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Te Tupu Ngātahi Supporting Growth Alliance – Pukekohe Detailed Business Case for Route Protection

For decision: For noting:

Reason for inclusion in closed board meeting session	
1. Please state why this report is being considered in the closed board meeting as opposed to the open board meeting. Please refer to the 'reasons for confidentiality' and provide a direct reference to one of these reasons.	To protect the integrity of political and administrative processes - sensitive information in the options report which is yet to be redacted and shared to the public.
2. Please provide an estimated date for release of this report.	By 31 December 2023, subject to approval by Waka Kotahi's Official Information team

Ngā tūtohunga / Recommendations

That the Auckland Transport Board (board):

- a) Endorses the recommended Strategic Transport Network identified in the Pukekohe Detailed Business Case (DBC) to support the future urban growth areas in Pukekohe, Paerata and West Drury.
- b) Endorses the route protection strategy for the Strategic Transport Network.
- c) Approves the release of \$7.1 million (comprising 51% Waka Kotahi New Zealand Transport Agency (Waka Kotahi) co-funding and 49% local share) from the Te Tupu Ngātahi Supporting Growth Alliance (Te Tupu Ngātahi) budget for post lodgement activities associated with route protection, subject to Waka Kotahi Board approval of the DBC and co-funding.
- d) Notes that a provision for early property acquisition risk from lodgement of the Notices of Requirement (NoR) for Auckland Transport (AT), estimated at \$36 million (P50 escalated) over the Regional Land Transport Plan (RLTP) period to 2031/32, will need to be made in the 2024/34 RLTP.

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Te whakarāpopototanga matua / Executive summary

1. Te Tupu Ngātahi is an alliance owned by AT and Waka Kotahi for the purpose of planning and route protecting the strategic transport networks required to support the future urban (greenfield) growth areas identified in the Auckland Plan, Future Urban Land Supply Strategy (FULSS) and Unitary Plan over the next 30+ years.
2. Pukekohe, Paerata and Drury West’s population is expected to triple over the next 30+ years. Auckland Council's draft Future Development Strategy maintains an emphasis in this area and much of forecast growth is expected to occur over the next 20 years. There is pressure for development now with a number of private plan changes either under investigation or lodged with Auckland Council.
3. Te Tupu Ngātahi’s Pukekohe DBC recommends a Strategic Transport Network to support this growth. The network is critical to the success of network outcomes overall and supports other key transport projects by AT, Waka Kotahi and KiwiRail including active modes, four tracking and electrification of the rail network between Papakura and Drury, Paerata and Drury West rail stations, and upgrades to SH22 and SH1.
4. Auckland Council’s draft Future Development Strategy (FDS) has added land use uncertainty with the proposed removal of flood impacted land in the northern south future urban areas of Takanini and Opaheke. Sensitivity analysis has been completed and the strategic transport network would remain resilient to these changes such is the existing network issues and significant growth planned for Pukekohe and the South overall.
5. The estimated cost of AT projects to realise this growth in Pukekohe is \$1.1 billion. This equates to \$105,000 per household and a Benefit-Cost Ratio is 0.9. Protecting the route early increases the benefit to AT in the long-term as land and construction costs will increase over time if the right routes in the right place are not protected now. Approximately 25 percent of the network is expected to be delivered through developer contributions.
6. There is \$7.1 million in the Te Tupu Ngātahi's budget for route protection in Pukekohe, Paerata and Drury West, which is included in the ‘SGA post lodgement and property’ line item in the current RLTP 2021-31. Funding has also been sought through the draft Joint Transport Plan (JTP) and draft RLTP 2024-34 review for Te Tupu Ngātahi and the early property acquisition risk that comes with route protection.
7. The Franklin Local Board and community in general is supportive of the strategic transport network and route protection. Some specific network issues have been raised but these have largely been resolved through alignment refinements and the provision of more detailed information. A resident’s group has recently established to oppose Waka Kotahi’s Pukekohe Strategic Arterial and its connection to AT’s Sims Road.

Ngā tuinga ō mua / Previous deliberations

Date	Report Title	Key Outcomes
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February 2019 Board	Supporting Growth – Preferred networks and next steps	The board approved the Indicative Strategic Transport Network and progressing to the next stages including detailed business case to lodgement.
October 2019 Board	Supporting Growth – Amended Programme Alliance Agreement	The board approved Target Cost Estimate Two (TCE2) for the programme which includes the pre and post lodgement activities for the Pukekohe package.
August 2023 Design and Delivery Committee (committee)	Te Tupu Ngātahi Supporting Growth Alliance – Pukekohe Detailed Business Case for Route Protection	<p>The committee:</p> <ul style="list-style-type: none"> a) inquired into the nature of the options that were considered and requested a summary of them; b) sought and received assurance that Auckland Council’s land use planning strategy team had been engaged throughout the process; c) queried the use and validity of Auckland Council’s stormwater model noting that while Auckland Council Healthy Waters advise that Auckland Council flood modelling is the most comprehensive and advanced modelling in NZ some infrastructure providers have sought to develop their own models; d) sought and received assurance that any recent changes to forecast land use growth had been addressed in the strategic case. The committee also received advice that the scope of the SGA programme is to enable Council’s strategic growth plans, and these confirmed plans are used as the basis for analysis; and e) noted that potential stormwater issues around Route 10 had been addressed.

Te horopaki me te tīaroaro rautaki / Context and strategic alignment

8. Early route protection provides certainty over the future strategic transport network for future decision to be made. It also reduces the social impacts on future communities upon delivery, provides opportunities for partnering with other parties and enables land use to be planned and integrated with transport. Overall, this results in significantly reduced cost risk while locking in the outcomes and benefits.
9. Over the next 30 years, the population of Pukekohe, Paerata and Drury West is expected to triple to approximately 55,000 (see Attachment 1), necessitating 21,000 new houses and 9,000 new jobs (FULSS). There is pressure for development now with a number of private plan changes either under investigation or lodged with Auckland Council.

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10. Auckland Council's draft FDS will replace the FULSS. The draft strategy maintains an emphasis in this area and much of forecast growth is expected to occur over the next 20 years in line with the current FULSS. In addition, the urbanised areas could undergo further intensification under Plan Change 78 to implement the Government's Medium Density Residential Standards (MDRS) National Policy Statement.
11. Te Tupu Ngātahi has prepared the Pukekohe DBC, which identifies the recommended Strategic Transport Network (see Attachment 2) for route protection to support planned growth in Pukekohe, Drury West, and Paerata. The recommended Strategic Transport Network was developed by AT and Waka Kotahi, in collaboration with its partners KiwiRail, Auckland Council and mana whenua.

Ngā matapakinga me ngā tātaritanga / Discussion and analysis

12. The purpose of a DBC is to build a complete understanding of acceptable risks, uncertainties and the benefits associated with the investment, so that a final decision can be made on whether to implement it. A Multi-Criteria Analysis (MCA) is undertaken to allow for differentiation between the options and identify the benefits and disbenefits and/or effects of each. The options assessment (see Attachment 3) followed a robust process including MCAs, workshoping with partners (Auckland Council, Manawhenua and KiwiRail) over an eight-week period and public engagement on the options and preferred option.
13. The DBC must then provide detailed analysis of the costs, risks, and benefits of the preferred option, including evidence that it's the right investment, is affordable and provides value for money, delivers the outcomes identified and puts in place plans for successful delivery. The recommended Strategic Transport Network has been developed is to support the existing and future communities by (see Attachment 2):
 - a. Providing safe, integrated, and reliable connections between key land uses and the public transport network, including a comprehensive and integrated active modes network for Pukekohe.
 - b. Achieving network resilience and efficient freight access to and around Pukekohe to reduce congestion and avoid reliance on the rural road network, which is not designed to accommodate urban traffic volumes.
 - c. Leveraging other key projects being planned by others to provide improved access and benefits realisation. These include the Dury to Pukekohe active modes corridor, four tracking and electrification of the rail network between Papakura and Drury, Paereta and Drury West rail stations, and SH22 and SH1 Papakura to Bombay upgrades.
 - d. Overall, providing improved travel choice and access to jobs, services and recreational opportunities for actives modes, public transport, freight, and private vehicle travel.
14. The network has been integrated with Auckland Council's Pukekohe Structure and has also taken account of current and planned growth in the north of Waikato. Urban intensification in Pukekohe under the MDRS has also been considered with upgrades to existing urban corridors balancing right sized to accommodate this growth and network outcomes while minimise property impacts.

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15. The total cost of the AT projects to meet the forecast growth is \$1.1 billion (P50 un-escalated), including \$147 million for property. This is greater value than Warkworth (\$130,000 and 0.6) and North-West (\$120,000 and 0.8). In addition to this, approximately 25 percent of the AT strategic transport network is anticipated to be delivered by developers if route protected (see Attachment 4).
16. The Benefit-Cost Ratio is 0.9. Many of the benefits result from travel time and safety cost savings arising from a network that relieves growth pressures and better promotes mode shift. Given the long-term timeframes, route protection DBCs typically don't achieve high BCRs. Value for money will increase through design and land take refinement and partnership opportunities with developers.
17. The recommended route protection strategy is to protect the whole network by way of NoR, mainly due to the land fragmentation in Pukekohe, Drury and Paerata.
18. Lodging Notices of Requirement (NoRs) for the network will permanently impact 245 properties. This comes with a financial and reputational risk associated with requests for property early acquisition and/or opposition from impacted landowners and communities (see key risks and mitigations section). Route protection does carry an early property acquisition risk, which is estimated at \$81 million (P50 escalated at 10 percent per annum) over the remaining RLTP to 2031. Provision for early property acquisition has not been made in the current approved capital programme and will need to be made in the 2024-34 RLTP.
19. Not designating and implementing the proposed network would result in growing reliance on private vehicle travel with increased emissions, travel time delays, reduced network resilience and negative outcomes for safety and active modes. This would also increase long-term costs put the success (benefits realisation) of the other key infrastructure projects in the area at risk (see Attachment 5).

Ngā tūraru matua / Key risks and mitigations

Key risk	Mitigation
<p>Lodging NoR creates a financial risk that AT may be obliged to purchase property earlier than required. This is particularly relevant given the early stage in draft RLTP development and constrained funding envelope over the next 2 years.</p>	<p>A regional “Route Protection and Encroachments Property” funding allocation has been included in the draft RLTP 2024-34. Certainty over this funding will become clearer in early 2024.</p> <p>AT’s hardship policy sets out circumstances for considering early acquisition of property from landowners on hardship grounds (i.e., financial hardship, illness etc). For early acquisition requests that do not meet the hardship thresholds or have insufficient justification, AT will continue to strike a balance between vulnerable landowners and managing financial risk.</p> <p>Overall, route protection will deliver significant benefits and cost savings into billions of dollars which outweigh the short-term risks and cost of early property acquisition.</p>

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<p>Lodging NoRs for Pukekohe may create adverse reputational risk due to the property impacts and landowner stress</p>	<p>Te Tupu Ngātahi has developed and will implement a proactive post lodgement approach to focus on and support landowners. This will include ongoing landowner letters, meetings and communications, and consideration of making support services available such as the Friend of the Submitter and counselling.</p> <p>AT is also developing a strategy for managing landowners and stakeholders once the designations are in place. These relationships will be enduring given the long-term nature of the programme and it is important that AT prepared and able to respond and communicate across its business interfaces.</p>
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Ngā ritenga-ā-pūtea me ngā rauemi / Financial and resource impacts

- 20. The AT and Waka Kotahi boards have approved the Tupu Ngātahi Supporting Growth Programme Alliance Agreement. The approved Tupu Ngātahi’s AT budget is \$127.3 million inclusive of AT overheads. This is included in the current RLTP 2021-31 under the lines ‘SGA investigations’ and ‘SGA property and post lodgement’.
- 21. This paper recommends releasing \$7.1 million of the budget for post-lodgement activities associated with route protection in Pukekohe, Paerata and Drury West. This is subject to Waka Kotahi’s board approving the release of co-funding.
- 22. Continued funding for the programme has been included in the draft JTP and draft RLTP 2024-34. It is understood that this is being prioritised ‘above the line’ at this stage in the process.
- 23. Early property acquisition risk from lodging NoRs for Pukekohe, Paerata and Drury West is estimated at \$36 million (P50 escalated) over the RLTP 2021-31 period. Funding has been sought through the draft JTP and draft RLTP 2024-34 reviews for a regional “Route Protection and Encroachments Property” line to accommodate all of Tupu Ngātahi’s early property acquisition risk.

Ngā whaiwhakaaro ō te taiao me te panonitanga o te āhuarangi / Environment and climate change considerations

- 24. Te Tupu Ngātahi has been aware of the impacts of climate change since its establishment in 2018. An eliminate / avoid, reduce / defer and optimise / offset approach has been adopted for the Indicative Business Case, DBC and NoR phases respectively. Enabled and embodied carbon considerations have also been embedded in businesses cases processes.
- 25. For Pukekohe, Paerata and Drury West, the Strategic Transport Network is expected to result in a 0.4 per cent reduction in Vehicle Kilometres Travelled (VKTs) in 2048+ and an emissions reduction of 2,772 tonnes CO₂-eq per year over 60 years compared to the base case. Most of the benefits will come from the decarbonisation of the vehicle fleet.

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26. Long-term climate change resilience has also been a focus. Flood modelling has been assessed at 2.1 degrees warming and 16 percent increase in rainfall events based on guidance from Auckland Council. Given the uncertainty of climate change effects in the future, the assessment also considers a severe climate change scenario of 3.8 degrees warming and a 32.7 percent increase in rainfall.
27. Route protecting the recommended network further contributes to emission reductions by supporting a compact land use, reducing trip distances, enabling mode shift, and enabling land release to be timed with sustainable mode improvements. It also ensures that the optimum route can be identified from an enabled and embodied carbon perspective.

Ngā whakaaweawe me ngā hakairo / Impacts and perspectives

Mana whenua

28. Mana whenua are a partner of Te Tupu Ngātahi and engage with the programme through regular hui. Kaitiaki representatives provided input into the option development process. Mana whenua support the DBC and the next stages of route protection.

Ngā mema pōti / Elected members

29. Te Tupu Ngātahi regularly engages with the Franklin Local Board on the DBC, seeking input on the public engagement approach and providing updates on the feedback received and preferred options development. There is general support for the network and route protection. Overall, the local board has been supportive and appreciative that the team has listened and kept the community updated.
30. Franklin Local Board and the Ward Councillor have raised concerns about parts of the network and freight movements through rural parts of Franklin. Te Tupu Ngātahi and AT has met with these elected members and has either responded to those concerns or has committed to considering those wider rural freight network concerns that sit outside of the programme.

Ngā rōpū kei raro i te Kaunihera / Council Controlled Organisations

31. Auckland Council is a partner of Te Tupu Ngātahi and are regularly updated on the programme, including the Pukekohe projects. Representatives participated in DBC option development. Te Tupu Ngātahi updates Watercare regularly on its projects. Panuku Development has been updated on the programme and joint engagement was undertaken in Pukekohe.

Ngā kiritaki / Customers

32. The community has largely responded positively to the recommended strategic transport network and route protection. There is support for improved connections and the removal of general traffic and freight from the centre of Pukekohe.
33. Concerns have been raised regarding:

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- a. Grace James Road arterial, which has now been realigned in response to the feedback and further investigations.
 - b. Opposition to Waka Kotahi’s Pukekohe Strategic Arterial alignment and its connection to AT’s Sims Road.
 - c. An outer western freight ring route through the rural area to Waikato is proposed by a developer and supported by the Pukekohe High School’s principal who is concerned about increased traffic in Pukekohe. Traffic modelling indicate relatively low traffic volumes in the future and does not support a ring route option now. Making better use of the existing transport network with local intersection and active modes improvements is recommended instead.
 - d. Existing freight network deficiencies have been identified outside of the Te Tupu Ngātahi network. The Indicative Business Case did identify safety improvement (which do not need rote protection) and AT is investigating this ahead of responding to the freight industry, residents, and elected members. There are no other current growth plans that would change the recommended network but new planning such as Auckland Council’s Economic Master Plan for the South could lead to future transport investigations.
34. The AT Strategic Transport Network will impact 35 full and 210 partial properties. After the NoRs are lodged, communication will continue with landowners and key stakeholders through letters, a proactive media strategy and meetings.

Ngā whaiwhakaaro haumarū me ngā whaiwhakaaro hauora / Health, safety and wellbeing considerations

35. Te Tupu Ngātahi has applied Vision Zero principles to its business cases and applied the avoid, shift, improve approach at each step. The recommended Strategic Transport Network for Pukekohe has been developed to avoid the need for private vehicle travel in the first instance, prioritise public transport and active modes, and ensure new and upgraded corridors have sufficient width to accommodate a safe and compliant design. Without the recommended strategic network, existing urban and unsafe rural roads will be relied upon for travel.

Ā muri ake nei / Next steps

36. Once approved, Te Tupu Ngātahi will continue preparing AT’s NoRs for lodgement in September 2023. Public notification of the NoRs is expected in February 2024 with hearings and appeals expected to be resolved by the end of 2024.

Ngā whakapiringa / Attachments

Attachment number	Description
1	Council’s vision and growth for Pukekohe, Paerata and Drury
2	Recommended Strategic Transport Network, and Active Modes and Freight Networks



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3	Option assessment
4	Affordability of route protection and property
5	How this cost will be shared in the future
6	Options report only

Te pou whenua tuhinga / Document ownership

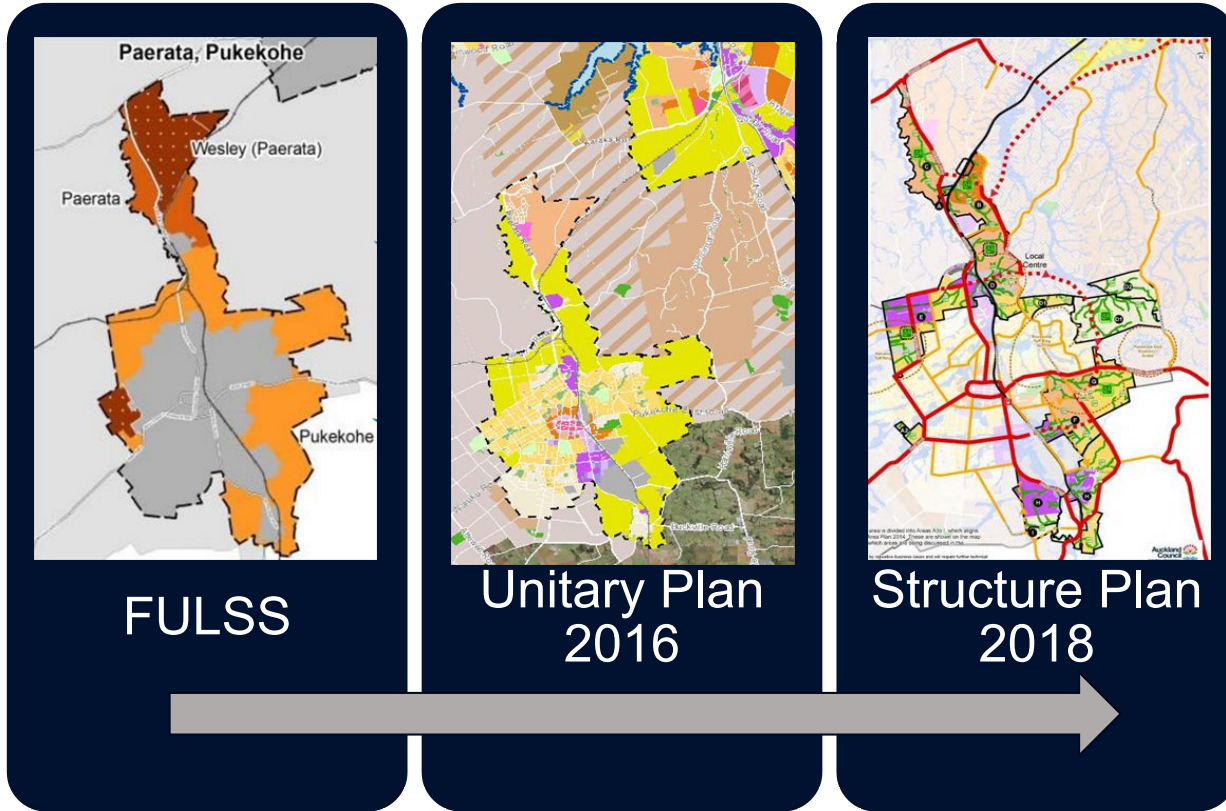
Submitted by	Alastair Lovell Owner Interface Manager – Supporting Growth Alliance Chris Watson Group Manager Investment Development	 
	Jenny Chetwynd Executive General Manager, Planning and Investment	
	Dean Kimpton Chief Executive	

Attachment 1

Council's vision and growth for Pukekohe, Paerata and Drury



Council's vision and growth for Pukekohe, Paerata and Drury West



FULSS

Unitary Plan 2016

Structure Plan 2018

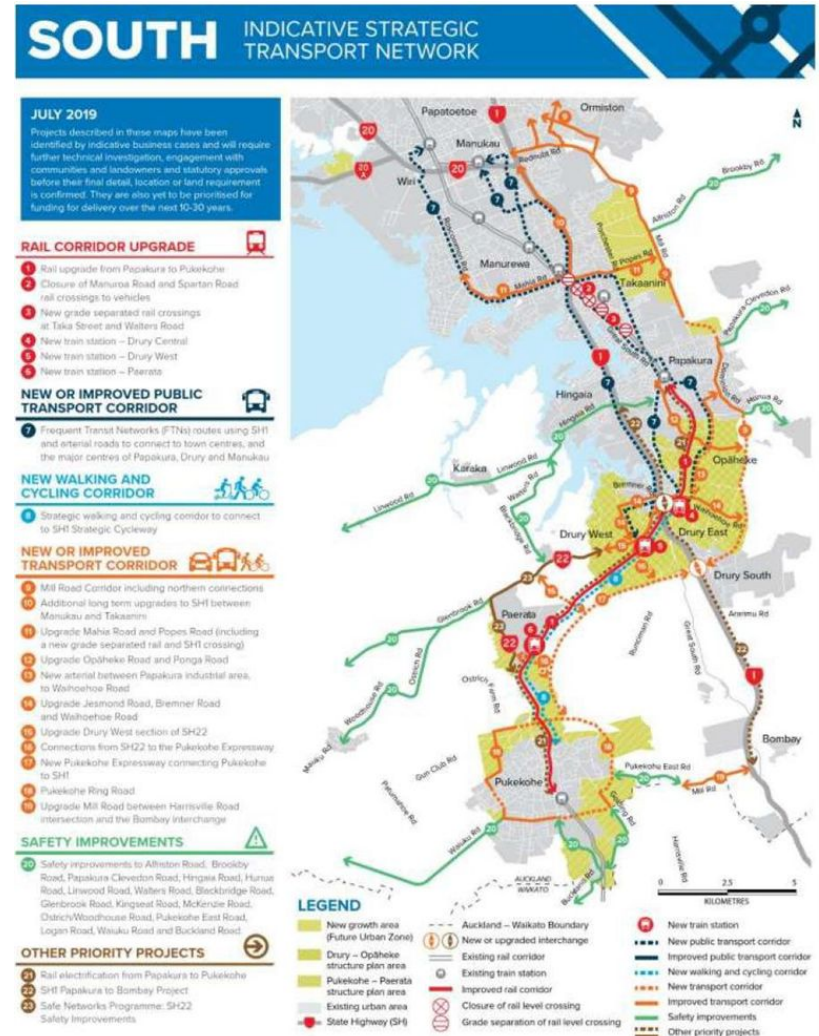


Growth

- 21,000 additional households
- 9,000 additional jobs
- 55,000 additional people (2-3 x existing population)

Council's Vision

- Enhance as a focal point and place to further support the surrounding rural economy
- ... a range of housing choice and employment opportunities ...
- Well connected to the wider Auckland and Waikato regions
- ... protecting and enhancing the natural, physical and cultural values ...



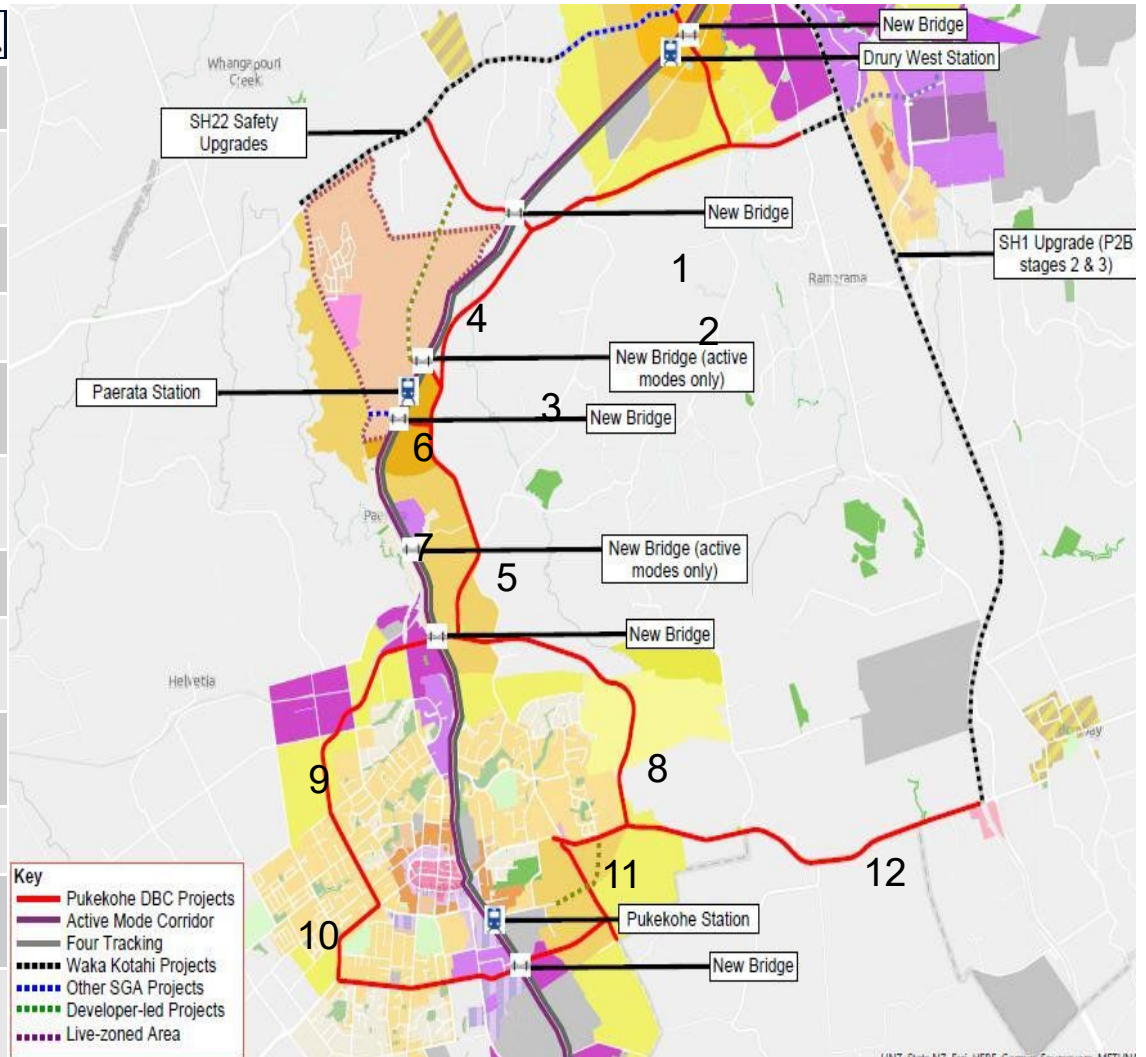
Attachment 2

Recommended Strategic Transport Network, and Active Modes and Freight Networks



Recommended Strategic Transport Network (2 slides)

#	Project	Project purpose	
1	Drury West Arterial (AT)	Enhance station access, enable growth and access to new SH1 interchange	
2	South Drury Arterial	Relieves SH22 traffic movements through West Drury with SH22 Connection, access to new SH1 interchange	
3	SH22 Connection	Works with South Drury Connection to relieve SH22	
4	Drury-Paerata Link	Completes new Drury-Pukekohe strategic link	
5	Paerata Arterial	Complete new Drury-Pukekohe strategic link, enables Paerata / north Pukekohe FUZ growth	
6	Sim Road Connection (AT)	Reconnects Sim Road, giving Paerata access to Drury-Pukekohe link and relieves station access road	
7	Paerata Station Connection (AT)	Links Drury-Pukekohe link to Paerata Station and SH22	
8	Pukekohe North East Arterial (AT)	Enables FUZ development and traffic movement around SE Pukekohe to access strategic network	
9	Pukekohe North West Arterial (AT)	Enables FUZ development and traffic movements around NW Pukekohe to access strategic network	
10	Pukekohe South West Arterial (AT)	Enhances active modes level of service	
11	Pukekohe South East Arterial (AT)	Enables FUZ development and strategic traffic movement around SE Pukekohe to access strategic network	
12	Pukekohe East Road / Mill Road	Enhances active mode facilities to SH1 and Bombay. Enhances strategic traffic access to SH1	



Attachment 3

Option assessment



Options Assessment (4 slides)

- Two rounds of options assessment as there was some time between South IBC network was recommended and kick off Pukekohe arterials options assessment.
- Also reinvestigated the “Pukekohe Expressway” and connections due to government policy and legislation changes.
 1. Corridor assessment – wider geographic areas
 2. Route refinement – progressed options recommended through corridor assessment further (looked at additional options in a more refined geographical area).
- Eight workshops were undertaken with Partners (representatives from AT and Waka Kotahi (subject matter experts), KiwiRail, Auckland Council and Manawhenua) at the beginning of options assessment process to gain feedback on the options development and assessment of Pukekohe Expressway and connections.

Workshop #	Date	Working with Auckland Council and other partners
Workshop 1	8 April 2022	Introduction to workshop series to collectively test Pukekohe Expressway’s role in the network, considering whether alternative options could achieve outcomes sought, and how changing policy direction could impact timing and sequencing.
Workshop 2	22 April 2022	Provide an overview of the project area history, site context, features and constraints.
Workshop 3	6 May 2022	Obtain Waka Kotahi, AT, KiwiRail and Manawhenua perspectives on the project area.
Workshop 4	20 May 2022	Obtain Auckland Council’s perspectives on the project area. The Project Team also presented outcomes sought for the Pukekohe Transport Network.
Workshop 5	3 June 2022	Provide an overview of network outcomes with and without Pukekohe Expressway.
Workshop 6	17 June 2022	Present and discuss options assessment process and provide an overview of the approach to packaging corridor options into Drury West, Paerata and North-South options.
Workshop 7	30 June 2022	Present the outcomes of corridor assessments for each package and seek feedback.
Workshop 8	29 July 2022	Present the recommended corridor options as a network and next steps (approach to route refinement and public engagement).



Attachment 4

Affordability of route protection and property



Affordability of route protection and property (P50-unescaled)

Total AT cost if designated now - \$1.1 billion
Total AT cost if not designated - \$1.4 billion
Savings - \$330 million

Total cost \$1.1B, property \$147M, property hardship to 2031 \$27M

Not route protecting could increase costs by 30%

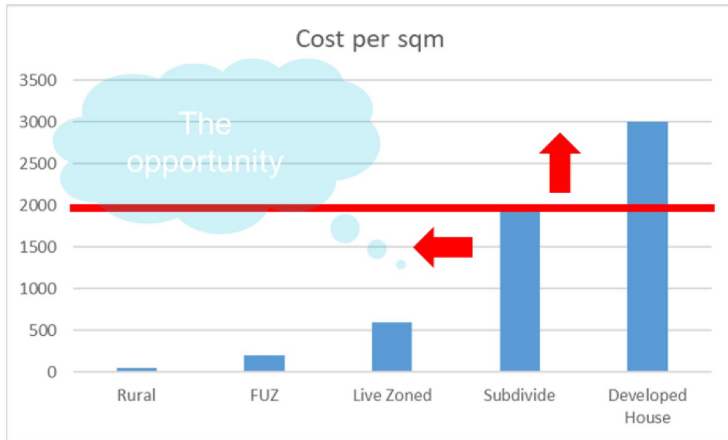
5-10% construction saving in the order of \$60 million

The earlier we acquire land the more we save

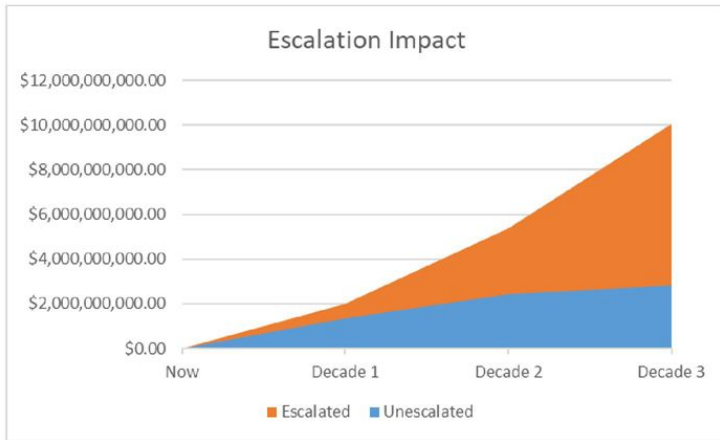
Avoid social impacts and costs by planning ahead of growth

**Can we afford to?
Can we afford not?**

Property increase in value as land is developed



Property escalation compounds overtime



Land is acquired just before construction



Attachment 5

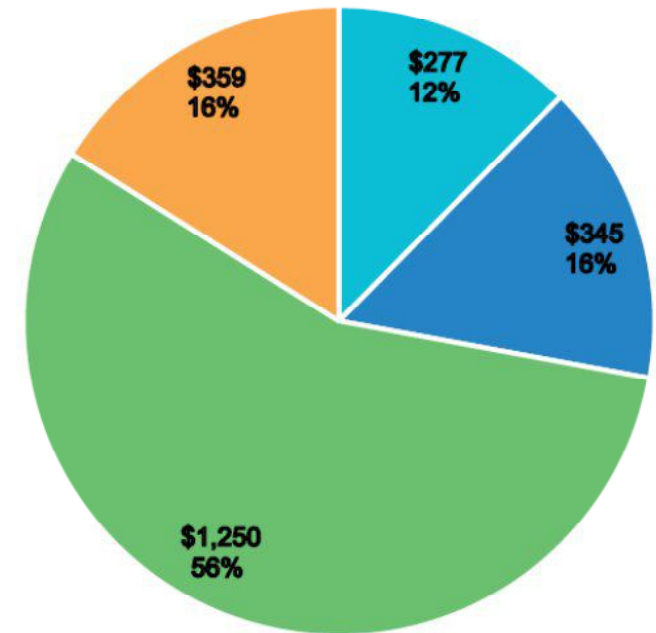
How this cost will be shared in the future



How this cost is shared in the future

- Opportunities to align with developers are expected to cover 25% of the value of the network for the AT projects.
- Early route protection helps enable this by securing the route and third-party land where needed to deliver.
- This reduces AT's and Waka Kotahi's share towards these AT projects.

Funding Split - P50 un-escalated estimate



2.2 billion AT & Waka Kotahi network total

- Development Contribution
- AT (local share)
- NLTP (SH investment)
- NLTP (co-investment)

Pukekohe

Appendix B: Options

Assessment Report

May 2023

Version 1.0

Document Status

Responsibility	Name
Author	s 9(2)(a)
Reviewer	s 9(2)(a)
Approver	s 9(2)(a)

Revision Status

Version	Date	Reason for Issue
1.0	18 May 2023	Issued for IQA

Disclaimer

This is a draft document for review by specified persons at Auckland Transport and the New Zealand Transport Agency. This draft would subsequently be updated following consideration of the comments from the persons at Auckland Transport and the New Zealand Transport Agency. This document is therefore still in a draft form and is subject to change. The document should not be disclosed in response to requests under the Official Information Act 1982 or Local Government Official Information and Meetings Act 1987 without seeking legal advice.

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Glossary

Acronym/Term	Description
AT	Auckland Transport
ATAP	Auckland Transport Alignment Project
ATCOP	AT Code of Practice
AUP:OP	Auckland Unitary Plan: Operative in Part (2016)
Council	Auckland Council
CHI	Cultural Heritage Inventory
CIA	Cultural Impact Assessment
CPTED	Crime Prevention through Environmental Design
DBC	Detailed Business Case
FTN	Future Transit Network
FULSS	Future Urban Land Supply Strategy
FUZ	Future Urban Zone
IBC	Indicative Business Case
MCA	Multi-Criteria Assessment
N/A	Not Applicable
NES	National Environmental Standard
NES:FW	Resource Management (National Environmental Standards for Freshwater) Regulations 2020
NES:Soil	Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011
NPS	National Policy Statement
NPS:FM	National Policy Statement on Freshwater Management
NPS:HPL	National Policy Statement on Highly Productive Land
NPS:UD	National Policy Statement on Urban Development
NIMT	North Island Main Trunk
NLTF	National Land Transport Fund
NLTP	National Land Transport Programme
NoRs	Notices of Requirement
NZ	New Zealand

Acronym/Term	Description
NZUP	New Zealand Upgrade Programme
ONF	Outstanding Natural Feature
ONL	Outstanding Natural Landscape
P2B	SH1 Papakura to Bombay Project
P2P	Papakura to Pukekohe rail electrification Project
Partner	Manawhenua, Auckland Council, Auckland Transport, and Waka Kotahi
PBC	Preliminary Business Case
RLT	Auckland Regional Land Transport Plan
RMA	Resource Management Act 1991
SEA	Significant Ecological Area
SEV	Stream Ecological Valuation
SH1	State Highway 1
SH22	State Highway 22
SMAF	Stormwater Management Area: Flow
Te Tupu Ngātahi	Te Tupu Ngātahi Supporting Growth Alliance
TDM	AT's Transport Design Manual
VKT	Vehicle Kilometres Travelled
Waka Kotahi	Waka Kotahi New Zealand Transport Agency
Zero Carbon Act	Climate Change Response (Zero Carbon) Amendment Act 2018

1 Introduction

1.1 Purpose of this Report

The Supporting Growth Programme is identifying the preferred transport network to support growth in the Drury, Paerata and Pukekohe areas of Auckland. In selecting the preferred transport network, a wide range of options have been developed and evaluated, including transport infrastructure corridors and routes to be protected via designations (or other planning measures).

This Options Assessment Report addresses the options development and assessment process and outcomes for the Detailed Business Case (DBC) being prepared for the Pukekohe Transport Network.

This report provides a summary of the preceding South Indicative Business Case (IBC) Options Assessment (as it relates to Pukekohe Business Case) including the long list and short list phases and describes the DBC options assessment process through to recommendation of a preferred transport network.

The following diagram outlines the process undertaken through the IBC and DBC phases:

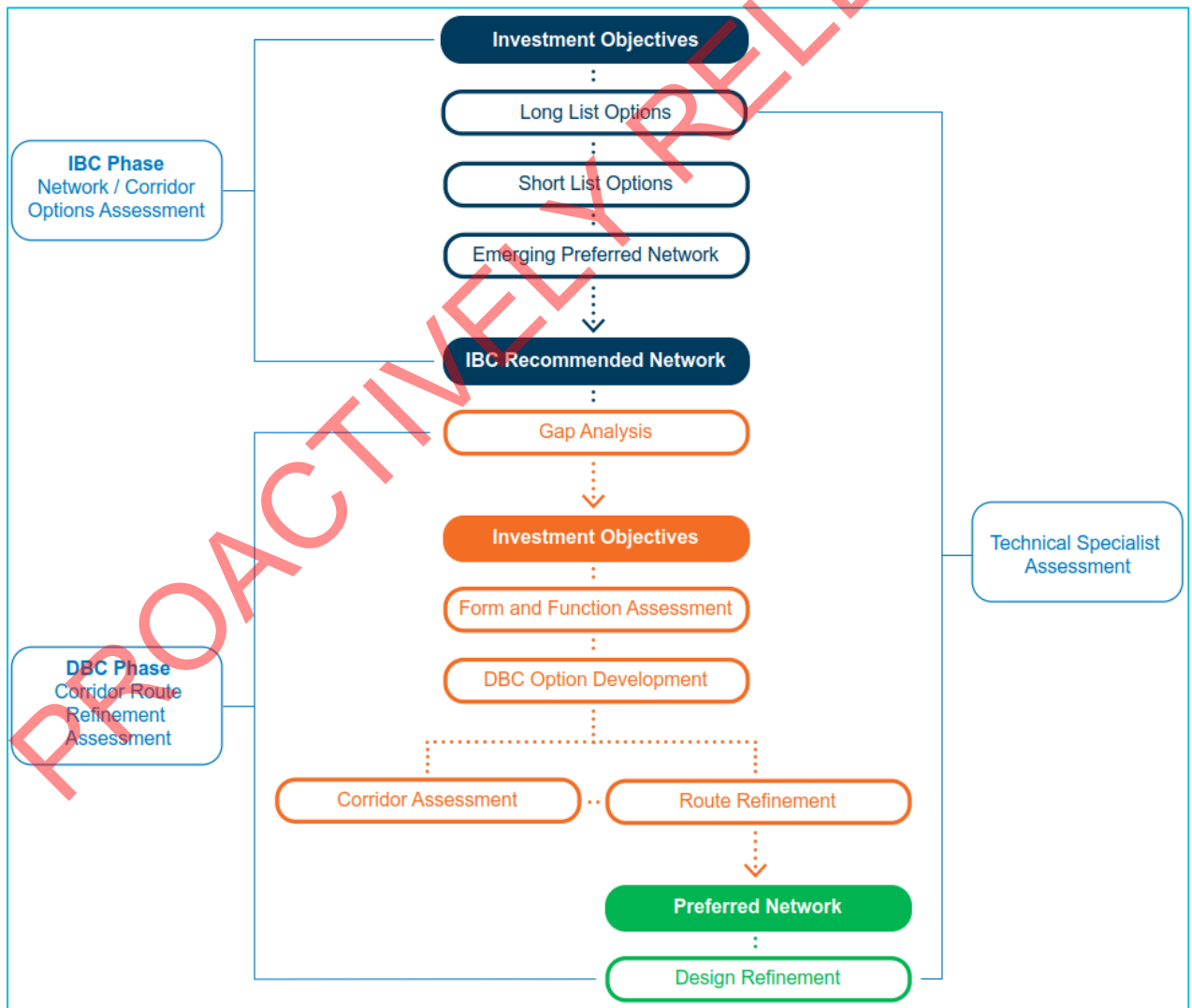


Figure 1-1 Overall Options Assessment Process

1.2 Structure of this Report

The report is structured as shown in Table 1-1.

Table 1-1: Structure of this report

Section	Heading	Description
1	Introduction	This introduction – sets out the purpose and structure of this report.
2	Background	Background to this options report, context around the Pukekohe growth area and previous project phases.
3	Overview of the Option Development and Evaluation Process for the DBC	The DBC option development and evaluation process: gap analysis, option development and evaluation, engagement, form and function and approach to stormwater processes.
4	Corridor Assessment	Sets out the corridor assessment for the Pukekohe DBC components- grouped into option packages: <ul style="list-style-type: none"> • Drury West Local • Paerata Local • North-South • Network Package Assessment (for Drury West Local, Paerata Local and North South) • Pukekohe Local
4	Route Refinement Assessment	Sets out the route refinement assessment for the Pukekohe DBC components- grouped into option packages: <ul style="list-style-type: none"> • Drury West • South Drury • SH22 Connection • Drury to Paerata Link • Paerata Arterial • Paerata Connections • Mill Road – Pukekohe East Road • Pukekohe NE Arterial • Pukekohe SE Arterial • Pukekohe SW Arterial • Pukekohe NW Arterial
6	The Emerging Preferred Network	Summarises the Emerging Preferred Network for the Pukekohe DBC

2 Background

Auckland is New Zealand's largest city, home to approximately 1.69 million people. The city is growing rapidly; driven by both natural growth (more births than deaths) and migration from overseas and from other parts of New Zealand. In 2017, Auckland attracted 36,800 new residents; more than the rest of the country combined. The Auckland Plan Development Strategy (2050) signals that Auckland could grow by another 720,000 people to reach 2.4 million over the next 30 years.

The Auckland Plan anticipates that this growth would generate demand for an additional 313,000 dwellings and require land for approximately 263,000 additional employment opportunities. In response to this demand, the Auckland Unitary Plan – Operative in Part (AUP-OIP) identified 11,000 hectares (ha) of predominantly rural land for future urbanisation. This land is equivalent to an area 1.5 times the size of urban Hamilton.

To enable urban development on this land, appropriate bulk infrastructure needs to be planned and enabled. To provide clarity and certainty about when the land identified in the AUP-OIP would be 'development ready', Auckland Council (the Council) developed the Future Urban Land Supply Strategy (FULSS) in 2015. The FULSS provides for sequenced and accelerated greenfield growth in the following areas of Auckland:

- Warkworth
- North: Orewa-Silverdale, Dairy Flat
- North West: Whenuapai-Redhills, Westgate, Kumeū, and Huapai
- South: Takaanini, Drury – Ōpāheke and Pukekohe - Paerata.

In July 2017, the FULSS was updated in line with the AUP-OIP zoning, with an increase to 15,000 hectares of land allocated for future urbanisation.

In response to the FULSS, Auckland Transport (AT), Waka Kotahi New Zealand Transport Agency (Waka Kotahi), and the Council (collectively referred to as the partners) identified a need to determine the most appropriate transport responses to support this envisioned urban growth. A tripartite governance group was formed to develop a response to two key issues:

- Inability to respond in a timely way to the pace and scale of greenfield development would restrict access to jobs, education and other core services around and in growth areas.
- Inability of the regional transportation system to cope with the growing demand of greenfield expansion would reduce travel choice and efficient movement of people and goods.

This joint approach recognised that the proposed growth is likely to require significant new additions to the arterial, local, and public transport network, and integration of such networks with new and existing urban form. It would also likely have impacts on and require improvements to the existing arterial, public transport, and state highway network, and to planning frameworks and/or policy.

The Supporting Growth Programme (Te Tupu Ngātahi) is a collaboration between AT and Waka Kotahi to plan transport investment in Auckland's future urban zoned areas over the next 10 to 30 years. AT and Waka Kotahi have partnered with Auckland Council, Manawhenua and KiwiRail Holdings Limited (KiwiRail) and are working closely with stakeholders and the community to develop the strategic transport network to support Auckland's growth areas.

2.1 Southern Growth Area

The Southern growth area is approximately 20km south of Auckland's central city and is approximately 30 km in length. This area makes up the largest proportion of future urban areas in

Auckland (45%). It includes the large future urban areas of Takaanini, Opāheke, Drury, Drury West, and Pukekohe-Paerata, and is shown in the wider future urban zones planned in Auckland in Figure 2-1 below.

