI 2.3 Increased employment in Dairy Flat and Silverdale by 2028	Number of jobs within the Dairy Flat and Silverdale areas	Qualitative Assessment (data source not currently available – modelling assumes same land use pattern)	To be confirmed, data not available at the time of drafting this report
KPI 3.1 Reduced average public transport times (minutes per passenger) between Whangaparāoa and Silverdale and Albany by 2028	Reduce modelled average public transport journey time (walk+wait+itv) between key destinations in minutes per passenger	MSM transport model	59.5 minutes average per passenger from Whangaparāoa to Silverdale in 2018 81.4 minutes average per passenger from Whangaparāoa to Albany in 2018
KPI 3.2 Travel time reliability (AM peak variance) on key journeys by 2028	Travel time reliability for general traffic and public transport	Qualitative Assessment (data source not currently available)	Qualitative Assessment (data source not currently available)
KPI 3.3 Comparative travel times for public transport vs general traffic between Whangaparāoa and Silverdale and Albany by 2028	Ratio of public transport travel times to general traffic	Transport models	Bus travel time is 2.8 times that of general traffic from Whangaparāoa to Silverdale in 2018 Bus travel time is 2.1 times that of general traffic from Whangaparāoa to Albany in 2018
KPI 4.1 Increased uptake of cycling between Whangaparāoa and SH1 by 2028	Cyclists using the Penlink corridor	Estimated, economic assumptions	No current users assumed in economic analysis
KPI 4.2 Increased uptake of walking between Whangaparāoa and SH1 by 2028	Pedestrians using the Penlink corridor	Estimated, economic assumptions	No current users assumed in economic analysis
KPI 5.1 Improved lane availability between Whangaparāoa Road and East Coast Road	Number and hours of road closures per annum	To be confirmed, data not available at the time of	Currently a single access road between Whangaparāoa Road and East Coast Road

KPI	Measure	Source	Baseline
and/or Northern Motorway by 2028		drafting this report	and/or Northern Motorway that is at risk from unplanned events/closures, as shown in Figure 5.
KPI 6.1 Reduced harm for all users by 2028 in line with Road to Zero targets by 2024-28	Death and Serious Injuries (5-year average)	Crash Analysis System	1 fatality and 18 serious injuries (2016-2020) 1 fatal crash 13 serious injury crashes

All quantitative key performance indicators displayed above for Penlink will be considered for the final data measures used in post-implementation monitoring (refer section 8.10).

9.8 Risk Management Arrangements

The Penlink project will be managed at all phases in full accordance with the NZUP Risk Management Framework.

The June 2019 Penlink DBC identified several risks or issues. The biggest economic risk for the delivery of Penlink to date has been securing investment and the ability to deliver the project within the available capital funding envelope. The NZUP investment has helped to address this significant risk and provide a greater level of certainty.

A number of environmental risks have been identified that have informed the consent conditions. These include responding to sensitive ecological areas and coastal marine receiving environments. The project also traverses some difficult terrain along the 6.8km route. The challenging topography and geotechnical ground conditions results in economic implications for the project, as significant cut and fill is required as well as retaining walls or batter slopes to address physical constraints.

The Designation and Resource Consents are all held by Waka Kotahi, and they will ultimately be responsible for confirming all conditions are met. As Waka Kotahi will form part of the Alliance, it is the Alliance that will be the vehicle to comply with the physical requirements and compliance with the consents. This requirement is included in the Minimum Requirements used by the proponents to complete their submissions.

The project alignment passes close to the existing Stillwater community. Previous assessments have also identified archaeological sites within the coastal margin of the Weiti River. For more information on these risks and constraints, refer to the June 2019 DBC in Appendix C.

A detailed Risk Register and Risk Management Plan (Appendix O) have been developed including key roles and responsibilities, reporting lines, mitigation plans and escalation processes. The Risk Register has been updated and is regularly and frequently reviewed.

An independent Quantitative Risk Assessment (QRA) has been completed identifying risk contingencies for both cost and schedule at P50 and P95 confidence levels. See Appendix J for the cost and schedule QRA reports.

The top five risks are included in regular reporting and Risk is a standing agenda item for governance meetings. The Risk Register is a living document; the current version (as of December 2021) is available on request. The top five project risks are summarised below.

Table 38 Top Five Current Risks

Key risks	Residual rating	Mitigation
Budget insufficient to deliver scope	High	<ul style="list-style-type: none"> Affordability threshold set to achieve budget Cost challenge signalled in RFP and bespoke Departures Process has been established Escalation exceeds 3% allowed in the project cost estimate QRA to be completed by an external consultancy
Tolling not adopted, or decision delayed, impacting scope, schedule and cost	High	<ul style="list-style-type: none"> Incorporate learnings from P2W that could reduce risk Engage with key stakeholders prior to consultation Provide clear and concise messaging during consultation Ensure correct process is followed and provide robust advice to the Minister
Unknown geotechnical information resulting in increased costs and schedule	High	<ul style="list-style-type: none"> Geotechnical investigation continuing in Alert Level 3 Additional borehole sites requested by Proponents Additional drill rig commissioned Geotech data made available to Proponents on a regular basis
Delayed contract award affecting cost and schedule	Medium	<ul style="list-style-type: none"> Clarity on programme of approvals required including interdependencies Commence detailed design prior to signing the PAA Submit Outline Plan of Works to Auckland Council to commence earthworks as per programme
Online only procurement process affecting team health, wellbeing and productivity / quality	Medium	<ul style="list-style-type: none"> Identify additional opportunities to engage with Proponents Proactively address team wellbeing/virtual meeting fatigue Discourage back-to-back lengthy virtual meetings Encourage staff to schedule regular breaks in their calendars