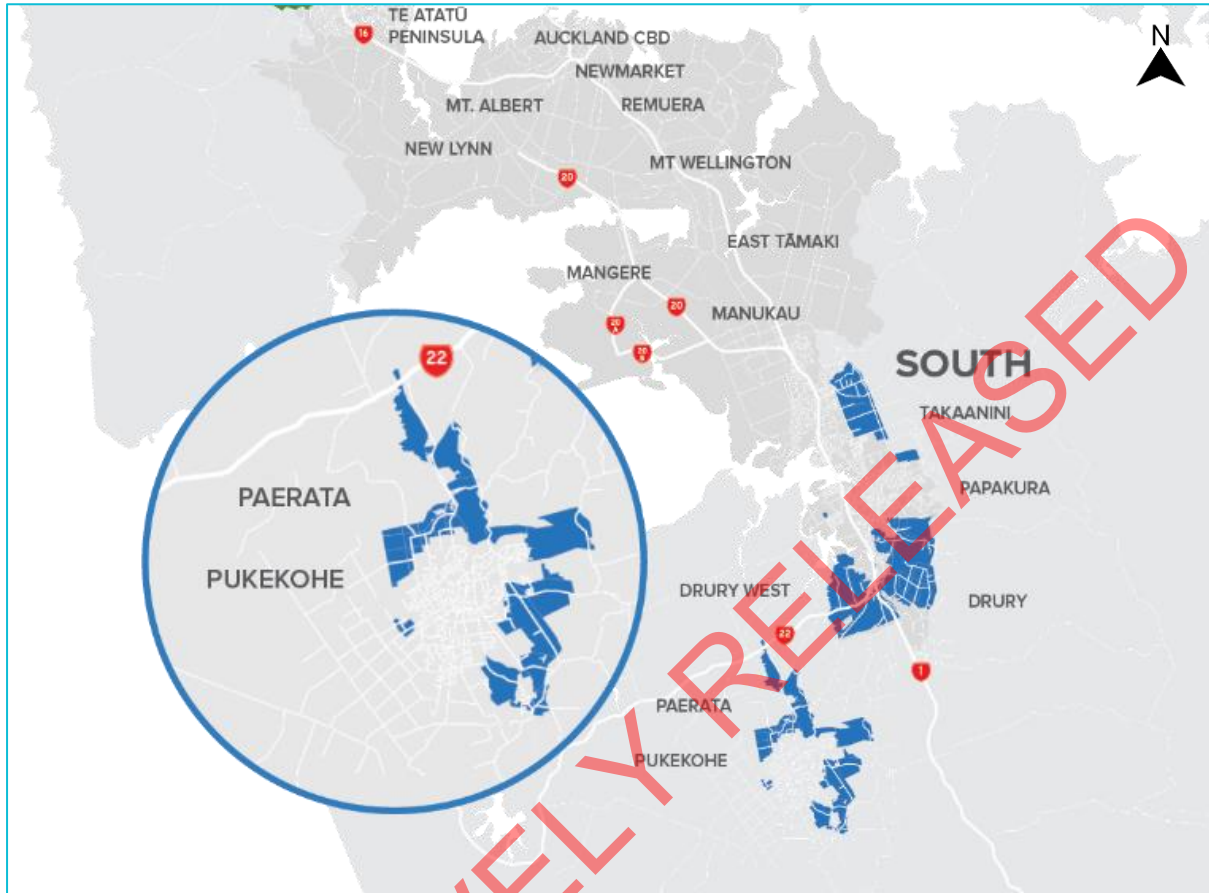


Figure 2-1 South Auckland's future urban growth areas (Pukekohe-Paerata inset)

Growth in the South and within the Pukekohe-Paerata and Drury West is forecast to increase substantially over the next 30 years. In summary:

- Housing in the Pukekohe, Paerata and Drury West is forecast to increase from 12,000 in 2016 to 33,000 in 2048+, a 275% increase, with a corresponding increase in population from 31,000 in 2016 to 86,000 in 2048+.
- Provision of employment opportunities is expected to rise from 11,000 in 2016 to 20,000 (180%) in 2046 in the Pukekohe region.

2.2 Transport for Future Urban Growth Programme Business Case

The draft preferred transport network identified in the PBC by the Transport for Future Urban Growth Programme¹ was informed by an optioneering process, which at a high level, compared various levels of investment for all FUZ growth areas across the region.

¹ Transport for Future Urban Growth Programme Business Case developed by Auckland Transport, Waka Kotahi and Auckland Council (2016)

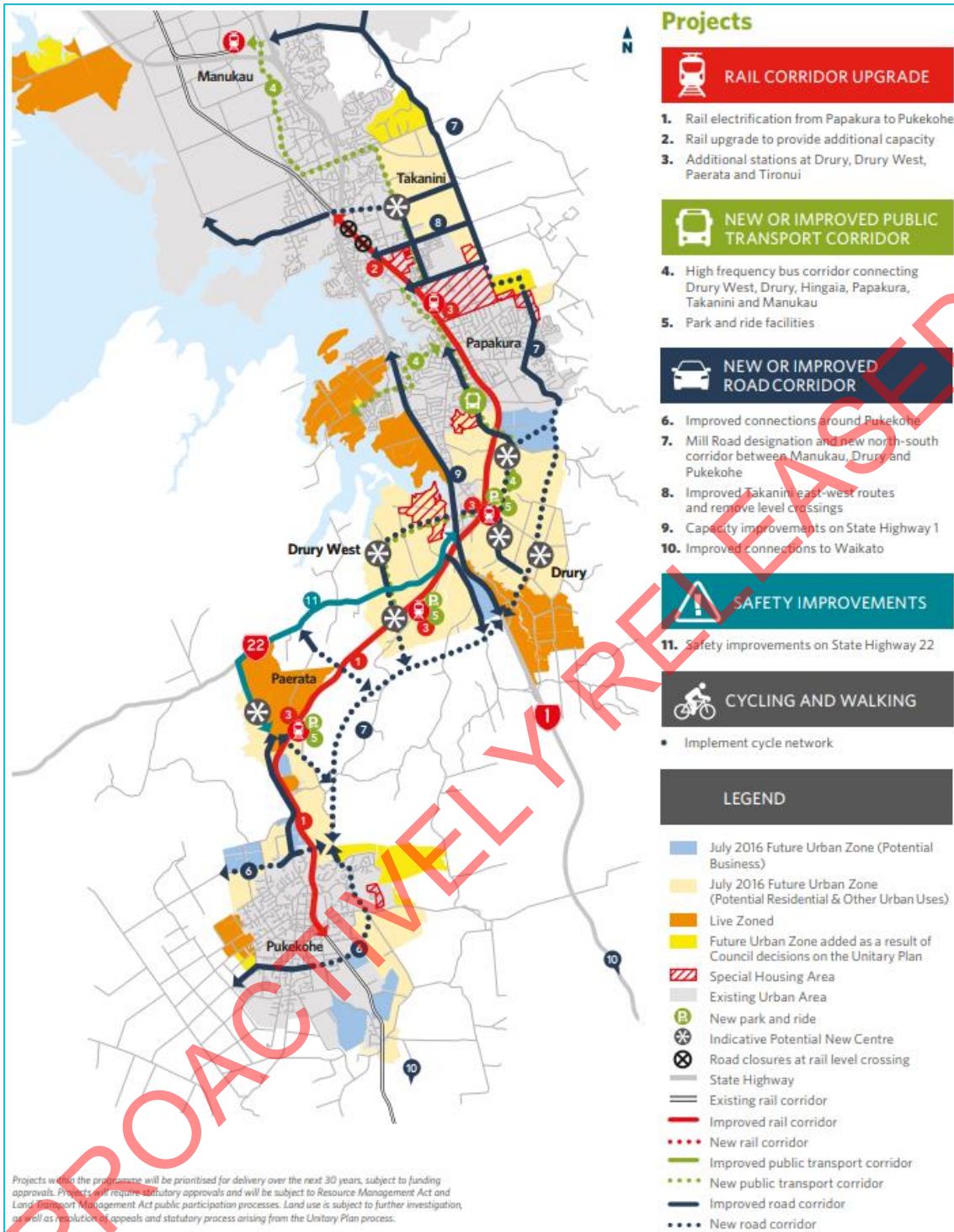


Figure 2-2 TFUG PBC Preferred South Transport Network

Of relevance to Pukekohe, the following issues were raised:

- Pukekohe and Paerata rely on rural highways with limited capacity and safety issues at intersections.
- In the long term, the lack of frequent and efficient public transport network options would trigger poor social and economic outcomes.

- More time spent in congestion (people and goods) impacts economic productivity and ultimately, adversely affects regional liveability indicators, compromising the vision that the future urban areas were established to provide.
- A significant proportion of trips originating in the southern growth area travelled no further north than Auckland Airport.
- The existing public transport network does not connect with many of the larger employment areas in south Auckland.

Options for local and regional roads were considered through the PBC for the southern growth area. Of these, the following three Pukekohe interventions were included in the preferred network to be investigated further in the South IBC:

- Pukekohe Expressway;
- Mill Road upgrade; and
- Pukekohe 'Inner Link'.

The South IBC was completed in 2019 recommending the Indicative Strategic Network for the future urban growth areas in south Auckland. This is discussed in more detail in the next section.

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2.3 South Indicative Business Case (2019)

For the South IBC, around 460 options were initially identified, comprising:

- Strategic Connections – 242 options
- Opāheke/Drury – 88 options
- Pukekohe-Paerata – 92 options
- Takaanini – 62 options

The initial long list of 460 options was then filtered to exclude options that were:

- Considered beyond the scope of the IBC (i.e., outside the project area);
- Land use options (opportunities were discussed separately with Auckland Council)
- Already part of a designated/consented/funded project;
- Considered business as usual, so would otherwise be implemented (for example: use of staging);
- Considered unfeasible due to significant physical constraints – based on a high-level engineering assessment (for example, “new train line from South to East - Pakuranga”)
- Duplicates of another option.

Through the filtering process 151 options were taken through to the long list MCA process (further discussed in sections 4.4.2, 4 and 4.5).

The South IBC recommended the Indicative Strategic Transport Network for south Auckland growth areas shown in Figure 2-3. This network was endorsed by the Auckland Transport (AT) board in February 2019 and the Waka Kotahi NZ Transport Agency (Waka Kotahi) board in May 2019.

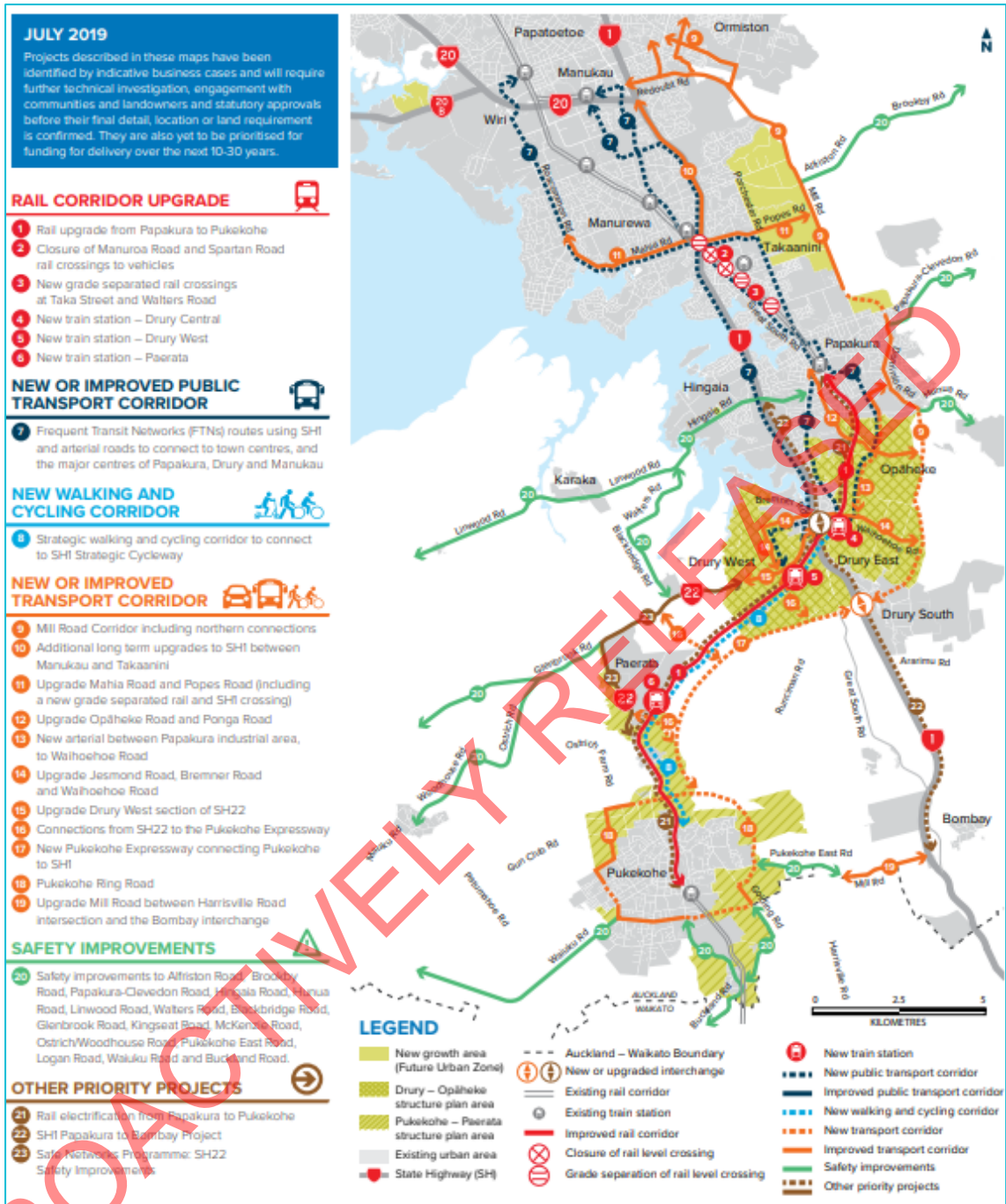


Figure 2-3 Southern growth area – Indicative Strategic Transport Network

2.4 Draft Strategic South Detailed Business Case

After endorsement of the Indicative Strategic Transport Network, the Strategic South DBC commenced which included the “strategic” components of the southern growth areas. This included the Pukekohe Expressway and connections including the north-east section of the “ring route” in Pukekohe.

The Strategic South DBC undertook options assessment on these components and recommended preferred options. Later in 2020, the New Zealand Upgrade Programme (NZUP) announced funding for implementation of the Mill Road components of the Strategic South DBC.

Due to a change in priorities, some of the Strategic South DBC projects were reallocated. The Pukekohe Expressway and connections were included in the Pukekohe DBC. While the Pukekohe projects were not pursued through the Strategic South DBC, they did progress through route refinement options assessment and to public engagement in 2020. The Pukekohe Expressway and Pukekohe Urban Arterial (North East) options were presented to the community for feedback.

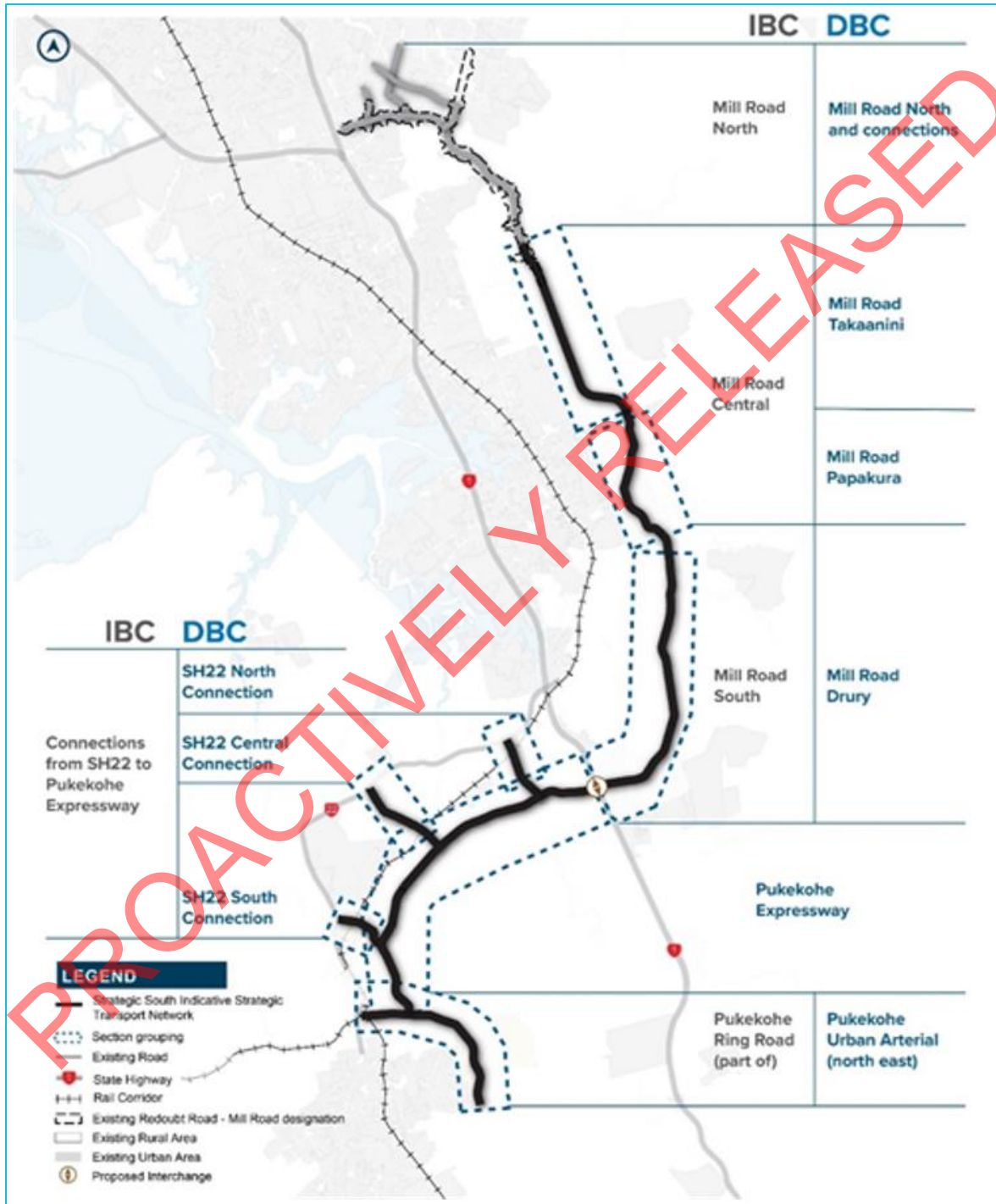


Figure 2-4 Summary of IBC and Strategic South DBC components

3 Detailed Business Case Assessment Process

3.1 Assessment Process

An overview of the DBC option assessment process is provided in Figure 3-1 and further detail described in Table 3-1.

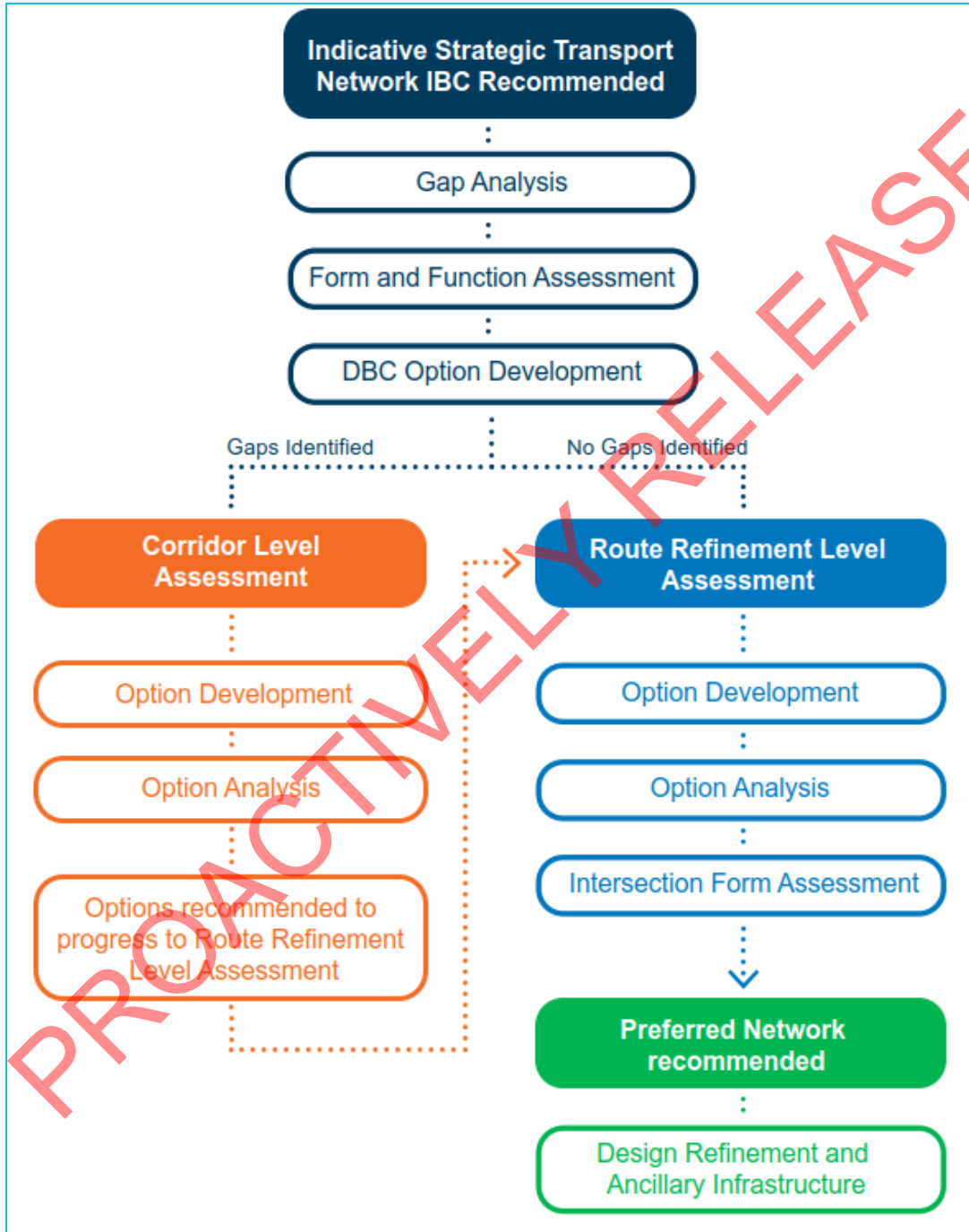


Figure 3-1 Overview of DBC Option Assessment process

Table 3-1 Summary of Options Assessment Process

Stage	Description
SGA GIS Options Assessment Viewer	<p>All options were uploaded to the SGA GIS viewer, an interactive tool to allow all technical experts to view options and known constraints as well as add any additional constraints identified.</p> <p>Due to Covid19 restrictions, the constraints analysis was largely done via desktop analysis. However, a site visit with specialists was held as soon as restrictions lifted in June 2022 to ground-truth the assessments.</p>
Site Visits	<p>31 March 2022 - Project Team, Auckland Transport, Waka Kotahi</p> <p>1 June 2022 - Manawhenua, Auckland Council, Project Team</p>
Briefing Packs	<p>A briefing pack was provided to technical experts with an outline of the options to be assessed, the criteria to be used in undertaking this assessment including the MCA framework, and a pre-scoring spreadsheet. The pack provided details on the planning and land use context for the various study areas, as well as the programme-wide approach to considering the existing and future environment in the MCA.</p> <p>A briefing session was also held to explain all options and answer any questions from specialists.</p>
Pre-scoring	<p>All technical specialists were asked to review the options in the online tool and map constraints and opportunities within each study area for each project and to pre-score options using the MCA tool prior to the workshop. Supporting each score was an explanation (reason) for the score.</p>
Interdisciplinary workshops	<p>MCA scores were presented and challenged in interdisciplinary workshops. Experts were given the opportunity to amend their scores considering the discussion at the workshop, if they felt that was appropriate. The presence of the design team at the workshop provided a valuable opportunity for experts to clarify / confirm the nature of all the options before confirming or assigning their final scores.</p>
Analysis and testing of results	<p>Following the workshop, the results were reviewed by the project team. This included consideration of how option segments interacted with each other, and how they best fit together. Where necessary, technical experts reviewed the scores and provided additional information.</p> <p>During the route refinement options assessment process, specialists identified several areas where further design considerations could be considered, or refinements should be made to deliver a better outcome. Once a preferred option was selected the Project Team, designers and specialists worked together to identify and make design refinements with the purpose of further minimising impacts of the preferred option through the route refinement assessment.</p> <p>This process was particularly useful where each option assessed had both positive and negative impacts, allowing a more balanced approach that adopted positive, and avoided negative, impacts where possible. Where design refinements were made, they are outlined in the discussion of the Project's preferred options for each option.</p>
Partner engagement	AT, Waka Kotahi and KiwiRail Specialist Matter Experts (SMEs)

Stage	Description
	<p>Workshops were held with SMEs to inform and seek feedback on the options developed and the MCA scoring. Their input was sought, and refinements were made where appropriate.</p> <p>Manawhenua</p> <p>Regular manawhenua hui were held to explain the options assessment process and seek feedback on the options. It is the preference of manawhenua to provide feedback rather than providing a quantitative analysis of options through the MCA.</p>
Identification of emerging preferred options	Once assessment of the findings of the technical workshops was complete, the Project Team identified emerging technical preferred option(s).
Community Engagement	Following identification of the preferred options after the route refinement assessment, an engagement period took place with the community. This was an opportunity for the public to provide feedback on the preferred options.
Analysis and testing of results	Upon completion of the engagement period, the Project Team met to review the technical preferred option(s) considering the feedback received through engagement and refine the options as necessary.

3.2 Gap Analysis

Due to the length of time between the IBC (approved in 2019), the projects relevant to the Pukekohe DBC that were partially completed through the Strategic South DBC (2020) (that adopted the general corridor alignments from the IBC), and commencement of the Pukekohe DBC (2022) a gap analysis of the options assessment for the IBC was undertaken. The gap analysis included the following:

- Review of Supporting Growth Programme Business Case (formerly Transport for Urban Growth (TFUG)) recommendations.
- Review the South IBC (main document and Options Assessment Report), including the long list and the short list options, and the reasons why options were recommended or discounted.
- Review of the draft Strategic South DBC options assessment and public feedback received.
- Background research, including previous project phases where this assisted understanding of previously identified issues.
- The alignment of the previously recommended options with relevant policy documents (for example, Government Policy Statement on Transport, AUPOIP). In particular, to see if anything has changed since the previous recommendations.
- Alignment with strategic plans other statutory documents and developer aspirations that may have progressed from the previous recommendations. For example, structure plans, plan changes (or appeals), recent Notices of Requirement and developer plans.
- Interaction with other projects in the area.

From the gap analysis, recommendations were made on the approach to developing options.

In summary, the gap analysis recommended corridor assessment of all components of the Pukekohe DBC transport components. This was due to:

- Government policy changes in climate change and response - in particular the GPS for Transport 2021 and Zero Carbon Act (2021) (which amended the Climate Change Response Act 2002).
- Funding of new rail stations in Paerata and Drury.
- Numerous private plan changes lodged or approved.
- Pukekohe Local corridors (apart from the NE Arterial) had not been assessed since 2019 at IBC level.

Specific recommendations are summarised in the corridor assessment for each package of options in section 4. In summary the gap analysis recommended that:

- Further alternatives should be considered (corridor assessment) which may provide more of a contribution to decarbonisation as set out in government direction. This could include the investigation of upgrading existing roads and maximising connectivity to the rail stations, integration with future urban development and increasing mode shift.
- The form and function of the Pukekohe Expressway should be re-assessed and the need for the expressway confirmed.
- As a number of connections including the SH22 connection, Drury West connection and north east quadrant of the Pukekohe arterials interact with the Pukekohe Expressway these also need to be re-assessed based on any movement of the expressway.
- Form and function of the Pukekohe Arterial routes need to be confirmed to inform options assessment (e.g. 2 vs. 4 lane) and if a two lane arterial, consideration needed to be given to upgrading existing roads rather than the offline options recommended in the IBC.

As a result, four groups of options were developed for corridor assessment:

- **Drury West Local** - local connectivity in the FUZ to the station and strategic corridors;
- **Paerata Local** - local connectivity in the FUZ to the station and strategic corridors;
- **North-South** - strategic or local connections between Drury, Paerata and Pukekohe; and
- **Pukekohe Local** – local connections around Pukekohe as alternatives to the current main connection through the Pukekohe centre.

Further details from the gap analysis are contained within each of the options assessment sections in this report (Drury West, Paerata, North South and Pukekohe Local).

3.3 Options Development

A long list of preliminary options was developed for each group, considering the indicative transport network identified in the IBC, the gap analysis and a high-level assessment of key engineering/design constraints including:

- Geology
- Contours and potential earthworks requirements
- Floodplains and flood sensitive areas
- Live zoning, plan changes and structure plans
- Sensitive areas such as AUP:OP overlays, critical services and special purpose zones.

The initial options were loaded into the Pukekohe GIS Constraints Online tool. This viewer included numerous constraints and management layers that can be turned on and off, including constraints/opportunities tagged during the IBC phase, all AUP:OP management layers and zoning, the public CHI register, Auckland Council geomaps landbase and Environment, and Cultural Heritage Environmental Assets.

The options were drawn in the GIS viewer as corridor centrelines with 50m route buffers either side of the centreline for new corridors and 30m from the centreline for upgrades to existing corridors. Each option segment had a unique code.

An analysis of initial constraints/opportunities assessments was carried out and recommendations were made for the long list of options to modify, discount or add new options.

3.4 Option Evaluation

To evaluate and compare options, a Te Tupu Ngātahi programme-wide assessment framework which included a Multi-Criteria Assessment (MCA), was developed by the Project Team in consultation with AT, Waka Kotahi and Manawhenua to be used throughout the Te Tupu Ngātahi.

An MCA framework is a common tool that is often used to assist in the decision-making process and provides an opportunity to understand how different options compare against a set of standard and grouped criteria.

The MCA framework developed by the Project Team was applied at both the IBC and DBC phases of Te Tupu Ngātahi and involved the following:

- Assessment criteria: Investment Objectives and the four well-beings: Cultural, Social, Environmental and Economic.
- Additional inputs: Partners, stakeholder and public feedback where this helped to differentiate between options.

Options were assessed using the MCA framework set out in

Table 3-3 and where appropriate, scored on an eleven-point scale shown in Table 3-2. Assessment of the criteria was completed by subject matter experts and discussed at MCA workshops.

Table 3-2 MCA Scoring Scale

Effects criteria	Scoring
Very high adverse impact	-5
High adverse impact	-4
Moderate adverse impact	-3
Low adverse impact	-2
Very low adverse impact	-1
Neutral impact	0
Very low positive impact	1
Low positive impact	2
Moderate positive impact	3
High positive impact	4
Very high positive impact	5

Table 3-3 Te Tupu Ngātahi MCA Framework

Investment Objective			Measure	
Investment Objectives			<p>Options assessed against the investment objectives:</p> <ul style="list-style-type: none"> Safety - Provide a transport network that is safe for all users within and between Pukekohe, Paerata and Drury West Integration - Provide a transport network that minimises conflict between movement and place, and contributes towards well-functioning future urban environment Access - Enable access to economic and social opportunities by providing multi-modal corridor Resilience - Enable resilient freight and people movement to, from and within Pukekohe, Paerata and Drury West Travel choice - Enable travel choice in Pukekohe, Paerata and Drury West by enhancing access to the existing rail network and providing a safe and attractive walking and cycling network 	
Well-being	MCA topic	#	Criteria	Measure
Cultural	Heritage	1a	Heritage	<p>Extent of effects on:</p> <ul style="list-style-type: none"> sites and places of valued heritage buildings, scheduled trees (with heritage value) and places. sites and places of archaeological value. sites and places of European cultural heritage value
		2a	Land use futures / integration with planned landuse	<p>To what extent would the option impact on the future development of land (within the corridor, adjacent to it and impacted by it – i.e., consider all three scales), in relation to:</p> <ul style="list-style-type: none"> Integration with the future land use scenario (including any Structure Plans or Plan Changes) Size and shape of potential development parcels to enable appropriate building typologies
2b	Urban design			
Social	Socio – economic impacts			

Investment Objective		Measure	
		2c	<p>Land requirement / property</p> <p>The extent of property effects:</p> <ul style="list-style-type: none"> • Scale of public / private land (m2 / number of properties / special status of impacted property) required to deliver the option • Ability to consolidate residual land • Access
		2d	<p>Social cohesion</p> <p>Impact on, use, connectivity / accessibility for and to the existing urban areas including use and access to:</p> <ul style="list-style-type: none"> • Employment • Other communities or within the same community • Shops / services / other community and cultural facilities / 'attractors' • Severance of the existing community (including consented) • Scale of effect on existing community facilities community and open space • Public access to the coast, rivers and lakes
		2e	<p>Human Health and Wellbeing</p> <p>Would the option potentially affect any sensitive land uses nearby or consented (adjacent residential, childcare centres, hospitals, rest homes, marae and schools)? particularly relating to:</p> <ul style="list-style-type: none"> • Air Quality • Contaminated land • Noise and vibration
Environment	Natural Environment	3a	<p>Landscape / visual</p> <p>The extent of effects on:</p> <ul style="list-style-type: none"> • The natural landscape and features such as streams, coastal edges, natural vegetation and underlying topography – acknowledging planned changes to area in light of urban land use / zoning • Natural character and outstanding natural features/landscapes including geological features (mapped and protected features) • Visual effects
		3b	<p>Stormwater</p> <p>Impact of operational stormwater (both quantity and quality) on the receiving environment, including:</p> <ul style="list-style-type: none"> • Potential flooding effects of the option within the catchment • Extent and consequences of likely mitigation measures • Consideration of future climate change scenarios
		3c	<p>Ecology</p> <p>Extent of effects on:</p> <ul style="list-style-type: none"> • Significant indigenous flora; • Significant habitats of indigenous fauna; • Indigenous biodiversity; • Stream / waterway ecology • Marine ecology

Investment Objective		Measure	
	3d	Natural Hazards	Extent of effect on adverse geology; steep slopes; seismic impacts; other resilience risks (low level infrastructure near coastlines, inundation areas)
Construction impacts	4a	Embodied carbon emissions	Consider the following design requirements: <ul style="list-style-type: none"> Length (in km) Area of impervious surface/ volume of earthworks Specific infrastructure requirements (e.g. bridges, viaducts, tunnels etc.)
	4b	Construction impacts on utilities / infrastructure	Requirements for relocation / design of existing infrastructure, including: <ul style="list-style-type: none"> Consideration of safety impacts Risk of continuity of service over construction Opportunities for integration with other bulk infrastructure
	4c	Construction Disruption	Construction impacts on people and businesses regarding: <ul style="list-style-type: none"> Traffic & noise Earthworks related effects including dust Quality of life and amenity Economic impacts on businesses / community / town centres
Cost & Construction Risk	5a	Construction costs / risk / value capture	Assessed cost for construction of options including: <ul style="list-style-type: none"> Complexity and risk in construction (including consideration of constructability, earthworks cut/fill balance and material reuse) Complexity in programme Cost and complexity of safely undertaking works (including works on contaminated land) Extent to which the option can use a value capture mechanism to offset construction costs.

3.5 Engagement

As set out in the section above, feedback from partners, stakeholders and the community is an important part of the options assessment process. Below sets out where and when feedback was sought during the options assessment process.

3.5.1 Partners

Partners includes representatives from Auckland Transport and Waka Kotahi (SMEs), KiwiRail, Auckland Council and Manawhenua. Partners were given the opportunity to provide feedback throughout the development and the options assessment of both corridor and route refinement assessments.

This section sets out some of the key dates and activities with partners. Feedback received throughout the process is set out in each of the options assessment tables in this report (corridor and route refinement for each package of options in section 4 and section 4.5).

Eight workshops were undertaken with Te Tupu Ngātahi partners at the beginning of the project including representatives Waka Kotahi, Auckland Transport, manawhenua, Auckland Council and KiwiRail. The purpose of the workshops was to gain feedback on the options development and corridor assessment of the North South, Drury West and Paerata packages.

- **Workshop 1** – 8 April 2022 – introduction to workshop series to collectively test Pukekohe Expressway’s role in the network, considering whether alternative options could achieve outcomes sought, and how changing policy direction could impact timing and sequencing.
- **Workshop 2** – 22 April 2022 - an overview of the project area history, site context, features and constraints.
- **Workshop 3** – 6 May 2022 – Waka Kotahi, Auckland Transport, KiwiRail and manawhenua perspectives on the project area.
- **Workshop 4** – 20 May 2022 - Auckland Council’s perspectives on the project area. The project team also presented outcomes sought for the Pukekohe Transport Network.
- **Workshop 5** – 3 June 2022 - to provide an overview of network outcomes with and without Pukekohe Expressway.
- **Workshop 6** – 17 June 2022 - to present and discuss options assessment process and provide an overview of the approach to packaging corridor options into Drury West, Paerata and North South options.
- **Workshop 7** – 30 June 2022 - to present the outcomes of corridor assessments for each package and seek feedback.
- **Workshop 8** – 29 July 2022 – to present the recommended corridor options as a network and next steps (approach to route refinement and public engagement).

The below sets out feedback received at the partner workshops relevant to the project area. Specific feedback on individual options is included in each options assessment tables in section 4 and section 5).

During the partner workshops, there was discussion around Pukekohe’s role as a satellite town – to be as self-sufficient as possible, i.e., providing employment opportunities, not just housing. It was suggested that environmental and cultural landscape outcomes should be prioritised with a target of enhancing environment and landscape rather than just preserving it as it is.

Auckland Transport shared their perspective on the importance of each part of the South Indicative Strategic Transport Network and how it functions together. The following was suggested when considering the Pukekohe Transport Network options:

- Traffic volumes on unsafe rural corridors and minor roads.
- Crossing points across the railway tracks.
- Connection of communities to the strategic network, park and ride, and walking / cycling.
- Growth is already occurring in Pukekohe, Paerata and Drury with more planned via Private Plan Changes.
- Significant development pressure outside of the area as well for example in Waikato.
- s 9(2)(ba)(i)
- Staging and sequencing of interventions is critical to respond to growth.

Auckland Transport also noted that Options NS4 and NS5 might still require interim safety upgrades.

Waka Kotahi expressed the following key issues:

- Uncertainty around growth forecasts with the NPS-UD and MDRS.
- Consider different growth scenarios and sensitivities.
- Gap around increasing employment in Pukekohe.
- Emissions Reduction Plan - 20% reduction in vehicle kilometres travelled across NZ.
- Auckland Council Future Development Strategy (FDS) - need to assess interrelated projects around Pukekohe and Drury, such as:
 - SH1 P2B - section between Drury and Bombay interchange planned for route protection.
 - Drury south interchange connection tie in.
 - Bombay interchange.
 - Safety and capacity issues would require long term major upgrade. Interim safety improvements are underway.
 - NZUP - SH22 urbanisation is part of shortlisted projects that are being progressed. Carefully consider what investment is required at SH22 and Mill Road (Bombay) if Pukekohe Expressway does not occur.

KiwiRail shared the following perspectives:

- Electrification of railways expected to be complete by 2025, which would result in higher frequencies of services. Need to consider how development would occur across the railway, including permeability.
- Ensure railway operation continues during the construction of Pukekohe Expressway.
- Considerations of connections to the three new rail stations in the project area.

Auckland Council shared the following perspectives:

- Two Private plan changes have been lodged along Golding Road.
- Developer activity around Helvetia Road and west of SH22.
- Difficult to anticipate developer pressures resulting from NPS-UD.
- Less constrained sites are likely to have more developer interest (example Wesley, Paerata Heights).

Manawhenua raised the following matters:

- Concern that the Pukekohe Expressway has the potential to induce more growth areas currently zoned rural.

s 9(2)(ba)(i)

- Manawhenua do not support further growth outside of the FUZ land. Difficult to justify two-lane arterial through greenfield rural zoned areas as this could induce further development on both sides. Advocates for four lanes as this is future proofing given predicted growth. But this does depend on potential impacts on bat movement and stream crossings.
- Any tolling roads should be done with consideration for road users who do not have viable alternatives.

Summary of SME Activities

After the initial partner workshops as described above, further SME workshops were held with Auckland Transport, Waka Kotahi and KiwiRail as the project progressed through options assessment. These forums provided the SMEs an opportunity to provide feedback on the options development, assessment and recommendations. Specific feedback (when this was provided) is set out in each of the options assessment tables in this report (corridor and route refinement for each package of options in section 4 and section 05).

Summary of Manawhenua engagement activities

Manawhenua are a partner in Te Tupu Ngātahi and regular two weekly hui is set up with southern manawhenua. The project team attended a number of hui to share progress on options development and seek feedback during options assessment. Table 3-4 below identifies manawhenua representative attendance at each hui. As mentioned earlier, specific feedback (when this was provided) is set out in each of the options assessment tables in this report (corridor and route refinement for each package of options in section 4 and section 5).

Table 3-4 Manawhenua representative attendance by hui

Date of hui	Manawhenua representative in attendance
March 3 2022	Ngāti Tamaoho, Ngāti Whanaunga, Te Ākitati Waiohua, Ngāti Te Ata Waiohua, Ngāti Maru, Te Patu Kirikiri, Ngāi Tai Ki Tamaki
April 7 2022	Ngāti Tamaoho, Ngāti Whanaunga, Te Ākitati Waiohua, Ngāti Te Ata Waiohua, Ngāti Maru, Ngāti Paoa Trust Board
April 26 2022	Ngāti Tamaoho, Te Ākitati Waiohua, Ngāi Tai ki Tāmaki, Ngāti Tamaoho, Ngāti Whanaunga, Ngāti Tamaterā
May 5 2022	Ngāi Tai ki Tāmaki, Ngāti Maru, Ngāti Tamoho, Ngāti Whanaunga, Te Ākitati Waiohua, Ngāti Tamaterā
June 2 2022	Ngāti Maru, Ngāti Tamaoho, Ngāti Whanaunga, Te Ākitati Waiohua, Ngāti Tamaterā, Ngāti Te Ata
June 21 2022	Ngāti Tamaoho, Te Ākitati Waiohua, Ngāti Whanaunga, Ngāti Maru
July 7 2022	Ngāti Tamaoho, Ngāti Paoa Trust Board, Ngāti Tamaterā, Te Ākitati Waiohua, Ngāti Te Ata Waiohua, Ngāti Whanaunga
July 8 2022	Ngāti Te Ata Waiohua, Ngāti Tamaoho
July 28 2022	Site visit with Ngāti Tamaoho and Ngāti Te Ata Waiohua
August 4 2022	Ngāti Tamaoho, Ngāti Tamaterā, Te Ākitati Waiohua, Ngāti Whanaunga
August 23 2022	Ngāti Tamaoho, Te Ākitati Waiohua, Ngāti Whanaunga, Ngāti Maru, Ngāi Tai ki Tāmaki
September 27 2022	Te Ākitati Waiohua, Ngāti Whanaunga, Ngāti Tamaterā, Ngāti Paoa Trust Board
October 6 2022	Te Ākitati Waiohua, Ngāti Te Ata Waiohua, Ngāti Tamaoho, Ngāti Tamaterā

October 12 2022	Ngāti Te Ata Waiohua (including site visit)
October 25 2022	Te Ākitai Waiohua, Ngāti Tamaoho, Ngāti Tamaterā, Ngāti Whanaunga, Te Ahiwaru, Ngāti Maru, Ngā Tai Ki Tāmaki
December 1 2022	Te Ākitai Waiohua, Ngāti Tamaoho, Ngāti Whanaunga
December 15 2022	Te Ākitai Waiohua, Ngāti Tamaoho
December 19 2022	Ngāti Te Ata Waiohua

3.5.2 Stakeholders and Community

Between 1 November and 20 December 2022, Te Tupu Ngātahi asked the community, and key stakeholders for feedback on the emerging preferred options for the future transport network for south Drury, Paerata and Pukekohe. The options presented focused on the route refinement options assessment. However, parts of the corridor assessment were also presented in some instances to show the range of options assessed. Feedback was collected using an interactive map and an online survey. The project team also held two community open days on 12 November 2022 (Franklin: The Centre) and 3 December 2022 (Pukekohe Memorial Hall) and attended the Waka Kotahi Papakura ki Pukekohe – Papakura to Bombay open day on 10 December 2022. All open days were well attended by the community.

Key stakeholders were also met with or provided feedback included:

- Local developers
- Bus and Coach Association New Zealand
- Federated Farmers of New Zealand
- Grace James (and surrounds) Residents Group
- Karaka Residents and Ratepayers Association
- Pukekohe Business Association
- Waikato District Council – Mayor Jacqui Church

One on one meetings were also held with landowners where this was requested.

Feedback received on specific options (or group of options) is set out in each of the options assessment tables in this report (corridor and route refinement for each package of options in section 4 to section 4.5).

3.6 Form and Function

3.6.1 Form and Function Considerations

During the IBC phase of the business cases, detailed recommendations on form and width were largely deferred to the DBC investigation phase. This level of detail was generally considered beyond the scope of the IBC phase. As such, during the DBC phase, assessments were undertaken to determine the form and function of DBC projects. This section outlines the form and function assessment process.

At a programme level for the DBCs at Te Tupu Ngātahi, a form and function assessment tool has been developed to support consistent decision making. The intent of the tool is to encourage well-

rounded thinking about both the place and movement function of corridors and avoid focus being placed on a single element, for example the role of the corridor in moving general traffic.

The output of the assessment is a desired cross section for the corridor being assessed. Typical cross sections for the Supporting Growth Programme were confirmed through a collaborative process with AT and Waka Kotahi. This included a set of standard cross section typologies that could be implemented across the Supporting Growth Programme and its networks. This decision was then socialised with the project owner (AT or Waka Kotahi) and approval obtained to proceed to design and options assessment.

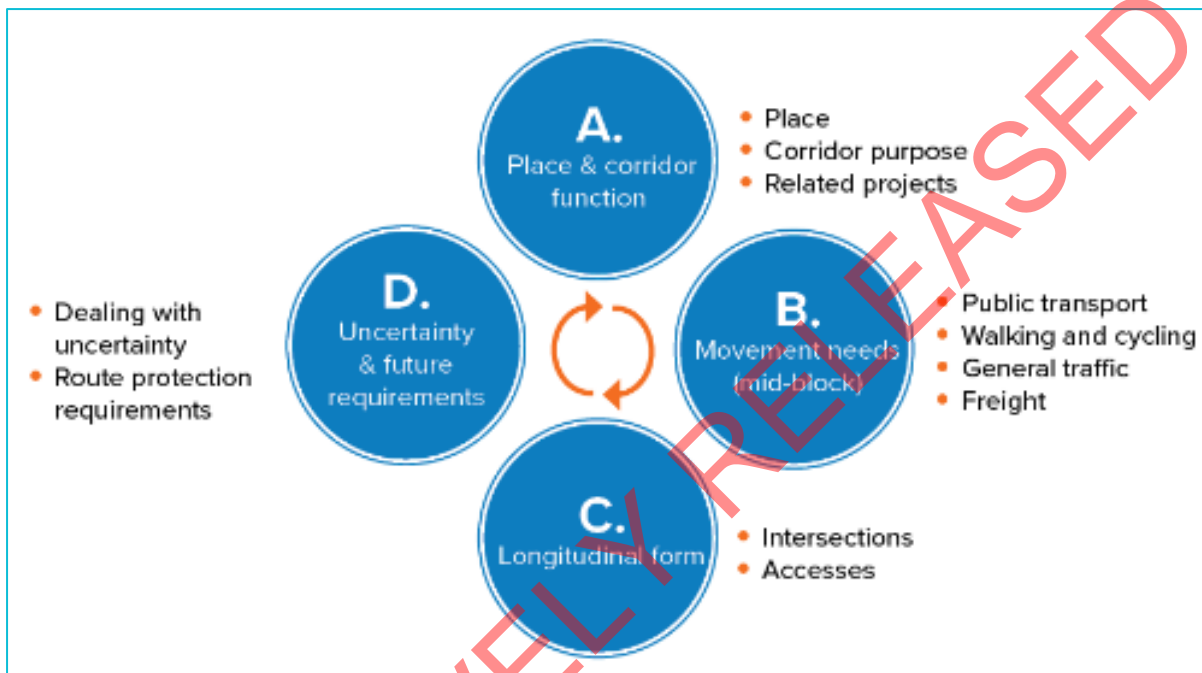


Figure 3-2 Form and function principles

The form and function assessment undertaken for each Pukekohe corridor is summarised in each of the sections route refinement assessments in section 5 . Figure 3-3 provides an overview of the form and function for the Pukekohe projects.

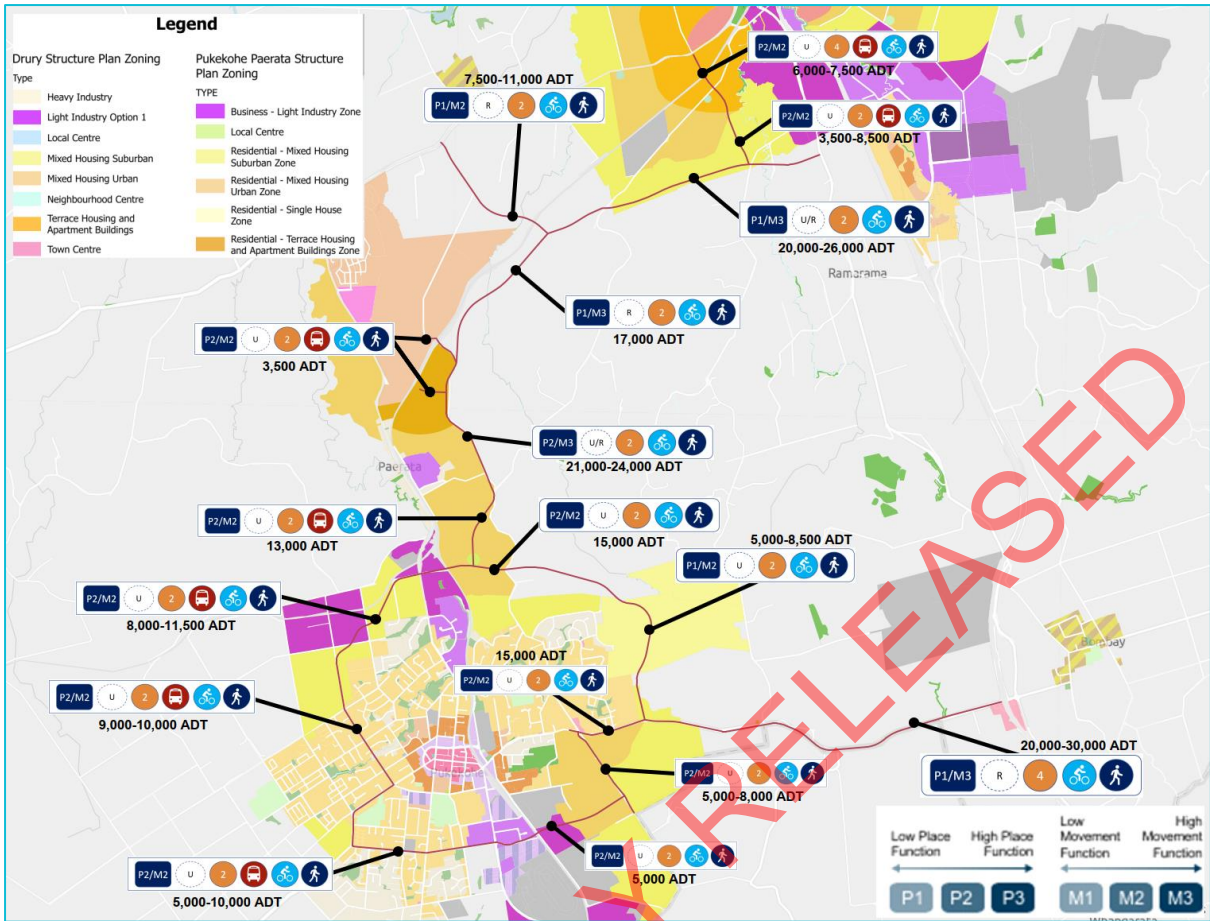


Figure 3-3 Pukekohe projects Form and Function

3.6.2 Interdependencies in the network

Table 3-5 provides an overview of the interdependencies and relationships between Pukekohe Projects and other projects in the wider South Auckland Area.

Table 3-5 Interrelated transport projects

Package	Project(s)	Inter-relationships with Pukekohe DBC
Drury Arterials	Frequent transit network (FTN) and Arterial Upgrades to Jesmond Rd, Bremner Rd and Waihoehoe Rd West (all designations confirmed in the AUP)	The functional intent of the FTN route in Drury is to provide north-south, and east west connectivity across the Drury area, and to form part of the Southern FTN connecting to the rail network and proposed Mill Rd improving multimodal connection. These projects interact with the Drury West Arterial (part of the Pukekohe DBC projects) that connects from SH22/Jesmond Road intersection and the Drury West rail station to the south of the Drury FUZ.

Package	Project(s)	Inter-relationships with Pukekohe DBC
	Upgrade of SH22 between Oira Road and the SH1 Drury interchange (alteration to SH22 designation confirmed in the AUP)	<p>This upgrade provides walking and cycling connections and better accommodates freight and general traffic to support current and future residents. This section of SH22 is important in the context of the urbanisation of the surrounding area, and the proposed rail upgrades and new rail stations.</p> <p>To support the urban growth in Drury, the upgrade to SH 22 proposes a change in the form and function from a State highway to an urban arterial (with an associated reduction in speed). In the longer term, as growth increases in the area and subsequently the volume of trips along this road, a strategic alternative connection is required to alleviate regional traffic flows and allow SH 22 to retain its urban arterial function.</p> <p>The Drury West Arterial (part of the Pukekohe DBC projects) interacts with this project at SH22/Jesmond Road intersection.</p>
Rail DBC / Stations NoR	Rail capacity improvements between Pukekohe and Papakura (and associated grade separations at road/rail crossings)	<p>Additional and more reliable rail capacity is anticipated to improve mode shift in the southern growth area. This would result in alleviating traffic pressures off the network, improving capacity along strategic routes.</p> <p>The Pukekohe DBC projects provide a number of new bridge crossings across the NIMT.</p>
	New rail stations at Drury Central, Drury West and Paerata	<p>Two new stations are proposed in Drury and one in Paerata. Drury Central and Paerata rail stations have been confirmed, the Drury West rail station NoR (and resource consents) has been lodged.</p> <p>The Pukekohe DBC projects provide new connections to the Drury West and Paerata rail stations.</p>
	Proposed Regional Active Mode Corridor (AMC) between SH 1 and North Island Main Trunk Line (NIMT)	<p>The Regional Active Mode Corridor provides a direct connection to stations/centres along the NIMT.</p> <p>The Pukekohe DBC projects interact with the proposed AMC where projects propose new crossings of the NIMT.</p>
Mill Road DBC	Proposed Mill Road Corridor	<p>A proposed new and upgraded strategic transport corridor from Manukau to Drury, including upgrades to Redoubt Road, Mill Road and Dominion Road and a new section connecting to SH1 in Drury South. The corridor links into the proposed Drury South Interchange. Funding was announced for implementation of Mill Road through NZUP. The status of the Mill Road corridor is uncertain at this stage.</p> <p>The Pukekohe DBC projects interact with the proposed alignment of the Mill Road at the proposed Drury South Interchange.</p>

<p>SH1 Papakura-to-Bombay (P2B) (NZUP)</p>	<p>The P2B project is being delivered by Waka Kotahi as a mixture of implementation works and route protection (for future implementation).</p> <p>The Papakura to Bombay project builds on the Southern Corridor Improvements, and includes upgrading the alignment to six lanes, providing wide shoulders to future-proof for bus services along the SH 1 corridor; interchange improvements; and a shared path.</p> <p>The Pukekohe DBC projects interact with P2B corridor at the proposed Drury South Interchange.</p>
<p>Safe Roads SH 22 Karaka Road (Safe Network Programme)</p>	<p>Waka Kotahi Safe Network Programme (SNP) includes SH22. The Glenbrook Road and SH22 roundabout has recently been constructed. SNP also includes other safety improvements at other locations along SH22 corridor, as well as reviewing the speed limits.</p> <p>The Pukekohe DBC projects interact with SH22 in a number of places.</p>
<p>Papakura to Pukekohe rail electrification</p>	<p>Funding has been allocated for an additional 15 electric trains to enable electric rail services to be extended to Pukekohe and to provide additional capacity on the rail network. Rail electrification removes the need for passengers to change trains at Papakura, increasing the attractiveness of public transport in the South.</p> <p>Construction works are already underway for this project. The Pukekohe DBC projects provide new crossings of the NIMT in a number of places.</p>

3.7 Intersection Form Assessment Process

Once the preferred route refinement options were identified, an assessment was undertaken to determine preferred intersection forms across the network. Figure 3-4 outlines this process of deciding on the typology, where an intersection is required.

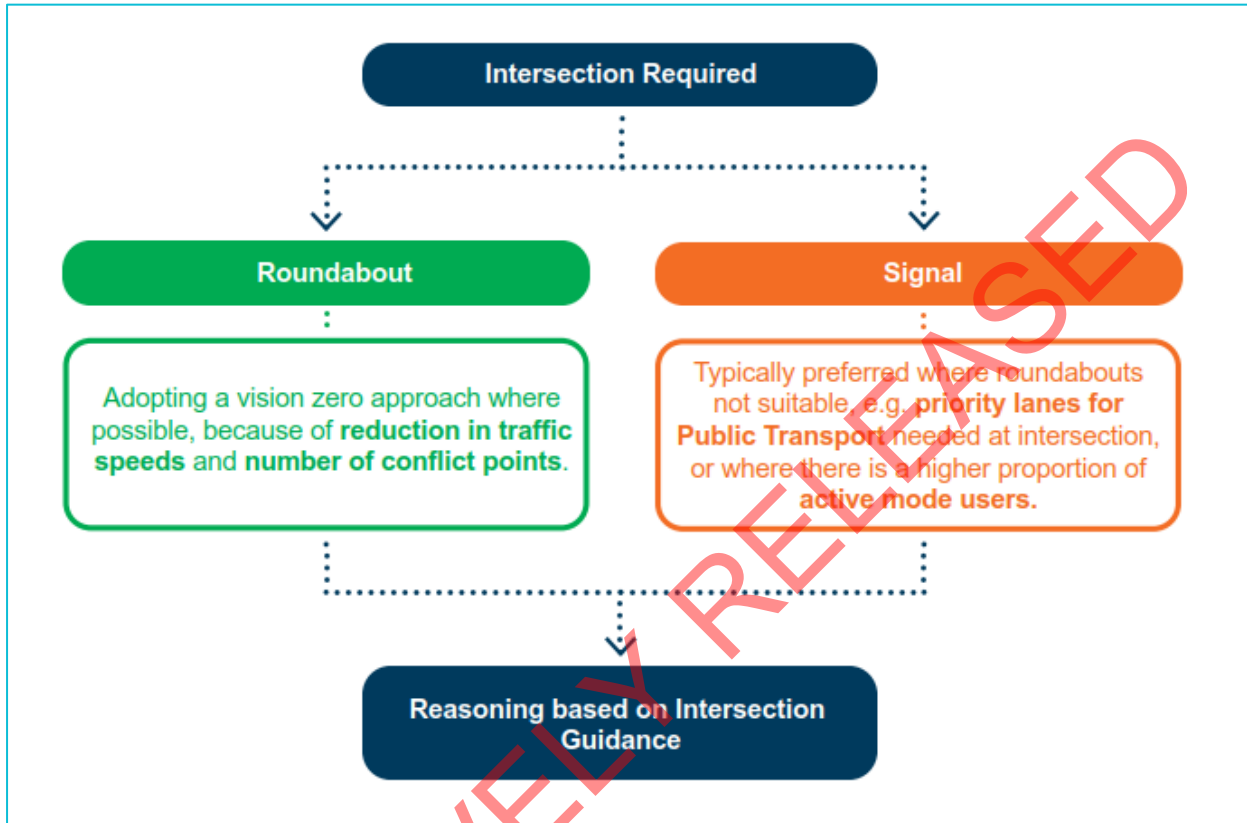


Figure 3-4 Intersection typology decision-making

Considerations for intersections in Pukekohe included:

- Maintaining access to private property where practicable, but not in a way that precluded efficient movement along the corridor, particularly for PT and active modes
- Adequate consideration of modal needs at intersections, for example priority intersection requirements for FTN and safe and efficient crossing opportunities for active modes
- Intersection size (determined by SiDRA modelling), particularly in more constrained existing urban areas
- Ensuring each intersection had sufficient space for queuing length and the level of service is acceptable

Where an intersection is required, Programme Wide guidance is used to determine whether this should be a roundabout or a signalised intersection. The guidance considers a number of factors including operational performance, safety, road environment and different road users. The guidance adopts a 'Safe Systems' approach and recommends roundabouts as the first choice for at-grade intersections due to the safety benefits for vehicular traffic resulting from slowing down through traffic and reducing the number of conflict points. However, where roundabouts are not appropriate, signalised intersections are then analysed. For either intersection typology chosen, design features are also considered to ensure that the intersection meets the needs of different users safely and effectively and responds to the site-specific factors. These factors are summarised in Figure 3-5.

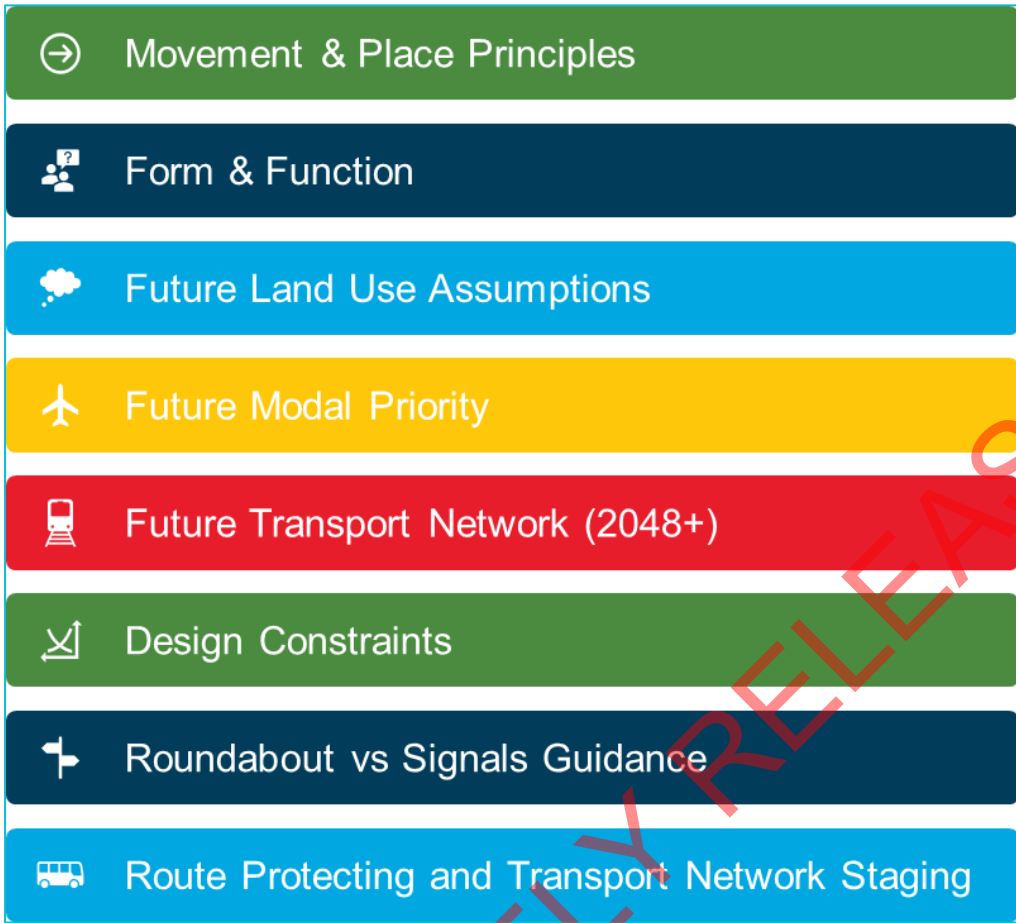


Figure 3-5 Intersection considerations

3.8 Approach to Stormwater Infrastructure

The additional land required to construct, operate and maintain the transport network for stormwater infrastructure is dependent upon the type of stormwater management devices chosen for each transport corridor. In order to determine the type and location of stormwater infrastructure a design process was undertaken. This process is summarised below:

1. Identification of existing stormwater infrastructure and management devices,
2. Develop a shortlist of appropriate stormwater management devices for each corridor,
3. Assess the size for these devices depending on if treatment, retention, detention and/or attenuation is needed,
4. Identify stormwater management device locations and sizes, and
5. Include stormwater infrastructure within the proposed designation boundary.

The type of stormwater management devices identified for use was based on a number of factors including the surrounding land-use, form of the transport route, road hierarchy and how connectivity to any adjacent properties is to be provided. This approach is summarised in Table 3-6.

Table 3-6 Stormwater System Design Approach Summary

Stormwater Design Environment	Treatment	Conveyance	Attenuation ²	Diversion
Existing Urban	Proprietary treatment devices or treatment wetland	Pits and pipes	Above ground devices, attenuation wetland or underground tanks	N/A
Future Urban¹	Proprietary treatment devices or treatment wetland	Pits and pipes	Above ground devices, attenuation wetland or underground tanks	Cut-off channels as required
Rural	Treatment swales or treatment wetland	Conveyance channels	Attenuation swale or wetland	Cut-off channels as required

Note: ¹ Assuming direct driveway access from future residential to the main corridor is restricted. To align with the overall project objective, developable land adjacent to the corridors within this environment should be maximised.

² Attenuation is typically only required in the upper half of the larger catchment where the wetland is located.

The following approach was generally taken to determine the need for, and location of attenuation devices such as stormwater wetlands, noting that stormwater attenuation devices tend to be most efficient where sited at a centralised location to capture larger catchments:

- Assess the catchment between two geometric high points in the road alignment,
- Calculate the wetland area as a percentage of this catchment (10% was used for catchments that require 1% AEP attenuation and 6% for catchments that do not require attenuation),
- The lowest point of the road is then located, and a wetland is placed in the best suited position to:
 - Reduce impacts on sensitive ecological areas,
 - Reduce impacts on waterways and floodplains,
 - Where possible, avoid steep land where excessive earthworks would be required,

- Provide clearance from proposed road design cut batters, and
 - Maximise use of orphaned land parcels where possible.
- Model the earthworks for the wetlands to ascertain the footprint required within the proposed designation.
- Indicatively design the pipe or swale network required to convey all flows to the wetland location.

If it was determined that a stormwater wetland was required, the location of the wetland was identified by placing the wetland at a low point along the transport corridor alignment and close to the corridor for easy access and maintenance. Also required is an outlet structure to discharge to a nearby natural stream. Where environmental constraints had been identified by technical specialists through constraint mapping and the options assessment process, these were also considered.

Bridges have been designed at all watercourse crossings where the upstream catchment is larger than 80 hectares. Culverts are included on flowpaths where the catchment is less than 80 hectares. The width of each bridge is approximately three-quarters of the floodplain as defined by Auckland Council's floodplain layer. Bridges and culvert structures are subject to a future resource consent process. The details and sizing of those structures will be determined at a later date to meet the council requirements and other legislation at the time of design and implementation.

PROACTIVELY RELEASED

4 Corridor Assessment

This section sets out the corridor assessment for the Pukekohe DBC transport components. Through the gap analysis (set out in section 3.2), four groups of options were developed for corridor assessment as set out below.

- **Drury West Local** – local connectivity in the FUZ to the station and strategic corridors;
- **Paerata Local** - local connectivity in the FUZ to the station and strategic corridors;
- **North-South** - strategic connections between Drury, Paerata and Pukekohe; and
- **Pukekohe Local** – local connections around Pukekohe as alternatives to the current main connection through the Pukekohe centre.

The Drury West Local, Paerata Local and North South options were assessed individually. Then the recommended corridors from Drury West Local and Paerata Local assessments were tested with a short list of the North South options as network packages. This was to test the individual recommendations from each of the geographic areas with each other to make an overall recommendation as an integrated transport network.

The Drury West Local and Paerata Local corridor assessments focused on maximising access to the proposed Drury West and Paerata rail stations, mode shift, and connectivity to existing strategic corridors (SH22 and SH1) and within the FUZ. The North South options investigated the need for the strategic North South connections when coupled with the Drury West Local and Paerata Local recommended corridors.

Pukekohe Local corridor options were assessed individually. However, were tested through assessing the interactions/tie ins with the recommended corridors of the North-South and Paerata Local recommended options at route refinement.

Route refinement options occurred on the recommended corridor options for each geographic area.

4.1 Drury West Corridor Assessment

4.1.1 Background - South IBC / Draft Strategic South DBC Assessment Summary

As set out in section 3.6 (gap analysis between IBC to DBC), options have been reassessed for the Drury West area in for the DBC. The IBC and draft Strategic South DBC provide important background to the previous rounds of options assessment. The options assessment at these phases are summarised below.

A number of new and upgraded arterials in Drury west were investigated at the IBC phase. The figure below shows the short list options considered in the IBC. The alignment of AR20 was recommended forming a connection between the IBC recommended Pukekohe Expressway, Drury west rail station and SH22 and Jesmond Road.

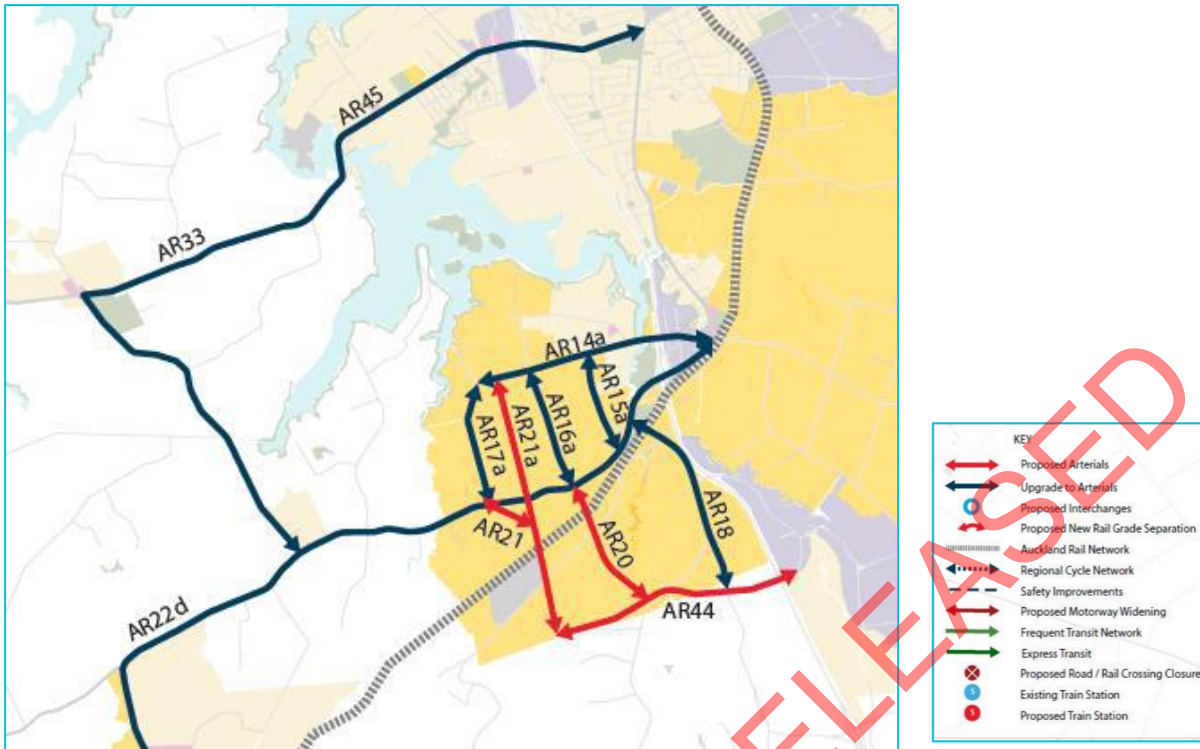


Figure 4-1 IBC Drury West Short List Options (Source: South IBC Options Assessment Report 2018)

Through the IBC, the AR20 alignment was recommended as a 2 lane, 24m wide cross section. This was developed further through the Strategic South DBC to 4 lane, 30m wide cross section. Two options (Option A and Option B) were developed for the SH22 North Connection for the Strategic South DBC:

- Option A – South alignment connecting Jesmond Rd and the Pukekohe Expressway to the west of Runciman Road and
- Option B – North alignment connecting Jesmond Rd and Pukekohe Expressway.

Both options scored similarly. A hybrid of both options, which generally follows the Option B alignment in the north section, and Option A alignment in the southern section was recommended. The tie-in point at Pukekohe Expressway is largely constrained by the Transpower electricity transmission lines and spacing of pylons.

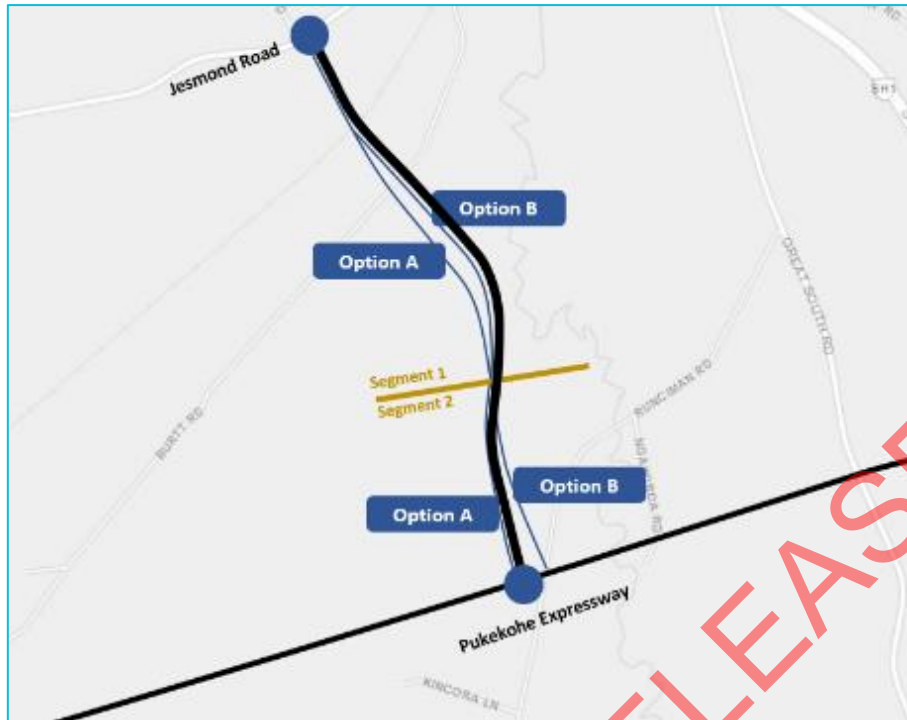


Figure 4-2 Summary of Option A and Option B (Source: Draft Strategic South DBC, July 2020)

4.1.2 Gap analysis- IBC to DBC

Table 4-1 provides a summary for Drury West components of the Pukekohe DBC, key changes since the previous recommendations made by the South IBC and Draft Strategic South DBC and a recommendation for the Pukekohe DBC.

Table 4-1 Summary of gap analysis and recommendations

Intention and Previous options assessment	Key changes since IBC and Draft Strategic South DBC	Recommendation(s)
<p>Provides access to Drury West station from SH22, crosses the rail line and connects to the Pukekohe Expressway. Two options were investigated at the Strategic South DBC.</p> <p>Interacts with the location of the Pukekohe Expressway. The access to the Drury West station needs consideration based on any revisit to the Pukekohe Expressway.</p>	<p>Drury West Plan changes within close proximity, which may influence the number of trips that may use the Drury West connector.</p> <p>GPS 2021/Zero Carbon Act – Climate change lens.</p> <p>Consider implications of NPS FM and NES FW – adopt avoidance of wetlands where possible as principle in first instance.</p>	<p>Corridor assessment considering the following:</p> <ul style="list-style-type: none"> • Interaction with Pukekohe Expressway. • East-west connectivity through FUZ – maximise access to proposed Drury West Station. • Consideration of natural wetlands under NPS FM. • Connections to existing strategic network (SH22 and SH1).

4.1.3 Option Development

The options developed within the Drury West area connect Drury to the new Drury South interchange, from SH22/Jesmond Road to Great South Road (GSR), providing connectivity to the wider strategic network (SH1, SH22, FTN Network and North Island Main Trunk), future town centre, new Drury West Rail Station and for future Drury West communities. There are two proposed transport projects that all options provide a connection between, these are:

- Proposed Drury West Rail Station – a Notice of Requirement (NoR) for a new designation has been lodged by KiwiRail; and
- Proposed Drury South Interchange (SH1) – A NoR for a new designation (or an alteration to the existing designation) is being sought by Waka Kotahi.

All options extend south from the accessway proposed by the Drury West Rail Station at the intersection of SH22 and Jesmond Road and connect to the proposed extent of the Drury South Interchange (SH1) at Great South Road. The Drury West options also interface with the following transport projects:

- State Highway 22 (SH22) Upgrade (Waka Kotahi) and Jesmond to Waihoehoe West FTN Upgrade (Auckland Transport) – NoRs by Waka Kotahi and AT were lodged in 2021 and recently confirmed (part of the Supporting Growth Programme).
- SH1 Papakura to Bombay Project (Waka Kotahi) – Stage 1 of this project which is between Papakura and Drury is under construction. This includes the upgrade of the existing Drury/SH22/SH1 interchange. Waka Kotahi will soon be lodging a NoR for the Drury South to Bombay section, which includes the proposed new Drury South Interchange.
- The future collector roads indicated in the Drury – Ōpāheke Structure Plan are expected to be developed through developer contributions (or delivered by developers) as areas are urbanised.

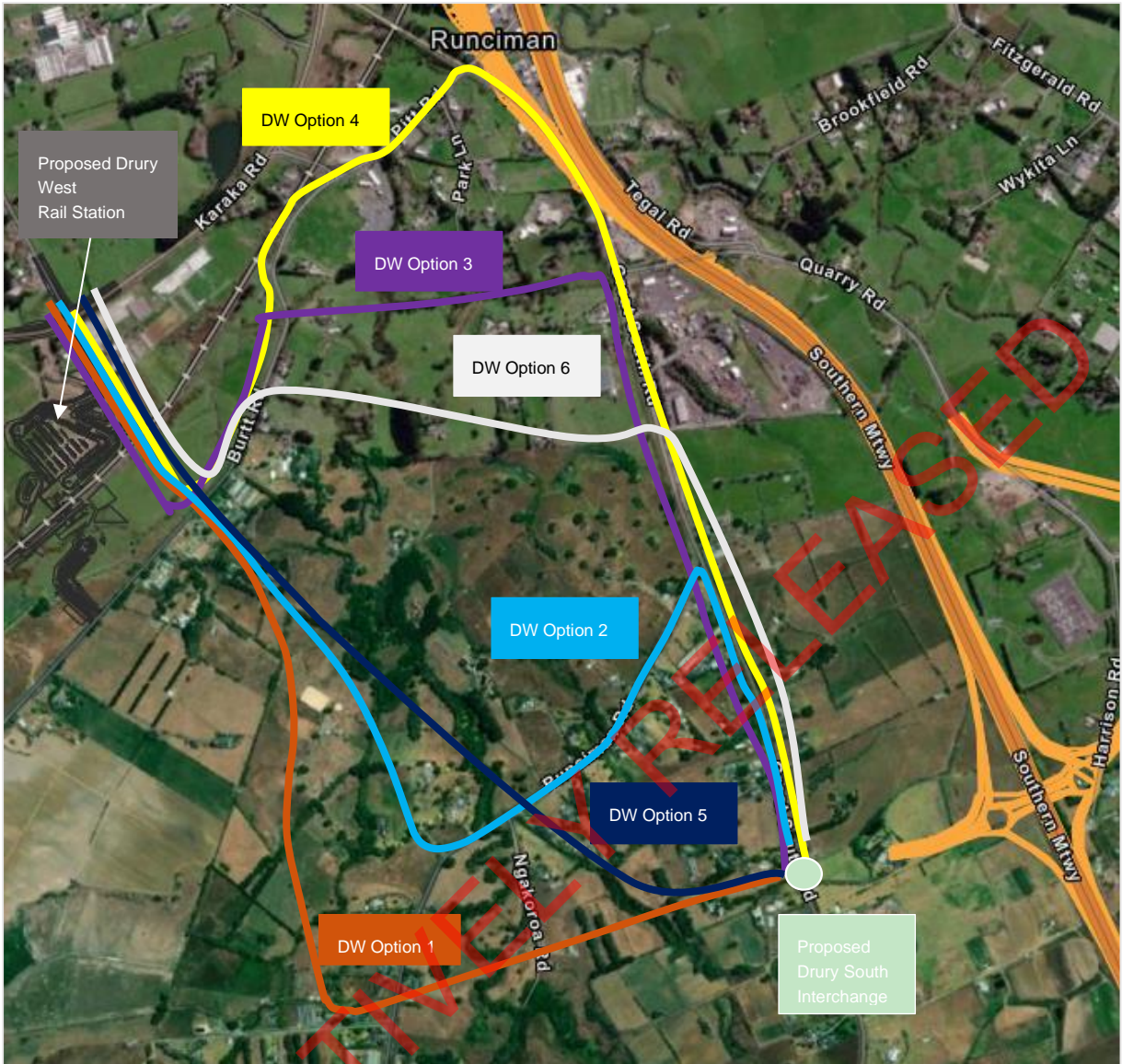


Figure 4-3 Summary of Drury West options

4.1.4 Option Assessment

Six options were assessed for the Drury West corridor assessment against the MCA framework by each subject matter expert. Table 4-2 provides a summary of the assessment undertaken by technical specialists against the MCA framework.

Table 4-2 Drury West option MCA scoring result

MCA Criteria	Scores					
Options	DW1	DW2	DW3	DW4	DW5	DW6
Investment objectives						
IO1 – Safety	1	1	2	3	1	2
IO2 – Integration	2	2	1	1	2	2

IO3 - Access	3	2	2	1	3	2
IO4 – Resilience	3	2	1	0	3	1
IO5 – Travel Choice	1	1	2	1	1	2
Cultural						
Heritage	0	-3	-3	-3	0	-3
Social						
Land use futures / integration with planned landuse	1	3	2	2	1	2
Urban design	2	-2	-1	-2	1	1
Land requirement / property	-3	-2	-2	-2	-3	-2
Social cohesion	2	2	2	1	1	1
Human health and wellbeing	-1	-1	-1	0	-1	-1
Environment						
Landscape / visual	-2	-1	-2	0	-2	-2
Stormwater	-2	-2	-3	-1	-2	-1
Ecology	-4	-3	-4	-2	-4	-3
Natural hazards	-3	-2	-3	-1	-4	-2
Construction impacts						
Embodied carbon emissions	-3	-3	-3	-3	-3	-3
Construction impacts on utilities / infrastructure	-1	-2	-2	-2	-1	-2
Construction Disruption	-1	-2	-2	-2	-1	-2
Construction costs / risk / value capture	-2	-2	-2	-2	-2	-2

Table 4-3 Drury West option assessment findings summary

Criteria	Summary of performance
Investment Objectives	<p>DW1 and DW5 were preferred providing a high degree of connectivity and access to support the growth.</p> <p>DW3 and DW6 improve E-W connectivity for active modes and buses but would need additional local connections to support growth.</p> <p>DW4 was least preferred as it would provide less network resilience.</p>
Heritage	Options DW1 and DW5 have no recorded heritage.

Criteria	Summary of performance
	<p>DW4 is the least preferred given it has the largest number of features being potentially impacted. This includes the Clarke homestead, villas, Herkt’s petrol station, Runciman Tennis club, and s 9(2)(ba)(i)</p>
<p>Social</p>	<p>Land use</p> <p>DW2 was preferred as it connects to the proposed Drury West rail station, directly to two business centres and traverse multiple future residential areas as well as future light industry.</p> <p>DW1 was least preferred given it is the longest stretch of new corridor and would take up a greater amount of developable land. DW5 was also less preferred due to impacts on developable land albeit partly located within a stream/floodplain.</p> <p>Urban design</p> <p>DW1 was preferred for taking a direct route to the proposed Drury South interchange over those options that deviate through the industrial area.</p> <p>DW2 is least preferred as it is not a direct connection, adding distance and reducing legibility.</p> <p>Land requirement</p> <p>DW4 was preferred as it requires partial acquisitions of large plots.</p> <p>DW1 and DW 5 were least preferred as these options would require full acquisitions of residential areas.</p> <p>Social cohesion</p> <p>DW2 is preferred as it provides the best connectivity between areas and crosses the Ngākoroa Stream at an existing crossing point.</p> <p>Health and wellbeing</p> <p>DW4 predominantly traverses light industrial area, which is not a sensitive land use and uses existing roads, where air quality, noise and vibration effects are existing and expected.</p>
<p>Environmental</p>	<p>Landscape and visual</p> <p>DW4 was preferred due to its use of existing road alignment and the proximity to FUZ. Effects would likely be limited to rural residential properties within the localised setting of the western part of the route. However, seen in the context of the anticipated future urban zoning. The area of new roading would likely result in the loss of a limited area of established planting.</p> <p>Stormwater</p> <p>DW4 was preferred as it contains the least new impervious area compared to the other options, however, it also has several small culverts that would be difficult to upgrade and crosses several flood plains.</p> <p>DW3 was the least preferred as the alignment follows the same path as a large stream and would require stream modification / realignment to accommodate the road, nearly all of this alignment is the 1% AEP floodplain and would require significant earthworks to mitigate displacement effects of the road embankment.</p> <p>Ecology</p> <p>While DW4 impacts a similar number of streams and wetlands as other options there are pre-existing impacts hence the magnitude of effects is</p>

Criteria	Summary of performance
	<p>likely to be lower and, in some cases, upgrading undersized bridges / culverts would improve ecological integrity.</p> <p>DW3 and DW5 were least preferred due to significant impacts on streams, requiring realignment. DW1 is also least preferred due to potentially high impact on bat movement.</p> <p>Natural Hazards</p> <p>The alignment is entirely within alluvium with a risk of soft soil/liquefaction. DW4 was preferred as it requires mostly widening on existing alignments and only crosses one floodplain, where the other options cross three.</p> <p>DW2 and DW6 also use the existing alignment but still crossed three flood plains making them potentially less attractive from a hazards point of view. DW3 and DW5 were least preferred.</p>
<p>Construction impacts</p>	<p>Embodied carbon emissions</p> <p>DW1 is preferred as it has low lane kilometres (likely lower materials and construction emissions) and no addition features which might adversely differentiate option based on earthworks or major structures.</p> <p>DW3 is least preferred as one of the longest (implies greater materials and construction fuel/energy). The corridor crosses a floodplain and would require a longer bridge and significant earthworks (greater materials emissions related to bridge, and construction emissions for earthworks).</p> <p>Construction impacts on infrastructure/utilities</p> <p>The alignment would require protection of the First Gas transmission pipe, overhead powerlines and transmission lines.</p> <p>DW2 , DW3 and DW6 are also likely to require undergrounding of overhead powerlines and relocation or protection of the water distribution pipe making them less preferred.</p> <p>Construction disruption</p> <p>Majority of route is greenfield. DW2, DW3, DW4 and DW6 are likely to require temporary traffic control making them less preferred.</p> <p>Construction costs</p> <p>All options require a number of bridges and there was limited differentiation between them.</p>
<p>Partner feedback</p>	<p>Key feedback from KiwiRail during workshops included:</p> <ul style="list-style-type: none"> • Support a direct, multi modal, connections to the Drury West Station. Relating to the option to upgrade Burt Road to an arterial, an upgrade is required regardless due to the that due to the future development around the station and also noting the catholic school. <p>Key points from AT and WK SMEs during workshops were:</p> <ul style="list-style-type: none"> • Consideration of accessibility to the proposed Drury West options through FUZ areas currently in floodplain (that likely can't be developed). • Access across the NIMT is crucial to reduce severance. <p>Manawhenua during hui expressed preference for reducing impacts on the Ngakoroa Stream</p>

Criteria	Summary of performance
	s 9(2)(ba)(i)

4.1.5 Discarded Options

Table 4-4 Options to be discarded

Option	Reason
DW1 (southern portion)	The southern part of the option is located outside the FUZ and this part of the corridor does not integrate or serve the FUZ well. A higher amount of land is required for this option. This option also has a potentially high impact on bat movement. Southern portion was discounted.
DW3	Follows a significant portion of the Ngakoroa Stream requiring significant stream diversion/realignment. Has higher construction costs and environmental impacts through the assessment.
DW4 and DW6	These options do not travel effectively through the growth area. Great South Road has the corridor width to be upgraded in a separate future project as this route is more focussed through industrial / business areas.

4.1.6 Recommended Corridor Option

It was recommended that a corridor between DW1 and DW2 be taken forward to test with the Paerata Local and North South recommended corridor options at a network level (see Section 4.4). This corridor provides good connectivity and access to support the growth and is a direct connection. At route refinement assessment, options will look to reduce impacts on the Ngakoroa Stream.

4.2 Paerata Local Corridor Assessment

4.2.1 South IBC / Strategic South DBC assessment summary

The Paerata Local component was considered as part of the North-South Connection in the IBC. See Section 4.3.1 for more details.

4.2.2 Gap analysis

Table 4-5 provides a summary for Paerata Local transport components of the Pukekohe DBC, key changes since the previous recommendations made by the South IBC and Draft Strategic South DBC and a recommendation for the Pukekohe DBC.

Table 4-5 Summary of gap analysis and recommendations

Intention and Previous options assessment	Key changes since IBC and South DBC	Recommendation(s)
Provides access to Paerata station, crosses the rail line and connects to the Pukekohe	<ul style="list-style-type: none"> A focus on climate change in government policy and future 	Corridor assessment considering the following:

Intention and Previous options assessment	Key changes since IBC and South DBC	Recommendation(s)
<p>Expressway – known as the Southern Connector.</p>	<p>direction (impending with RMA reform):</p> <ul style="list-style-type: none"> • The Government Policy Statement on Land Transport (2021) requires investment decisions to be consistent with transformation to a low carbon transport network. • Auckland Council's declaration of climate change emergency. • Increased scrutiny on the impacts on climate change from transport corridors, affordability, socio-political pressure. • Funding of Paerata Rail Station through NZUP. • Active development in Paerata Rise. 	<ul style="list-style-type: none"> • The form and function of the Pukekohe Expressway is re-assessed and the need confirmed which influence the connections in Paerata. • Further alternatives are considered (corridor assessment) which may provide more of a contribution to decarbonisation as set out in government direction. This could include the investigation of upgrading existing roads. • Maximise connectivity to the proposed rail stations (NZUP) and associated mode shift through strategic connections. • Through any optioneering processes new information such as impacts on wetlands (under the NPS FW) and opportunities to integrate with urban development are identified.

4.2.3 Option Development

The options developed within the Paerata area investigate local connectivity to the proposed Paerata Station and to SH22 and within the Paerata and north Pukekohe future urban areas. Five options were considered. The Paerata options at the southern extent interact with the Pukekohe Local options – with the north-east section of the Pukekohe arterials. They also interact with the north-south options.

At the time of assessment, KiwiRail had lodged a Notice of Requirement for the Paerata Station confirmed through the COVID fast track process. Construction of the station is expected to commence in 2023.

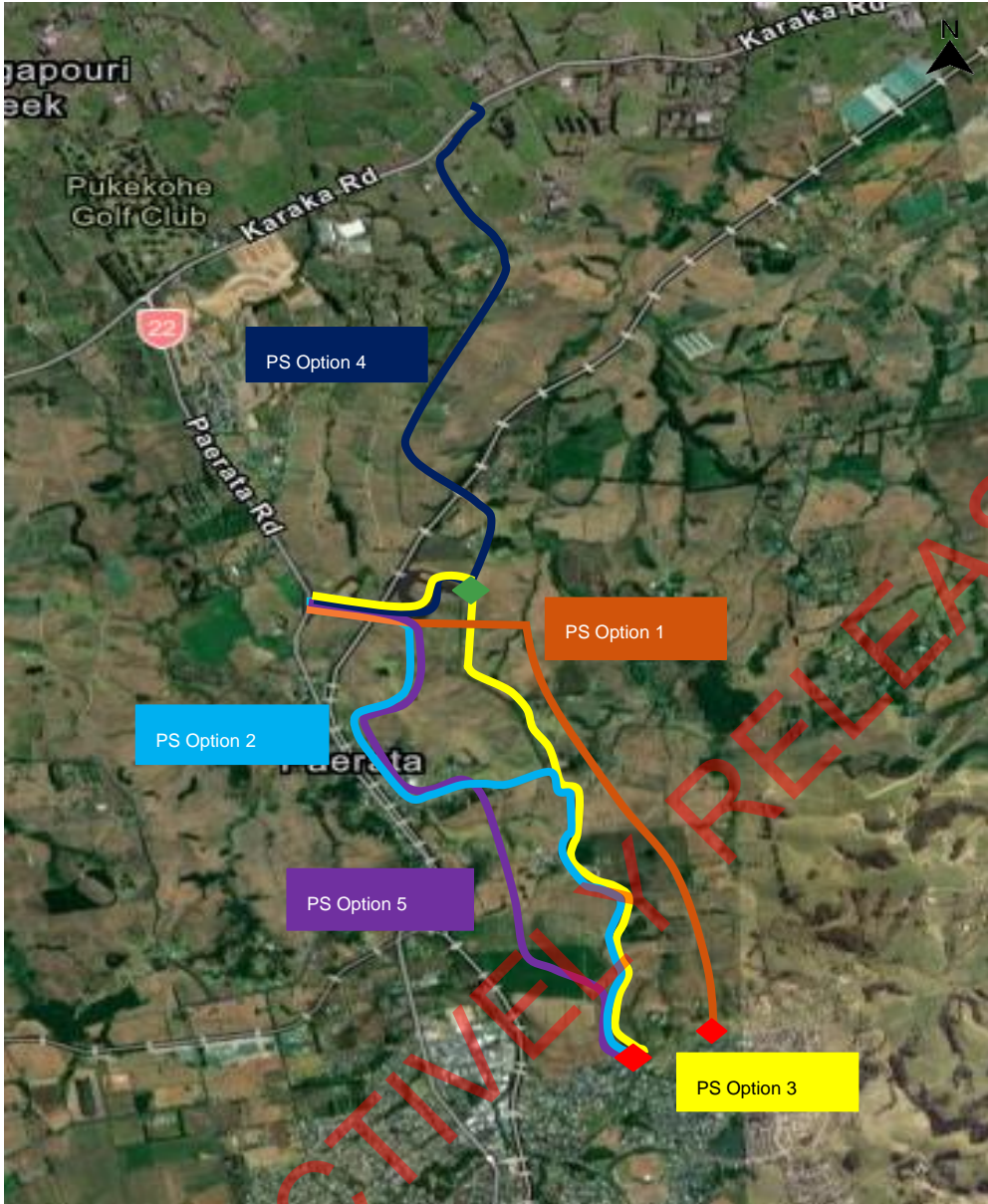


Figure 4-4 Summary of Paerata corridor options

4.2.4 Option Assessment

Five options were assessed against the MCA framework by each subject matter expert. Table 4-6 provides a summary of the assessment undertaken by technical specialists against the MCA framework.