Mitigation and Contingency plans are included in the Risk Register and Contingency Plan as part of Contract Management documentation. A standalone Waka Kotahi Risk Management Plan will be developed to capture project risks specific to Waka Kotahi following contract award and will be separate to the risks to be managed by the Alliance.

The constraints and dependencies for the Penlink project have also been captured in the project Risk Register (Appendix O). Key constraints and dependencies primarily relate to financial and physical constraints, with the majority identified in late 2021 as the design of Penlink was further developed. They include:

- Environment requirements for the treatment of stormwater run-off into the Weiti River. These design requirements could also be constrained by the National Policy Statement for Freshwater Management 2020 changes
- Protocols in place to reduce bio risk to the surrounding environment from Kauri dieback
- The NZUP budget allocation approved by the Minister.

In addition, the Project Manager also has ongoing responsibility for the following across the entire lifespan of the project:

- A Risk Register and Risk Management Plan has been developed and maintained in accordance with SM044. This includes regular reviews (monthly) of risk registers. Only risks assessed as high or very high are reported in the monthly Project Progress Report
- A full risk review and workshop has been conducted at key milestones (and will be prior to future milestones) including:
 - o Kick-off phase
 - o Completion of draft Minimum Requirements and Reference Design
 - o Completion of ROI Phase
 - o Completion of Alliance Tender Phase, prior to engagement of consortium on IPAA
 - o Collaboratively with successful consortium upon execution of IPAA and against upon execution of PAA
- Planview is utilised for tracking key Waka Kotahi risks and project issues. The NZUP programme PMO will track some risks at a programme level to establish where efficiencies can be engineered or lessons learned, for wider benefits to be realised
- A Change Register will be developed and maintained by the Project Manager for the duration of the project to track changes to core scope and reasoning as approved
- An independent Quantitative Risk Assessment (QRA) has been completed.

9.9 Contract and Service Management Arrangements

The project team (project controls) keeps a Contract Register on the Microsoft Teams platform, managed by the Commercial Manager. This register includes up to date information on engaged contracts and any variations relating thereto. Contract management is done in compliance with the relevant Waka Kotahi manuals.

All engagements and/or variations follow a project process whereby an 'execution request form' is issued to all relevant project members to confirm the correctness of the scope, fees, sufficient funding and DFA for approval before the relevant contract document is executed and submitted to the consultant.

All consultant progress claims are reviewed and approved during a claim review process, between the relevant project managers, Commercial Manager and the Project Director, before the consultant issues a progress invoice.

9.10 Assurance and Post-project Arrangements

Quality Management

A Quality Plan has been developed to confirm the quality and formal sign-off of key deliverables. This is a living document, and the current version is available on request.

Assurance

Investment Quality Assurance (IQA) has been ongoing throughout the project and recommendations from the IQA team have been incorporated into the 2021 Business Case Addendum and this Implementation Business Case.

An independent peer review was also undertaken on the modelling, economics and Business Case Addendum, which forms part of this document.

Internal Quality Assurance has been undertaken via a peer review of this document, external to the team. The Project Plan at Appendix L contains further details on the assurance process for the Penlink project. The Internal and Independent Quality Assessment reports are provided in full at Appendix Q.

Assurance Plan

To date, key independent reviews have been undertaken to test the viability of the project. A draft Assurance Plan has been included in the Project Management plan (Appendix L). Following receipt of approval to proceed to the implementation phase, the Assurance Plan will be updated upon establishment of the Alliance which will outline the ongoing assurance activities to support the ongoing health, performance, governance, and structure of the project. These include, but are not limited to:

- Baseline cost establishment audit (external)
- Monthly cost audit (external)
- Monthly qualitative cost risk analysis (Contingency Management)
- Cost performance
- Performance measurement and reporting against KRAs
- Contract Management Reviews
- Change Management
- Monthly project governance group meetings (Project Alliance Board and Project Steering Committee)
- Construction Management Review(s) (external)

Treasury Gateway and Waka Kotahi Stage Gate Reviews

As part of ongoing quality assurance for the project, there are internal and external 'gateways' to review the overall project and focus on key elements in preparation for upcoming phases.