Table 4-6 Paerata Local option MCA scoring

MCA Criteria					
Options	PS1	PS2	PS3	PS4	PS5
Investment objectives					
IO1 – Safety	2	3	3	3	2

IO2 – Integration	0	3	2	3	3
IO3 - Access	1	3	2	3	3
IO4 – Resilience	3	2	1	3	3
IO5 – Travel Choice	-1	2	2	2	3
Cultural					
Heritage	0	-2	0	-1	-2
Social					
Land use futures	1	2	2	1	3
Urban design	-3	-1	1	-1	-1
Land requirement / property	-2	-2	-2	-1	-2
Social cohesion	0	2	1	2	2
Human health and wellbeing	-1	-1	0	-1	-1
Environment					
Landscape / visual	-2	-2	-2	-1	-2
Stormwater	-2	-2	-1	-1	-2
Ecology	-4	-3	-3	-2	-3
Natural hazards	-2	-1	-1	-1	-3
Construction impacts					
Embodied carbon emissions	-3	-3	-3	-3	-3
Construction impacts	-2	-2	-2	-2	-2
Construction Disruption	-1	-2	-2	-2	-2
Construction costs / risk	-2	-2	-2	-2	-3

Table 4-7 Paerata Local corridor option assessment findings summary

Criteria	Summary of performance
Investment Objectives	<p>PS2 and PS5 are preferred as these options increase connectivity between FUZ areas across the rail corridor. Consideration of a more direct option for PS5 was recommended (for route refinement).</p> <p>PS4 also scored favourably but was likely to have a different function to the other options and would need to be combined with other options.</p>

Criteria	Summary of performance
	PS1 was least preferred due to lack of integration with FUZ and limited benefits for mode choice.
Heritage	<p>PS1 and PS3 have no recorded heritage and were the preferred options.</p> <p>PS2 and PS5 had the potential to impact early mid-20th century heritage: railway workers cottages, Paerata dairy factory, dairy factory workers cottages and Paerata bowling club.</p> <p>PS4 had the potential to impact 2 heritage barns close to Sim Road.</p>
Social	<p>Land use</p> <p>PS5 was preferred as it connects the proposed rail station to future urban areas and provides good integration. This option would create large, viable areas of developable land. In addition, the route provides for large volumes of vehicles to travel around the future residential areas providing best integration for these future land uses.</p> <p>PS2 and PS3 were less preferred as the corridor is partly outside the FUZ/planned residential areas, reducing the amount of developable land being impacted and potentially creating a future conflict between those residential land uses and high-volume road corridor reducing integration.</p> <p>PS1 was the least preferred as it was within the rural zone and too far from the FUZ and did not provide good integration with current and future land uses. It also was considered to encourage development outside the FUZ.</p> <p>Urban design</p> <p>PS3 is preferred as it runs along the edge of the FUZ on an existing corridor, defining the rural/urban boundary, and would separate traffic from future residential development.</p> <p>PS2, PS4, PS5 traverse an area identified as THAB in the Structure Plan which may create challenges around future development creating a positive interface with the road corridor. The topography has potential to negatively affect character and amenity and create poor interface outcomes, particularly in the southern area.</p> <p>PS1 was the least preferred as it is outside the FUZ and there are no place making opportunities. This option was considered likely to create pressure to extend FUZ and create a Rural Urban Boundary. Due to running through Rural area this option would have an adverse effect on the amenity and character of the area.</p> <p>Land requirement</p> <p>PS4 was the preferred option as it required the acquisition of the least number of properties.</p> <p>PS1, PS2, and PS5 had greater impacts on properties.</p> <p>PS3 was also less preferred but it was noted that by following the southern side of Sim Road this could be mitigated and would be similar to PS4.</p> <p>Social cohesion</p> <p>PS2, PS4 and PS5 create a link through rural land and past an existing industrial area to an existing residential. PS3 creates a link to the existing residential area.</p> <p>PS1 is least preferred as it does not provide a direct connection to existing urban areas.</p> <p>Health and wellbeing</p> <p>PS1, PS2, PS4, PS5 were similar. The options would have a negative impact introducing a new corridor near existing and future residential areas and Country</p>

Criteria	Summary of performance
	<p>Village Preschool. PS3 was the preferred option as while it is in proximity to residential land use it is not close to any other sensitive receivers.</p>
<p>Environmental</p>	<p>Landscape and visual</p> <p>PS4 was the preferred option. While there were likely to be effects on rural character, there was an opportunity to provide planting along the new road corridor to integrate the road into the landscape.</p> <p>PS1, PS2, PS3 and PS5 were less preferred as the proposed route would result in the road being located upon steep topography and potentially impacting a stand of vegetation on Cape Hill Road identified as an SEA.</p> <p>Stormwater</p> <p>PS3 and PS4 are the preferred options.</p> <p>PS1 would require water quality detention and attenuation via wetlands.</p> <p>PS2 and PS5 cross a number of small tributaries and run alongside / over a flood prone area near the NIMT rail. Mitigation would be required to balance flood effects on the railway line and upstream properties.</p> <p>Ecology</p> <p>PS4 was preferred as reduces potential impacts on wetlands</p> <p>PS1 and PS5 were the least preferred due to potential impacts on nationally critical long-tailed bats recorded in Paerata Scenic Reserve (1km West) and Coulthards Scenic reserve (1km East). Fragmentation of numerous stream corridors and bush fragments likely to provide key habitat corridors for bats.</p> <p>PS2 and PS3 were also not preferred due to potential impacts along the east side of Cape Hill Road, where indigenous vegetation occurs in the SEA_T_4380.</p> <p>Natural Hazards</p> <p>PS2, PS3 and PS4 manages to avoid most of the problematic terrain.</p> <p>PS1 was not preferred as it mostly crosses undulating terrain associated with volcanic deposits (mostly tuff and basalt) with numerous flood plains in gullies.</p> <p>PS5 was the least preferred as involves new construction on swamp in southern section, adjacent to Whangapouri Creek.</p>
<p>Construction impacts</p>	<p>Embodied carbon emissions</p> <p>There was limited differentiation between options. PS3 was the preferred option as it is mostly the widening of existing roads and may benefit from reusable materials and previous works, from a construction emissions perspective.</p> <p>Construction impacts on infrastructure/utilities</p> <p>There was limited differentiation between options as a number of services would need to be protected or relocated including first gas, overhead transmission lines and power lines.</p> <p>Construction disruption</p> <p>PS1 was the preferred option. All other options would require lane narrowing or temporary traffic control needs to be implemented during construction on the existing roads.</p> <p>Construction costs</p> <p>All options have challenging terrain, and some require a bridge to cross the railway.</p>

Criteria	Summary of performance
Partner feedback	<p>During workshops KiwiRail shared insights on railway electrification (by 2025) and construction of railway / Paerata and Drury Rail Stations.</p> <p>During the workshop AT and Waka Kotahi SMEs raised following matters:</p> <ul style="list-style-type: none"> • AT shared existing and potential plan changes within the study area. • Auckland Transport raised that due to the narrow extent of Paerata FUZ, an arterial through the middle of it may have some integration issues. Benefits were acknowledged for the option on the edge of the FUZ supported by a local road within the FUZ as development progresses. • Consideration of the efficiency of the freight network in terms of journey time and emissions. A number of intersections may delay movement. • Acknowledgement of topographical constraints on Cape Hill Road. • Discussion on a network that reduces VKT whilst supporting development. <p>Manawhenua shared at hui:</p> <ul style="list-style-type: none"> • s 9(2)(ba)(i) • Ngāti Te Ata Waiohua queried the weighting of cultural and environmental impacts in options assessment and the project confirmed these will be critically considered while developing and assessing options.

4.2.5 Discarded Options

Table 4-8 Options to be discarded

Option	Reason
PS1	Almost completely outside of the FUZ, within existing and future rural land. Provides the least connection to employment, communities, and facilities. Does not meet the project objectives (-1 for mode choice). Highest ecological potential impact on bats and waterways. However, this option may be revisited if the Pukekohe Expressway option is chosen.
PS2	Discounted due to potential impacts on heritage items and potential flooding effects.
PS4	Discounted as Paerata Rise Development is providing collector roads that have a similar function.

4.2.6 Recommended Corridor Option(s)

It is recommended that PS3 and PS5 (a corridor within the Paerata FUZ) be taken forward to tested with the Drury West Local and North South recommended corridor options at a network level (see Package Assessment in Section 4.4). PS4 and PS5 provide good connectivity and access to support the growth.

Recommendations for route refinement include a more direct route for PS5 and consideration of topographical constraints of upgrading Sim Road/Cape Hill Road for PS3. Also to consider the connection to the Paerata Station (formerly known as the Southern Connector at Draft Strategic South DBC).

4.3 North-South Corridor Assessment

4.3.1 South IBC / Draft Strategic South assessment summary

4.3.1.1 South IBC

At the IBC phase, several options were investigated (mutually exclusive from each other but relating to other strategic routes such as Mill Road, or the arterial routes in Pukekohe) to test multiple locations and alignments for a Pukekohe Expressway providing a direct link to SH1 from Pukekohe, therefore, taking traffic off SH22, which traverses both Pukekohe and Drury west growth areas.

The longlist of options is shown in Figure 4-5 below and included:

- SR4A – central alignment: Drury South Interchange to Pukekohe East Road
- SR4B – alignment on edge of FUZ connecting to Drury South Interchange
- SR4C – eastern alignment: Drury South Interchange to Pukekohe East Road
- SR4D – Ramarama interchange connecting to SH22 south of Paerata
- SR4E – Upgrade Pukekohe East Road and widen Mill Road connecting to Bombay Interchange
- SR4F – northern alignment: Drury South Interchange along edge of Drury west FUZ connecting to SH22 south of Paerata
- SR19 – central alignment: Drury South interchange along the edge of Drury west FUZ to Pukekohe East Road (amalgamation of options).
- MT10 provides a bus rapid transit option between Pukekohe and Drury at SH1. This was not given a specific alignment as it would be located on SR options.

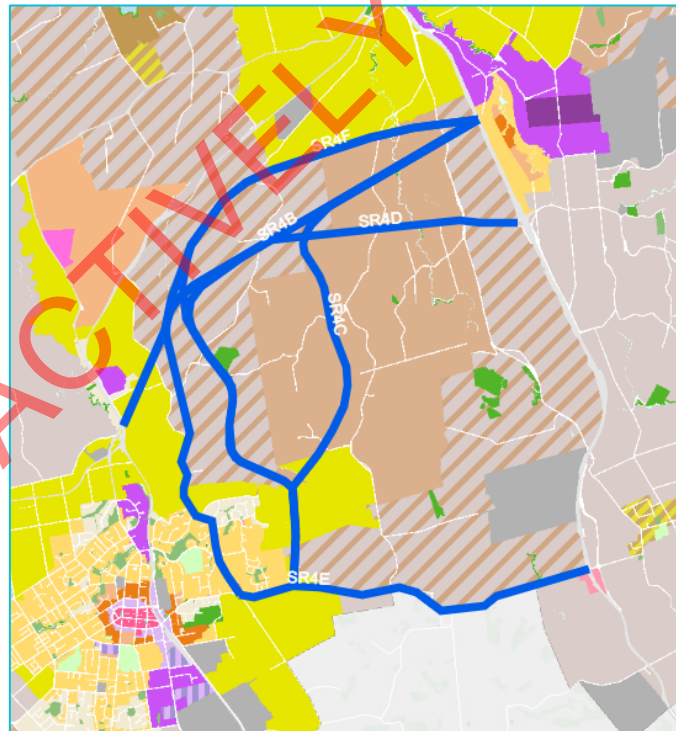


Figure 4-5 South IBC long list options

Short List

Options SR4E, SR4F and SR19 were recommended for the short list as they all scored positively against all three investment objectives. Option MT10 was also recommended for the short list for further investigation.

Options SR4A, 4B, 4C and 4D were discarded due to the potential moderate to high adverse environmental effects, inability to achieve all the investment objectives, and lack of integration with future or existing communities.

Following this, SR4E was packaged separately from the other two Pukekohe Expressway options, where it was taken forward as an option under 'Strategic Connections'. Option SR4F (including the main trunk of SR19) was the recommended option for the Pukekohe Expressway as it aligns best with future land use at north-east Pukekohe, avoids proximity to the Outstanding Natural Landscape (ONL) - Coulthards Scenic Reserve and provides a more direct route compared with SR19.

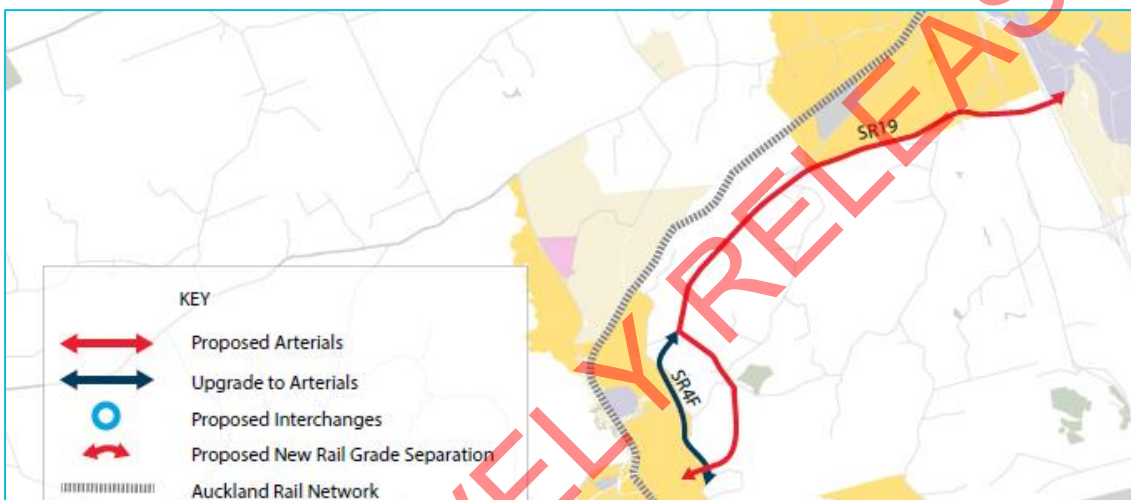


Figure 4-6 South IBC short list options (the southern section of SR19 and SR4F are mutually exclusive)

4.3.1.2 Draft Strategic South DBC

The Strategic South DBC divided the Pukekohe Expressway into two sections – Pukekohe Expressway (A) and (B). Section B was progressed to a corridor assessment to investigate if impacts could be avoided.

- Three options were developed for the Pukekohe Expressway (B) section during the SS DBC (Options A, B and C as shown in the option sketch). Option A was identified as the IBC recommended option. Option B and C track further to the west of Option A, before connecting to the Pukekohe Urban Arterial (NE).
- Following the option development at the route refinement level, the Pukekohe Expressway was divided into four segments, identified by constraints in the area and interaction with other options.
- Two options were developed for segment 3, and three options were developed for Segments 1,2 and 4.



Figure 4-7 Summary of Pukekohe Expressway (B) options (Source: Strategic South Detailed Business Case, July 2020).

It was recommended that Option A and Option B be progressed to route refinement in the form of a hybrid option, broken down into the following segments:

- Segment 1: Option B - Offline, south of Transpower line
- Segment 2: Option B - Offline, south of Transpower line
- Segment 3: Option A - Offline, south of NIMT line, west of Oira Stream
- Segment 4: Option C - Offline, east of Cape Hill Road

The hybrid option would broadly follow the Option A alignment between SH22 Central Connection and the SH22 Southern Connection, and the Option B alignment from the SH22 South Connection to the Pukekohe Urban Arterial. The form and function recommended in the Strategic South DBC was for a 4 lane arterial.

This preferred option was selected as it would be far west of the identified pā site/volcanic feature as practicable and is better aligned with the FUZ.

4.3.2 Gap analysis - IBC to DBC

Key transport and environmental policy direction have changed since the recommendations made by the South IBC and Draft Strategic South DBC on Pukekohe Expressway. This includes:

- A focus on climate change in government policy and future direction (with RMA reform coming).
- The Government Policy Statement on Land Transport (2021) requires investment decisions to be consistent with transformation to a low carbon transport network.
- Auckland Council's declaration of climate change emergency.
- Increased scrutiny on the impacts on climate change from transport corridors, affordability, socio-political pressure.

In considering the above changes, the following carbon emissions assessment methodology was formed to further test the alignment of the preferred network with this new policy direction:

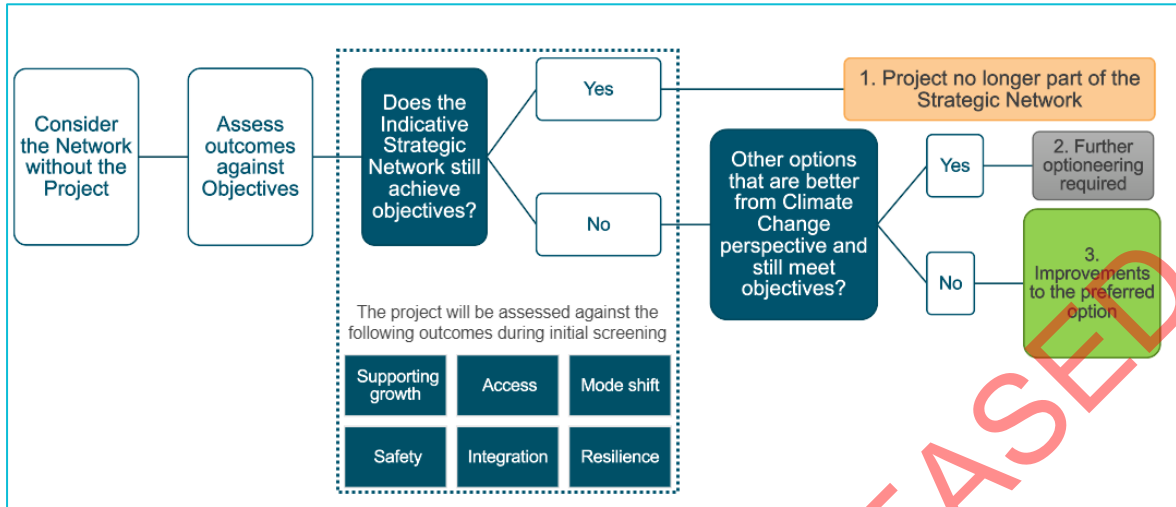


Figure 4-8 carbon emissions assessment methodology

Table 4-9 provides a summary of the Pukekohe Expressway transport components of the Pukekohe DBC, key changes since the previous recommendations made by the South IBC and Draft Strategic South DBC and a recommendation for the Pukekohe DBC.

Table 4-9 Summary of gap analysis and recommendations

Intention and Previous options assessment	Key changes since IBC and South DBC	Recommendation(s)
<p>The Draft Strategic South DBC took the recommended option from the IBC and investigated another two options (three in total) – and then undertook a route refinement assessment.</p>	<p>GPS 2021/Zero Carbon Act – Climate change lens – implications on the need for a four lane “expressway” that will induce light vehicle travel.</p> <p>Risk that road projects are challenged due to their contribution to greenhouse gasses – contrary to legislative direction to reduce emissions.</p> <p>Consider implications of NPS FM and NES FW – adopt avoidance of wetlands where possible as principle in first instance.</p> <p>Engagement undertaken as part of the Strategic South DBC included opposition to the Pukekohe Expressway. Concerns around potential loss of rural lifestyle/outlooks and property values.</p> <p>Three new rail stations were confirmed through NZUP (funding confirmed).</p>	<p>Corridor assessment considering the following:</p> <ul style="list-style-type: none"> The form and function of the Pukekohe Expressway is re-assessed and the need confirmed. Further alternatives are considered (corridor assessment) which may provide more of a contribution to decarbonisation as set out in government direction. This could include the investigation of upgrading existing roads. Maximise connectivity to the proposed rail stations (NZUP) and associated mode shift through strategic connections. Through any optioneering processes new information such as impacts on wetlands (under the NPS FW) and opportunities to integrate with

Intention and Previous options assessment	Key changes since IBC and South DBC	Recommendation(s)
		urban development are identified.

Through the gap analysis it was concluded that the changes in the policy direction of the Government and Auckland Council and the need for the Project warranted further investigation of alternative corridors.

4.3.3 Option Development

The primary purpose of the North-South options is to provide a direct route from Drury West to Pukekohe, to reduce pressure on the SH22 corridor and existing surrounding rural roads and to provide for the urbanisation of the Drury West, Paerata and Pukekohe areas.

The project aims to increase accessibility to a range of transport choices and increased people movement within the area to provide connections to employment, industrial areas, existing and future residential areas, and rail stations, within the study area.

The options include the recommendations from the Draft Strategic South DBC (a four lane high speed state highway) as well as new options that investigate upgrading existing rural roads, upgrading existing strategic roads, new corridors and a combination of these.

As set out earlier, the North South corridor assessment options were assessed separately. However, a short list of the options were tested with the Drury West and Paerata options from a network perspective. This network assessment is set out in section 4.4.

Nine options were initially developed for the North-South package (shown in Figure 4-9 and identified in Table 4-10 below) and two additional options were added (set out in Table 4-11 Additional North-South options description summary

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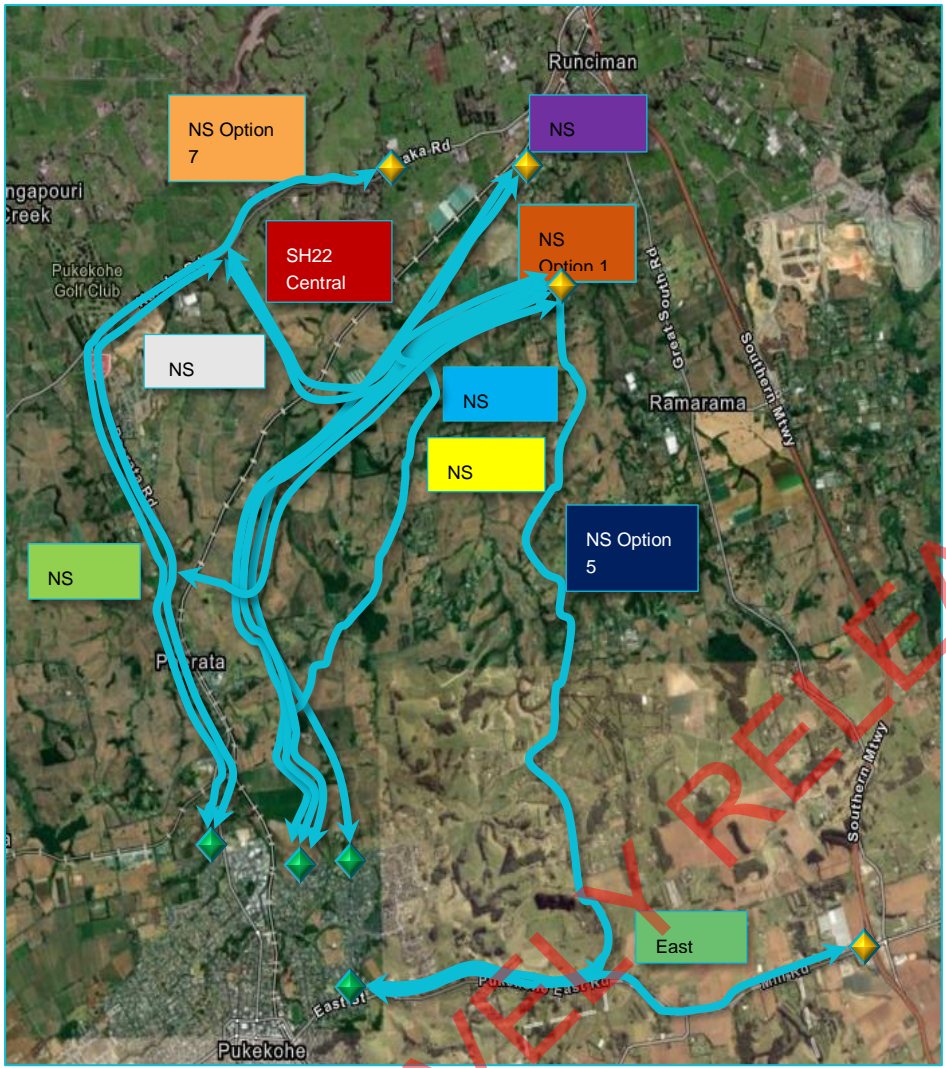


Figure 4-9 Summary of North-South options

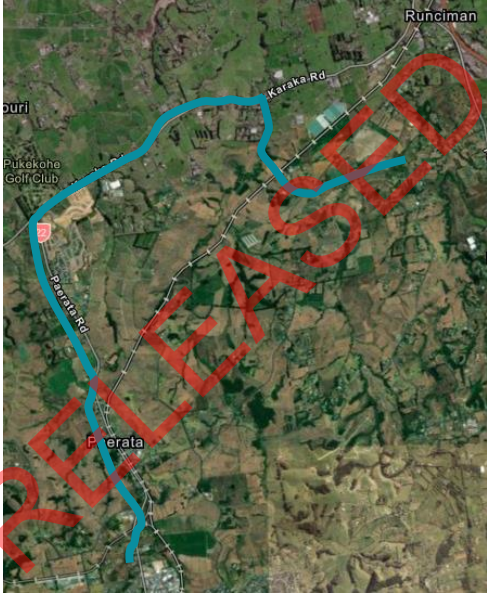
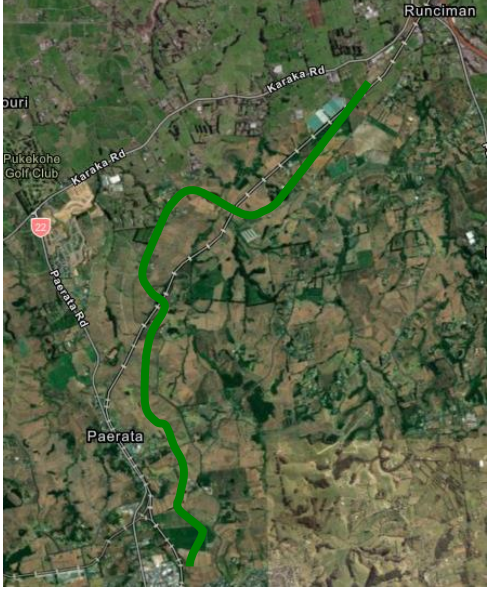
Table 4-10 North-South Option description summary

Option	Route	Form & Function
NS1	New corridor from the proposed Drury South interchange connection at GSR to the edge of the Pukekohe FUZ area.	<ul style="list-style-type: none"> Rural four-lane New corridor: 8.7 km 30 m cross-section 80 kph
NS1A		<ul style="list-style-type: none"> Urban two-lane New corridor: 8.7 km 24 m cross-section 50 kph
NS2	New corridor between the proposed Drury South interchange at Great South Road and Paerata, where it then uses the existing Cape Hill Rd to Pukekohe.	<ul style="list-style-type: none"> Urban two-lane / rural New corridor: 5.6 km Upgrade roads: 3.7 km 24 m Urban - 50 kph / rural - 60 kph to 80 kph

Option	Route	Form & Function
NS3	Between the Drury West station and Pukekohe. Uses Burt Road, with a new connection between Burt Road and Paerata Station. Uses Cape Hill Road to Pukekohe.	<ul style="list-style-type: none"> Rural two-lane high speed / urban two-lane New corridor: 2.4 km Upgrade roads: 6.2 km 24 m cross-section Urban - 50 kph / rural - 60 kph to 80 kph
NS4	Between Drury West station and Pukekohe. Uses Burt Rd, Tuhimata Road and Cape Hill Road.	<ul style="list-style-type: none"> Rural two-lane Upgrade roads: 8.7 km 24 m cross-section Urban - 50 kph / rural - 60 kph to 80 kph
NS5	Follows Runciman Road between the Great South Road / Runciman Rd south of Drury West station and Pukekohe East Rd west, through to East Street / Valley Road.	<ul style="list-style-type: none"> Rural two-lane high speed / urban two lane Upgrade roads: 10.3 km 24 m cross-section Urban - 50 kph, rural - 60 kph to 80 kph
NS6	A new corridor from the proposed Drury Interchange at Great South Road to SH22. Then uses the existing SH22 until it reaches Pukekohe centre	<ul style="list-style-type: none"> Rural two-lane high speed / urban four lane arterial New corridor: 5.5 km Upgrade roads: 6.9 km 24 m cross-section from Great South Rd to SH22 / Sim Rd and 30 m cross-section from Sim Rd / SH22 to Butcher Rd / SH22. Urban - 50 kph, rural - 60 kph and 80 kph
NS7	Upgrades the existing SH22 to four lanes between Oira Creek and Butcher Rd / SH22.	<ul style="list-style-type: none"> Rural four-lane high speed rural / urban four lane arterial Upgrade roads: 8.8 km 30 m cross-section Urban - 50 kph, rural - 60 kph and 80 kph
NS8	A new connection from the proposed Drury South interchange at Great South Road to Paerata Station.	<ul style="list-style-type: none"> Rural two-lane high speed / urban two-lane arterial New corridor: 6.8 km 24m cross-section Rural - 60 kph to 80 kph. urban - 50 kph
East	Upgrade to the existing Mill Road and Pukekohe East Road from Bombay / interchange to Golding Rd / Belgium Rd.	<ul style="list-style-type: none"> Four-lane arterials (Urban-Rural Edge) Upgrade roads: 6 km 30 m cross-section 60 to 80 kph
SH22 Central	New corridor connecting Karaka Rd / SH22 to Runciman Road.	<ul style="list-style-type: none"> Rural two-lane high speed Upgrade roads: 750 m New corridor: 4.8 km 24 m cross-section 50 kph

Two new options were added after the first round of assessment. These are shown in Table 4-11
Additional North-South options description summary

Table 4-11 Additional North-South options description summary

Option	Description / Reason	
NS9	An upgrade of SH22 along with a new section of transport corridor to Drury.	
NS10	Refinement of the NS3 and SH22 Central Options – including an upgrade of Burt Road along with a new section of road across the NIMT then utilising Sim Road within the Paerata Rise development as well as an upgrade of Sim Road (south) and Cape hill Road.	

4.3.4 Option Assessment

Eleven options were assessed against the MCA framework by each subject matter expert. Table 4-12 provides a summary of the assessment undertaken by technical specialists against the MCA framework.

Table 4-12 North-South corridor assessment MCA scoring

MCA Criteria	Scores												
Options	NS1	NS1 A	NS2	NS3	NS4	NS5	NS6	NS7	NS8	NS9	NS10	East	SH22
Investment objectives													
IO1 – Safety	4	4	3	3	2	1	2	3	2	2	3	2	2
IO2 – Integration	3	3	3	3	1	1	2	2	1	2	3	2	1
2IO3 - Access	2	2	3	3	1	0	2	1	1	2	3	1	1
IO4 – Resilience	4	4	3	3	1	1	1	1	2	1	2	2	1
IO5 – Travel Choice	-2	-1	1	1	1	0	1	1	1	1	2	1	1
Heritage													
Heritage	0	0	0	-2	-2	-5	-2	-2	0	-2	-2	-1	0
Social													
Land use futures	3	1	2	3	2	1	2	3	1	2	2	1	1
Urban design	-4	-4	-2	-1	-2	-1	-3	-2	-2	-2	-2	-1	-1
Land requirement	-3	-3	-2	-1	-1	-2	-3	-3	-2	-2	-3	-1	-2
Social cohesion	2	2	2	2	2	2	2	2	2	2	2	1	1
Human health	-1	-1	-1	-1	-1	-1	-2	-2	-1	-2	-1	-1	-1
Environment													
Landscape / visual	-2	-2	-2	-2	-3	-4	-2	-2	-2	-2	-2	-3	-2
Stormwater	-2	-2	-2	-1	-1	-1	-2	-1	-2	-2	-2	-1	-2
Ecology	-4	-4	-4	-4	-4	-4	-4	-3	-4	-4	-3	-3	-4
Natural hazards	-3	-3	-2	-2	-1	-3	-3	-1	-3	-3	-2	-2	-3
Construction impacts													

Embodied carbon	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3
Construction impacts	-2	-2	-2	-2	-2	-3	-2	-2	-2	-2	-2	-2	-1
Construction Disruption	-1	-1	-2	-2	-2	-2	-2	-2	-1	-2	-2	-2	-1
Construction costs / risk	-4	-3	-3	-3	-3	-3	-3	-2	-2	-3	-3	-2	-3

Table 4-13 North-South corridor assessment findings summary

Criteria	Summary of performance
Investment Objectives	<p>Safety</p> <p>NS1 and NS1a scored the highest for safety as they will significantly reduce the likely future traffic using unsafe rural roads (Burt Road and Runciman) and also reduce traffic growth on SH22 which will result in further safety benefits.</p> <p>Options NS7, NS 9 and NS10 provide some safety improvements but do not address all safety concerns.</p> <p>NS5 scored the lowest for safety concerns as it doesn't resolve existing and future safety issues and would need major improvements to SH22, Sim Road, Cape Hill Road and local connections in Paerata and Drury West.</p> <p>Integration</p> <p>NS1, 1a, 2, 3 and 10 all scored the highest for integration, with good network-wide integration with Pukekohe, Paerata and Drury West. These options also provide significant movement integration with general traffic and limited amount with PT and active modes.</p> <p>Option NS 4, 5 8 are scored the lowest for integration. Option NS 4 and 5 scored lower due to the options being outside of the FUZ (less integrated). This is less preferred and has limited network-wide benefits to reduce the conflict between movement and place in Pukekohe, Paerata and Drury West. NS 8 provides good integration between Drury West and Paerata but limited integration between Paerata and Pukekohe.</p> <p>Access</p> <p>NS1, 1a, 2, 3 and 10 provide significant improvement in access to key destinations. They provide significant improvement to general traffic and PT and modest improvement for active modes. NS2 and 3 scored the highest.</p> <p>The East option does not provide the same connection as the other options and alone will not provide the same strategic benefits as the other north south options. However, it is beneficial in combination with the north south options and should be progressed in conjunction with a north-south option(s).</p> <p>NS 5 scored the lowest with very limited improvement in access to key destinations and limited access improvement by all modes.</p> <p>Resilience</p> <p>NS1 and 1a scored the highest with high network-wide improvement in resilience, but over supplying of resilience may result in auto-dependency.</p>

Criteria	Summary of performance
	<p>NS 2 and 3 provide for medium to high network-wide improvements in resilience. NS 4 – 9 and the central and east options scored the lowest for access with limited network-wide improvement in resilience.</p> <p>Travel Choice</p> <p>NS 10 scored the highest regarding travel choice with medium to high improvements in general traffic, modest benefit to public transport and active modes. This option will increase car mode share slightly and significantly reduce VKT.</p> <p>NS1 and NS1a scored the lowest regarding travel choice with significant improvement in general traffic, but disbenefits to public transport and limited improvement to active modes. These options have a significant amount of enabled carbon, will increase car mode share significantly and reduce VKT.</p> <p>Other options either had medium to high improvement in general traffic, but little benefit to public transport and modest improvement to active modes or else had little improvement to general traffic and to public transport but modest to high improvement to active modes.</p> <p>Overall</p> <p>Options NS2 and NS3 were preferred as these would best enable network-wide benefit to support growth.</p> <p>NS4 and NS5 are least preferred as they have a limited ability to address the network wide investment objectives.</p>
Heritage	<p>Options NS1, NS1a, NS2, NS8 and SH22 Central have no recorded heritage. NS5 and East have the potential to impact on heritage due to the number of features along the corridor, including the Pukekohe East Presbyterian Church, which was the site of an 1863 battle at the beginning of the Waikato Invasion, which makes it a highly significant site. NS5 scored the lowest.</p> <p>Both NS9 and NS10 the potential to impact on heritage items in the CHI including the Paerata Community Hall, Paerata Station Water Tower and early 20th century Villa.</p> <p>The remaining options have minor impacts on heritage features and can be mitigated.</p>
Social	<p>Land use</p> <p>Options NS1, NS3 and NS7 were preferred due to the greatest integration with the FUZ catchment/planned development in the Drury West, Paerata and Pukekohe areas. NS3 provides the most direct connection between the two stations and multiple future residential areas.</p> <p>NS1 was preferred over NS1a, as a four-lane, high-speed arterial, located outside the FUZ avoids severance effects and does not reduce developable land. A two-lane low-speed arterial located outside the existing and future urban area was not considered to integrate with the land use.</p> <p>Options NS1a, NS5, NS8, NS9, NS10, East Option and SH22 Central were least preferred due to reduced integration with the FUZ catchment and/or the creation of small residual pockets of rural land between the FUZ and the option, which may encourage development beyond the FUZ/structure plan area. The East Option in particular, provided the least connection between FUZ areas.</p> <p>Urban design</p>

Criteria	Summary of performance
	<p>All options had challenges creating a positive interface with the road corridor and topography.</p> <p>The East Option is preferred as it follows an existing corridor into Pukekohe, avoiding the steep topography of Pukekohe north.</p> <p>Options NS1 and NS1a are least preferred as they cut through the rural area, which would adversely impact the existing amenity and character and provide minimal interface opportunities.</p> <p>Land requirement</p> <p>NS3, NS4 and the East option have the least property impacts, being existing routes. Of these, NS4 is preferred as the impact on dwellings can be mitigated if the alignment follows one side of the existing road.</p> <p>Options NS1 and 1A are least preferred given the significant property acquisitions required.</p> <p>Social cohesion</p> <p>NS7 is the preferred option as it provides a new connection to existing facilities, including the Paerata Rise development.</p> <p>The East Option provides the least connected to employment, communities, and facilities, being more isolated than the other options.</p> <p>Health and wellbeing</p> <p>NS4 is preferred as it predominantly traverses existing roads, where air quality, noise and vibration effects are existing and expected. NS5 was considered slightly less preferable as it is closer to a school which is considered a sensitive receiver.</p> <p>Options NS6 and NS7 were least preferred as they would create a new corridor close to existing residential areas and several schools, which introduces new air quality, noise and vibration effects to these receivers. Although this option scores the same as NS7, NS7 is predominantly within existing road, therefore effects here are generally anticipated.</p>
<p>Environmental</p>	<p>Landscape and visual</p> <p>NS7 is preferred given it traverses an existing roading alignment, where only limited amounts of vegetation would be required to be removed. Potential visual amenity effects would be limited to residences within existing and future developed areas.</p> <p>NS5 is least preferred (-4) due to the nearby Outstanding Natural Feature (ONF) and potential effects on rural character, visual amenity and notable trees.</p> <p>Stormwater</p> <p>There is limited differentiation between options. All options impact upon overland flow paths but would have manageable stormwater impacts.</p> <p>In general, new roads have more impact on stormwater (Options NS1, NS1a, NS2, NS6, NS8 and SH22 Central) and options that involve upgrading existing assets have less impact on stormwater (Options NS3, NS4, NS5, NS7, NS9 and NS10 and East Option).</p> <p>Ecology</p> <p>All options would either impact nationally critical bats, bird species, SEAs, streams, wetlands or a combination of these features, earning high negative scores.</p>

Criteria	Summary of performance
	<p>NS7 and the East Option are entirely upgrades of existing infrastructure and therefore are more preferred as the impacts are already present.</p> <p>Options NS1 and NS1A are new corridors that run entirely outside the FUZ, potentially impacting a large number of streams, wetlands and identified habitat for species of significance including bats and birds. These are less preferred.</p> <p>Natural Hazards</p> <p>Existing roads score slightly better, as they are already stabilised.</p> <p>Options NS4 and NS7 are preferred as these are mainly existing corridors. The East Option, while also an existing road is adjacent to the tuff crater.</p> <p>NS1 and NS1A were least preferred as involved new construction over undulating alluvium with potentially liquefiable soils at the eastern end.</p>
Construction impacts	<p>Embodied carbon emissions</p> <p>While NS8 is a new corridor, with more involved earthworks, it is a short two-lane corridor, which is likely to indicate lower construction emissions overall. Therefore, this option is preferred.</p> <p>NS9 and NS6 are least preferred given its length, the need for two bridges, likely significant earthworks, four-lane cross section and greenfield development for half the corridor.</p> <p>Construction impacts on infrastructures and utilities</p> <p>The SH22 Central option is preferred as it requires a smaller amount of earthworks given its short corridor.</p> <p>NS5 is least preferred given the number of impacts to existing infrastructure, such as two First Gas Transmission pipes, a water distribution pipe and the Transpower electricity transmission lines.</p> <p>Construction disruption</p> <p>In general, options passing through greenfield areas (Options NS1, NS1A, NS8 and SH22 Central) encounter less disruption than options passing through existing and future urban areas.</p> <p>Construction costs</p> <p>NS7 is preferred as it has less earthworks as it upgrades an existing corridor.</p> <p>NS1 is least preferred due to the length of new corridor through rural greenfield and steep topography, as well as the construction of five bridges.</p>
Partner feedback	<p>The following matters were raised by partners during workshops:</p> <ul style="list-style-type: none"> • Auckland Council provided an update on the existing and potential private plan changes in the study area highlighting the growth planned in the near future. • Waka Kotahi highlighted inter-related projects around Pukekohe and Drury such as safety improvements on SH22, SH1 Upgrade (Papakura to Bombay). • North Waikato perspectives highlight the significant growth pressure on existing local connections if Waikato Growth Strategy is followed through. Investment needed in active mode infrastructure and public transport networks to make these modes competitive to private vehicle use. • Waka Kotahi emphasised the importance of climate change / vehicle kilometres travelled (VKT) reduction being considered in the options assessment and supported the alternatives being considered.

Criteria	Summary of performance
	<ul style="list-style-type: none"> Auckland Council confirmed that no additional Council initiated rezoning of rural zoned land is currently being considered. <p>Manawhenua representatives raised the following key matters at hui:</p> <ul style="list-style-type: none"> A representative from Ngāti Tamaoho advocated for future proofing for four lanes given predicted growth (dependent on ecology matters). Ngāti Tamaoho highlighted that careful consideration will be required for corridors outside Future Urban Zones (FUZ) and expressed concerns of inducing further development. Ngāti Te Ata Waiohua stated that all options have an impact on cultural values/integrity and taonga.

4.3.5 Discarded Options

Table 4-14 summarises the reasons for discounting the options individually.

Table 4-14 Options to be discarded

Option	Reason
NS4	Too far east and does not achieve the investment objectives.
NS5	Too far east and does not achieve the investment objectives.
SH22 Central Option and NS6	Duplicate NS7 and do not offer significant additional connection.
NS8	Duplicates NS2 and the Paerata options.
NS9	Provides limited network wide resilience, greater potential carbon emissions and potential heritage impacts
NS10	Higher property impacts and construction costs and potential heritage impacts

4.3.6 Recommended Corridor Options

The north south corridor options investigated new corridors, upgrading existing strategic corridors (SH22 and Mill Road Bombay), upgrading existing rural roads and a combination of these.

It was recommended that the following North South corridors are progressed to the Package Assessment (short list) to be tested with the Drury West Local and Paerata Local recommended corridor options:

- NS7 - Upgrade of the existing SH22 to four lanes (Drury to Pukekohe): this corridor improves safety, upgrades an existing strategic corridor and scored marginally better through the assessment because of this. However, upgrading the existing corridor does not improve network resilience.
- East option – upgrading existing Mill Road Bombay and Pukekohe East Road: The East option does not provide a similar north south connection as the other options and alone will not provide the same strategic benefits as the other north south options. However, this corridor does provide

benefits for movements between Pukekohe and the strategic transport network (SH1) and was progressed to the Package Assessment to further understand it’s benefits in the network.

- NS3 – Upgraded and new section of corridor between the Drury West station and Paerata. Upgrades Burt Road, with a new connection between Burt Road and Paerata Station and connects to the Paerata Arterial at Cape Hill Road: This option was one of the preferred options through the investment objective assessment as it would best enable network-wide benefits to support growth.
- NS2 – A new two lane connection from the proposed Drury South interchange at Great South Road to Paerata Station. This was one of the preferred options from a transport perspective as it would best enable network-wide benefit to support growth.
- NS1 – A new four lane, high speed corridor from the proposed Drury South interchange at GSR to the edge of the Pukekohe FUZ area (formerly known as the Pukekohe Expressway). While this option has high network resilience scoring, it does not score favourably in terms of investment objective 5 – travel choice. While this option induces light vehicle movements significantly and provides reduced benefits in terms of public transport, it was progressed to the Package Assessment to compare against the other packages.

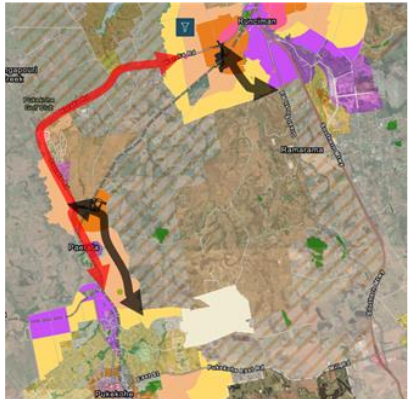
4.4 Network Package Assessment (Drury West, Paerata and North South)

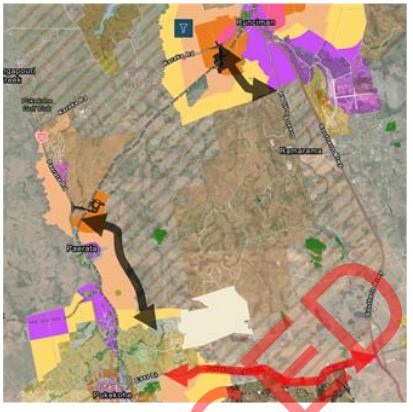
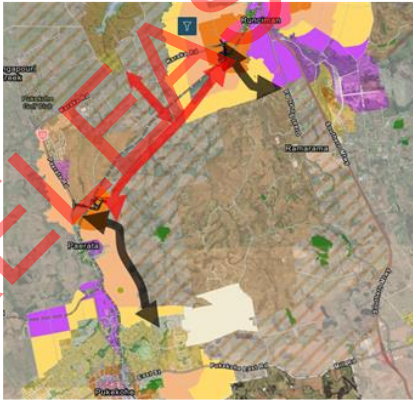
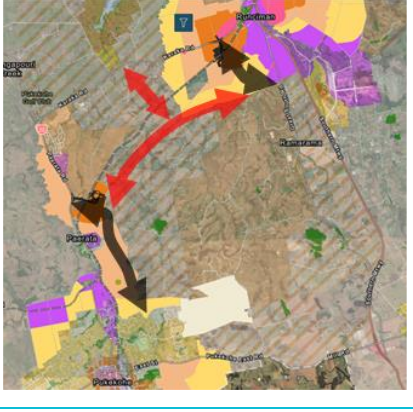
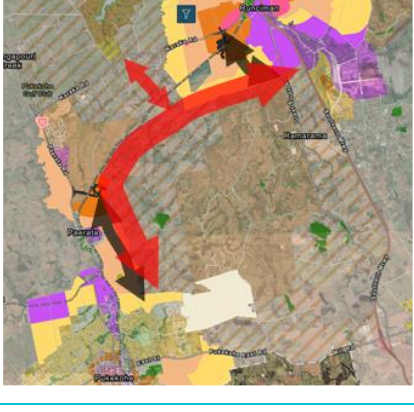
To determine the preferred network solution, the recommended corridor options from the Drury West Local and Paerata Local were considered with a short list of North South options.

4.4.1 Package Development

The package assessment options were grouped into five packages as shown in Table 4-15.

Table 4-15 Network Package description summary

Option	Routes	Overview Image
<p>Package 1</p>	<p>Drury West Arterial (DW5) Paerata Arterial (PS5) Upgrade of existing SH22 (NS7), adding an additional lane each way to four lanes.</p>	

Option	Routes	Overview Image
<p>Package 2</p>	<p>Drury West Arterial (DW5) Paerata Arterial (PS5) South connection (upgrading Mill Road and Pukekohe East Road), (East Option), adding an additional lane each way to four lanes.</p>	
<p>Package 3a</p>	<p>Drury West Arterial (DW5) Paerata Arterial (PS5) New and upgraded connection between Drury and Paerata (NS3), two lanes.</p>	
<p>Package 3b</p>	<p>Drury West Arterial (DW5) Paerata Arterial (PS5) New two lane connection between Drury and Paerata (NS8), two lanes.</p>	
<p>Package 4</p>	<p>New connection between Drury and Paerata (NS1), four lanes.</p>	

4.4.2 Package Assessment

Five options were assessed against the MCA framework by each subject matter expert. The packages were assessed quantitatively against the investment objectives and qualitatively by other technical specialists. Table 4-16 Table 4-6 provides a summary of the assessment undertaken by technical specialists against the MCA framework.

Table 4-16 Package assessment MCA scoring

MCA Criteria	Scores				
Options	Package 1	Package 2	Package 3a	Package 3b	Package 4
Investment objectives					
IO1 – Safety	2	2	3	3	4
IO2 – Integration	1	1	3	3	3
IO3 - Access	1	1	3	3	2
IO4 – Resilience	1	2	3	3	4
IO5 – Travel Choice	1	1	1	1	-2

Table 4-17 Package assessment findings summary

Criteria	Summary of performance
Investment Objectives	<p>Package 1 improves safety on SH22 for all users but has limited network-wide safety benefits. It does not resolve future safety issues on rural roads and compromises urban corridor function of SH22 at Drury West and Paerata.</p> <p>Package 2 Improves safety for local connectivity including active modes but provides limited network-wide safety benefits. Does not resolve future safety issues on rural roads. It will also require other north-south projects to better serve Pukekohe, Paerata and Drury West. It does provide an important strategic upgrade and should be progressed together with another package.</p> <p>Package 3a reduces future traffic using rural roads, reduces traffic growth on SH22, improves safety and integration in Drury West, provides an improvement to general traffic, PT and active modes. It is however likely to put pressure on Drury West collector network and interacts with a future school on Burt Rd. Speeds will need to be reduced for safety which will influence the strategic function of the corridor.</p> <p>Package 3b has the same benefits as Package 3a, except that it does not interact with a school and adds resilience to the network, reduces the pressure on existing local roads more than 3a. Like 3a, it provides improvements for all modes - general traffic, PT and active modes being located within/adjacent to the FUZ.</p> <p>Package 4 Reduces traffic growth on SH22: significantly improves safety and integration in DW.Reduces future traffic using rural roads Significant increases network resilience and safety. However, mode shift scores poorly (-2). This package induces light fleet travel which undermines mode shift. It is has less desirable route or benefit for PT or active modes.</p>

Criteria	Summary of performance
Heritage	<p>Limited differentiation between the DW and PS options here and in other packages.</p> <p>Package 1 would potentially impact on a villa, probably early 20th century (CHI item 22338), Paerata community hall, date unknown, now demolished (CHI item 14979), Paerata train station water tower, date unknown, now demolished (CHI item 22218), World War II memorial plaque (CHI item 14978), Karaka Methodist Church, date unknown (CHI item 15106).</p> <p>Package 2 potentially impacts on Pukekohe East Community Hall, built 1959 (CHI item 19320) and Tennis courts (CHI item 22321).</p> <p>Package 3a potentially impacts on a late 19th / early 20th century villa (CHI item 22279).</p> <p>There was no recorded heritage for Packages 3a, 4 or 5.</p>
Social	<p>Land use</p> <p>Package 3a was the most preferred as it provides good integration and a more direct connection including direct connections to the proposed Drury and Paerata arterials.</p> <p>Package 1 was second most preferred as it connects both train stations and the Pukekohe town centre, which provides for good integration. Provides an alternate, parallel route at Paerata to increase access to residential catchment.</p> <p>Packages 3b and 4 also had positive effects for integration as they connect both train stations and the Pukekohe town centre, which provides for good integration</p> <p>Package 2 was the least preferred due to limited integration with town centre, other FUZ areas, proposed arterials and train stations.</p> <p>Urban design</p> <p>Package 1 and Package 3a uses existing corridors which reduces the visual impact but the rural areas to the north will not be able to respond to the alignment. Topography has potential to negatively affect character and amenity.</p> <p>Package 3b provides a direct connection but impacts on amenity and character in the rural area and traverses an area identified as THAB in the Paerata-Pukekohe Structure Plan.</p> <p>Package 4 cuts through the rural area, which will adversely impact the existing amenity and character. Its alignment away from the FUZ in the southern section may create pressure to extend the FUZ to the east.</p> <p>Land requirement</p> <p>Package 1 has fewer full acquisitions than Package 3b and Package 4.</p> <p>Package 3a requires only partial acquisitions.</p> <p>Social cohesion</p> <p>Package 1 was the most preferred as it connects the Drury community through Paerata to Pukekohe through rural land to existing residential. Connects Treetops Learning - Early Childhood Pukekohe Hill, new Paerata development, Paerata School, Wesley College, and existing light industrial and business areas.</p> <p>Packages 3a, 3b and 4 connect the Drury community through Paerata to Pukekohe through rural land to existing residential and provide an additional connection to SH22 provides greater indirect connection to Paerata Rise development and alternative route through existing communities.</p> <p>While Package 2 provides a link to shops in the precinct area it does not provide a connection to or directly between proposed Drury and Paerata arterials.</p>

Criteria	Summary of performance
	<p>Health and wellbeing</p> <p>Package 4 was the preferred option as there are no nearby sensitive land uses.</p> <p>Packages 2, 3a and 3b are in proximity to existing residential land use.</p> <p>While Package 1 is mostly an upgrade to existing road it is in proximity to residential land uses and is adjacent Wesley College, Paerata School, Country Village Preschool and is therefore the least preferred.</p>
Environmental	<p>Landscape and visual</p> <p>Package 1 includes potential effects on notable trees proximate to Paerata Road and effects on rural character.</p> <p>Package 2 includes potential effects on rural character and amenity and potential for impacts on the Pukekohe Tuff Ring Outstanding Natural Feature (ONF).</p> <p>Package 3a would result in the road being located upon steep topography and into adjacent catchments, including a stand of vegetation on Cape Hill Road identified as a Significant Ecology Area (SEA).</p> <p>Package 3b and 4 include the potential to impact on rural character and would require the removal of limited areas of mature vegetation.</p> <p>Stormwater</p> <p>Packages 1, 3a 3b has no new floodplain structures are needed and so impact of flooding is minimal.</p> <p>Package 2 will add minimal hardstand, however culverts and bridges will be required and WQ detention will be required via wetlands or raingardens.</p> <p>Ecology</p> <p>Nationally critical long-tailed bats recorded in Paerata Scenic Reserve (1km West) and Coulthards Scenic reserve and likely to occur in Oira Creek and Ngakorua Stream. Bat effects likely for all packages.</p> <p>Package 1 would potentially have a direct impact on Paerata Scenic Reserve (SEA T_4384), with known bat use.</p> <p>Package 2 avoids impacts on SEAs and significant areas of bush however likely to still be impacts to bats.</p> <p>Package 3a was preferred over Packages 1 and 2 as partially within FUZ, reducing overall impact on streams, wetlands and bat habitat.</p> <p>For Package 3b effects were similar to 3a, however, a two lane highway easier to mitigate than four lanes.</p> <p>Package 4 was the least preferred as it is four lanes and more difficult to mitigate as well as being outside the FUZ.</p> <p>Natural Hazards</p> <p>Those routes which used existing roads (Packages 1, 2 and 3a) were more preferred.</p> <p>Packages 3b and 4 included potential liquefiable areas.</p>
Construction impacts	<p>Embodied carbon emissions</p> <p>Packages 2 and 3b were preferred option due to being a shorter route and only two lanes.</p> <p>Package 3a was slightly less preferred due to length.</p> <p>Packages 1 and 4 were less preferred due to four lanes and their length.</p>

Criteria	Summary of performance
	<p>Construction impacts on infrastructures and utilities</p> <p>All packages required protection of a First Gas Transmission pipe.</p> <p>Packages 1 – 3b also required protection or relocation of local services.</p> <p>Construction disruption</p> <p>All packages required upgrading the existing rural corridor and the new corridors on the greenfield.</p> <p>Package 4 was preferred due to less disruption compared to other packages.</p> <p>Construction costs</p> <p>Package 4 was likely to be the most expensive due to steep topography and the number of bridges likely to be required.</p> <p>Packages 1, 2 and 3a were not likely to require any major engineering works and the associated cost is lower.</p>
<p>Partner feedback</p>	<p>Key feedback during workshops on the packages from partner SMEs included:</p> <ul style="list-style-type: none"> • That the upgrade Mill Road (East Option) should be progressed with the preferred package. It is an important strategic connection between Pukekohe, State Highway 1 and south into Waikato (Package 2). • North Waikato is also experiencing significant growth (Package 2). • Consideration of development adjacent to SH22 in Drury and Paerata. Is going to put increasing pressure on SH22 (with reference to Package 1). • Safety on existing rural roads is a high priority to AT (all packages). • The preferred package needs to support transit oriented development. • Grafton Downs (Paerata) are developing the next stages of their development. Engagement to take place shortly. • Support for Package 3b that provides more of a bypass rather than directing traffic through the centre of Drury West – Package 3a. • Support for investigating alternatives to Package 4 (which was recommended in 2018 through the South IBC) due to a number of central government changes in approach to climate change. In particular, decarbonising the transport network. <p>The key feedback from Manawhenua representatives during hui were:</p> <ul style="list-style-type: none"> • Planned schools in the area should be considered. Supported consideration of schools during options assessment (reference to Package 3a). • Support for future proofing for four lanes (for all packages), but consideration of impacts on ecological features is important. • All packages have an impact on cultural values, integrity and taonga. Package 4 has the greatest impact. • One representative raised concern towards the potential for arterials in rural areas which may encourage growth around the new roads rather than an ‘expressway’ (strategic connection between Drury and Pukekohe). This, in the representative’s view, was a higher speed road with more limited access. • s 9(2)(ba)(i) [REDACTED]

4.4.3 Discarded Package Options

Table 4-18 Options to be discarded

Option	Reasons for being discarded
Package 1	Does not resolve future safety issues on rural roads and compromises urban corridor function of SH22 at Drury West and Paerata.
Package 2	Does not resolve future safety issues on rural roads such as Runciman Road and Burt Road. It will also require other north-south projects to better serve Pukekohe, Paerata and Drury West. SH22 integration outcomes with planned urban development are also poor with this package. It does however provide an important strategic upgrade and should be progressed together with the preferred North South package.
Package 3a	Likely to put pressure on Drury West collector network and interacts with a future school on Burt Rd. Speeds will need to be reduced for safety which will influence the strategic function of the corridor.
Package 4	Induces the most amount of light fleet travel and has limited benefits for PT and active modes. It scores poorly against mode shift investment objective (-2).

4.4.4 Recommended Package Option

Following the MCA assessment and consideration of feedback received from project partners, Package 3b is the preferred package. Package 3b was preferred because:

- Provides an alternative to SH22 and SH1 – significantly improving network resilience.
- Reduces future traffic using existing rural roads which reduces safety concerns.
- Improves safety and integration in Drury West urban development as well as providing improved access and resilience for general traffic, PT and active modes.
- Induces less light vehicle travel than Package 4.
- Is located close to FUZ to integrate with future urban development further supporting active modes.
- Has reduced potential impact on ecological features such as streams and wetland environment compared to other packages.
- Has reduced impact on potential bat habitat compared to other options.
- Has reduced potential impact on archaeology and built heritage compared to other options.

Package 3b will be developed further through route refinement assessment. Recommendations for the report refinement options were to minimise impact on private properties where possible, the consideration of property access and reducing impacts on ecological features.

The East Option – was also recommended to progress with Package 3b to route refinement. This option is an important strategic corridor between Pukekohe, SH1 and south to Waikato. Upgrading this corridor has significant benefits for freight movement and supports future urban growth in Pukekohe and north Waikato. Recommendations for route refinement for the East Option were to reduce impacts on the ONF Pukekohe Tuff Ring.

4.5 Pukekohe Local Corridor Assessment

4.5.1 South IBC – Pukekohe Arterials

At the IBC phase, several options were investigated to test multiple locations and alignments for a 'ring route' around the Pukekohe township. The ring route arterials provide an alternative route to going through the town centre and to support future urban growth. The other arterial options improve capacity for all modes of transport as well as support future urban growth and offer the opportunity for complete street solutions where all modes of transport can be sufficiently improved. The options (shown in Figure 4-10) included:

- Existing arterial upgrades (AR24, AR30, AR31, AR46)
- Western ring route options (AR25, AR29, AR35, AR40)
- Eastern ring route options (AR28, AR34, AR38, AR39, AR41, AR42, AR43)
- South-eastern ring route options (AR26, AR27, AR36, AR37)

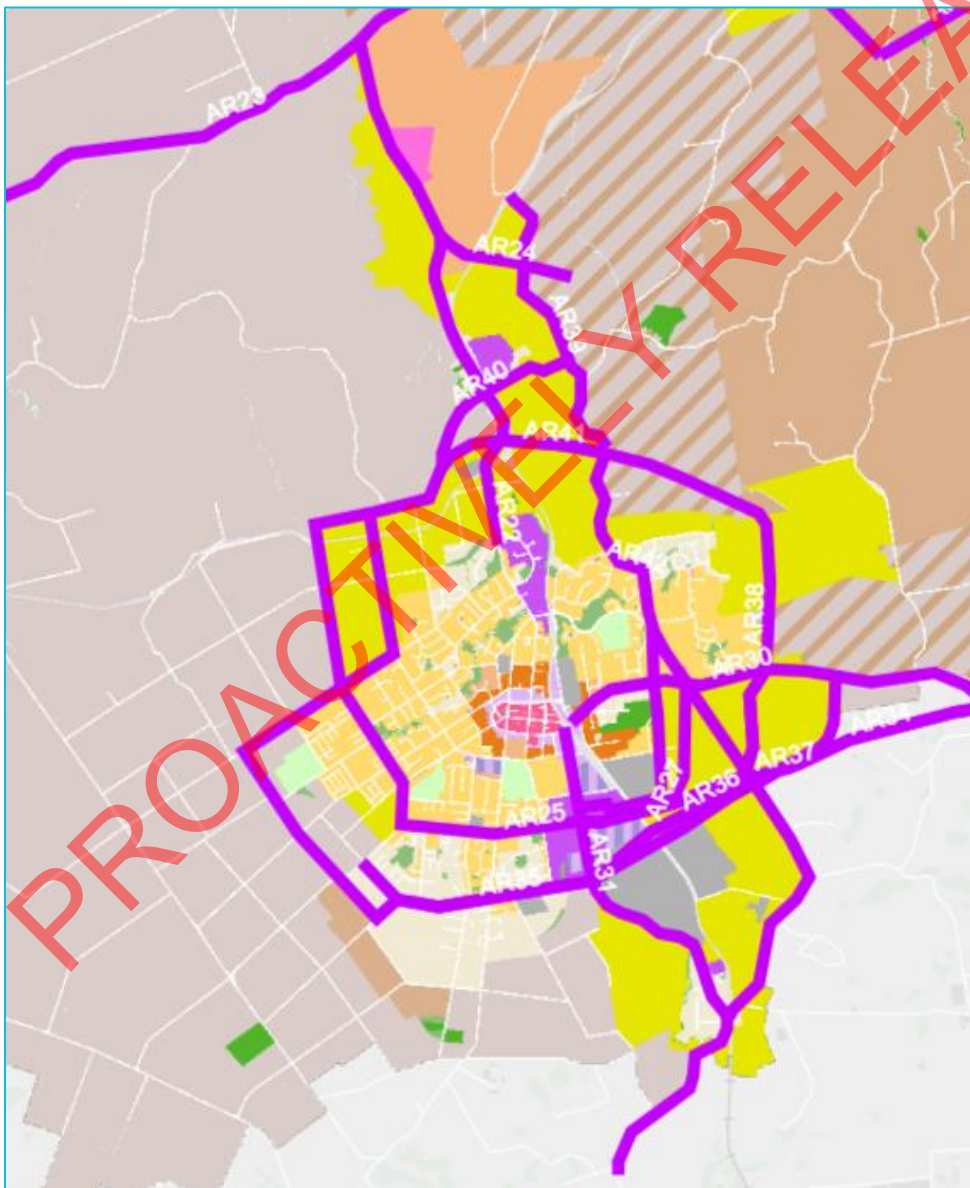


Figure 4-10 South IBC long list options

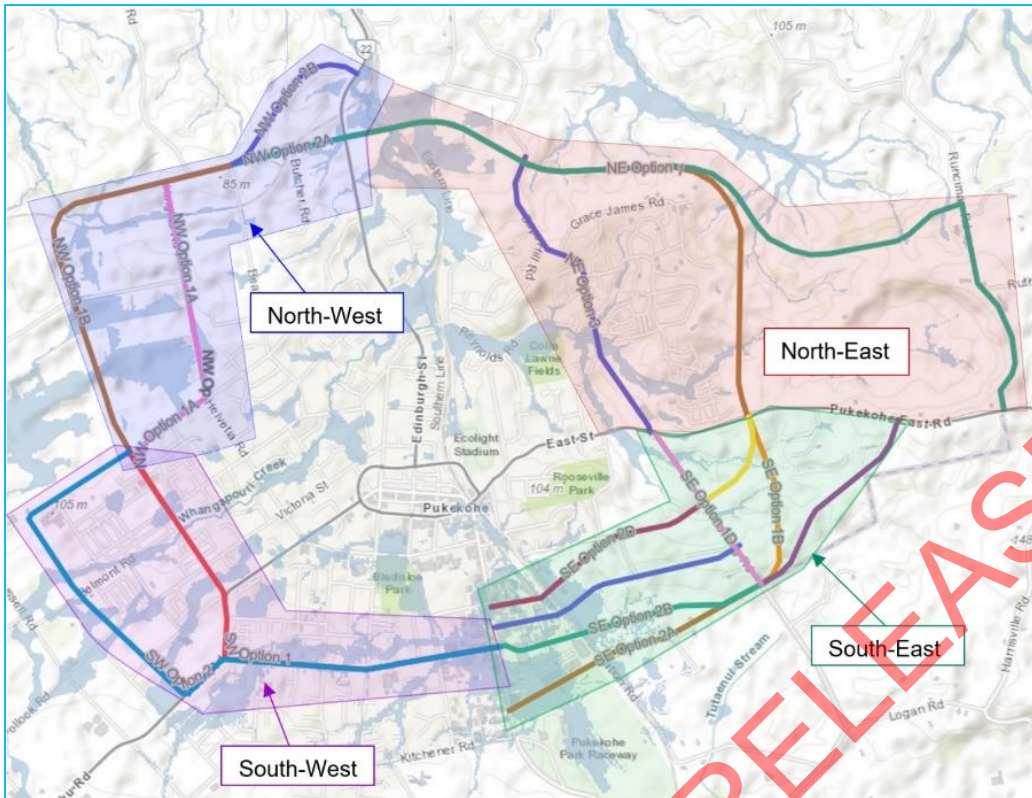


Figure 4-12 Summary of Pukekohe options

Each of the four quadrants are set out in the following sections.

4.5.3 Pukekohe North East Corridor Assessment

4.5.3.1 South IBC / Strategic South DBC assessment summary

- 7 options (referred to as AR28, AR34, AR38, AR39, AR41, AR42, AR43) were identified during the IBC longlist development.
- 7 options were taken through to the IBC short list assessment.
- AR38a was added during the short list assessment by engineering refinement. This option involves safety upgrades with no widening of the corridor.
- 2 options (AR41 and AR38a) were recommended in the IBC.
- AR41 has high benefits assuming that it connects to the Pukekohe Expressway, also acting as a supportive link to a wider network. Both options were selected for the following reasons:
 - To enable quality access from/to Paerata rail station
 - To enable freight traffic to avoid town centre
 - Allows through traffic to use strategic roads avoiding town centre.

Functional intent of these options is to facilitate an alternative north/south movement, linking the eastern growth areas. IBC recommended 4 lane arterial with walking and cycling provided.

The draft Strategic South DBC developed the Pukekohe Urban Arterial (NE Arterial) to connect the former Pukekohe Expressway. Two options were developed with a preference for an alignment that followed the FUZ boundary and was located further away (in the southern section) from the Pukekohe Tuff Ring (ONF).

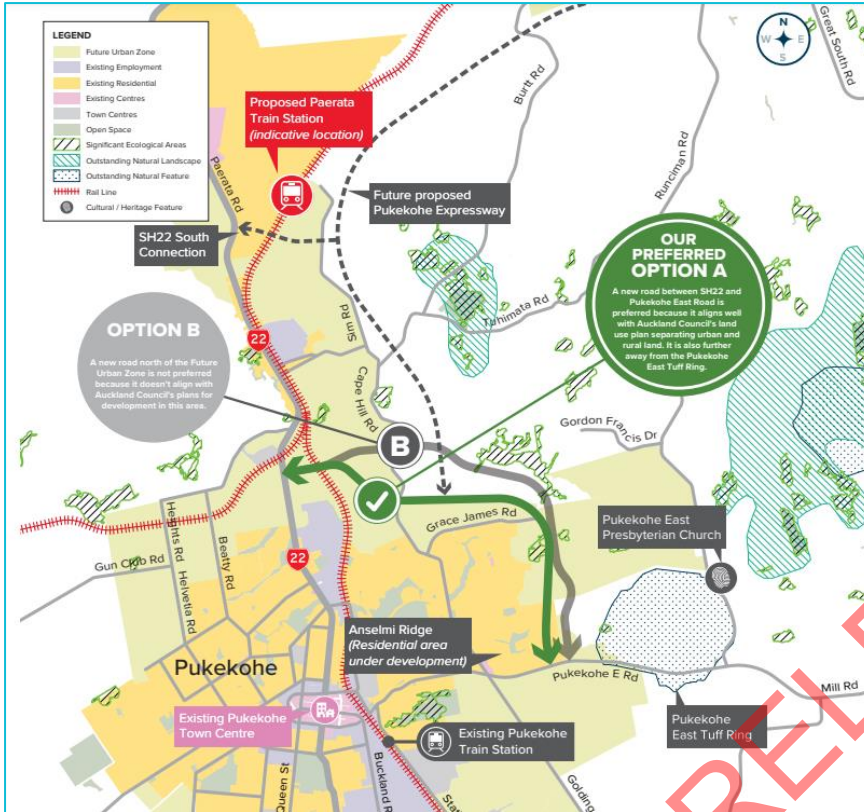


Figure 4-13 - Pukekohe Urban Arterial (NE Arterial) from Draft Strategic South DBC

4.5.3.2 Gap analysis IBC – DBC

Table 4-19 provides a summary for Pukekohe North East Arterial transport components of the Pukekohe DBC, key changes since the previous recommendations made by the South IBC and Draft Strategic South DBC and a recommendation for the Pukekohe DBC.

Table 4-19 Summary of gap analysis and recommendations

Intention and Previous options assessment	Key changes since IBC and South DBC	Recommendation(s)
<p>Arterial route connecting from SH22 west to Heights Road. Provides a strategic link to PEX and relieves the through-town traffic.</p> <p>The alignment was planned to be 4 lanes for vehicles with no planned PT lanes.</p>	<p>Developer interest / resource consents lodged.</p> <p>GPS 2021/Zero Carbon Act – Climate change lens, which may have implications on former Pukekohe Expressway alignment.</p> <p>Consider implications of NPS FM and NES FW – adopt avoidance of wetlands where possible as principle in first instance.</p>	<p>Corridor assessment considering the following:</p> <ul style="list-style-type: none"> Form and function of the Pukekohe Arterials to be confirmed. The options have not been assessed since the IBC (2019) which left the form and function to be confirmed in the DBC. The arterials are likely to be two lanes which may influence their placement over a four lane corridor. The form and function of the Pukekohe Expressway is re-assessed and the need confirmed. This interacts and

Intention and Previous options assessment	Key changes since IBC and South DBC	Recommendation(s)
		<p>is likely to influence the NE Arterial.</p> <ul style="list-style-type: none"> • Further alternatives are considered (corridor assessment) which may provide more of a contribution to decarbonisation as set out in government direction. This could include the investigation of upgrading existing roads. • Through any optioneering processes new information such as impacts on wetlands (under the NPS FW) and opportunities to integrate with urban development are identified.

4.5.3.3 Option Development

Three options were developed for the Pukekohe North East Arterial corridor assessment as shown in the figure below.

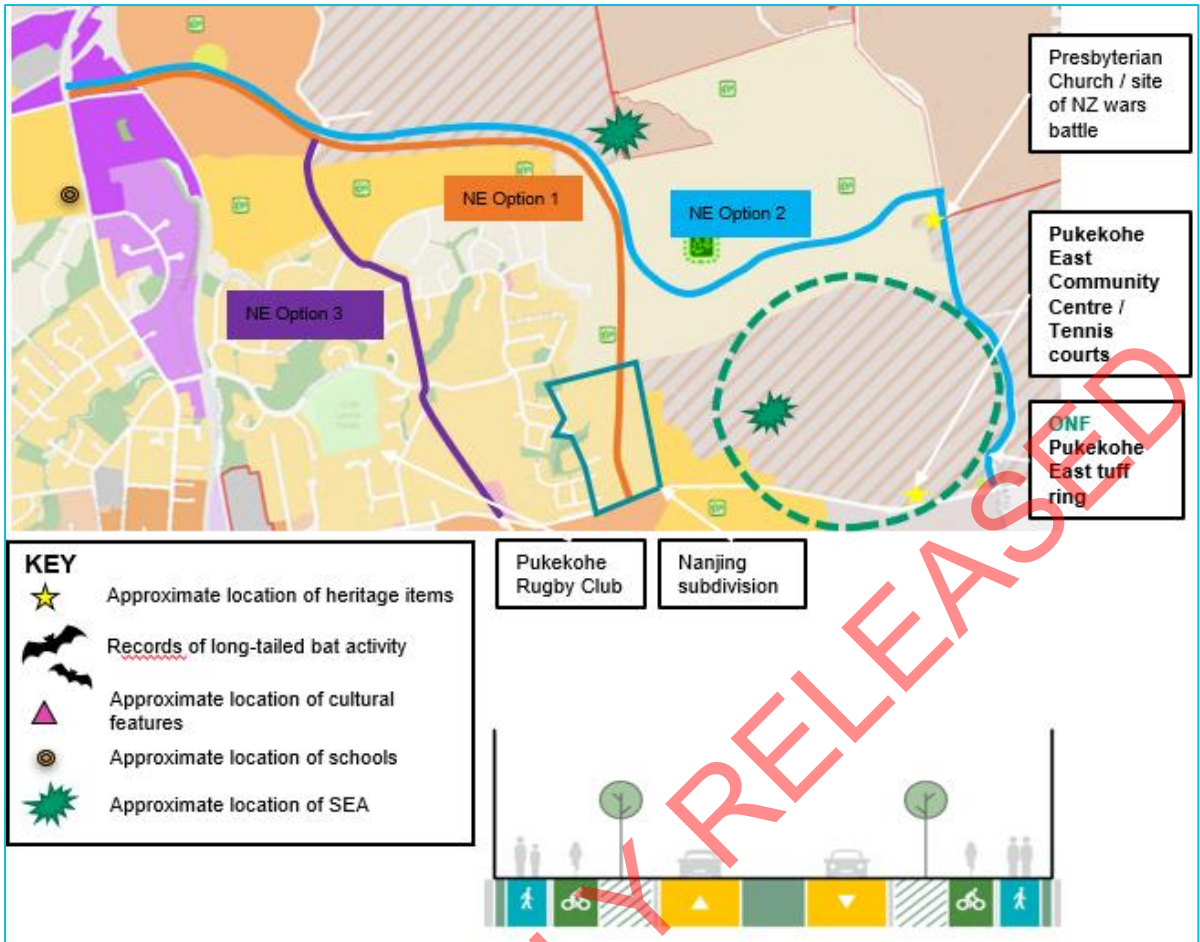


Figure 4-14 Pukekohe North East Arterial Corridor Assessment Options with Receiving Environment



Figure 4-15 Pukekohe North East Arterial Corridor Assessment Options

4.5.3.4 Option Assessment

Three options were assessed against the MCA framework by each subject matter expert in Table 4-20. Table 4-21 provides a summary of the assessment undertaken by technical specialists against the MCA framework.

Table 4-20 Pukekohe Local – North-East corridor option MCA scoring

MCA Criteria	Scores		
Options	NE1	NE2	NE3
Investment objectives			
IO1 – Safety	2	1	0
IO2 – Integration	2	1	0
IO3 – Access	2	2	0
IO4 – Resilience	3	1	-1
IO5 – Travel Choice	1	1	1
Cultural			
Heritage	0	-5	0
Social			
Land use futures	-1	1	1
Urban design	-1	-1	-2
Land requirement / property	-2	-1	-3
Social cohesion	2	1	1
Human health and wellbeing	-1	-1	0
Environment			
Landscape / visual	-3	-4	-1
Stormwater	-3	-3	-1
Ecology	-4	-4	-2
Natural hazards	-3	-3	-2
Construction impacts			
Embodied carbon emissions	-3	-3	-3
Construction impacts on utilities / infrastructure	-2	-2	-2
Construction Disruption	-1	-1	-2

Construction costs / risk / value capture

-3

-3

-2

Table 4-21 Pukekohe Local – North-East option assessment findings summary

Criteria	Summary of performance
Investment Objectives	<p>NE1 is preferred as it scored most favourably against the objectives overall.</p> <p>NE3 is the least preferred as has limited benefits for active modes and the pressure on other modes would increase. Does not provide network resilience by upgrading a road in an existing urban area.</p>
Heritage	<p>NE1 and NE3 did not have any recorded heritage.</p> <p>NE2 potentially impacts the Sharp residence, a memorial plaque and flagpole, Pukekohe East Presbyterian Church, and the site of an 1863 battle at the beginning of the Waikato Invasion and a significant site. It therefore scores very poorly (-5).</p>
Social	<p>Land use</p> <p>NE3 was the preferred option as it would integrate the best with future development. While NE1 connects the most future land uses, it goes through a future subdivision which is advanced to a stage where the design cannot be adjusted to accommodate the new corridor. NE2 would reduce the amount of developable land and provides less direct connections between higher density residential areas.</p> <p>Urban design</p> <p>NE1 is preferred on the basis of future development having the opportunity to respond to the corridors.</p> <p>Land requirement</p> <p>NE2 was preferred as it involved mostly partial acquisition of mixed rural or future urban zoned land. NE3 would require the full acquisition of approximately a large number of homes, mostly new builds (<10 years old).</p> <p>Social cohesion</p> <p>NE1 provides the greater connection between areas and crosses existing residential areas, with indirect access to the Rugby Club and direct access to two reserves. NE2 has a lack of connection within the existing environment as it traverses the FUZ and rural areas.</p> <p>Health and wellbeing</p> <p>NE3 is predominantly an existing road, with less sensitive activities nearby. NE2 was the least preferred as it passes a school which was considered a sensitive receiver.</p>
Environmental	<p>Landscape and visual</p> <p>NE3 was preferred due to alignment relating to underlying landscape patterns (topography and vegetation), notable trees and the level of potential visual effects.</p> <p>NE2 was least preferred due potential impacts on the ONF (Tuff Crater), through SEA's and not following the underlying landscape patterns, and potential effects on rural character, visual amenity and notable trees.</p> <p>Stormwater</p> <p>NE3 was preferred as it involves upgrading existing roads and would cross less streams and floodplains than the other options.</p> <p>Ecology</p>

Criteria	Summary of performance
	<p>NE3 was preferred as it uses existing roads and avoids impacts on wetlands, indigenous vegetation and bats.</p> <p>NE1 and NE2 both impact the edge of several SEAs and are likely to impact smaller stands of indigenous vegetation and numerous streams and wetlands outside SEA areas.</p> <p>Natural Hazards</p> <p>NE3 is widening only, follows mostly existing roads. NE1 and NE2 cross peat swamp, NE1 has greater stability issues.</p>
Construction impacts	<p>Embodied carbon emissions</p> <p>NE3 is neutral overall as it is a short corridor with no major earthworks or structures. NE2 is the longest option and involves mostly new development through rural greenfield. Requires significant earthworks and two bridges.</p> <p>Construction impacts on infrastructure/utilities</p> <p>All options require relocation or protection of the first gas transmission pipe and scored the same.</p> <p>Construction disruption</p> <p>NE1 and NE2 were likely to have minimal impacts on the community as they are greenfield development. NE3 was least preferred as it would require lane narrowing and disruption for upgrades to the existing urban and rural corridor.</p> <p>Construction costs</p> <p>NE1 and NE2 were likely to have higher construction costs as they would include new corridor and bridge structures. NE3 was preferred as it involved upgrades to the existing road only.</p>
Partner feedback	<p>Key feedback from SMEs from workshops included:</p> <ul style="list-style-type: none"> • Queries on option NE3 in terms of what improvements would be required of the existing roads. • Option NE3 currently carries a higher proportion of freight which will increase and needs consideration. • Feedback on the active urban development in the area and the interaction with a proposed development north of Pukekohe East Road (Nanjing) for NE1. <p>During the manawhenua Site Visit (28 July 2022), the following matters were raised:</p> <ul style="list-style-type: none"> • Ngaati Te Ata Waiohua noted that both the Tuff Ring and SEAs were in the area. • Next steps for route refinement were discussed in the context of developing options to avoid urban development and the reduce impacts on significant features. • Ngaati Te Ata Waiohua is not supportive of option 3 (NE3) due to the potential impact on existing residential areas. A preference for Option 1 (NE1) over the other two options. However, noted the dew urban development occurring in the area north of Pukekohe East Road.

4.5.3.5 Discarded Options

Table 4-22 Options to be discarded

Option	Reason
NE2	Potential to impact a significant heritage site. Scores low positives against the investment objectives, as a longer, less attractive route.
NE3	Upgrades existing road in an existing urban area. Does not integrate with FUZ. Scores poorly against resilience objective.

4.5.3.6 Recommended Corridor Option

NE1 is the recommended corridor option as it provides increased resilience in the transport network and scores most favourably against the investment objectives.

Recommendations for route refinement are to reduce impacts on active development around the Pukekohe East Road area.

4.5.4 Pukekohe South East Corridor Assessment

4.5.4.1 South IBC assessment summary

See IBC long list and short list figures in section 4.5.1.

- 4 south-eastern ring route options (AR26, AR27, AR36, AR37) were identified in IBC longlist assessment.
- 4 options were taken through to the IBC short list assessment (AR26, AR26a, AR37 and AR37a).
- AR26a and AR37a were added during the shortlist development by engineering refinement.
- The IBC recommended AR26a - an inner bypass around south-eastern side of Pukekohe from Manuka Rd to Pukekohe East Rd via Svenden Rd and Anselmi Ridge. This option was selected for the following reasons:
 - To service further development south of Pukekohe town centre
 - To enable freight traffic to avoid town centre
 - To enable existing alignments to be more flexible
 - Allows through traffic to use strategic roads avoiding town centre

Functional intent of these options was to link south-eastern growth areas providing improved access to SH1 via Mill Road and also supports access to Pokeno and Tuakau. IBC recommended 4 lane arterial with walking and cycling provided.

4.5.4.2 Gap analysis IBC to DBC

Table 4-23 provides a summary for Pukekohe South East Arterial transport components of the Pukekohe DBC, key changes since the previous recommendations made by the South IBC and Strategic South DBC and a recommendation for the Pukekohe DBC.

Table 4-23 Summary of gap analysis and recommendations

Intention and Previous options assessment	Key changes since IBC and South DBC	Recommendation(s)
From Svendsen Rd over the rail tracks to Golding Rd, heading north to Pukekohe East Rd.	Developer interest / resource consents lodged.	<ul style="list-style-type: none"> • Corridor assessment considering the following:

Intention and Previous options assessment	Key changes since IBC and South DBC	Recommendation(s)
<p>Enables freight to travel around Pukekohe for greater efficiency and a reduction in congestion within Pukekohe town centre.</p>	<p>GPS 2021/Zero Carbon Act – Climate change lens, which may have implications on PEX alignment.</p> <p>Consider implications of NPS FM and NES FW – adopt avoidance of wetlands where possible as principle in first instance.</p>	<ul style="list-style-type: none"> Form and function of the Pukekohe Arterials to be confirmed. The options have not been assessed since the IBC (2019) which left the form and function to be confirmed in the DBC. The arterials are likely to be two lanes which may influence their placement over a four lane corridor. Further alternatives are considered (corridor assessment) which may provide more of a contribution to decarbonisation as set out in government direction. This could include the investigation of upgrading existing roads. A number of plan changes have been lodged (or are planned) in proximity to this corridor – in particular along Golding Road. Opportunity to better integrate with these developments. Through any optioneering processes new information such as impacts on wetlands (under the NPS FW) and opportunities to integrate with urban development are identified.

4.5.4.3 Option Development

The South East Arterial was split into two segments for assessment purposes:

- Segment 1 – four options east of and including Golding Road.
- Segment 2 – four options west of Golding Road connecting between Golding Road and Manukau Road.



Figure 4-16: Pukekohe South East Corridor Option Development

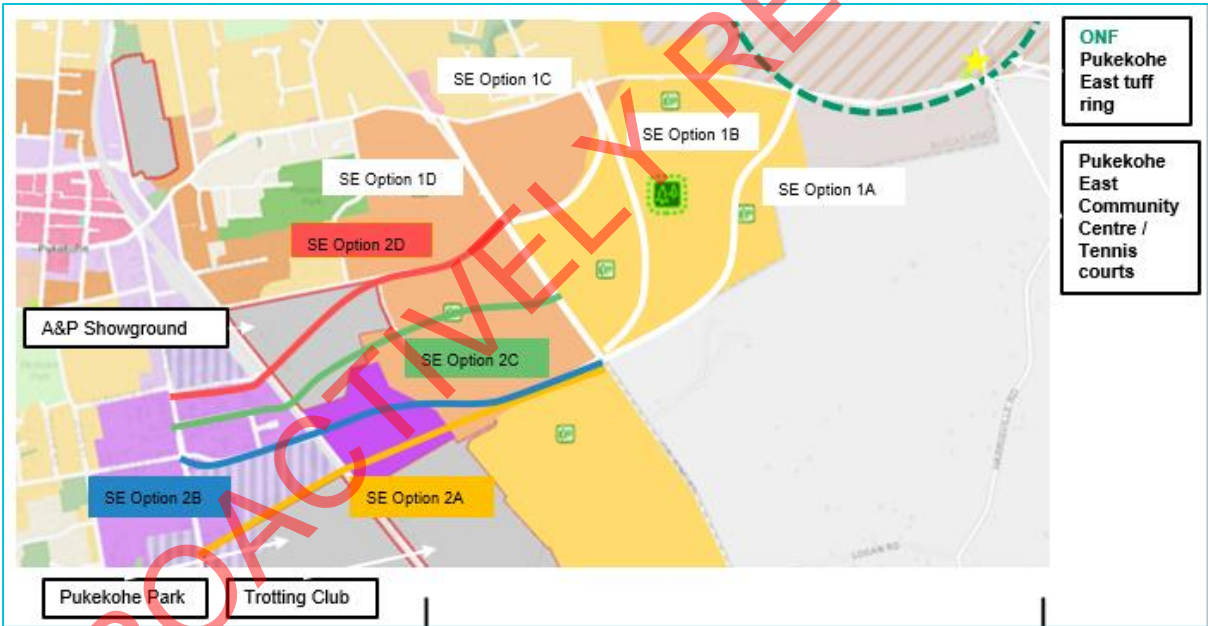


Figure 4-17: Pukekohe South East Corridor Option Development

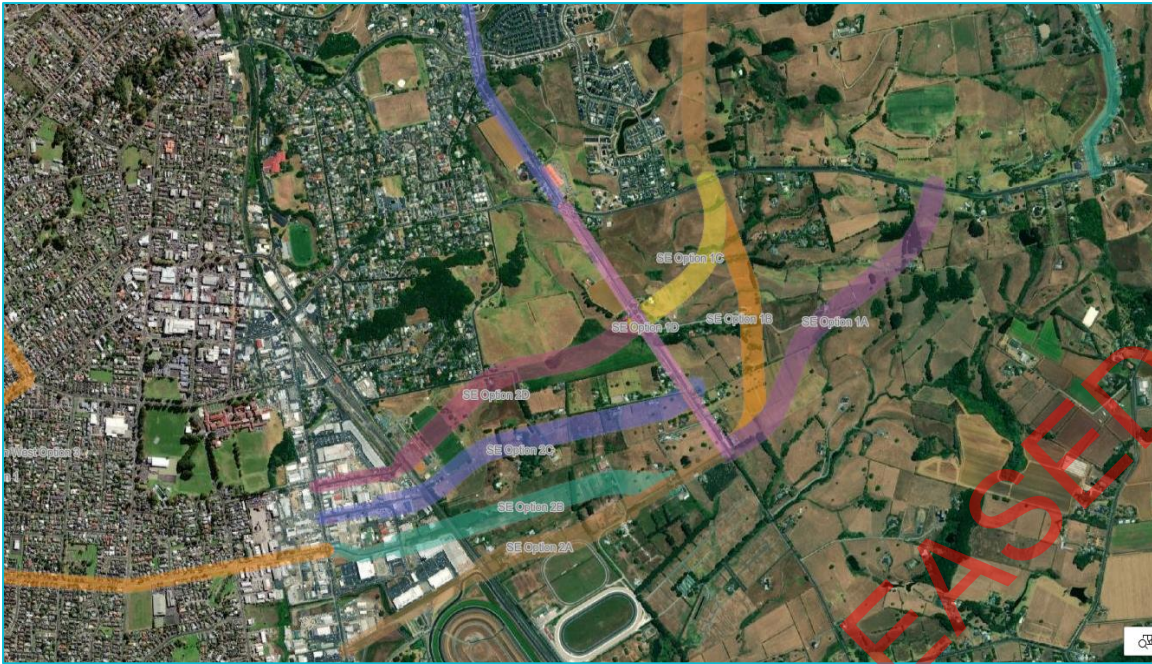


Figure 4-18: Pukekohe South East Corridor Assessment Options

4.5.4.4 Option Assessment

Options were assessed against the MCA framework by each subject matter expert. Table 4-24 provides a summary of the assessment undertaken by technical specialists against the MCA framework.

Table 4-24 Pukekohe Local – South-East corridor option MCA scoring

MCA Criteria	Scores							
	SE1A	SE1B	SE1C	SE1D	SE2A	SE2B	SE2C	SE2D
Investment objectives								
IO1 – Safety	1	1	1	2	1	2	2	2
IO2 – Integration	1	2	2	1	2	2	2	2
IO3 - Access	1	1	1	1	1	2	2	2
IO4 – Resilience	2	2	2	0	3	3	3	3
IO5 – Travel Choice	1	1	1	1	1	1	2	2
Cultural								
Heritage	0	0	0	0	0	0	-1	0
Social								
Land use futures	1	2	2	2	1	2	1	1

Urban design	-2	-2	-2	0	-2	-1	-2	-2
Land requirement / property	-1	-2	-1	-1	-2	-2	-2	-3
Social cohesion	0	0	1	1	-1	2	-2	-2
Human health and wellbeing	-1	-1	-1	0	-1	-1	-2	-2
Environment								
Landscape / visual	-3	-2	-1	-1	-1	-1	-2	-2
Stormwater	-1	-1	-1	-1	-2	-2	-2	-2
Ecology	-4	-3	-3	-1	-2	-2	-2	-2
Natural hazards	-3	-3	-2	-2	-3	-3	-2	-2
Construction impacts								
Embodied carbon emissions	-3	-3	-3	-3	-3	-3	-3	-3
Construction impacts	-1	-1	-1	-2	-2	-2	-2	-2
Construction Disruption	-1	-1	-1	-1	-2	-2	-2	-2
Construction costs / risk	-2	-2	-2	-2	-2	-2	-2	-2

Table 4-25 Pukekohe Local – South-East option assessment findings summary

Criteria	Summary of performance	
	Segment 1	Segment 2
Investment Objectives	All options result in improved safety and provide balanced land-use and transport outcomes. SE1A, 1B and 1C provide an alternative connection to Golding Road and improve resilience and stronger freight connections. 1A scored slightly lower as it is located on FUZ fringe, has reduced integration and has a reduced catchment.	SE2C and SE2D were preferred as these options would significantly improve E-W access and were closer to Pukekohe Town Centre and rail station. These options also improved travel choice between the existing environment and likely future environment for all modes but also closer to jobs and schools.
Heritage	No recorded heritage.	SE2C had the potential to impact on early 20th century villa (CHI item 22335), 1920s railway workers cottages (CHI item 22373). No other recorded heritage.
Social	Land use SE1A is the least preferred as it provides less integration with the FUZ. All	Land use SE2B was preferred as it avoids all precincts and the Franklin Showground a regionally important venue.

Criteria	Summary of performance	
	<p>other options provided good integration with FUZ areas.</p> <p>Urban design</p> <p>SE1D was preferred as uses an existing corridor alignment and topography appears to be less challenging in this location. By being outside of FUZ area the alignment increases development flexibility.</p> <p>Land requirement</p> <p>SE1B was the least preferred as it would have the largest property impact in terms of acquisitions and betterment. All other options were similar.</p> <p>Social cohesion</p> <p>SE1C and SE1D preferred as provides an upgraded existing direct route and includes walking cycling connections closer to existing residential.</p> <p>Health and wellbeing</p> <p>SE1D is preferred as involves only upgrades to existing roads, the remaining options were less preferred.</p>	<p>Urban design</p> <p>SE2B was preferred as provides a connection to the SW options and uses an existing corridor and avoids community assets and is preferred on this basis.</p> <p>Land requirement</p> <p>SE2D was the least preferred due to negative impact to commercial properties along subway road, Saleyards and Franklin Agricultural Society land and a number of full and partial acquisitions.</p> <p>Social cohesion</p> <p>SE2B was preferred as provides a connection over the rail line between existing rural, business and light industrial indirectly to Pukekohe town centre.</p> <p>Health and wellbeing</p> <p>SE2A and SE2B were preferred as do not impact the showgrounds.</p>
Environmental	<p>Landscape and visual</p> <p>SE1C and SE1D were preferred due to underlying landscape patterns (topography and vegetation), notable trees and the level of potential visual effects.</p> <p>SE1A presents new road infrastructure within the rural environment and within the productive landscape and has potential effects on notable trees and was the least preferred.</p> <p>Stormwater</p> <p>There was limited differentiation between options.</p> <p>SE1 crosses several streams in the headwaters of the Whangapouri Creek catchments which would require culverts sized for flow and fish passage. However, no significant flooding effects expected.</p> <p>Ecology</p> <p>SE1D was preferred as upgrading the existing 2 lane design would largely avoid impacts on streams and would upgrade</p>	<p>Landscape and visual</p> <p>SE2A and SE2B were preferred due to underlying landscape patterns (topography and vegetation). SE2C and SE2D were not preferred as these options would sever the Pukekohe Showgrounds which represents a publicly accessible facility and would result in adverse visual effects to its users.</p> <p>Stormwater</p> <p>There was limited differentiation between options.</p> <p>For SE2 new hardstand would require water quality, detention and attenuation via wetlands and options pass through floodplain mostly on the western side of the railway line and would require mitigation to offset the displacement effects of the earthworks.</p> <p>Ecology</p> <p>Preferred SE2B as impacts would be minor, relating to individual scattered native / exotic trees.</p> <p>Natural Hazards</p>

Criteria	Summary of performance	
	<p>existing infrastructure (upgrade undersized culverts).</p> <p>Natural Hazards</p> <p>The preferred options are primarily within tuff and basalt (SE1C and SE1D). The options were within alluvium, with likely soft and compressible conditions.</p>	<p>The preferred options are primarily within tuff and basalt (SE2C and SE2D). The options were within alluvium, with likely soft and compressible conditions.</p>
<p>Construction impacts</p>	<p>Embodied carbon emissions</p> <p>SE1C was preferred as a short new development through rural greenfield. However, this option was likely to require two bridges.</p> <p>Construction impacts on infrastructure/utilities</p> <p>For SE1 services require protection where the new alignment intersects with existing roads. SE1D was least preferred as existing overhead powerlines are likely to require undergrounding on Golding Rd.</p> <p>Construction disruption</p> <p>For SE1 construction of a new corridor in a rural greenfield. Minimal impacts on the community. SE1D was the least preferred as would require lane narrowing / temporary traffic control.</p> <p>Construction costs</p> <p>Limited differentiation between options.</p>	<p>Embodied carbon emissions</p> <p>SE2C and SE2D were both preferred.</p> <p>Construction impacts on infrastructure/utilities</p> <p>For SE2 impacts on local network utilities only. Protection of services or relocation is likely required.</p> <p>Construction disruption</p> <p>For SE2 all options are likely to require lane narrowing / temporary traffic control, as well as direct access to businesses likely to be affected during construction.</p> <p>Construction costs</p> <p>Limited differentiation between options.</p>
<p>Partner feedback</p>	<p>Key matters raised during partner SME workshops included:</p> <ul style="list-style-type: none"> • Lots of active or planned plan changes in the immediate area that interact with the options. Provides opportunities to work with developers. • Consideration of how collector roads with the development will connect with the options. • Consideration of upgrading existing intersections such as Pukekohe East/Golding Road to make more efficient in the future. • Support for new crossing over the rail corridor and that this will be attractive for freight. • Consideration of gradient of transport corridors for active modes. <p>Lots of active development</p> <p>Key matters raised by a Ngaati Te Ata representative in hui were:</p> <ul style="list-style-type: none"> • Plan change 76 discussed. Golding Road SE1D option allows for Auckland Transport to work with developers either side of Golding Road through private plan changes. Additionally, terrain is more difficult on the east side of Golding Road, with numerous ecological features. Ngaati Te Ata support the upgrade of Golding Road SE1D. • Ngaati Te Ata Waiohua supported not to affecting the AMP showgrounds and Trotting Club. 	