For Penlink, there are two key gateway milestones, the Treasury Gateway Review 3, 'Investment Decision' and Waka Kotahi Stage Gate 4, 'Readiness for Award'. The Gateway Review 3 is required to review the robustness of the project, governance and procurement undertaken to date, and looking forward. Passing the Gateway Review 3 is key to progressing the ImBC through to ultimate approval by the Minister of Transport. The internal Waka Kotahi Stage Gate 4 focuses more on procurement, confirming the documentation and processes are in place for successful engagement and delivery of the alliance contract.

Post-Project Reviews

The post-implementation monitoring and performance data tracking for Penlink will begin as soon as the new link opens. The Penlink KPIs will be used to measure the expected performance of the preferred option will continue to be used in future to monitor the actual performance of this investment, relative to investment targets. All performance measures to be monitored as part of benefits realisation for this project are shown below.

Table 39 Key Performance Indicators and Data Measures for Post-Implementation Monitoring

Post-Implementation Performance Measure	Organisation Responsible	Baseline Data	Monitoring Timeframe
Deaths and serious injuries for active mode users	Waka Kotahi	2 active mode injuries (2016-2020)	Annually
Deaths and serious injuries for general traffic and freight users		1 fatal, 18 serious injuries (2016-2020)	

Post-Implementation Performance Measure	Organisation Responsible	Baseline Data	Monitoring Timeframe
Annual average daily traffic flows through the Silverdale interchange (SH1 on and off ramps) and on Penlink		Silverdale interchange (34,900 vehicles per day (2018))	
Average travel time between key locations		Orewa-Silverdale 10 minutes in 2018	
		Whangaparāoa-Silverdale 21.4 minutes in 2018	
		Albany-Silverdale 18.3 minutes in 2018	
		Whangaparāoa-Albany 38.4 minutes in 2018	
Average public transport travel times	Waka Kotahi	Whangaparāoa-Silverdale 59.5 minutes in 2018 Whangaparāoa-Albany 81.4 minutes in 2018	Annually
Employment population per square kilometre (Census mesh block area)	Statistics New Zealand	To be confirmed, data not available at the time of drafting this report	Every four years as per Census

Many of the measures and data sources identified in Table 39 are regularly monitored by Waka Kotahi staff or project partners as part of business-as-usual practices. Therefore, minimal additional resourcing will be required to incorporate the future monitoring of Penlink metrics into existing state highway performance monitoring activities. It is anticipated that reporting will occur on opening and at both two and five years post opening.

10. Documents Supporting this Business Case

The planning and control documents summarised and referenced in this ImBC (listed below) are in place or substantially under development and will be the basis for management of this project. In addition, Waka Kotahi has project management structures, plans and processes in place to enable successful delivery.

These documents are available to decision-makers for review upon request.

Table 40 Appendices and Supporting Documents

#	Title	Version	Date	Comment
A	Waka Kotahi Delegation Letter: Hon Michael Wood	Final	2021	
B	Penlink Detailed Business Case Addendum	Final	2021	
C	Auckland Transport Penlink Detailed Business Case	Final	2019	
D	Penlink Reference Design Report	Final	2021	
E	Penlink Toll Modelling Report	Final	2021	
F	Penlink Traffic Modelling Report	Final	2021	
G	Recommended Option Economic Evaluation Memorandum	Final	2022	
H	Procurement Plan	Final	2022	
I	Alta Cost Estimate Report	Final	2021	
J	Quantitative Risk Analysis	Final	2022	
K	Programme and Critical Path	Final	2022	
L	Project Plan	Final	2022	
M	Communications Plan	Final	2021	
N	Benefits Realisation Plan	Final	2022	
O	Risk Register/Management Plan/Quality Risk Assurance	Final	2021	
P	Penlink CIPA Analysis	Final	2021	
Supporting Documents				
-	Waka Kotahi Penlink Integrated Planning Guidance	Final	2021	
-	Evaluation process and criteria	Final	2021	Included in Procurement Plan
-	Evaluation panel report/minutes	-	-	Not yet available
-	Key Contractual Documents	-	-	
-	Detailed Risk Transfer Schedule	-	-	
-	Resourcing Plan	Final	2022	Included in Project Plan
-	Change Management Plan			
-	Quality Plan			
-	Assurance Plan			

Appendices

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Appendix A – Waka Kotahi Delegation Letter: Hon Michael Wood

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Appendix B – Penlink Detailed Business Case Addendum

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

Appendix C – 2019 Auckland Transport Draft Detailed Business Case

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Appendix D – Penlink Reference Design Report

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

Appendix E – Beca Toll Modelling Report

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

Appendix F – Beca Traffic Modelling Report

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

Appendix G – Recommended Option Economic Evaluation Memorandum

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

Appendix H – Procurement Plan

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

Appendix I – Alta Cost Estimate Report

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

Appendix J – Quantitative Risk Analysis

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

Appendix K – Programme and Critical Path

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

Appendix L – Penlink Project Plan

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Appendix M – Communications and Engagement Plan

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Appendix N – Benefits Realisation Plan

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

Appendix O – Risk Register and Risk Management Plan

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

Appendix P – Penlink CIPA Analysis

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Appendix Q – Penlink Internal and Independent Quality Assessments

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Appendix R – Tolling Assessment Technical Memo

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