Criteria	Summary of performance
	<ul style="list-style-type: none"> Ngaati Te Ata Waiohua supported keeping away from plan change areas that are advanced.

4.5.4.5 Discarded Options

Table 4-26 Options to be discarded

Option	Reason for being discarded
SE1A	Due to impacts on landscape features specifically the tuff ring and potential ecological impacts on wetlands and potential bat habitat.
SE1B	Requires the largest amount of land, traverses a number of gullies, wetlands, difficult topography.
SE1C	Traverses a number of gullies, wetlands, difficult topography.
SE2A	Significant property impacts including Auckland trotting club and Golding Road development.
SE2C	Impacts A&P showgrounds a significant regional facility.
SE2D	Impacts A&P showgrounds a significant regional facility.

4.5.4.6 Recommended Corridor Option

Options SE1D and SE2B are the emerging preferred options as:

- SE1D was most preferred through MCA assessment. This is already a busy corridor and will have a significant public transport function in future. Has reduced potential impacts on stormwater, landscape and visual, and ecology than other options. This option provides opportunities to work with developers to deliver the upgrade.
- SE2B: Avoids the Auckland Trotting Club/Golding Road active development and Franklin A&P showgrounds and provides the most direct east-west connection for freight and general traffic.

Recommendations for route refinement are:

- SE1D: A section of Pukekohe East Road will also need to be upgraded to support this route.
- SE2B: Further investigation in the best place to cross the existing rail line and reduce property impacts.

4.5.5 Pukekohe South West Corridor

4.5.5.1 South IBC assessment summary

See IBC long list and short list figures in section 4.5.1.

The IBC looked at the southwest and north west together as “western arterials”. This included:

- 4 western ring route options (AR25, AR29, AR35, AR40) were identified during the IBC longlist assessment.

- A third option between AR25 and AR35 was considered during an internal alliance review, but due to a reserve, versatile soils and an irregular form of the urban edge this was not included in the longlist for assessment.
- Two western ring routes (AR25 and AR35) were taken through to the IBC shortlist assessment.
- The IBC recommended AR25 – an inner bypass around west of Pukekohe from Height Rd in the north to Manukau Rd in the south. This option was selected for the following reasons:
 - To enable freight traffic to avoid town centre
 - To enable existing alignments to be more flexible
 - Allows through traffic to use strategic roads avoiding town centre

Functional intent is to facilitate movement of traffic north/south linking growth in the western areas.

4.5.5.2 Gap Analysis IBC – DBC

Table 4-27 provides a summary for Pukekohe South East Arterial transport components of the Pukekohe DBC, key changes since the previous recommendations made by the South IBC and Strategic South DBC and a recommendation for the Pukekohe DBC.

Table 4-27 Summary of gap analysis and recommendations

Intention and Previous options assessment	Key changes since IBC and South DBC	Recommendation(s)
<p>Facilitate movement of traffic north/south linking growth in the western area.</p> <p>Enables movements around Pukekohe for greater efficiency and a reduction in congestion within Pukekohe town centre.</p>	<p>Developer interest / resource consents lodged.</p> <p>GPS 2021/Zero Carbon Act – Climate change lens, which may have implications on PEX alignment.</p> <p>Consider implications of NPS FM and NES FW – adopt avoidance of wetlands where possible as principle in first instance.</p>	<p>Corridor assessment considering the following:</p> <ul style="list-style-type: none"> • Form and function of the Pukekohe Arterials to be confirmed. The options have not been assessed since the IBC (2019) which left the form and function to be confirmed in the DBC. The arterials are likely to be two lanes which may influence their placement over a four lane corridor. • Further alternatives are considered (corridor assessment) which may provide more of a contribution to decarbonisation as set out in government direction. This could include the investigation of upgrading existing roads. • A number of plan changes have been lodged (or are planned) in proximity to this corridor – in particular along Golding Road. Opportunity to better integrate with these developments. • Through any optioneering processes new information

Intention and Previous options assessment	Key changes since IBC and South DBC	Recommendation(s)
		such as impacts on wetlands (under the NPS FW) and opportunities to integrate with urban development are identified.

4.5.5.3 Option Development

Three options were developed for the Pukekohe South West Arterial as shown in Figure 4-19 and Figure 4-20.

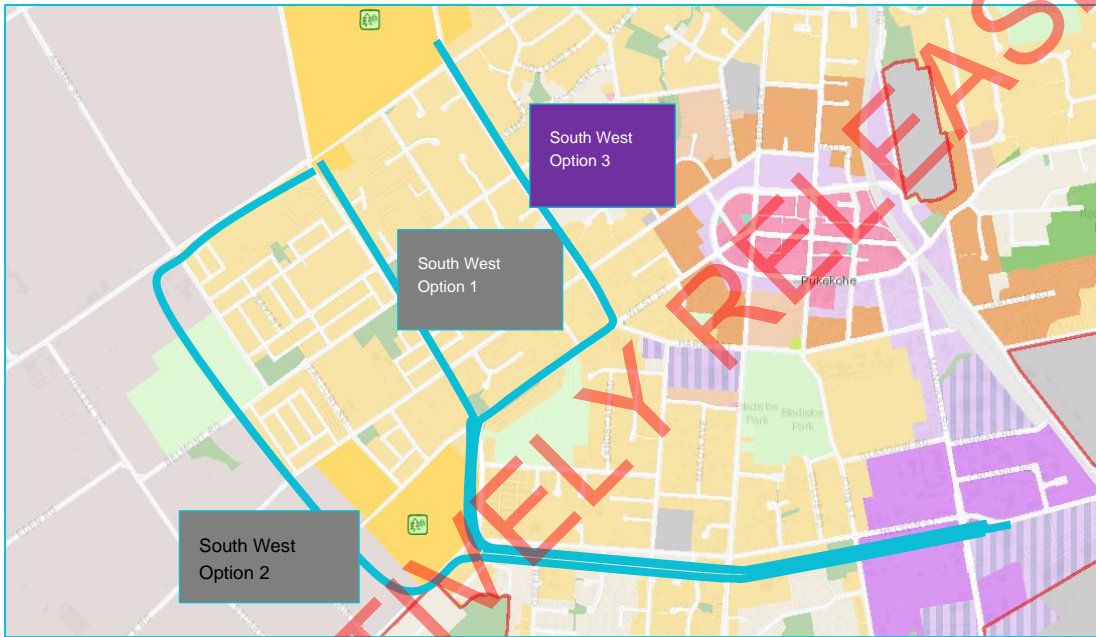


Figure 4-19 Pukekohe South West Corridor Assessment Option



Figure 4-20 Pukekohe South West Corridor Assessment Options

4.5.5.4 Option Assessment

Three options were assessed against the MCA framework by each subject matter expert in

Table 4-28. Table 4-29 provides a summary of the assessment undertaken by technical specialists against the MCA framework.

Table 4-28 Pukekohe Local – South-West corridor option MCA scoring

MCA Criteria	Scores		
	SW1	SW2	SW3
Options			
Investment objectives			
IO1 – Safety	1	1	2
IO2 – Integration	1	1	2
IO3 – Access	2	1	3
IO4 – Resilience	1	1	1
IO5 – Travel Choice	2	1	2
Cultural			
Heritage	-4	-4	-4
Social			
Land use futures / integration with planned landuse	2	1	1

Urban design	-3	-2	-2
Land requirement / property	-3	-3	-2
Social cohesion	2	-1	2
Human health and wellbeing	-1	-2	0
Environment			
Landscape / visual	-2	-3	-2
Stormwater	-1	-1	-1
Ecology	-2	-5	-3
Natural hazards	-3	-3	-2
Construction impacts			
Embodied carbon emissions	-3	-3	-3
Construction impacts on utilities / infrastructure	-2	-2	-2
Construction Disruption	-2	-2	-2
Construction costs / risk / value capture	-2	-2	-2

Table 4-29 Pukekohe Local – South-West option assessment findings summary

Criteria	Summary of performance
Investment Objectives	<p>All options have a positive effect on safety and improve connectivity for the strategic network and travel choice.</p> <p>SW1 introduces a freight route close to a school, which is not ideal and would likely be subject to further speed reductions. SW2 is less direct freight and general traffic would likely use the existing Helvetia Rd and Seddon St instead. Neither of these options is ideal and option along Helvetia Road (SW3) was preferred.</p>
Heritage	<p>All options have impacts to heritage. Including potential impacts on the Borough Power House, 20th century (CHI item 15070), plaque marking the site of the First Presbyterian Church from 1868 (CHI item 12531), Pukekohe multid denominational Cemetery, from 1882, and War Memorial (CHI item 19319), Nehru Hall from 1953 (CHI item 15868)</p>
Social	<p>Land use</p> <p>SW3 was the preferred option as it provides a more direct connection, integrates more directly with the FUZ, serves more of the existing urban area. SW2 creates areas of residual land within the rural area, which may encourage development beyond the FUZ and existing urban areas. Both SW1 and SW2 provide similar connections.</p> <p>Urban design</p> <p>All options have interface issues. The second segment of SW2 runs along the urban boundary and would define the urban edge and this is the preferred option.</p>

Criteria	Summary of performance
	<p>Land requirement</p> <p>SW3 was the preferred option as partial acquisitions only would be required. SW1 would require approximately 40 full residential acquisitions and would also impact the cemetery on Nelson Street.</p> <p>SW2 would require 5 properties zoned rural production would be adversely affected, potentially requiring full acquisition. The cemetery, residential properties and commercial properties along Nelson Road would be similarly impacted in SW2.</p> <p>Social cohesion</p> <p>All options provide a connection to Franklin Care Centre, Pukekohe Indian Community Centre, Pukekohe Cemetery and Pukekohe Hill School and Tamaoho School. SW3 was the preferred option. SW1 severs open space (reserve) where there is an existing connection. SW2 has less existing residential catchment in being located partially within the rural area, less connections to facilities and it severs a large open space.</p> <p>Health and wellbeing</p> <p>Existing urban area, receivers including Franklin Care Centre, Cemetery, Indian Community Centre, Pukekohe Hill School, Tamaoho School. SW1 was preferred as involves upgrade to existing corridor rather than completely new road.</p>
Environmental	<p>Landscape and visual</p> <p>SW1 visual amenity effects likely limited to residences immediately adjacent to corridor. SW2 would have a limited loss of vegetation required to facilitate the route along existing corridor, however vegetation required to facilitate the route in the rural environment, including a block of vegetation to the north west (SEA). SW1 was the preferred option.</p> <p>Stormwater</p> <p>There are existing floodplains and existing culverts under these roads, all may require culvert upgrades and flood effect mitigation depending on flood displacement of the upgrade works. SW3 was the preferred option as there would be minimal new hardstand and no flooding effects are expected.</p> <p>Ecology</p> <p>SW3 was the preferred option as it impacts limited individual and scattered mature trees (largely exotic) and provided the opportunity to avoid the stream corridor.</p> <p>SW1 had one new stream crossing (Whangapouri), with potential associated wetlands and limited impacts to individual and scattered mature trees (including exotic trees in Jutland Road South Playground).</p> <p>SW2 involved the partial or complete loss of SEA_T_5384 (Regionally - Critically Endangered WF8 - Kahikatea, pukatea forest). Impacts on a stand of mature indigenous forest (including potential bat risk) and smaller areas of indigenous forest and a potential natural wetland and was the least preferred option.</p> <p>Natural Hazards</p> <p>SW3 was the preferred option as the majority of the alignment lies on volcanic soils. Both SW1 and SW2 interacted with the tuff crater, with soft and compressible soils anticipated, passing in to basalt and tuff. At Whangapouri Creek soft/compressible soils are anticipated.</p>
Construction impacts	Embodied carbon emissions

Criteria	Summary of performance
	<p>Limited differentiation between options. SW3 was preferred due to reduced extent of earthworks.</p> <p>Construction impacts on infrastructure/utilities</p> <p>All options have impacts on local network utilities only. Protection of services or relocation is likely required.</p> <p>Construction disruption</p> <p>All options require lane narrowing or temporary traffic control needs to be implemented during construction on the existing roads.</p> <p>Construction costs</p> <p>There was limited differentiation between options.</p>
Partner feedback	<p>Key feedback from SMEs during workshops included:</p> <ul style="list-style-type: none"> Acknowledgement in the difficulty in providing for a safe and direct cycle route and freight corridor in the existing urban environment. A preference for option 3 as is generally already used by freight. Option 1 is likely to impact a number of new residential areas. <p>Ngaati Te Ata Waiohua supported an upgrade to cycleway and path and supports reducing impacts on property in existing urban areas.</p>

4.5.5.5 Discarded Options

Table 4-30 Options to be discarded

Option	Reason
SW2	Impacts a SEA with critically endangered species. Indirect, people would use existing roads.
SW1	Next to school (30km speed reduction). Not ideal location for freight movement.

4.5.5.6 Recommended Corridor Option

SW3 is the preferred option. It had slightly better scoring of investment objectives, is indicated as an AT future bus route and has a better catchment for existing and future areas.

Recommendations for route refinement are to investigate upgrading the existing road reserve (20m wide cross section rather than a 24m wide cross section) to reduce property impacts. This corridor is in an existing urban areas with many residential houses along the alignment.

4.5.6 Pukekohe North-West Corridor Assessment

4.5.6.1 South IBC assessment summary

See South West section 4.5.5.1

4.5.6.2 Gap Analysis IBC to DBC

See South West section 4.5.5.2.

4.5.6.3 Option Development

The Pukekohe North West options were split into two segments as shown in the figures Figure 4-21.

- Segment 1 – north south: two options
- Segment 2 – east west: two options



Figure 4-2122: Pukekohe North West Corridor Assessment Option



Figure 4-23 Pukekohe North West Corridor Assessment Options

4.5.6.4 Option Assessment

Table 4-31 Pukekohe Local – North-West Corridor option MCA scoring

MCA Criteria	Scores			
Options	NW1A	NW1B	NW2A	NW2B
Investment objectives				
IO1 – Safety	3	1	3	2
IO2 – Integration	3	2	3	1
IO3 – Access	3	2	3	2
IO4 – Resilience	1	2	3	1
IO5 – Travel Choice	2	1	3	1
Cultural				
Heritage	-2	0	0	0
Social				

Land use futures	3	1	3	1
Urban design	-1	0	-1	0
Land requirement / property	-3	-2	-1	-1
Social cohesion	1	0	0	0
Human health and wellbeing	0	-1	-1	0
Environment				
Landscape / visual	-2	-3	-1	-1
Stormwater	-3	-2	-1	-1
Ecology	-2	-5	-3	-2
Natural hazards	-4	-3	-4	-1
Construction impacts				
Embodied carbon emissions	-3	-3	-3	-3
Construction impacts on infrastructure	-2	-2	-2	-1
Construction Disruption	-1	-1	-1	-1
Construction costs / risk / value capture	-2	-2	-2	-2

Table 4-32 Pukekohe Local – North-West option assessment findings summary

Criteria	Summary of performance	
	Segment 1	Segment 2
Investment Objectives	NW1A is the preferred option. It aligns best with the investment objectives. NW1B does not address existing safety issues on the roads.	NW2A is the preferred option. It aligns best with the investment objectives. NW2B has poor integration as some growth areas south of Heights Road are poorly connected and little benefit for access and travel choice.
Heritage	NW1B is the preferred option. NW1A has possible impacts on Pukekohe Police Lockup.	Limited differentiation between options.
Social	<p>Land use</p> <p>NW1A is the preferred option over NW1B under this criteria as NW1B creates areas of residual land within the rural area, which may encourage development beyond the FUZ and existing urban areas. Both options provide similar connections. While providing a corridor outside the FUZ reduces the amount of developable land taken up, the connections created are less</p>	<p>Land use</p> <p>NW2A is our preferred option over NW2B under this criteria as NW2B would potentially encourage development within the rural area. Both options provide similar connections, however, the corridor within the FUZ would provide greater integration as a central connection.</p> <p>Urban design</p>

Criteria	Summary of performance	
	<p>direct and less integrated with the existing and future urban areas.</p> <p>Urban design</p> <p>All NW options have minor access and interface challenges. NW1A would bring traffic through the middle of a residential area, reducing amenity outcomes. NW1B is preferred.</p> <p>Land requirement</p> <p>NW1B was preferred due to the reduced property impact. A greater number of acquisitions required by NW1A.</p> <p>Social cohesion</p> <p>NW1A was preferred over NW1B as it provides greater connection between existing residential areas.</p> <p>Health and wellbeing</p> <p>Existing industrial and residential receivers. NW1A was the preferred option as it predominantly uses existing roads, where air quality, noise and vibration effects are existing and expected.</p>	<p>NW2A may isolate some areas while NW2B allows more flexibility in terms of access and future development.</p> <p>Land requirement</p> <p>NW2B was not preferred as it follows an existing route and preference was for NW2A as a new connection.</p> <p>Social cohesion</p> <p>While NW2A and NW2B have the same score, NW2A was preferred. The differentiator being that it is a more direct route, slightly closer to Pukekohe residential and business areas. It also provides two crossings over the rail line.</p> <p>Health and wellbeing</p> <p>Existing industrial and residential receivers. NW2B was the preferred option as it predominantly uses existing roads, where air quality, noise and vibration effects are existing and expected.</p>
<p>Environmental</p>	<p>Landscape and visual</p> <p>NW1B does not logically follow the underlying topography and cuts across an incised catchment and stream system within its northern reaches.</p> <p>Stormwater</p> <p>NW1B was preferred as it had a much lower interaction with floodplain areas and overland flowpaths.</p> <p>Ecology</p> <p>NW1A was preferred as it avoids stream or wetland impacts. Kauri trees impacted on Kauri Road; however, these are planted and not mature.</p> <p>NW1B comprises two very high value stream crossings, within SEA_T_5281. Regionally Critically endangered (WF7) Puriri Forest, nationally critical long-tailed bats recorded and was least preferred.</p> <p>Natural Hazards</p> <p>All options involved partial new construction through swamp/tuff crater, with associated soft/compressible soils. Preference was for NW1A which is mostly upgrade of existing roads.</p>	<p>Landscape and visual</p> <p>NW2A and NW2B both scored the same due to underlying landscape patterns (topography and vegetation), notable trees and the level of potential visual effects.</p> <p>Stormwater</p> <p>NW2B was preferred as it would add minimal new hardstand (impervious area) to the catchment.</p> <p>Ecology</p> <p>NW2B follows existing road and therefore impacts likely minimal.</p> <p>Natural Hazards</p> <p>Options involved partial new construction through swamp/tuff crater, with associated soft/compressible soils. Preference for NW2B as a short option and upgrades mostly to existing roads.</p>

Criteria	Summary of performance	
<p>Construction impacts</p>	<p>Embodied carbon emissions</p> <p>There was a negligible difference in lane km and structures. There was limited differentiation between NW1A and NW1B.</p> <p>Construction impacts on infrastructure/utilities</p> <p>NW1A and NW1B scored the same as both require local protection or relocation of gas transmission pipe. NW1B could also require overhead powerline to be undergrounded.</p> <p>Construction disruption</p> <p>Currently a greenfield site in rural area with limited sensitive receivers. Limited differentiation between options.</p> <p>Construction costs</p> <p>There was limited differentiation between options due to complex construction over the rail crossing.</p>	<p>Embodied carbon emissions</p> <p>NW2A was preferred as it was the shorter option.</p> <p>Construction impacts on infrastructure/utilities</p> <p>NW2B was preferred as it would interfere the least with infrastructure/utilities.</p> <p>Construction disruption</p> <p>Currently a greenfield site in rural area with limited sensitive receivers. Limited differentiation between options.</p> <p>Construction costs</p> <p>There was limited differentiation between options due to complex construction over the rail crossing.</p>
<p>Partner feedback</p>	<p>Key feedback from SMEs at workshops included:</p> <ul style="list-style-type: none"> • Grade separation is required where corridors intersection with the Glenbrook rail line. • s 9(2)(ba)(i) • Option NWB navigates a sharp turn at Helvetia/Heights Road. • The topography at Heights Road needs to be carefully considered. <p>Key matters raised during hui with manawhenua representatives included:</p> <ul style="list-style-type: none"> • NW1B is not supported as it impacts SEA, Puriri forest, and includes 2 new crossings of the Whangapouri stream. • s 9(2)(ba)(i) <p>On a site visit with Ngaati Te Ata and Ngāti Tamaoho in July 2022 the following matters were discussed:</p> <ul style="list-style-type: none"> • The SEA was viewed from the end of Helvetia Road. Ngati Tamaoho emphasised the preference for option NW1A avoiding the route (NW1B) near the SEA. • In terms of the Butcher Road option – Ngaati Te Ata Waiohua noted no issue with taking a new alignment (NW2A) and not selecting the upgrade of Heights Road (NW2B). • Regarding the Pukekohe Local Arterials corridor assessment, Ngāti Te Ata supported the rationale: SEAs have been avoided, use of existing roads, moving roads closer to existing infrastructure (rail and pylons), supports the work undertaken. 	

4.5.6.5 Discarded Options

Table 4-33 Options to be discarded

Option	Reason
NW1B	The option most negatively scored and mentioned by specialists as least preferred. It will impact a SEA (endangered Puriri forest), likely to impact known location of bats, requires two new stream crossings (-5).
NW2B	Steep topography, poor integration with the growth areas south of Heights Road. Would involve a large crossing of NIMT, Glenbrook rail line and Whangapouri Stream to connect to the NE quadrant.

4.5.6.6 Recommended Corridor Option

Options NW1A and NW2A are the recommended corridor options as they were the most positively scored through the MCA. NW1A avoids a SEA and requires no new stream crossings. NW2A provides the most direct connection and reduces complexity in connection to the NE quadrant.

Recommendations for route refinement include further investigation of crossing the Glenbrook rail line and connection with SH22 and Pukekohe NE quadrant.

4.6 Corridor Assessment Conclusion

The following options are recommended for route refinement assessment which will refine the alignment of each option and form an integrated transport network for the Drury West, Paerata and Pukekohe areas.

Table 4-34: Summary of Recommended Corridor Options to be taken forward to Route Refinement

Corridor Assessment Option Package	Recommended Corridor Option	Recommendations for Route Refinement
Drury West	DW1 and DW2	<ul style="list-style-type: none"> Reduce impacts on the Ngakoroa Stream.
Paerata Local	PS3 and PS5	<ul style="list-style-type: none"> A more direct route for PS5. Consideration of topographical constraints of upgrading Sim Road/Cape Hill Road for PS3. Consideration of a connection to the Paerata Station (formerly known as the Southern Connector at Draft Strategic South DBC) and connectivity with Paerata Rise development.
North South	NS8; and East Option	<ul style="list-style-type: none"> For NS8 - reduce impacts on private properties where possible and consideration of property access.

Corridor Assessment Option Package	Recommended Corridor Option	Recommendations for Route Refinement
		<ul style="list-style-type: none"> The East Option – to reduce impacts on the ONF Pukekohe Tiff Ring.
Pukekohe Local		
Pukekohe North East Arterial	NE1	<ul style="list-style-type: none"> Reduce impacts on active development around the Pukekohe East Road area.
Pukekohe South East Arterial	SE1 D and SE2B	<ul style="list-style-type: none"> SE1D: A section of Pukekohe East Road will also need to be upgraded to support this route. SE2B: Further investigation in the best place to cross the existing rail line and reduce property impacts.
Pukekohe South West Arterial	SW3	<ul style="list-style-type: none"> Investigate upgrading the existing road reserve (20m wide cross section rather than a 24m wide cross section) to reduce property impacts. This corridor is in an existing urban areas with many residential houses an social infrastructure along the alignment.
Pukekohe North West Arterial	NW1A and NW2A	<ul style="list-style-type: none"> Further investigation of crossing the Glenbrook rail line and connection with SH22 and NE quadrant.

5 Route Refinement Assessment

Route refinement assessment further refines the recommended option from the relevant corridor assessment set out in the sections above. The assessment uses the same MCA framework as corridor assessment.

The recommended corridor options were split into components (or packages) for the route refinement assessment. These are set out in Figure 5-1 and Table 5-1.

An initial form and function assessment of the options is undertaken at corridor assessment, and this is confirmed at the route refinement stage to inform option development and assessment.

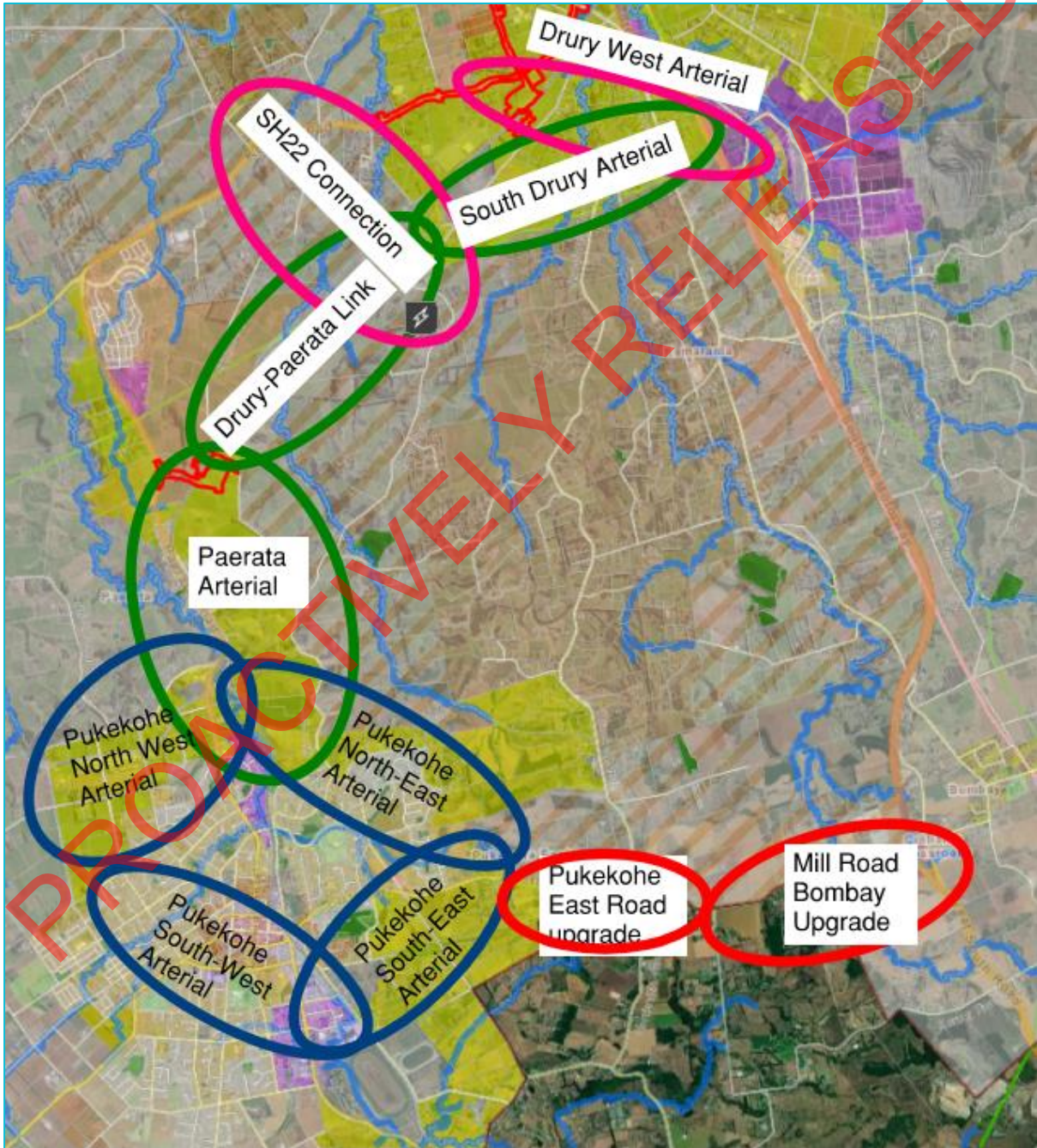


Figure 5-1 Route Refinement Options Assessment Packages

Table 5-1 - Refinement Packages and Options

Route Refinement Package	Options
Drury West Arterial	<ul style="list-style-type: none"> • Drury West Arterial Option 1 (DW_1) • Drury West Arterial Option 2 (DW_2)
South Drury Arterial	<ul style="list-style-type: none"> • South Drury Arterial Option 1 (SD_1) • South Drury Arterial Option 2 (SD_2) • South Drury Arterial Option 3 (SD_3)
SH22 Connection	<ul style="list-style-type: none"> • SH22 Connection Option 1 (SH22_1) • SH22 Connection Option 2 (SH22_2) • SH22 Connection Option 3 (SH22_3) • SH22 Connection Option 4 (SH22_4)
Drury-Paerata Link	<ul style="list-style-type: none"> • Drury-Paerata Link Option 1 (PL_1) • Drury-Paerata Link Option 2 (PL_2)
Paerata Arterial	<ul style="list-style-type: none"> • Paerata Arterial Option 1 (PA_1) • Paerata Arterial Option 2 (PA_2)
Mill Road Bombay Upgrade – Pukekohe East Road Upgrade	<ul style="list-style-type: none"> • Mill Road upgrade <ul style="list-style-type: none"> ○ Option 1 MR_1 ○ Option 2 MR_2 ○ Option 3 MR_3 • Pukekohe East Road upgrade <ul style="list-style-type: none"> ○ Option 1 PE_O1 ○ Option 2 PE_O2
Pukekohe South-East Arterial	<ul style="list-style-type: none"> • Pukekohe South-East Arterial Segment 1 <ul style="list-style-type: none"> ○ Option 1 (PSEA_S1_O1) ○ Option 2 (PSEA_S1_O2) ○ Option 3 (PSEA_S1_O3) • Pukekohe South-East Arterial Segment 2 <ul style="list-style-type: none"> ○ Option 1 (PSEA_S2_O1) ○ Option 2 (PSEA_S2_O2) ○ Option 3 (PSEA_S2_O3) • Pukekohe South-East Arterial Segment 3 <ul style="list-style-type: none"> ○ Option 1 (PSEA_S3_O1) ○ Option 2 (PSEA_S3_O2) ○ Option 3 (PSEA_S3_O3)
Pukekohe North-West Arterial	<ul style="list-style-type: none"> • Pukekohe North-West Arterial Segment 1 <ul style="list-style-type: none"> ○ Option 1 (PNWA_S1_O1) ○ Option 2 (PNWA_S1_O2) ○ Option 3 (PNWA_S1_O3) • Pukekohe North-West Arterial Segment 2 <ul style="list-style-type: none"> ○ Option 1 (PNWA_S2_O1) ○ Option 2 (PNWA_S2_O2)

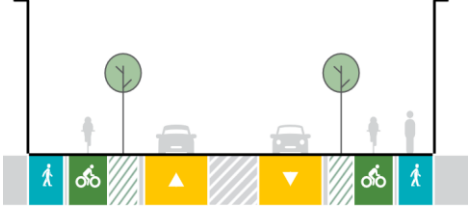
	<ul style="list-style-type: none"> ○ Option 3 (PNWA_S2_O3)
Pukekohe North-East Arterial	<ul style="list-style-type: none"> ● Pukekohe North-East Arterial Segment 1 <ul style="list-style-type: none"> ○ Option 1 (PNEA_S1_O1) ○ Option 2 (PNEA_S1_O2) ○ Option 3 (PNEA_S1_O3) ● Pukekohe North-East Arterial Segment 2 <ul style="list-style-type: none"> ○ Option 1 (PNEA_S2_O1) ○ Option 2 (PNEA_S2_O2) ● Pukekohe North-East Arterial Segment 3 <ul style="list-style-type: none"> ○ Option 1 (PNEA_S3_O1) ○ Option 2 (PNEA_S3_O2)
Pukekohe South-West Arterial	<ul style="list-style-type: none"> ● Assessment of options within the existing road reserve.

5.1 Drury West Route Refinement

5.1.1 Form and Function

Following the methodology summarised in Section 3.4, a form and function assessment was undertaken for the Drury West connection to inform the route refinement assessment. Table 5-2 provides a summary of the assumptions and outcomes of the assessment.

Table 5-2 Drury West Form and function assumptions and summary

Criteria	Summary
Purpose	Provides an arterial connection from SH22/Jesmond Road to the edge of FUZ. Connecting to Drury West Town Centres, Drury West Rail Station and access to the strategic corridors (SH1, SH22). It also provides a new rail crossing over the rail line improving local connectivity in Drury West area.
Cross Section	 <p>24m cross section, 2 lane general traffic, walking and cycling on both sides</p>
Function	<p>P2 - Attracts activity from across a subregion or neighbouring local board area</p> <p>M2 - Medium strategic network significance with increasing volume of users</p>
Flows (ADT 2048)	9,000
Speed	50 kph speed limit

Criteria	Summary
Public transport (indicative 2048)	27 buses per hour (section from Jesmond to Rail line) 11 buses per hour (section from Rail line to Runciman Road) Priority lanes north of rail line and intersections south of rail line
Freight	Level 3 Route

5.1.2 Option Development

Two Drury West options DW7 and DW8 underwent a route refinement assessment through the MCA framework by each subject matter expert. These are shown in Figure 5-2.

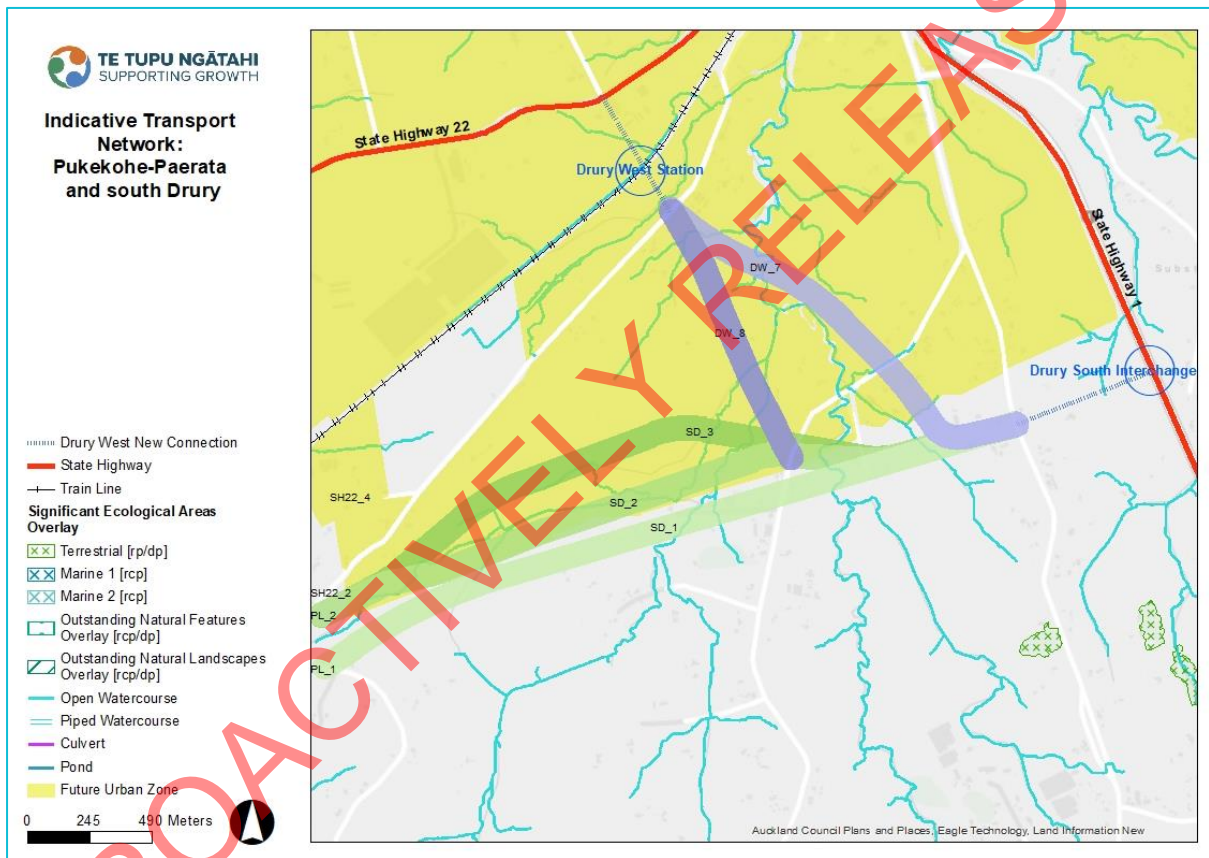


Figure 5-2 Drury West Route Refinement Options

5.1.3 Option Assessment

Options were assessed against the MCA framework by each subject matter expert, refer to Table 5-3. Commentary is provided in Table 5-4

Table 5-3 Drury West Route Refinement MCA scoring

MCA Criteria	Scores	
Options	DW7	DW8

Investment objectives		
IO1 – Safety	2	2
IO2 – Integration	1	2
IO3 - Access	1	2
IO4 – Resilience	2	2
IO5 – Travel Choice	2	2
Cultural		
Heritage	0	0
Social		
Land use futures / integration with planned landuse	1	3
Urban design	0	1
Land requirement / property	-3	-2
Social cohesion	1	1
Human health and wellbeing	-1	-1
Environment		
Landscape / visual	-2	-1
Stormwater	-2	-3
Ecology	-4	-4
Natural hazards	-2	-2
Construction impacts		
Embodied carbon emissions	-2	-1
Construction impacts on utilities / infrastructure	-2	-2
Construction Disruption	-1	-1
Construction costs / risk / value capture	-2	-2

Table 5-4 Drury West route refinement assessment findings summary

Criteria	Summary of performance
Investment Objectives	Both options have a positive effect on safety and improve connectivity for the strategic network and travel choice.

Criteria	Summary of performance
	<p>DW7 provides multi-modal access but serves a smaller catchment for Drury West areas particularly on the western side. DW8 serves a higher residential catchment on both sides within Drury West areas.</p>
Heritage	<p>No recorded heritage features. No difference between options.</p>
Social	<p>Land use</p> <p>Both options connect directly to the station and adjacent to the proposed industrial centre which integrates with the FUZ. DW7 the integration is limited due to the presence of the flood plain. DW8 was preferred as it provides better integration with the FUZ.</p> <p>Identified developer interest to the north-east. No known granted consents/plan changes in this area.</p> <p>Urban design</p> <p>Both options include a large amount of earthworks which would limit the ability of the corridor to present an active interface between the public and private realm in these locations. Being located in the FUZ, future development can respond to the corridor, mitigating some amenity effects.</p> <p>DW8 was the preferred option because it was considered slightly more flexible for future development to respond to the corridor.</p> <p>Land requirement</p> <p>DW8 is the preferred option due to less impacts on property.</p> <p>DW7 requires greater land acquisition compared to DW8.</p> <p>Social cohesion</p> <p>No difference between options. Both provide access between two strategic corridors, improves access to employment and communities.</p> <p>Health and wellbeing</p> <p>No difference between options. Existing rural residential receivers. Construction effects and operational noise for existing dwellings.</p>
Environmental	<p>Landscape and visual</p> <p>DW7 and DW8 avoid all landscape related overlays and notable trees. Visual amenity effects were limited to rural residential properties within the localised setting of the southern part of the route for both DW7 and DW8.</p> <p>DW8 was preferred as it avoided areas of established vegetation and only occasional shelterbelts being affected.</p> <p>Stormwater</p> <p>DW7 was preferred as it is shorter overall and more direct, this would result in less new impervious surfaces and therefore less of an effect on the hydrology of the area.</p> <p>Ecology</p> <p>DW7 and DW8 were likely to have impacts on planted native / exotic riparian vegetation, likely used by TAR species bats and copper skink. Overall likely impact for both options was considered to be high.</p> <p>Natural Hazards</p> <p>DW7 was preferred due to the terrain, mostly poorly consolidated dune sand.</p>

Criteria	Summary of performance
	The embankments for DW8 were likely subject to settlement from prospective compressible deposits and the rest of the terrain was variable including liquifiable deposits.
Construction impacts	<p>Embodied carbon emissions</p> <p>There was a negligible difference in lane km and structures. DW7 was least preferred due to impact on wetlands and biomass (that can act as carbon sinks).</p> <p>Construction impacts on infrastructure/utilities</p> <p>Limited differentiation between options. Localised protection or relocation required. Co-ordination required with Transpower in detailed design phase to confirm vertical clearance.</p> <p>Construction disruption</p> <p>Currently a greenfield site in rural area with limited sensitive receivers. Limited differentiation between options.</p> <p>Construction costs</p> <p>DW7 was considered least preferred due to potentially higher costs associated with a longer crossing of an identified minor natural hazard.</p>
Partner and public feedback	<p>Partner</p> <p>A matter raised in SME workshops was the consideration of how the collector network will connect with the Drury West options in the future. There are a number of stream crossings and flood plains in this area.</p> <p>A manawhenua representative gave feedback on the preference for the proposed Drury West Arterial to limit crossings of the Ngakoroa (Ngaakooroa) Stream, due to iwi aspirations of leaving the stream in a better condition than it is currently.</p> <p>Public</p> <p>Limited feedback was received on the Drury West Arterial options during public engagement. Potential property impacts were raised in the limited feedback – in particular on working farms.</p> <p>At the public open days, there was general conversations with some attendees on support for connections to the proposed rail stations such as the Drury West station.</p>

5.1.4 Discarded Options

Table 5-5 summarises the reasons for discounting the options individually.

Table 5-5 Discarded options and reasons

Option	Reason
DW7	DW7 was discounted because it has a smaller residential catchment, is in a greater area of flood plain and has greater impacts on vegetation including riparian vegetation.

5.1.5 Preferred Option

DW8 was the preferred option because it has a larger future residential catchment, better integrates with future development, affects fewer properties, and has reduced landscape and visual impact.

Further considerations for design refinements include:

- Refinement of intersection forms (for example single or multi lane roundabouts).
- Access for properties to the south on Ngakoroa Road and realigned Runciman Road.


PROACTIVELY RELEASED

5.2 South Drury Option Refinement Assessment

5.2.1 Form and Function

Following the methodology summarised in Section 3.4, a form and function assessment was undertaken. Table 5-6 provides a summary of the assumptions and outcomes of the assessment.

Table 5-6 South Drury form and function assumptions and summary

Criteria	Summary
Purpose	Provides an arterial connection in Drury West. It runs east-west on the edge of the FUZ providing a strategic connection to Drury South Interchange and connecting Drury West with Paerata.
Cross Section	 <p>24m cross section, 2 lane general traffic, walking and cycling on one side</p>
Function	<p>P1 - Predominantly local function with a small catchment of users</p> <p>M3 - High strategic significance with higher volume of users</p>
Flows (ADT 2048)	22,000-24,000
Speed	50-60 kph speed limit
Public transport (indicative 2048)	<p>8-10 buses per hour</p> <p>Priority at intersections is required</p>
Freight	Level 2 connects to regional freight corridor on SH1

5.2.2 Option Development

Three options were developed as shown in Figure 5-3 below.

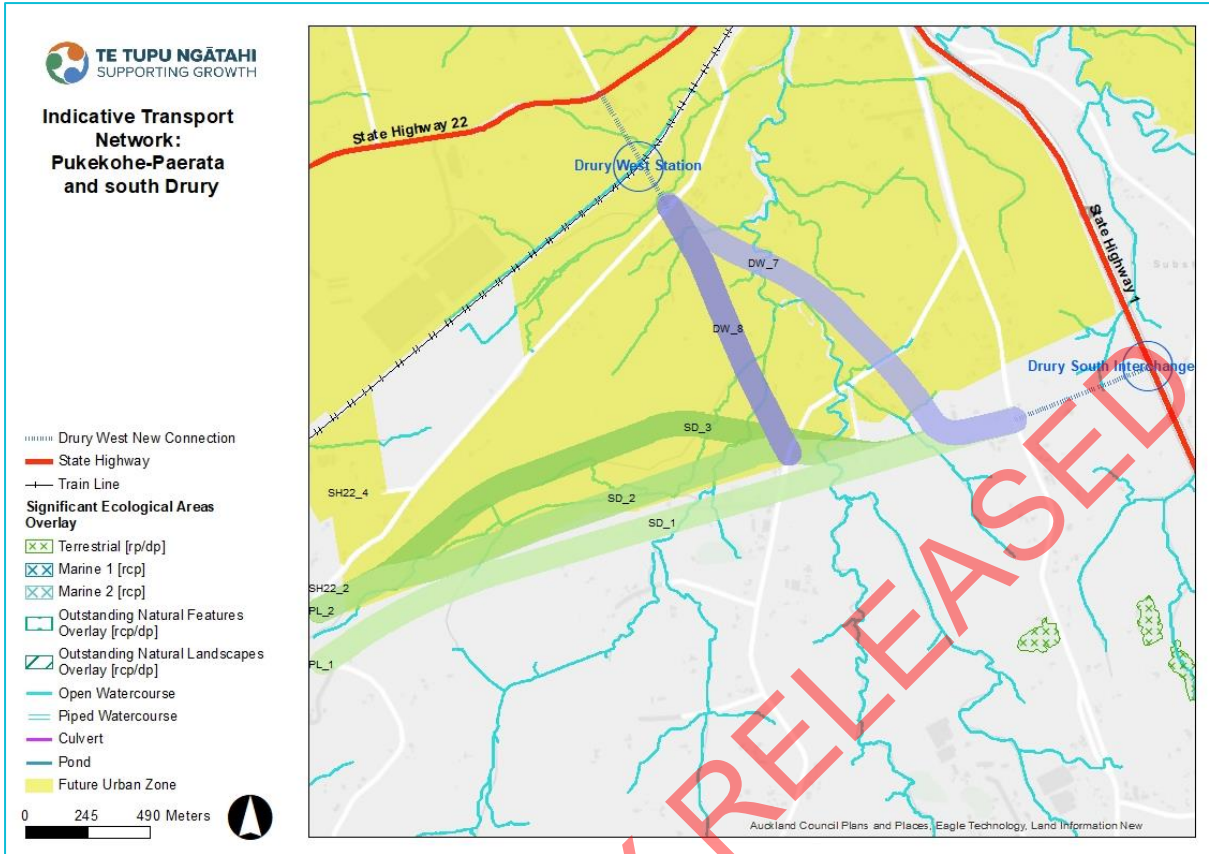


Figure 5-3 Summary of South Drury options

5.2.3 Option Assessment

Options were assessed against the MCA framework by each subject matter expert, refer to Table 5-7. Commentary is provided in Table 5-8.

Table 5-7 South Drury Route Refinement MCA scoring

MCA Criteria	Scores		
Options	SD_1 South	SD_2 Centre	SD_3 North
Investment objectives			
IO1 – Safety	3	3	1
IO2 – Integration	2	2	0
IO3 - Access	1	1	1
IO4 – Resilience	2	2	1
IO5 – Travel Choice	1	2	2
Cultural			
Heritage	0	0	0

Social			
Land use futures / integration with planned landuse	-1	1	2
Urban design	-3	2	1
Land requirement / property	-3	-2	-3
Social cohesion	1	1	1
Human health and wellbeing	0	0	0
Environment			
Landscape / visual	-2	-3	-2
Stormwater	-2	-3	-3
Ecology	-4	-4	-4
Natural hazards	-2	-4	-4
Construction impacts			
Embodied carbon emissions	-1	-2	-1
Construction impacts on utilities / infrastructure	-2	-2	-2
Construction Disruption	-1	-1	-1
Construction costs / risk / value capture	-2	-2	-3

Table 5-8 South Drury route refinement MCA assessment findings summary

Criteria	Summary of performance
Investment Objectives	<p>All options reduce the likely future traffic on rural roads, reduce traffic on SH22 and improve access to key destinations. Option SD_3 was least preferred due to the high traffic volumes within the FUZ increases the potential for movement and place conflicts.</p> <p>SD_2 which follows the FUZ edge was preferred as it was considered to provide the best integration with active modes and PT.</p>
Heritage	No recorded heritage.
Social	<p>Land use</p> <p>SD_2 was preferred as it integrates with future development, defines the rural urban boundary and increase separation between the Transpower Pylons and future residential development.</p> <p>SD_1 was not considered to be well integrated and SD_3 was not preferred as it would reduce the amount of developable land in the FUZ.</p> <p>Urban design</p>

Criteria	Summary of performance
	<p>SD_2 was the preferred option as it would assist in defining the rural urban boundary and increase separation between the Transpower Pylons and future residential development.</p> <p>SD_1 was the least preferred as the alignment was within the rural zone and considered unable to respond to the corridor. This option would create an awkward linear area of FUZ between the rural area and the flood plain.</p> <p>SD_3 is also not preferred, but it was noted this alignment was within the FUZ and would be able to respond to the corridor, mitigating some amenity effects, however, would still have an impact.</p> <p>Land requirement</p> <p>SD_2 would have the least impact on property and was the preferred option.</p> <p>SD_1 would impact the greatest number of properties and was the least preferred option. SD_3 would impact on a number of large agricultural blocks.</p> <p>Social cohesion</p> <p>The design is for a two-lane arterial on the edge of the FUZ zone so it is unlikely there will be significant severance effects for any option.</p> <p>Health and wellbeing</p> <p>All options provide a new corridor which introduces new sources of noise and air emissions. However, the route is in a rural area with limited sensitive receivers (existing community).</p>
Environmental	<p>Landscape and visual</p> <p>All options avoid landscape related overlays. Visual amenity are limited to rural residential properties (south of FUZ).</p> <p>SD_2 was the preferred option as it would result in minimal vegetation loss.</p> <p>SD_1 would likely involve the loss of mature vegetation (shelterbelt planting).</p> <p>SD_3 was not preferred as it affects two potential parks identified in structure plan.</p> <p>Stormwater</p> <p>SD_1 was the preferred options as it is more direct and would have the least effect on hydrology.</p> <p>SD_2 and SD_3 would have greater effect on hydrology / stream erosion.</p> <p>Ecology</p> <p>SD_2 was the preferred option as effects on existing environment likely lower as within the FUZ i.e. the environment would be subject to change and disruption prior to the construction of the project.</p> <p>SD_1 and SD_3 were not preferred as wetland offset requirements could be significant. Monitoring and mitigation required such as bat hop over-vegetation and lighting controls.</p> <p>Natural Hazards</p>
Construction impacts	<p>Embodied carbon emissions</p> <p>SD_1 and SD_3 were considered more preferable based on lane km and structure. SD_2 was least preferred based on lane km and structures.</p> <p>Construction impacts on infrastructure/utilities</p> <p>Limited differentiation between options. A number of overhead powerlines require localised protection or relocation.</p>

Criteria	Summary of performance
	<p>Construction disruption</p> <p>Majority of the work to be undertaken offline through the greenfield.</p> <p>Disruption to the local traffic is expected as the new intersection gets built, might require localised diversion route due to construction works</p> <p>Construction costs</p> <p>Similar road corridor both requiring road widening and construction of structures. SD_3 was the least preferred due to ground conditions (hazards) which would increase construction complexity and cost.</p>
Engagement	<p>Partners</p> <p>Key feedback from SMEs at workshops included:</p> <ul style="list-style-type: none"> • Consideration of the tie in with Burt Road. • Consideration of highly productive soils in the rural zone. <p>Manawhenua agree alignment should be north of pylons.</p> <p>Public</p> <p>Limited feedback was received for the South Drury Connection options during public engagement. Potential property impacts was raised. In particular, to working farms.</p>

5.2.4 Discarded Options

Table 5-9 summarises the reasons for discounting the options individually.

Table 5-9 Options to be discarded

Option	Reason
SD_1	SD_1 was discounted because it is not well integrated with future development as it is located within the rural zone, would result in odd shaped parcels of land outside the FUZ in the rural zone, and affected the greatest number of properties.
SD_3	SD_3 was discounted because as it would be likely to result in movement and place conflict in the future urban communities (as the corridor will be used by large number of vehicles travelling through the area) and provided less network resilience compared to the other two options. It also had the greatest effect on hydrology/stream erosion and presented difficult ground conditions (hazards) for design and construction.

5.2.5 Preferred Option

SD_2 is the preferred option as it provides a good interface at the urban edge of the FUZ and can assist in defining the rural urban boundary, has less impact on developable land, has less potential impacts on vegetation.

5.2.6 Preferred Option Refinement

Following the identification of a preferred route refinement option for Drury West (assessment in section 5.2.6) and South Drury Connection there was a further assessment undertaken to determine

the tie in between the two transport corridors. Figure 5-4 Error! Reference source not found. Error! Reference source not found. Error! Reference source not found.

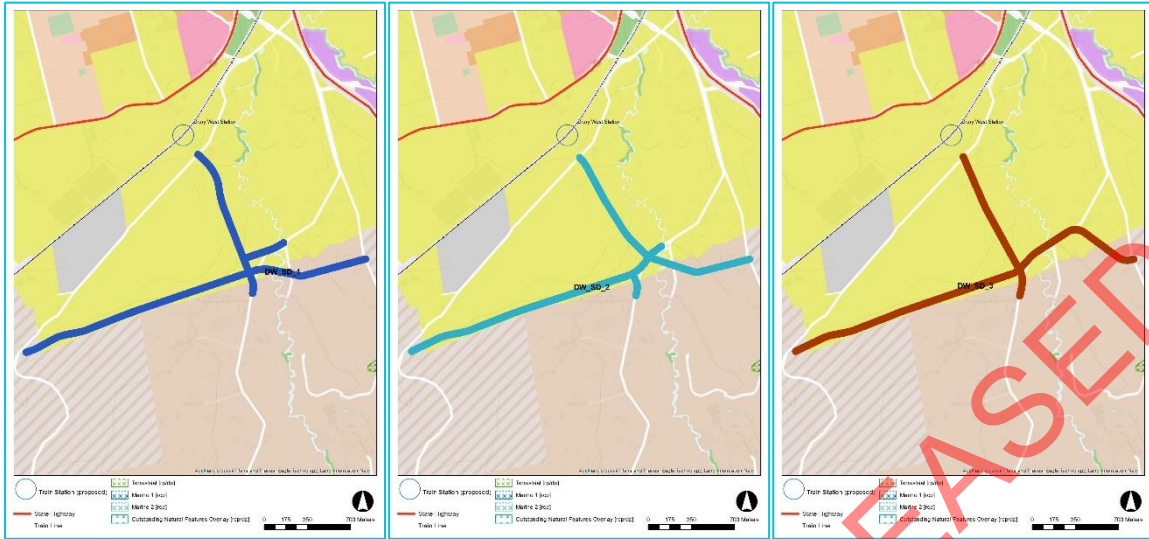


Figure 5-4 Summary of Drury West / South Drury Arterial options

Table 5-10 Description of tie in options for Drury West / South Drury Arterial

Tie In Option	Description / Reason
Drury West – South Drury Connection Option 1 (DW_SD_1)	Creates a new tie in with Runciman Road and a new intersection with the proposed Drury West connection and South Drury Connection.
Drury West – South Drury Connection Option 2 (DW_SD_2)	Creates a new four leg intersection with Runciman Road, Drury West, the proposed South Drury Connection and a new three-leg intersection with Runciman Road further to the south.
Drury West – South Drury Connection Option 3 (DW_SD_3)	Creates a new four leg intersection with Runciman Road, Drury West, the proposed South Drury Arterial and re-aligns Runciman Road to integrate with the Drury South Interchange.

Table 5-11 Drury West and South Drury tie in options MCA scoring

MCA Criteria	Scores		
Options	DW_SD_1	DW_SD_2	DW_SD_3
Investment objectives			
IO1 – Safety	1	1	0
IO2 – Integration	2	1	-1
IO3 - Access	2	1	1
IO4 – Resilience	3	2	1
IO5 – Travel Choice	3	2	1

Cultural			
Heritage	0	0	0
Social			
Land use futures / integration with planned landuse	2	2	1
Urban design	2	2	1
Land requirement / property	-3	-2	-2
Social cohesion	1	1	1
Human health and wellbeing	-1	-1	-1
Environment			
Landscape / visual			
Stormwater	-2	-2	-2
Ecology	-4	-4	-3
Natural hazards	-3	-3	-3
Construction impacts			
Embodied carbon emissions	-2	-2	-1
Construction impacts on utilities / infrastructure	-2	-2	-2
Construction Disruption	-2	-2	-2
Construction costs / risk / value capture	-3	-3	-2

Table 5-12 Drury West tie in option MCA key findings

Criteria	Summary of performance
Investment Objectives	<p>Safety</p> <p>DW_SD_1 and 2 scored the same, however, DW_SD_1 is preferred over the other options as it is more direct and separates local and regional trips better. DW_SD_3 scored less than the other two options due to the mix of local and strategic corridors, which makes it more difficult for active modes.</p> <p>Integration</p> <p>DW_SD_1 is preferred as it is on the FUZ boundary and provides good integration with strategic corridor not travelling through urban areas. DW_SD_2 and 3 is mostly on FUZ boundary but due to mixing local and strategic functions, scored lower.</p> <p>Access</p> <p>DW_SD_1 is preferred as there is more access opportunities for all modes. DW_SD_2 and 3 has reduced access due to the alignment.</p> <p>Resilience</p>

Criteria	Summary of performance
	<p>DW_SD_1 segregates local and strategic traffic improving resilience and therefore is preferred compared to DW_SD_2 and 3.</p> <p>Travel choice</p> <p>All options provide more travel choice for all road users, with the most travel choice being provided through DW_SD_1, which scored the highest out of the three options.</p>
Heritage	<p>No recorded heritage.</p>
Social	<p>Land use</p> <p>The corridor predominantly traverses the FUZ, however, does traverse the Rural Zone at the eastern end. DW_SD_1 and 2 scored the same. DW_SD_3 is less preferred as it is favourable to keep the route on the edge of the FUZ to maximise developable land.</p> <p>Urban design</p> <p>DW_SD_3 leaves an area of FUZ on the south side of the option in the eastern segment. DW_SD_1 and 2 scored the same and are therefore preferable as the corridor defines the edge of the FUZ.</p> <p>Land requirement</p> <p>DW_SD_1 is least preferable as it requires the greatest numbers of property acquisition (with potentially 9 full acquisitions and 10 partial). DW_SD_1 and 2 have a similar score with option 2 being marginally more preferable due to a lesser impact on two properties. Both DW_SD_1 and 2 require approximately 8 full acquisitions either 9 or 8 partial acquisitions respectively.</p> <p>Social cohesion</p> <p>All options were scored the same and they all provide access between two strategic corridors, improving access to employment and communities.</p> <p>Health and wellbeing</p> <p>All options have existing rural residential receivers and scored the same.</p>
Environmental	<p>Landscape and visual</p> <p>All options scored the same and include construction of new roading infrastructure within existing rural area (within the eastern portion of the alignment). This will result in the loss of small areas of vegetation. The northern part of the route is located within the Structure Plan area of anticipated future urban development (Industrial, THAB, MHS).</p> <p>All options avoid landscape overlays, however, there will be visual amenity effects to rural residential properties.</p> <p>Stormwater</p> <p>All options require 6 stream crossings, and significant floodplain filling. DW_SD_3 is preferred.</p> <p>Ecology</p> <p>DW_SD_1 and 2 will have high overall ecological impacts and are scored the same. DW_SD_3 will have moderate ecological impacts and therefore, is there preferred option.</p> <p>Natural Hazards</p> <p>All options are scored the same and entail construction on extensive deposits of variable (potentially soft) alluvium.</p>

Criteria	Summary of performance
Construction impacts	<p>Embodied carbon emissions</p> <p>DW_SD_3 reduces the overall construction of new road infrastructure and may not require construction of two new bridges as active modes bridge could be constructed instead. This is therefore the preferred option scoring higher than the other two options.</p> <p>Construction impacts on infrastructure/utilities</p> <p>DW_SD_1 and 2 cross the 1200 CS watermain at Runciman Road. All options interact with the Transpower line and are scored the same.</p> <p>Construction disruption</p> <p>For DW_SD_1 and 2, the majority of the work to be undertaken offline through the green field. For all options, disruption is likely with the build of the new intersection. This is likely to have an increased adverse effect for DW_SD_3.</p> <p>All options are scored the same.</p> <p>Construction costs</p> <p>DW_SD_3 is the preferred option reduces the overall construction of new road infrastructure. It may not require construction of two new bridges as active modes bridge could be constructed instead.</p>

5.2.7 Discarded Refined and Preferred Options

Error! Reference source not found. summarises the reasons for discounting the options individually.

Table 5-13 Options to be discarded

Option	Reason
DW_SD_2	Has the potential to create movement and place conflict as has some mix of local and strategic functions. Has impacts on access.
DW_SD_3	Provides less improvement in resilience. The mix between local and strategic functions will make it more difficult for active modes and movement and place conflict. This option leaves an area of FUZ on the south side of the proposed alignment reducing the available developable land.

The preferred option for the tie in was DW_SD_1. This option is located at the FUZ boundary providing better integration than the other tie in options. The option was considered likely to provide more access opportunities for all modes and improved resilience.

5.2.8 Preferred Option Summary


The emerging preferred option for South Drury Connection is SD_2 with the DW_SD_1 tie in. This provides a good interface at the urban edge of the FUZ and can assist in defining the rural urban boundary, has less impact on developable land, has less potential impacts on vegetation.

5.3 SH22 Connection Route Refinement

5.3.1 Form and Function

Following the methodology summarised in Section 3.4, a form and function assessment was undertaken. Table 5-14 provides a summary of the assumptions and outcomes of the assessment.

Table 5-14 SH22 Connection form and function assumptions and summary

Criteria	Summary
Purpose	Connects SH22 to the new north-south corridor. This connection improves travel options, with access to the strategic active modes corridor, crosses the NIMT, improves local access between Drury West and Paerata, provides an alternative to SH22 and direct connectivity to proposed Drury South Interchange at SH1.
Cross Section	 <p>24m cross section, 2 lane general traffic, walking and cycling on one side with integration with SH22</p>
Function	<p>P1 - Predominantly local function with a small catchment of users</p> <p>M1 - Low strategic network significance. Provides predominantly local access for people, goods and services</p>
Flows (ADT 2048)	10,000
Speed	60-85 kph speed limit
Public transport (indicative 2048)	N/A
Freight	Level 2/3

5.3.2 Option Development

Four options were developed for the SH22 Connection as shown in the figure below.

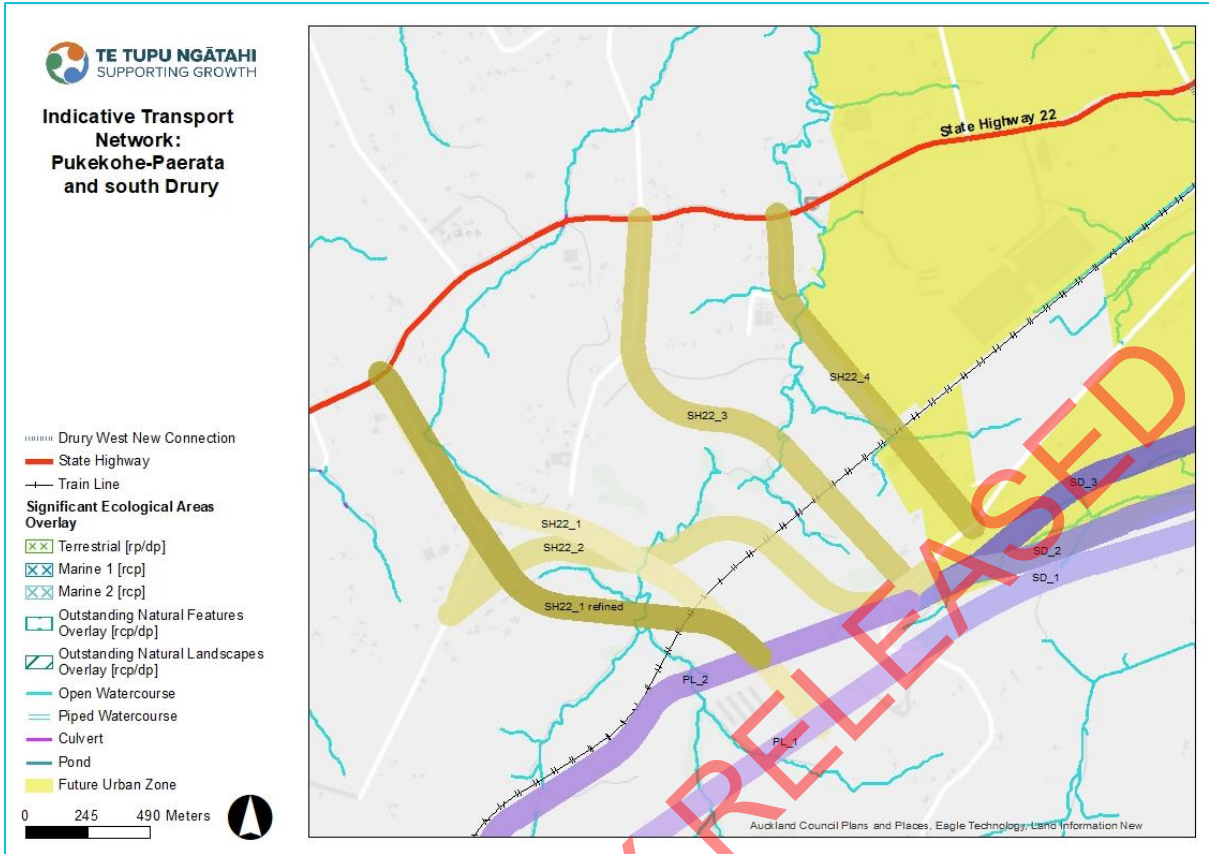


Figure 5-5 SH22 Connection Route Refinement options

5.3.3 Option Assessment

Options were assessed against the MCA framework by each subject matter expert.

Table 5-15 SH22 Route Refinement MCA scoring

MCA Criteria	Scores			
Options	SH22 Connection Option 1 (SH22_1)	SH22 Connection Option 2 (SH22_2)	SH22 Connection Option 3 (SH22_3)	SH22 Connection Option 4 (SH22_4)
Investment objectives				
IO1 – Safety	1	0	1	1
IO2 – Integration	2	1	1	1
IO3 - Access	2	1	1	1
IO4 – Resilience	3	2	1	1
IO5 – Travel Choice	2	1	1	1
Cultural				

Heritage	0	0	0	-2
Social				
Land use futures / integration with planned landuse	1	-1	-2	2
Urban design	-2	-2	-2	1
Land requirement / property	-2	-1	-1	-1
Social cohesion	2	1	1	1
Human health and wellbeing	0	0	0	-1
Environment				
Landscape / visual	-1	-2	-2	-2
Stormwater	-1	-2	-1	-1
Ecology	-4	-4	-4	-4
Natural hazards	-2	-2	-2	-3
Construction impacts				
Embodied carbon emissions	-2	-2	-2	-1
Construction impacts on utilities / infrastructure	-2	-3	-2	-2
Construction Disruption	-2	-2	-2	-2
Construction costs / risk / value capture	-2	-3	-2	-2

Table 5-16 SH22 route refinement assessment findings summary

Criteria	Summary of performance
Investment Objectives	<p>All options provide some benefits for integration, access, resilience and travel choice. However, SH22_1 provided better network wide integration with SH22, better balancing of movement and place and significant network-wide improvement in resilience compared to other options.</p> <p>SH22_2 and SH22_3 provide limited or no access improvements. SH22_4 provides limited integration and could create movement and place conflicts.</p>
Heritage	<p>No heritage recorded for SH22_1, SH22_2 and SH22_3.</p> <p>SH22_4 had the potential to impact Karaka Railway station and was the least preferred.</p>
Social	<p>Land use</p> <p>SH22_4 was the preferred option as it is located adjacent to / within the FUZ and includes the upgrade of existing roads.</p>

Criteria	Summary of performance
	<p>SH22_1 was not preferred as it was considered to provide access benefits for the existing Paerata Rise community by providing a better connection from the south at Sim Road, however, could encourage development outside the FUZ.</p> <p>SH22_2 was less preferred as it was predominantly within rural land and considered to have limited integration and would impact on highly productive soils.</p> <p>SH22_3 was considered the least preferred as it was also within rural land and resulted in less integration, impacts on highly productive soils and could result in development outside the FUZ.</p> <p>Urban design</p> <p>SH22_1, SH22_2 and SH22_3 were likely to change the character and amenity of the area and due to being in the rural zone were considered less likely to have the opportunity to respond to the corridor in the future.</p> <p>SH22_4 also had limited capacity for development to respond to change however, provided the opportunity for a defined edge for FUZ north of the railway.</p> <p>Land requirement</p> <p>SH22_4 was preferred as it impacts on the least number of properties but does require at least one full acquisition.</p> <p>SH22_1 was least preferred as it was likely to impact on the greatest number of properties.</p> <p>Social cohesion</p> <p>SH22_1 was the preferred option as it resulted in improved connection for Paerata Rise community and Karaka School. All other options result in improved access to Karaka School.</p> <p>Health and wellbeing</p> <p>SH22_4 was the least preferred due to its proximity to 485 Burt Road (catholic St Ignatius of Loyola Catholic College). Limited differentiation between other options with</p>
Environmental	<p>Landscape and visual</p> <p>SH22_1 was preferred as it has reduced stream crossings, follows natural topography and would minimise vegetation loss.</p> <p>SH22_2 would likely require the loss of established vegetation. SH22_3 would also require some vegetation loss including shelterbelts and blocks of trees affected adjacent to the stream. SH22_4 had vegetation loss anticipated along Woodlyn Drive and nearby streams.</p> <p>Stormwater</p> <p>SH22_3 was the preferred option as it also has a lower impact on hydrology and includes the use of existing roads.</p> <p>SH22_2 was the least preferred as it would have the greatest impact on hydrology, part of the alignment will directly fill a stream tributary and will require stream diversion.</p> <p>SH22_1 had a low impact on streams and a medium impact on hydrology and SH22_4 had the least impact on hydrology but would require some channel bank works to protect the crossing. Both these options were considered acceptable.</p> <p>Ecology</p>

Criteria	Summary of performance
	<p>SH22_4 was the preferred option due to its location (partially) within FUZ. It was recommended the alignment go east of Oira Creek, within FUZ, avoiding the need for a large bridge crossing.</p> <p>SH22_2 was the least preferred option due to significant direct habitat loss and fragmentation of key habitat corridors for bats and wetland birds.</p> <p>SH22_1 and SH22_3 largely avoided direct habitat impacts but fragmentation of key habitat corridors was still a concern. The magnitude of effects on existing environment was likely to be higher as outside the FUZ.</p> <p>Natural Hazards</p> <p>SH22_4 was the least preferred as the alignment along Woodlyn Road along valley margin will extend length over settlement-susceptible and possibly liquefiable alluvium (Q1a).</p> <p>For all other options the majority of the alignment is over terrain underlain by Takaanini (Puketoka) Formation soils with a sections near the Oira Creek over variable alluvium.</p>
Construction impacts	<p>Embodied carbon emissions</p> <p>SH22_4 was the preferred option based on lane km and large structures. All other options scored the same.</p> <p>Construction impacts on infrastructure/utilities</p> <p>SH22_2 was the least preferred due to the number of utilities which required localised protection or relocation. All options impacted some utilities including overhead powerlines.</p> <p>Construction disruption</p> <p>Limited differentiation between options. Disruption to current local traffic (temporary traffic management including lane narrowing) due to works on existing roads and crossing of rail line for all options.</p> <p>Construction costs</p> <p>SH22_2 was the least preferred due to the length of the road corridor and auxiliary works to Sim Road which would require road widening and construction of structures.</p> <p>All other options were similar and would require road widening and bridges.</p>
Engagement	<p>Partners</p> <p>Key feedback from SMEs during workshops was:</p> <ul style="list-style-type: none"> • Consideration of highly productive soils • Growth pressure around transport corridors in the rural zone <p>Ngāti Te Ata support the rationale whereby the connection is closer to Paerata Rise to capture traffic from the west to use the alternative connection to SH22. Manawhenua are also supportive of avoidance of SEAs, and designation being moved closer to existing infrastructure such as rail and pylons. Overall, supportive of proposal.</p> <p>Public</p> <p>Those that provided feedback on the State Highway 22 Connection during public engagement, wanted additional connections to support traffic to and from Karaka (to the north of the project area).</p>

5.3.4 Discarded Options

Table 5-17 summarises the reasons for discounting the options individually.

Table 5-17 SH22 Connection Options to be discarded

Option	Reason
SH22_2	SH22_2 was discounted as it is less integrated with existing or proposed development, provides a less direct connection, has increased impacts on ecological features including streams and wetlands.
SH22_3	SH22_3 was discounted as it provides limited access improvements, is less likely to take traffic off SH22 due to its location to the east and was least preferred in terms of flooding and ecology due to the earthworks in and around streams.
SH22_4	SH22_4 was discounted as it has the potential for movement place conflict being close to FUZ with the amount of through traffic using the connection, and has potential impacts on heritage item Karaka Railway station.

5.3.5 Preferred Option

Preferred option is SH22_1 with a refinement to move to the southwest close to the Paerata Rise development (SH22_1A).

SH22_1 (with design refinement SH22_1A) is recommended because it provides a direct and attractive connection between SH22 and south Drury and the Paerata to Drury link and provides accessibility benefits to the Paerata Rise development. SH22_1 generally follows the natural topography and has reduced stream crossings, minimal vegetation loss and reduced impacts on ecological features including streams and wetlands.

5.3.6 Preferred Option Refinement

Once the preferred SH22 Connection option was selected (SH22_1A) which utilises Sim Road, it was then investigated which side of the road to widen. The three options for widening were to widen to one side (east or west) or both sides (central). The assessment of the SH22 Connection Sim Road widening are set out Table 5-18. Commentary is provided in Table 5-19.

Table 5-18: Sim Road widening MCA scoring

MCA Criteria	Scores		
Options	SH22 - Sim Road widening SR_1 (west)	SH22 - Sim Road widening SR_2 (centre)	SH22 - Sim Road widening SR_3 (east)
Investment objectives			
IO1 – Safety	1	1	1
IO2 – Integration	2	2	2
IO3 - Access	2	2	2

IO4 – Resilience	3	3	3
IO5 – Travel Choice	2	2	2
Cultural			
Heritage	0	0	0
Social			
Land use futures / integration with planned landuse	1	1	1
Urban design	0	0	0
Land requirement / property	-1	-1	-1
Social cohesion	1	1	1
Human health and wellbeing	-1	-1	-1
Environment			
Landscape / visual	-1	-1	-1
Stormwater	-1	-1	-1
Ecology	-1	-1	-2
Natural hazards	0	0	0
Construction impacts			
Embodied carbon emissions	-1	-1	-1
Construction impacts on utilities / infrastructure	-1	-1	-1
Construction Disruption	-1	-1	-1
Construction costs / risk / value capture	-1	-1	-1

Table 5-19: Sim Road widening option MCA key findings

Criteria	Summary of performance –Sim Road widening options
Investment Objectives	<p>Safety</p> <p>All options scored the same and will reduce the likely future traffic on SH22 resulting in safety benefits.</p> <p>Integration</p> <p>All options scored the same and will provide better network wide integration with SH22 and better balancing movement and place.</p> <p>Access</p> <p>All options scored the same and will provide improved access between Paerata and Drury West FUZ. By mode significant improvement to freight and general traffic, a modest improvement in access for active modes.</p> <p>Resilience</p>

Criteria	Summary of performance –Sim Road widening options
	<p>All options scored the same and will provide significant network-wide improvement in resilience.</p> <p>Travel Choice</p> <p>All options scored the same and will provide significant improvement for general traffic and freight. The options will increase car mode share and reduce VKT.</p>
Heritage	No recorded heritage affected Sim Road widening options.
Social	<p>Land use</p> <p>SR_1, 2 and 3 are scored the same, as it is within the existing rural zone and there is a low likelihood of change in the future environment.</p> <p>Urban design</p> <p>SR_1, 2 and 3 are scored the same as they are outside of FUZ and will have impact on amenity and character of immediately adjacent sites.</p> <p>Land requirement</p> <p>SR_1, 2 and 3 are scored the same. Multiple acquisitions required, SR_1 (west) is the least preferred due to the potential impact on the existing dwellings. SR_2 (centre) is the most preferred due to least impact on the dwellings on either side of the road.</p> <p>Social cohesion</p> <p>SR_1, 2 and 3 all upgrade of existing road and are scored the same.</p> <p>Health and wellbeing</p> <p>Existing rural residential receivers for SR_1, 2 and 3, which all scored the same.</p>
Environmental	<p>Landscape and visual</p> <p>SR_1, 2 and 3 are all scored the same and follow existing Sim Road alignment. This will have visual amenity impacts on surrounding houses. There are no landscape related overlays impacted.</p> <p>Stormwater</p> <p>SR_1, 2 and 3 are all scored the same and follow the terrain ridge along Sim Road. There is only very limited local effects from widening on either side or centrally. New pavement will have local effects and can be mitigated.</p> <p>Ecology</p> <p>SR_1, 2 and 3 has impacts which are limited to mature vegetation, SR_2 is preferred. SR_3 is least preferred and there is potential impact on stream / riparian corridor east of Sim Road.</p> <p>Natural Hazards</p> <p>SR_1, 2 and 3 all scored the same as there are limited impacts on natural hazard.</p>
Construction impacts	<p>Embodied carbon emissions</p> <p>SR_1, 2 and 3 all scored the same as it is a standard road widening construction.</p> <p>Construction impacts on infrastructure/utilities</p> <p>SR_1, 2 and 3 all scored the same and will have low adverse effects existing local utilities network.</p> <p>Construction disruption</p>

Criteria	Summary of performance –Sim Road widening options
	<p>SR_1, 2 and 3 all scored the same and will have low adverse effects on disruption during construction as existing households are quite spaced from each other and future land use is rural.</p> <p>Construction costs</p> <p>SR_1, 2 and 3 will have low adverse effect as it is a standard road widening exercise, and all scored the same.</p>

5.3.7 Discarded Refined Options and Preferred Refined Options

Error! Reference source not found. summarises the reasons for discounting the options individually.

Table 5-20 Options to be discarded Sim Road Widening

Option	Reason
SR_1 (west)	This option has the highest property impacts and some limited impacts on vegetation.
SR_3 (east)	This option has the potential for the highest ecological effects.

For the widening of Sim Road, the preferred option is SR_2 to widen on both sides of the road (centre) to reduce impacts on ecological features to the west of the alignment while providing the best opportunity for integration. Through further design refinement, it is recommended to reduce impacts on existing dwellings where possible.

5.3.8 Preferred Option Summary


SH22_1 (with design refinement SH22_1A) is recommended because it provides a direct and attractive connection between SH22 and south Drury and the Paerata to Drury link and provides accessibility benefits to the Paerata Rise development. SH22_1 generally follows the natural topography and has reduced stream crossings, minimal vegetation loss and reduced impacts on ecological features including streams and wetlands. Widening on both sides (SR_2) of Sim Road is recommended to reduce impacts on ecological features with opportunities to reduce impacts on existing dwellings.

5.4 Drury-Paerata Link Route Refinement

5.4.1 Form and Function

Following the methodology summarised in Section 3.4, a form and function assessment was undertaken. **Error! Reference source not found.** provides a summary of the assumptions and outcomes of the assessment.

Table 5-21 Drury-Paerata Link form and function assumptions and summary

Criteria	Summary
Purpose	Improves the wider network connectivity, safety and resilience between Drury West and Pukekohe with a primary general traffic and freight function.
Cross Section	 <p>24m cross section, 2 lane general traffic, walking and cycling on one side</p>
Function	P1 - Predominantly local function with a small catchment of users M3 - High strategic significance with higher volume of users
Flows (ADT 2048)	20,000-23,000
Speed	80 kph speed limit
Public transport (indicative 2048)	N/A
Freight	Level 2

5.4.2 Option Development

Two options were developed for the Drury-Paerata Link route refinement assessment as shown in Figure 5-6.

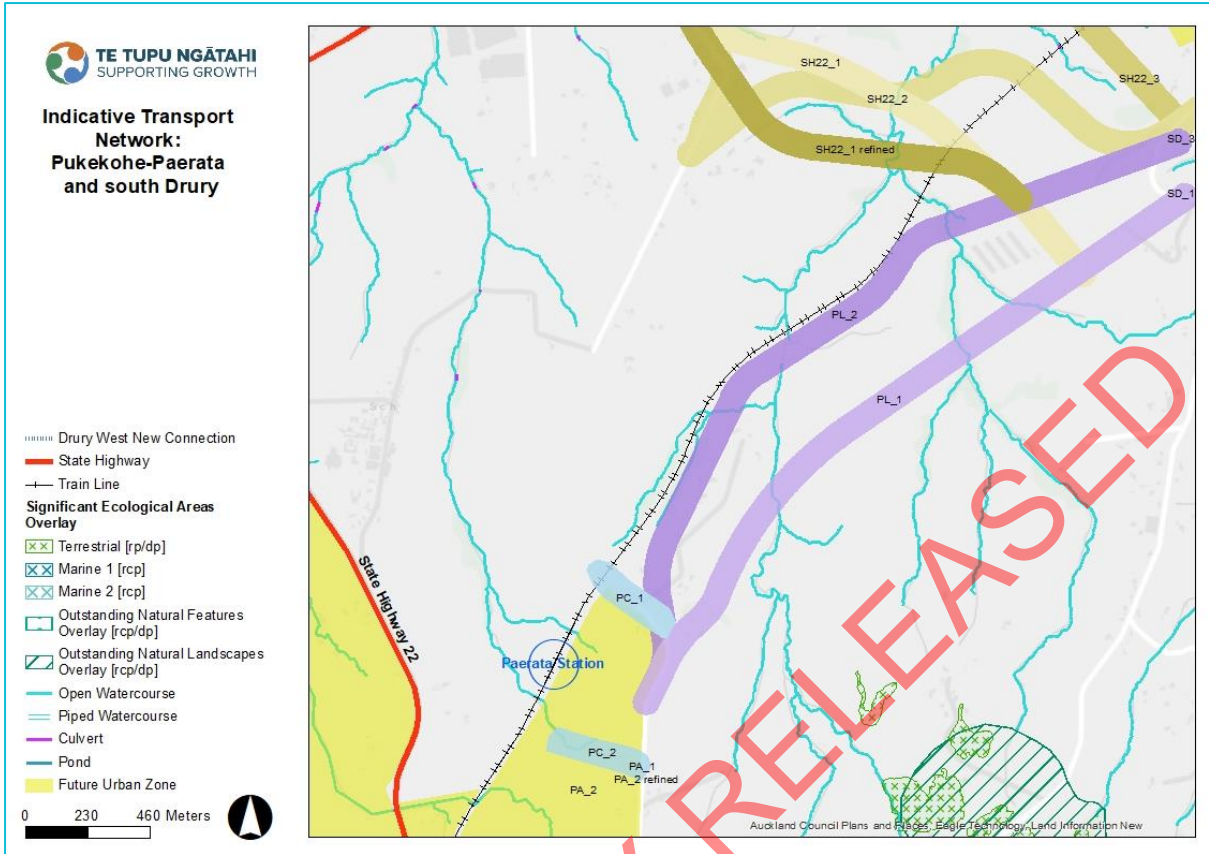


Figure 5-6 Summary of Drury Paerata Link options

5.4.3 Options Assessment

Two options were assessed against the MCA framework by each subject matter expert for the Drury-Paerata Link route options in **Error! Reference source not found.** with commentary provided in **Error! Reference source not found.**

Table 5-22 Drury Paerata Link Route Refinement MCA scoring

MCA Criteria	Scores	
	PL_1 South	PL_2 North
Options		
Investment objectives		
IO1 – Safety	2	2
IO2 – Integration	1	1
IO3 - Access	2	2
IO4 – Resilience	2	2
IO5 – Travel Choice	2	2
Cultural		
Heritage	0	0

Social		
Land use futures / integration with planned landuse	1	2
Urban design	-3	-2
Land requirement / property	-1	-2
Social cohesion	0	0
Human health and wellbeing	0	0
Environment		
Landscape / visual	-2	-2
Stormwater	-1	-1
Ecology	-4	-4
Natural hazards	-3	-2
Construction impacts		
Embodied carbon emissions	-1	-1
Construction impacts on utilities / infrastructure	-1	-1
Construction Disruption	-1	-1
Construction costs / risk / value capture	-2	-2

Table 5-23 Drury Paerata Link route refinement assessment findings summary

Criteria	Summary of performance
Investment Objectives	Both options were considered to improve access between Drury West and Paerata areas, although limited improvements for active mode access were identified. There were significant network-wide improvements in safety and resilience.
Heritage	No recorded heritage.
Social	<p>Land use</p> <p>Both options were considered to provide a new connection between Drury and Paerata FUZ and an interface with Paerata station. PL_2 was preferred as it follows the existing train line so does not have such an impact on the availability of developable land (albeit rural zoned).</p> <p>Urban design</p> <p>Both options were likely to result in impacts on the character and amenity of rural zoned land which is unable to respond to the new corridor. However, PL_2 was preferred as co-locating the new road with the NIMT corridor would reduce the impacts on character and amenity.</p> <p>Land requirement</p>

Criteria	Summary of performance
	<p>Both options impacted the same number of properties. PL_1 was likely to require only partial acquisitions and was slightly preferred.</p> <p>Social cohesion</p> <p>There was limited differentiation between options as the area is mostly rural with some small businesses. The design is for a two-lane arterial so it is unlikely there will be significant severance effects.</p> <p>Health and wellbeing</p> <p>While the alignment would introduce a new corridor no sensitive receivers were identified.</p>
Environmental	<p>Landscape and visual</p> <p>Both corridors were similar and require the loss of established vegetation present along the stream corridors and an established block of vegetation north of Sim Road. Visual amenity effects limited to rural residential properties within the localised setting of the route. However, a slight preference for PL_2 due to the potential to co-locate infrastructure.</p> <p>Stormwater</p> <p>PL_1 was preferred as it had a lesser impact on hydrology. PL_2 was less preferred due to the need to upgrade rail culverts and would have a greater impact on hydrology.</p> <p>Ecology</p> <p>Strong preference for PL_2 as the magnitude of effects on existing environment likely lower as associated with existing rail corridor.</p> <p>For PL_1 significant direct habitat loss and fragmentation of key habitat corridors for bats and wetland birds. Due to limited existing vegetation effects may be difficult to mitigate.</p> <p>Natural Hazards</p> <p>PL_2 preferred as crosses less of the volcanic deposits and is more closely aligned to topographic contours. PL_1 crosses areas of possible liquefaction, and the alignment may be transiting across several landslides.</p>
Construction impacts	<p>Embodied carbon emissions</p> <p>Options were considered likely to have similar embodied emissions profile.</p> <p>Construction impacts on infrastructure/utilities</p> <p>Both options similarly crosses utilities which required protection or relocation.</p> <p>Construction disruption</p> <p>Greenfield site so limited disruption. Options scored the same however for PL_2 coordination with Kiwi Rail will be required.</p> <p>Construction costs</p> <p>There was limited differentiation between options as they require road widening and new bridge structures. PL_2 is slightly shorter than PL_1.</p>
Engagement	<p>Partners</p> <p>Key feedback from SMEs during workshops included:</p> <ul style="list-style-type: none"> • Opportunities to tie in with the proposed regional active mode corridor (along NIMT).

Criteria	Summary of performance
	<ul style="list-style-type: none"> Leaving adequate clearance for rail crossings to allow for future four tracking and future regional active mode corridor. <p>During the 12 October 2022 Hui– Ngāti Te Ata Hui supported the Drury to Paerata Link alignment being closer to the rail corridor (Option PL_2).</p> <p>Public</p> <p>There was high level support from the wider community for improved connections for future generations.</p>

5.4.4 Discarded Options

Table 5-24 Options to be discarded summarises the reasons for discounting the options individually.

Table 5-24 Options to be discarded

Option	Reason
PL_1	PL_1 was discounted because it has greater potential ecological effects (on wetlands, streams, vegetation and habitat loss) and visual impacts could result in fragmentation the rural zoned land.

5.4.5 Preferred Option

PL_2 is preferred as co-locates transport and rail corridor, has reduced visual impact and less potential ecological effects on wetlands, streams, vegetation and habitat loss. It also has less fragmentation of rural land including productive soils.

5.4.6 Preferred Option Refinement

Following the identification of preferred options for the SH22 Connection, South Drury and Drury-Paerata Link, there was a further assessment to determine the tie ins. Three options for the tie ins were investigated as set out in Figure 5-7.



Figure 5-7 Summary of further SH22 Connection tie in options

Table 5-25 Description SH22 Connection tie in options

Option	Description / Reason
SH22_PL_1	Option 1 – Includes a new four leg intersection connection SH22 connection project, South Drury project and Drury-Paerata Link project and a realigned Burt Road. This option includes a major realignment of Burt Road.
SH22_PL_2	Option 2 – Includes a new four leg intersection connection SH22 connection project, South Drury project and Drury-Paerata Link project and a realigned Burt Road. This option includes a minor realignment of Burt Road.
SH22_PL_3	Option 3 – Includes two new intersections, one with the SH22 connection project to the Drury-Paerata Link project and other intersection is a four leg intersection includes Drury Paerata Link project, South Drury project and Burt Road. This option includes the minor realignment of Burt Road.

Table 5-26 SH22 Connection Route Refinement – Tie in MCA scoring

MCA Criteria	Scores		
	SH22 tie in		
Options	SH22 - Paerata Link Option 1 (SH22_PL_1)	SH22 - Paerata Link Option 2 (SH22_PL_2)	SH22 - Paerata Link Option 3 (SH22_PL_3)
Investment objectives			
IO1 – Safety	1	1	2
IO2 – Integration	2	2	2
IO3 - Access	1	1	2
IO4 – Resilience	1	1	2
IO5 – Travel Choice	2	2	2
Cultural			
Heritage	0	0	0
Social			
Land use futures / integration with planned landuse	1	1	1
Urban design	-1	-1	-1
Land requirement / property	-2	-2	-2
Social cohesion	1	1	1
Human health and wellbeing	-1	-1	-1
Environment			

Landscape / visual	-2	-2	-2
Stormwater	-1	-1	-1
Ecology	-3	-2	-3
Natural hazards	-2	-2	-2
Construction impacts			
Embodied carbon emissions	-2	-2	-1
Construction impacts on utilities / infrastructure	-2	-2	-2
Construction Disruption	-2	-2	-2
Construction costs / risk / value capture	-3	-3	-2

Table 5-27 SH22 Connection Route Refinement – Tie in Findings Summary

Criteria	Summary of performance:
Investment Objectives	<p>Safety SH22_PL 1 and 2 result in easier access to rural roads reducing safety. SH22_PL 3 is safer as it separates rural, local and strategic traffic, and therefore scored the highest.</p> <p>Integration SH22_PL 1, 2 and 3 all improve integration in the wider network with has limited differences between options. All options scored the same.</p> <p>Access SH22_PL 3 scored the highest with slightly better access improvement than SH22_PL 1 and 2.</p> <p>Resilience SH22_PL 3 scored the highest with slightly better resilience improvement than SH22_PL 1 and 2.</p> <p>Travel Choice SH22_PL 1,2 and 3 all scored the same with equal improvement to travel choice.</p>
Heritage	No recorded heritage affected by the tie in options.
Social	<p>Land use All options are within the rural zone where there is a low likelihood of change, except SH22_PL 3, which integrates with the FUZ. SH22_PL3 is therefore preferred.</p> <p>Urban design SH22_PL 1, 2 and 3 are scored the same all options are outside of FUZ, will have impact on amenity and character of immediately adjacent sites from earthworks</p> <p>Land requirement</p>

Criteria	Summary of performance:
	<p>SH22_PL 1, 2 and 3 are scored the same. SH22_PL 1 potentially requires one full acquisition and potentially one other property. It aligns with property boundaries which reduces impacts on property. SH22_PL 2 has similar impacts but avoids the full acquisition of one land parcel and is the preferred option. SH22_PL 3 has similar impacts to SH22_PL 1 but is least preferred due to the full acquisitions two properties.</p> <p>Social cohesion</p> <p>SH22_PL 1,2 and 3 all provide a new connection for Paerata Rise and are scored the same.</p> <p>Health and wellbeing</p> <p>No sensitive receivers for SH22_PL 1,2 and 3.</p>
Environmental	<p>Landscape and visual</p> <p>SH22_PL 1,2 and 3 are all scored the same and include the construction of new roading infrastructure within existing rural area, connecting with existing Sim and Burt Road. The here options avoid landscape related overlays but does not follow topography and crosses respective streams. All options will result in vegetation loss.</p> <p>Stormwater</p> <p>SH22_PL 1,2 and 3 are all scored the same and result in stream crossings.</p> <p>Ecology</p> <p>SH22_PL 1,2 and 3 will all impact streams and wetlands. SH22_PL 2 is scored higher than SH22_PL 1 and 3 and is therefore preferred as appears to minimise impacts on streams and wetlands.</p> <p>Natural Hazards</p> <p>SH22_PL 1,2 and 3 have scored the same and have similar ground conditions, but SH22_PL 1 is preferred due reduced earthworks.</p>
Construction impacts	<p>Embodied carbon emissions</p> <p>SH22_PL 1 and 2 are scored the same as the road corridor and bridge structure length is similar.</p> <p>Construction impacts on infrastructure/utilities</p> <p>SH22_PL 1,2 and 3 are all scored the same and require coordination with Transpower, as the options run under the Transpower line south of Runciman Road. Potentially more adverse effect (relocation of pylons) if vertical clearance insufficient.</p> <p>Construction disruption</p> <p>SH22_PL 1,2 and 3 have all scored the same and will result in disruption to current local traffic. There will also be disruption crossing the rail line.</p> <p>Construction costs</p> <p>Both options SH22_PL 1 and 2 require significant road extension of Burt Road. Road corridor and bridge length similar for these options. SH22_PL 3 is preferred despite challenging topography.</p>

5.4.7 Discarded Refined Options and Preferred Refined Options

Table 5-28 summarises the reasons for discounting the options individually.

Table 5-28 Options to be discarded

Option	Reason
SH22_PL_1	This option provides reduced access improvements and resilience. It also has higher construction costs as requires a significant extension of Burt Road. This has the greatest potential impacts on wetland.
SH22_PL_2	Similar to Option 1 this option provides reduced access improvements and resilience as well as higher construction costs due to the extension of Burt Road.

SH22_PL_3 was the preferred option for the tie in due to the better access improvements and greater improvements in resilience. SH22_PL_3 also had the least development within identified highly productive land.

5.4.8 Preferred Option Summary

PL_2 is preferred as co-locates transport and rail corridor, has reduced visual impact and less potential ecological effects on wetlands, streams, vegetation and habitat loss. It also has less fragmentation of rural land including productive soils.


SH22_PL_3 is the preferred option for the tie in due to the better access improvements and greater improvements in resilience. SH22_PL_3 also had the least development within identified highly productive land.

5.5 Paerata Arterial Route Refinement

5.5.1 Form and Function

Following the methodology summarised in Section 3.4, a form and function assessment was undertaken. Table 5-29 provides a summary of the assumptions and outcomes of the assessment.

Table 5-29 Paerata Arterial form and function assumptions and summary

Criteria	Summary
Purpose	Runs through the eastern edge of Paerata FUZ, increasing connectivity to Paerata station and town centre. The corridor is proposed as an urban arterial with connection to Paerata and Drury West in north and to Pukekohe local connections to the south.
Cross Section	 <p>24m cross section, 2 lane general traffic, walking and cycling on one side with integration with SH22</p>
Function	P2 - Attracts activity from across a subregion or neighbouring local board area

Criteria	Summary
	M3 - High strategic significance with higher volume of users
Flows (ADT 2048)	15,000 - 18,000
Speed	50 kph speed limit
Public transport (indicative 2048)	10-12 buses per hour Priority at intersections is required
Freight	Level 3

5.5.2 Option Development

Two options were developed for the Paerata Arterial route refinement assessment as shown Figure 5-8.

Figure 5-8

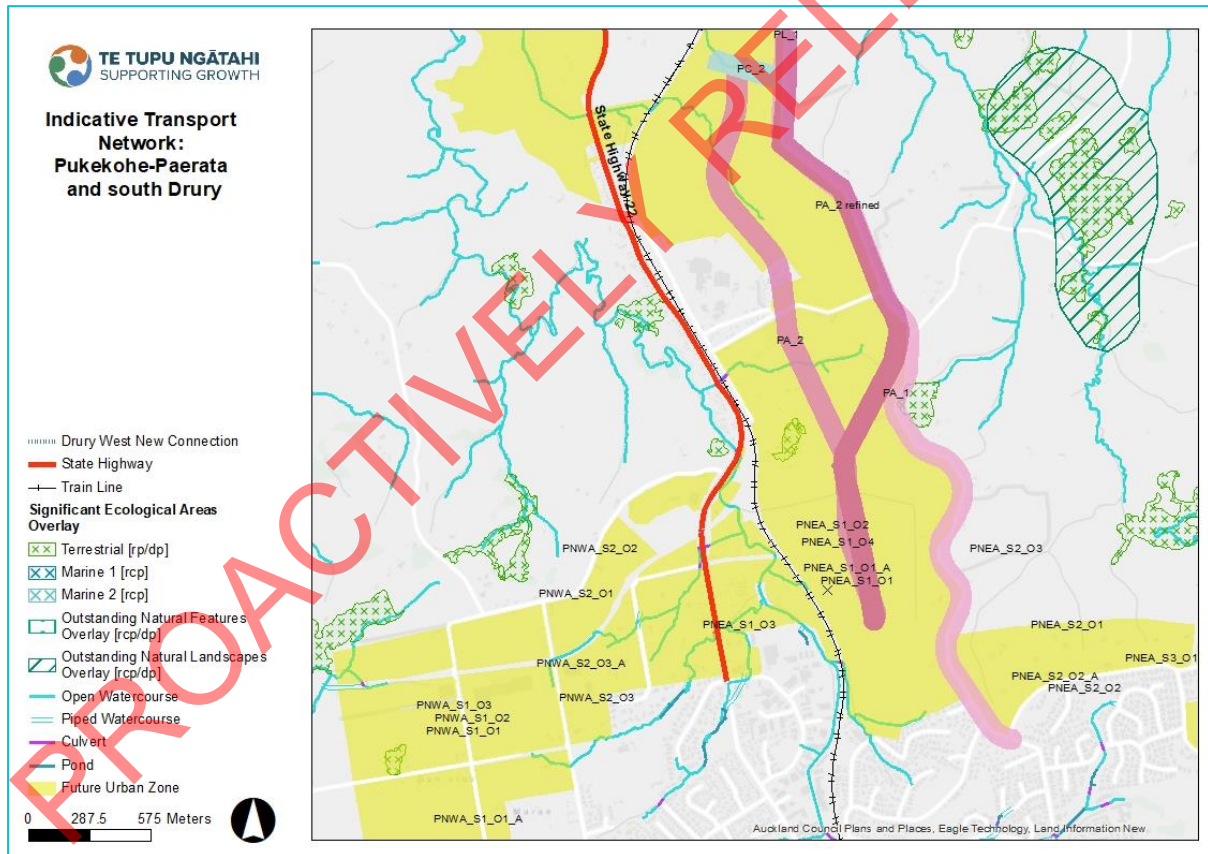


Figure 5-8 Summary of Paerata Arterial options

5.5.3 Option Assessment

Two options were assessed for the Paerata Arterial route refinement assessment against the MCA framework by each subject matter expert in Table 5-30. Commentary is provided in Table 5-31.

Table 5-30 Paerata Arterial Route Refinement MCA scoring

MCA Criteria	Scores	
	PA1	PA2
Options		
Investment objectives		
IO1 – Safety	3	2
IO2 – Integration	3	2
IO3 - Access	2	3
IO4 – Resilience	2	2
IO5 – Travel Choice	2	3
Cultural		
Heritage	0	-2
Social		
Land use futures / integration with planned landuse	1	2
Urban design	1	-3
Land requirement / property	-1	2
Social cohesion	0	0
Human health and wellbeing	0	2
Environment		
Landscape / visual	-2	-2
Stormwater	-1	-3
Ecology	-3	-3
Natural hazards	-2	-3
Construction impacts		
Embodied carbon emissions	-2	-1
Construction impacts on utilities / infrastructure	-2	-1
Construction Disruption	-3	-1
Construction costs / risk / value capture	-3	-2

Table 5-31 Paerata Arterial route refinement assessment findings summary

Criteria	Summary of performance
Investment Objectives	PA_1 was the preferred option as it minimises movement place conflicts in the urban environment and provides good integration between key destinations. This

Criteria	Summary of performance
	<p>alignment also improves resilience for general traffic and freight movements between Paerata and Pukekohe.</p> <p>PA_2 integrates with Paerata FUZ on both sides. However, has a higher movement place conflict due to the number of through movements using the corridor. The route will improve resilience in the local Paerata area. However, this is limited without upgrades on Cape Hill Road for better traffic and freight movements between Paerata and Pukekohe.</p>
Heritage	<p>PA1 was the preferred option as no recorded heritage. PA_2 had the potential to impact on Paerata Primary school building.</p>
Social	<p>Land use</p> <p>PA_1 is located with Paerata FUZ on one side and rural zoning on the other. The location of the route the outside of the FUZ allows higher vehicle movements to pass on the outside of future residential development. This alignment also maximises future development opportunity in the FUZ and overall is considered to be better integrated.</p> <p>PA_2 was less preferred as the route cuts through the FUZ resulting in less developable land and the potential earthworks required could reduce the area of FUZ available to develop.</p> <p>Urban design</p> <p>PA_1 was the preferred option and scored positively as it could be used to define the rural urban boundary and provides maximum development flexibility. Moreover, using the existing road corridor would limit impacts on the character and amenity of the surrounding area.</p> <p>PA_2 provides a connection through the middle of the FUZ, directly connecting to the Paerata Station in a legible manner. However, it would limit the opportunities for development of FUZ.</p> <p>Land requirement</p> <p>PA_2 was preferred as it had less impact on properties. However, this option would have a significant impact on several large rural blocks. The route may impact on the development potential of the FUZ zoned land.</p> <p>PA_1 potentially impacted a greater number of properties, however, there was an opportunity to use the existing road which could mitigate some acquisition.</p> <p>Social Cohesion</p> <p>PA_1 scored slightly higher as was likely to provide an alternative connection with existing light industrial area near Paerata centre.</p> <p>PA_2 is mostly rural with some small businesses. The design is for a two lane arterial it is unlikely there would be significant severance effects.</p> <p>Health and wellbeing</p> <p>Both options were considered to introduce a new corridor with limited sensitive receivers.</p>
Environmental	<p>Landscape and visual</p> <p>PA_1 was the preferred option as visual impacts were likely to be limited within the localised setting of the route with the potential to provide mitigation planting and sensitive design outcomes along Cape Hill Road.</p> <p>PA_2 was not preferred as runs through a block of established vegetation south of Tuhimata Road and an area for a proposed new suburban park (5ha-10ha) in the structure plan.</p>

Criteria	Summary of performance
	<p>Stormwater</p> <p>PA_1 was preferred as it follows the ridge and existing road, this option crosses no streams and uses existing pavement to the maximum extent, this option has minimal impact on stream hydrology, flooding or water quality. PA_2 is a new road crossing and impacts several small streams and number of smaller flow paths. The southern extent passes through floodplain and would generate flood effects that would need mitigation.</p> <p>Ecology</p> <p>Both options were likely to impact on bats. PA_1 was slightly preferred as while it had the potential to impact the east side of Cape Hill Road, where indigenous vegetation occurs in the SEA_T_4380 and other small fragments adjacent to the road it mostly avoids streams and wetlands.</p> <p>Natural Hazards</p> <p>PA_1 was preferred due to the terrain. Although the alignment is based on widening existing roads, the narrow Sim Road ridge could entail significant earthworks to accommodate the road width, especially on the east side where the ground falls away steeply.</p> <p>PA_2 crosses a mapped geological fault in this low-lying ground raises the prospect of liquefaction risk and the need to mitigate it.</p>
Construction impacts	<p>Embodied carbon emissions</p> <p>PA_2 was preferred based on the lane kilometres of road. However, PA_1 includes the opportunity to reuse material.</p> <p>Construction impacts on infrastructure/utilities</p> <p>Both options cross overhead powerlines and other utilities which would require local protection or relocation. PA_1 was least preferred as it also crosses the gas transmission line.</p> <p>Construction disruption</p> <p>PA_1 was least preferred as disruption to local traffic (temporary traffic management including lane narrowing and potentially requiring a temporary road as a diversion) on Sim Road, Cape Hill Road and Valley Road for 3.8km.</p> <p>PA_2 involves construction in greenfield area with limited receivers.</p> <p>Construction costs</p> <p>PA_2 was preferred as PA_1 is significantly longer and requires full reconstruction of the existing road to improve existing horizontal and vertical alignments.</p>
Partner and Public Feedback	<p>Partner</p> <p>Key feedback from SMEs at workshops included:</p> <ul style="list-style-type: none"> • A request for consideration of a new corridor to connect the extents of Sim to Sim (paper road) across the NIMT be included in the network. This would increase accessibility and provide an alternative crossing of the rail corridor which would relieve through movements past the Paerata Station. • Support for PA_2 as the arterial and a future collector delivered by developers being the spine for PT and active modes. <p>Public</p> <p>Limited feedback was provided on the Paerata Arterial in public engagement. However, from the feedback received, potential property impacts were a concern</p>

Criteria	Summary of performance
	on Sim Road (south) and Cape Hill Road and the potential effect on farms. There were also some concerns raised that a four-lane road is no longer proposed.

5.5.4 Discarded Option

PA_1 was discarded as it has a higher movement place conflict due to the number of through movements using the corridor. It would also require upgrades on Cape Hill Road for better traffic and freight movements between Paerata and Pukekohe.

5.5.5 Preferred Option

PA_2 (with a refinement) is preferred as it minimises movement place conflicts in the urban environment being located on the edge of the FUZ. It provides good integration between key destinations. This alignment also improves resilience for general traffic and freight movements between Paerata and Pukekohe. Through the assessment, a hybrid alignment was proposed which included the northern extent of PA_1 to use Sim/Cape Hill Road and then moving west to more closely align to PA_2 in the southern portion to avoid the SEA and steep topography.

Further considerations for design include:

- Minimise property effects (in particular at the southern end near Sim Road) and consider access for these properties
- Discuss opportunities for the AMC corridor with Auckland Transport KiwiRail
- Investigation of connections to the Paerata Rail Station and across the rail corridor to the Paerata Rise development. See next section.


5.6 Paerata Connections

5.6.1 Form and Function

Following the methodology summarised in Section 3.4, a form and function assessment was undertaken. Table 5-32 provides a summary of the assumptions and outcomes of the assessment.

Table 5-32 Paerata Connections form and function assumptions and summary

Criteria	Summary
Purpose	The Paerata Connections provide key connections to SH22, Sim Rd, Paerata station, Paerata Rise Development and centres. These two connections are the primary east-west connection for all modes and crossing over the railway (NIMT).
Cross Section	The indicative cross-section is 24m wide and includes two general vehicle lanes and active transport on both sides of the transport corridor. Both connections cross over the NIMT.

Criteria	Summary
	
Function	<p>M2 - Medium strategic network significance with increasing volume of users.</p> <p>P2 - Attracts activity from across a subregion or neighbouring local board area.</p>
Flows (ADT 2048)	3,200 – 3,500
Speed	50 kph speed limit
Public transport	8-12 buses per hour (priority at intersections)
Freight	Level 3 Freight Route - connecting to/between strategic freight areas where planning and design should consider the efficient movement of freight

5.6.2 Option Development

Two options were developed for each segment of the Paerata Connections, as shown in the Figure 5-9 below:

- Paerata Station Connection: PC_2A and 2B provide a connection between Sim Road (Paerata Arterial) and the Paerata Rail Station. PC_2B from Sim Road and interacts with facilities supporting the Paerata Rail Station.
- Sim Connection: PC_1A and 1B provide a connection over the railway (NIMT) between the Paerata Arterial to Sim Road (north). PC_1A follows the Sim Road paper road and PC_1B provides a new road connection.

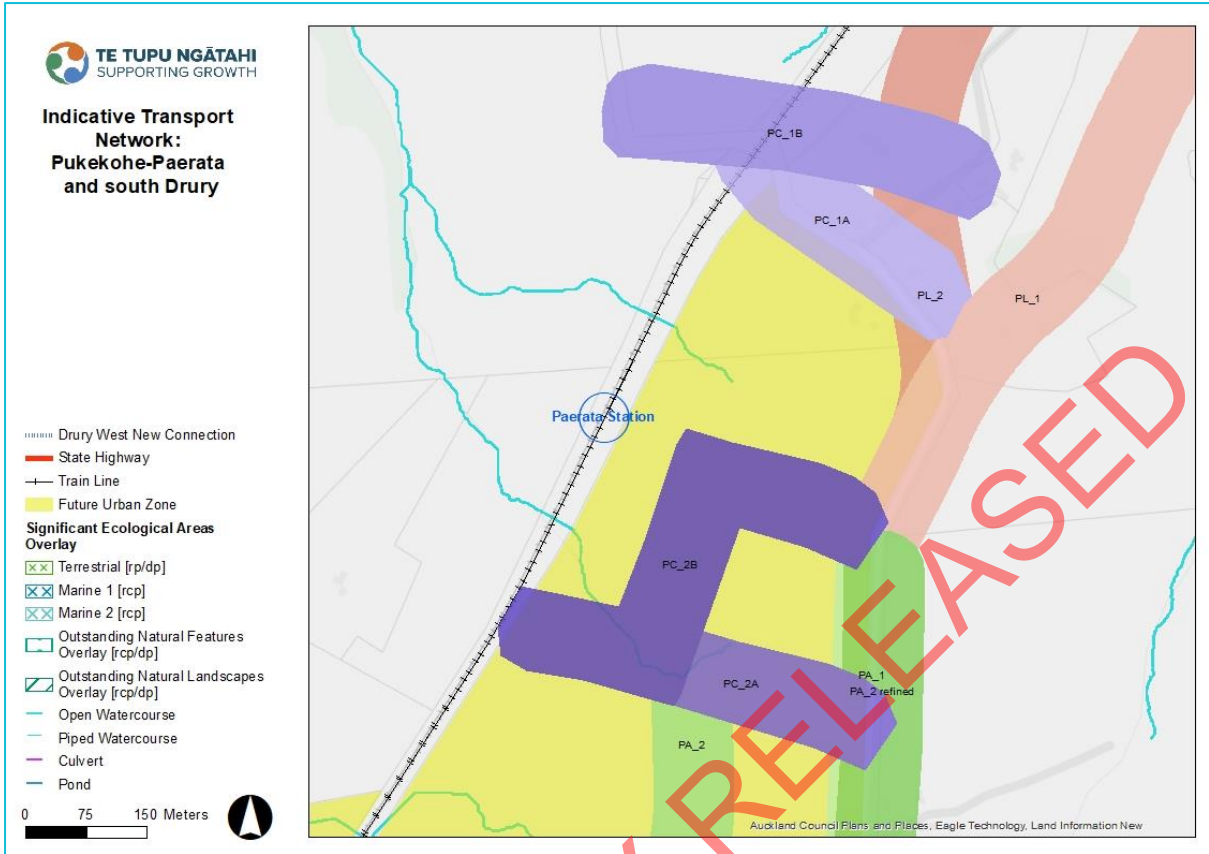


Figure 5-9 Summary of Paerata Connection options

5.6.3 Option Assessment

Two options were assessed for each of the Paerata Connections route refinement assessment against the MCA framework by each subject matter expert shown in Table 5-33. Commentary is provided in Table 5-34.

Table 5-33 Paerata Connections Route Refinement MCA scoring

MCA Criteria	Scores			
	Paerata Rail Station		Sim Connection	
	PC_2A	PC_2B	PC_1A	PC_1B
Investment objectives				
IO1 – Safety	2	2	2	2
IO2 – Integration	3	2	3	2
IO3 - Access	3	2	3	2
IO4 – Resilience	2	2	2	2
IO5 – Travel Choice	3	3	2	2
Cultural				

Heritage	0	0	0	0
Social				
Land use futures / integration with planned landuse	3	2	3	2
Urban design	3	2	3	1
Land requirement / property	-1	-1	-1	-2
Social cohesion	0	0	2	2
Human health and wellbeing	0	0	-1	-1
Environment				
Landscape / visual	-1	-1	-1	-1
Stormwater	-1	-1	-1	-1
Ecology	-3	-2	-3	-3
Natural hazards	-3	-3	-2	-2
Construction impacts				
Embodied carbon emissions	-1	-1	-2	-2
Construction impacts on utilities / infrastructure	-1	-1	-1	-1
Construction Disruption	-1	-1	-1	-1
Construction costs / risk / value capture	-2	-3	-2	-3

Table 5-34 Paerata Connections route refinement assessment findings summary

Criteria	Summary of performance – Paerata Rail Station Connection	Summary of performance – Sim Connection
Investment Objectives	<p>Safety</p> <p>PC_2A and PC_2B scored the same. However, 2A has a safer geometry being a straight connection.</p> <p>Integration</p> <p>PC_2A integrates better with the FUZ on both sides and with the Paerata Rail Station, compared with PC_2B, and therefore scored higher.</p> <p>Access</p> <p>PC_2A and 2B enable better localised access to opportunities on both sides, shorter, multi-modal access for buses and active modes connecting to Paerata rail station. PC_2B would require a slightly longer trip compared to PC_2A for</p>	<p>Safety</p> <p>PC_1A and 1B both result in shorter trips over the railway crossing and will improve overall safety of the network. Both options scored the same.</p> <p>Integration</p> <p>PC_1A and 1B provide network wide integration by better connecting communities which may be affected by rail severance. PC_1A is preferred as it runs closer to the FUZ boundary.</p> <p>Access</p> <p>PC_1A and 1B improve access within Paerata areas for all modes and provides better connectivity due to proximity to the FUZ. This is more so the case for PC_1A</p>

Criteria	Summary of performance – Paerata Rail Station Connection	Summary of performance – Sim Connection
	<p>both buses and active modes connecting to the Paerata Railway Station, hence why PC_2A is preferred.</p> <p>Resilience</p> <p>Both options provide improved resilience in the local Paerata area. Strategic traffic gets a shorter and more direct alignment.</p> <p>PC_2B will result in traffic accessing very close to the Paerata Station therefore reducing overall resilience resulting in PC_2A being a preferred choice.</p> <p>Travel Choice</p> <p>Both options are scored the same and provide significant improvement for all modes and will reduce VKT.</p>	<p>as it provides better connectivity, being located closer to the FUZ, hence why PC_1A scored higher.</p> <p>Resilience</p> <p>PC_1A and 1B scored the same. Both options provide improved resilience in the local Paerata area. Strategic traffic gets a shorter and more direct alignment</p> <p>Travel Choice</p> <p>Both options are scored the same and provide significant improvement for all modes and will reduce VKT.</p>
Heritage	No heritage recorded.	No heritage recorded.
Social	<p>Land use</p> <p>PC_2A and 2B provide for a transport corridor through FUZ land, which the Pukekohe Paerata Plan Structure Plan show planned to be THAB zone. PC_2B is slightly less integrated due to the dog leg in the road.</p> <p>Urban design</p> <p>PC_2A and 2B provide clear and direct connection over the NIMT corridor, connecting Paerata rise with the Paerata Station and the new area of FUZ providing for connected communities. PC_2A is preferred as the sTraight connection provides for development flexibility adjacent to the station location, compared to option2 which the weave in the route may reduce legibility.</p> <p>Land requirement</p> <p>PC_2A and PC_2B, scored the same as only one property is impacted for both options.</p> <p>Social Cohesion</p> <p>PC_2A and 2B have no existing urban areas.</p> <p>Health and wellbeing</p> <p>PC_2A and B introduce a new corridor and no existing sensitive receivers identified.</p>	<p>Land use</p> <p>PC_1A and 1B increase connectivity over the NIMT, past the Paerata Rail Station and connect directly to the Paerata Rise development, providing for integration with land use development. PC_1B has slightly reduced integration due to being located only within the rural zone and further away from the FUZ.</p> <p>Urban design</p> <p>PC_1B scored lower than PC_1A due to being located in the rural zone bringing changes to character of the area, where development is not expected to occur. PC_1A provides a direct and clear connection over the NIMT corridor, connecting Paerata Rise with the new area of FUZ providing for connected communities. The location of the corridor on the edge of the FUZ can assist in defining the urban boundary at the north of the FUZ.</p> <p>Land requirement</p> <p>PC_1B is less integrated with the FUZ, and solely within rural land, increasing property effects, resulting in the preferred option being PC_1A. PC_1B may also result in residual land in the rural zone.</p> <p>Social Cohesion</p> <p>PC_1A and 1B allow movements past the Paerata Rail Station and connect directly to the Paerata Rise development,</p>

Criteria	Summary of performance – Paerata Rail Station Connection	Summary of performance – Sim Connection
		<p>providing for integration with the development. Both options scored the same.</p> <p>Health and wellbeing</p> <p>PC_1A and 1B score the same as the corridor connects to Paerata Rise development. There is currently no development in this location. The development will be provided at phase 4 based on Paerata Rise master plan, resulting in some impacts. However, there is opportunity for construction of Paerata Connection at same time as urban development, resulting in less adverse effects than if urban environments were existing.</p>
Environmental	<p>Landscape and visual</p> <p>PC_2A and B propose a new road alignment through FUZ land, and the alignment appears to avoid all other landscape related overlays. There is limited visual amenity effects anticipated as the alignment spans through FUZ land. Both options scored the same.</p> <p>Stormwater</p> <p>Both options scored the same as neither option involve stream crossings. Options have minimal impact on stream hydrology, flooding or water quality.</p> <p>Ecology</p> <p>PC_2A and B are likely to avoid streams and wetlands. PC_2A may have an indirect impact on Puriri Forest, which is not the case for PC_2B. Therefore, PC_2B is slightly more preferred ecologically.</p> <p>Natural Hazards</p> <p>PC_2A and B involve the construction of a new corridor in rural greenfield for segment one. Most of the alignment will lie on undifferentiated tephra (Qut), which are likely to be weaker soils than the lithic tuff (Qst). PC_2B is slightly favourable option due to more investigation data near the proposed alignment (DH122 & DH129), however, both options scored the same.</p>	<p>Landscape and visual</p> <p>PC_1A and 1B scored the same. Both options may result in adverse visual amenity effects existing rural properties proximate to the alignment.</p> <p>Stormwater</p> <p>Both options scored the same as neither option involve stream crossings. Options have minimal impact on stream hydrology, flooding or water quality.</p> <p>Ecology</p> <p>PC_1A and 1B will have moderate ecological effects, due to impacts on mature exotic trees and portions of the scrub which are likely to be utilised by TAR bat and lizard species (i.e., long-tailed bats and copper skinks). Both options scored the same.</p> <p>Natural Hazards</p> <p>Both options scored the same with no available geotechnical information in the vicinity of the options. The options crossover three geologies: Lithic Tuff (Qst), Undifferentiated tephra (Qut) and Takaanini Formation (PPQt).</p>
Construction impacts	Embodied carbon emissions	Embodied carbon emissions

Criteria	Summary of performance – Paerata Rail Station Connection	Summary of performance – Sim Connection
	<p>PC_2A and B scored the same. PC_2A is shorter, and both options do not require bridging.</p> <p>Construction impacts</p> <p>PC_2A and B cross chorus comms, spark cable, FX network and overhead power at intersection with Sim Road. Both options scored the same.</p> <p>Construction disruption</p> <p>PC_2A and B are scored the same and are currently greenfield rural sites within the FUZ. The options may result in minor disruption on Sim Road.</p> <p>Construction costs</p> <p>PC_2A is the shortest option and therefore preferred, compared to PC_2B.</p>	<p>PC_1A and 1B scored the same. PC_1B is slightly shorter, and both options require bridging which increases embodied carbon emissions</p> <p>Construction impacts</p> <p>PC_1A and 1B scored the same. Services are overhead powerlines, chorus comms, FX network, Spark, and Vodafone.</p> <p>Construction disruption</p> <p>PC_1B will result in disruption to local traffic (temporary traffic management including lane narrowing) due to works on Sim Road for 0.4km. This is also the case for PC_1a, but to a lesser extent (0.15km).</p> <p>Construction costs</p> <p>PC_1A is preferred as the bridge crossing the rail at optimum angle (perpendicular to rail line) which will help minimise the bridge length and associated costs.</p>
Partner and Public Feedback	<p>Partner</p> <p>Option PC 1A and 1B directly respond to feedback from SMEs at workshops where a request was made for consideration of an additional corridor to connect the extents of Sim Road across the NIMT to assist in relieve through movements past the Paerata Station.</p>	

5.6.4 Discarded Option

For segment 1 (Paerata Rail Station Connection) option PC_2B was discarded as was a longer option resulting in slightly longer trips than PC_2A for both buses and active modes connecting to the Paerata Railway Station. Additionally, option PC_2B did not integrate as well with the FUZ on both sides and the Paerata Rail Station.

For segment 2 (Sim Connection), option PC_1B was discarded because it requires more complex bridge construction and is less integrated with the FUZ.

5.6.5 Preferred Option

PC_2A (Paerata Rail Station) is preferred as it is the most direct route to both the Paerata Rail Station and the Paerata Rise development and onwards to SH22, reducing travel time and providing a direct and legible connection. It also best integrates with the FUZ on both sides.

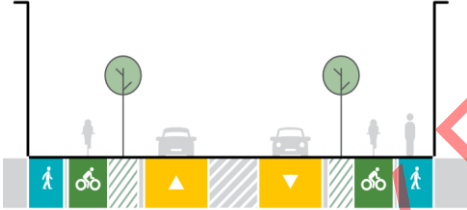
PC_1A (Sim Connection) is preferred as it provides good integration between key destinations, utilises a paper road, integrates better with the FUZ and has a less complex bridge construction.

5.7 Pukekohe North East Arterial Route Refinement

5.7.1 Form and Function

Following the methodology summarised in Section 3.4, a form and function assessment was undertaken. Table 5-35 **Error! Reference source not found.** provides a summary of the assumptions and outcomes of the assessment.

Table 5-35 Pukekohe Local – North-East form and function assumptions and summary

Criteria	Summary
	North East Arterial
Purpose	Arterial corridor from SH22 in the north-west to Pukekohe East Road in the south-east. Its primary function is for general traffic, freight, and active mode links between neighbourhoods and alleviating traffic on Cape Hill and Valley Road.
Cross Section	 <p>24m cross section, 2 lane general traffic, walking and cycling on both sides</p>
Function	P1 - Predominantly local function with a small catchment of users M2 - Medium strategic network significance with increasing volume of users
Flows (ADT 2048)	7,000-10,000
Speed	50 kph speed limit
Public transport (indicative 2048)	N/A
Freight	Level 2

5.7.2 Option Development

The North East Arterial was split into three segments for the route refinement assessment as shown in the figure below.

- Segment 1: three options between SH22 and Cape Hill Road
- Segment 2: two options between Cape Hill Road and the end of Grace James Road
- Segment 3: two options north south from the end of Grace James Road to Pukekohe East Road.

After public engagement and significant opposition to the route refinement options for the Pukekohe NE Arterial in particular, segment 2 option PNEA_S2_02 (upgrading Grace James Road) and

Segment 3 option PNEA_S3_01, further options were developed (PNEA_S1_04, PNEA_S2_03 and PNEA_03_03) and options re-tested with the new information obtained to inform the options assessment. All options are shown in Figure 5-10.

The new information included:

- Public feedback – opposition to the upgrade of Grace James Road from residents in the area and freight community.
- Additional transport modelling.
- Site visits by project team to further understand ecological features.

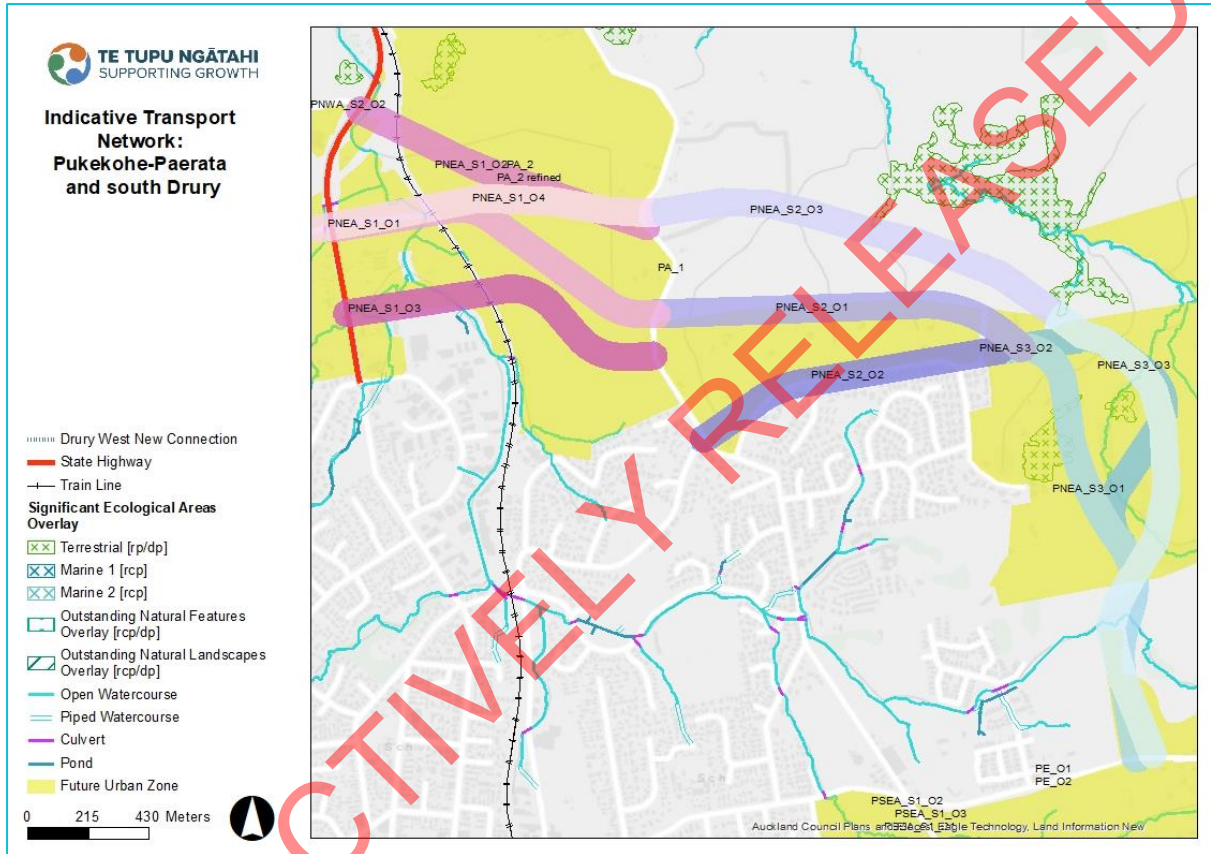


Figure 5-10 North East Arterial Route Refinement Options (three segments)

5.7.3 Option Assessment

The options were assessed against the MCA framework by each subject matter expert in Table 5-36. Commentary is provided in Table 5-37.

Table 5-36 Pukekohe Local – North-East Route Refinement MCA scoring

MCA										
Criteria	Scores									
Options	PNEA_S 1_01	PNEA_S 1_02	PNEA_S 1_03	PNEA_S 1_04	PNEA_S 2_01	PNEA_S 2_02	PNEA_S 2_03	PNEA_S 3_01	PNEA_S 3_02	PNEA_S 3_03
Investment										

objectives										
IO1 – Safety	1	1	1	1	1	1	1	1	1	1
IO2 – Integration	2	2	2	3	2	0	2	2	1	2
IO3 - Access	3	1	3	2	2	1	2	2	1	2
IO4 – Resilience	2	2	2	2	2	2	2	2	1	2
IO5 – Travel Choice	2	2	2	2	2	2	2	2	2	2
Cultural										
Heritage	0	0	0	0	0	0	0	0	0	0
Social										
Land use futures / integration with planned landuse	2	2	2	2	1	2	1	2	2	1
Urban design	0	1	0	1	0	-2	-2	-2	-3	-3
Land requirement / property	-1	-1	-1	-1	-2	-1	-1	-2	-1	-1
Social cohesion	0	0	0	0	0	0	0	0	0	0
Human health and wellbeing	0	0	0	-1	0	-1	-1	-1	-1	-1
Environment										
Landscape / visual	-1	-1	-2	-1	-4	-1	-4	-3	-3	-3

Stormwater	-2	-1	-2	-1	-2	-1	-2	-1	-1	-1
Ecology	-2	-4	-3	-2	-4	-2	-4	-4	-4	-4
Natural hazards	-4	-4	-4	-2	-2	-1	-3	-2	-2	-3
Construction impacts										
Embodied carbon emissions	-1	-2	-2	-1	-2	-1	-1	-1	-2	-1
Construction impacts on utilities / infrastructure	-3	-3	-2	-1	-1	-2	-1	-1	-1	-1
Construction Disruption	-1	-1	-1	-2	-1	-2	-2	-1	-1	-2
Construction costs / risk / value capture	-2	-2	-3	-2	-3	-2	-2	-2	-2	-2

Table 5-37 Pukekohe Local – North-East route refinement assessment findings summary

Criteria	Summary of performance		
	Segment 1	Segment 2	Segment 3
Investment Objectives	<p>PNEA_S1_O1 and PNEA_S1_O3 would both integrate well with urban environments, improve access and resilience for all modes and provides equal access opportunities on both sides.</p> <p>PNEA_S1_O4 was preferred as it was considered to provide better network integration is better for traffic from</p>	<p>PNEA_S2_O3 was the preferred option as the alignment outside the FUZ would likely reduce movement conflicts and provide better network integration for high traffic coming off Paerata Arterial. The alignment was also likely to facilitate direct east west connection from Pukekohe NW arterials.</p> <p>PNEA_S2_O1 would maximise the development</p>	<p>PNEA_S3_O1 and PNEA_S3_O3 were preferred as they better integrate with the urban/suburban development.</p> <p>PNEA_S3_O2 was not preferred as it is further from residential developments in the western end, will reduce the integration benefits. Moreover, the indirect alignment for active mode</p>

Criteria	Summary of performance		
	<p>Paerata Arterial and Pukekohe NW arterial.</p> <p>PNEA_S1_O2 was the least preferred as does not provide good access opportunities to a lot of existing and future developments.</p>	<p>potential of the FUZ and improves access and resilience for all modes.</p> <p>PNEA_S2_O2 was not preferred as it is very close to existing residential development, will increase movement place conflict in urban environments.</p>	<p>users, reduce access benefits.</p>
Heritage	No recorded heritage.	No recorded heritage.	No recorded heritage.
Social	<p>Land use</p> <p>There was limited differentiation between options as a new corridor which integrates with FUZ to the south east.</p> <p>Urban design</p> <p>PNEA_S1_O2 was the preferred option as it has the least earthworks and shortest bridge.</p> <p>PNEA_S1_O1 and PNEA_S1_O3 had slightly increased earthworks for bridge abutments.</p> <p>Land requirement</p> <p>PNEA_S1_O2 was least preferred as it impacts a number of properties.</p> <p>Social cohesion</p> <p>There was limited differentiation between options the design is for a two lane arterial it is unlikely there will be significant severance effects.</p> <p>Health and wellbeing</p> <p>Limited differentiation between options. Introducing new corridor within an area with a small number of sensitive receivers (rural residential)</p>	<p>Land use</p> <p>PNEA_S2_O2 was preferred as the upgrade to existing road, the corridor is contained within the FUZ / existing residential area. It will integrate the best with future development and limit the development of land outside the FUZ.</p> <p>Urban design</p> <p>PNEA_S2_O1 was the preferred option.</p> <p>PNEA_S2_O2 was not preferred due to the impact on the adjacent housing with earthworks encroaching on the front yards.</p> <p>Land requirement</p> <p>PNEA_S2_O2 was the preferred option. PNEA_S2_O1 and PNEA_S2_O3 would have more impact on rural land by not following existing route.</p> <p>Social cohesion</p> <p>There was limited differentiation between options, as the design is for a two lane arterial it is unlikely there will be significant severance effects.</p> <p>Health and wellbeing</p> <p>PNEA_S2_O1 and PNEA_S2_O3 were</p>	<p>Land use</p> <p>All options provide a new corridor primarily within the FUZ with some areas zoned rural. Both options interact with some private plan changes in the area.</p> <p>Urban design</p> <p>Due to topography, there are some larger areas of earthworks. PNEA_S3_O1 was preferred as it is the more direct alignment of the two.</p> <p>Land requirement</p> <p>PNEA_S3_O2 was the preferred option as reduced number of full acquisitions.</p> <p>Social cohesion</p> <p>There was limited differentiation between options and the design for a two lane arterial is unlikely to generate significant severance effects.</p> <p>Health and wellbeing</p> <p>Limited differentiation between options with effects on small number of rural residential receivers or all options.</p>

Criteria	Summary of performance		
		<p>preferred as there are limited sensitive receivers.</p> <p>PNEA_S2_O2 was not preferred as existing residential receivers on Grace James Drive. Look to minimise effects by widening on north side.</p>	
<p>Environmental</p>	<p>Landscape and visual</p> <p>PNEA_S1_O2 was the preferred option as would result in a limited extent of vegetation removal.</p> <p>PNEA_S1_O1 and PNEA_S1_O3 would affect large established trees along property boundaries.</p> <p>Stormwater</p> <p>PNEA_S1_O2 is the preferred option as it has minimal interaction with floodplain.</p> <p>PNEA_S1_O3 would also have minimal interaction with the floodplain.</p> <p>Ecology</p> <p>PNEA_S1_O1 is the preferred option as one stream crossing and bridge structure could avoid impacts to stream and riparian margin</p> <p>PNEA_S1_O2 and PNEA_S1_O3 were not preferred and have greater impacts on wetlands and streams.</p> <p>Natural Hazards</p> <p>There was limited differentiation between options. Complex ground conditions with some adverse consequences coincides with complex engineering requirement.</p>	<p>Landscape and visual</p> <p>PNEA_S2_O2 was the preferred option due to minimal vegetation removal and limited visual amenity effects to residential properties along the existing settlement edge.</p> <p>PNEA_S2_O1 was not preferred due to very complex topography. This option would require substantial alteration to this landform and landscape character.</p> <p>Stormwater</p> <p>PNEA_S2_O2 was the preferred option as the road follows the ridge and has no culverts or floodplain interaction. There were also reduced impacts to water quality and hydrology with his option.</p> <p>PNEA_S2_O1 was not preferred the new road will have the largest water quality and hydrology effects.</p> <p>Ecology</p> <p>All options have the potential to impact lizards. PNEA_S2_O2 was the preferred option as impacts on vegetation limited to planted indigenous vegetation, no new stream crossings (upgrading an existing corridor).</p> <p>PNEA_S2_O1 and PNEA_S2_O3 were considered likely to result in wetland and stream loss,</p>	<p>Landscape and visual</p> <p>PNEA_S3_O2 was the preferred option as it avoids impacts on an SEA.</p> <p>PNEA_S3_O1 was least preferred as it result in loss of established vegetation within an identified SEA and gullies and along property boundaries. The impact was considered likely to result in alteration to the landform and effects on landscape character.</p> <p>Stormwater</p> <p>PNEA_S3_O1 was the preferred option, and it would have the least impact on water quality and hydrology. PNEA_S3_O3 was similar to PNEA_S3_O1 but slightly longer which would have a higher impact on hydrology.</p> <p>Ecology</p> <p>PNEA_S3_O2 was the preferred option as better avoids higher value habitat, (SEAs and indigenous wetlands).</p> <p>PNEA_S3_O2 was not preferred as potentially significant wetland and stream loss and direct impact and fragmentation of SEA_T_4374.</p> <p>Natural Hazards</p> <p>There was limited differentiation between options. Terrain mostly underlain by volcanic soils bridge crossing over</p>

Criteria	Summary of performance		
	<p>with requirement for offset mitigation.</p> <p>Natural Hazards</p> <p>PNEA_S2_O2 was preferred as avoids stream and less earthworks required.</p>		
<p>Construction impacts</p>	<p>Embodied carbon emissions</p> <p>PNEA_S1_O1 was the preferred option.</p> <p>Construction impacts on infrastructure/utilities</p> <p>PNEA_S1_O3 was the preferred option. All options required localised protection of utilities (overhead powerlines). PNEA_S1_O1 and PNEA_S1_O2 were less preferred as also require relocation or protection of gas transmission line.</p> <p>Construction disruption</p> <p>There was limited differentiation between options. Currently all options are on greenfield in a rural area which would result in limited disruption. Coordination with Kiwirail required.</p> <p>Construction costs</p> <p>PNEA_S1_O1 and PNEA_S1_O2 both have a similar road corridor length requiring road widening.</p>	<p>Embodied carbon emissions</p> <p>PNEA_S2_O2 was the preferred option as it had less earthworks.</p> <p>Construction impacts on infrastructure/utilities</p> <p>PNEA_S2_O1 was preferred as less utilities requiring protection or relocation.</p> <p>PNEA_S2_O2 would require relocation services are underground power, chorus comms, watermain (100mmØ uPVC), and stormwater watercourses and pipes (up to 375mmØ).</p> <p>Construction disruption</p> <p>PNEA_S2_O1 was preferred as greenfield site. PNEA_S2_O2 not preferred due to disruption to local traffic (temporary traffic management including lane narrowing) due to works on Grace James Road</p> <p>Construction costs</p> <p>PNEA_S2_O2 was preferred as opportunity to use the existing road (and kerb on the north side).</p>	<p>Embodied carbon emissions</p> <p>There was limited differentiation between options. PNEA_S3_O1 was the preferred option as it had less earthworks.</p> <p>Construction impacts on infrastructure/utilities</p> <p>There was limited differentiation between options. Crossing of 630mmØ watermain (distribution) and overhead powerline at intersection of Pukekohe East Road</p> <p>Construction disruption</p> <p>There was limited differentiation between options. Currently greenfield site (but FUZ).</p> <p>Construction costs</p> <p>There was limited differentiation between options. Similar length of road widening. PNEA_S3_O3 was least preferred due to complex topography.</p>
<p>Partner and Public Feedback</p>	<p>Partner</p> <p>Key feedback during SME workshops included:</p> <ul style="list-style-type: none"> • Freight is a key consideration in Pukekohe • Consideration of how the collector network will connect with the NE Arterial • Grace James Road will change over time as the FUZ develops on the northern side. • Acknowledgement that the topography is challenging in this area. • Consideration of highly productive soils. <p>Key feedback from Manawhenua representatives in hui included:</p>		

Criteria	Summary of performance
	<ul style="list-style-type: none"> Opportunities for the restoration of the Whangapouri Creek. The water quality in the stream has degraded and its mauri has diminished; the whole catchment needs to be restored. During 19 December 2022 Hui, Ngāti Te Ata supported the recommended options for the Pukekohe NE Arterial in principal PNEA_S1_O4, PNEA_S2_O3, PNEA_S3_O3 subject to further technical assessments being undertaken which Ngāti Te Ata would like to be engaged on. <p>Public</p> <p>In general, there was support for the Pukekohe Arterials during public consultation. The sentiment from the community is that the arterials are needed to remove traffic and congestion from the centre of Pukekohe and provide an alternative route for users that will connect existing and new residential areas</p> <p>However, there was significant community opposition through feedback on options to the upgrade of Grace James Road (PNEA_S2_O2) which was shown in public engagement material) from local residents and freight community.</p>

5.7.4 Discarded Options

Table 5-38 summarises the reasons for discounting the options individually.

Table 5-38 Options to be discarded

Option	Reason
PNEA_S1_O1	Less integration compared with PNEA_S1_O4.
PNEA_S1_O2	discounted as it is more complex to construct with large bridge structure crossing the rail corridor with significant earthworks near a stream and crosses a gas pipeline.
PNEA_S1_O3	discounted because it is more complex to construct with two bridge structures crossing the rail corridor and stream with significant earthworks, and may impact on ecological features such as wetlands and bird habitat.
PNEA_S2_O1	discounted because of the impacts on ecological features such as wetlands, streams and vegetation, more complex construction due to topography and earthworks.
PNEA_S2_O2	Proximity to existing residential development, has the potential to increase movement place conflict in urban environments.
PNEA_S3_O1	Provides limited connectivity and greater impact on properties.
PNEA_S3_O2	It provides a less direct connection, is less integrated with likely future land use, affects a proposed (potential location) suburban park identified in the structure plan and requires greater earthworks.

5.7.5 Preferred Option

The preferred options for the Pukekohe North East Arterial are:

PNEA_S1_O4 – This option provides the best integration for existing urban areas and the provides better network integration from Paerata Arterial and Pukekohe NW Arterial. The alignment also

improves resilience and access for all modes. It has less of earthworks than other options, providing the opportunity for future development to establish an active interface to the corridor. It creates a direct east-west connection through the FUZ providing the most flexibility for future development.

PNEA_S2_O3 – This option provides better network integration for high traffic flows coming off Paerata Arterial and provides a direct east west connection from Pukekohe NW arterials to Pukekohe East Road.

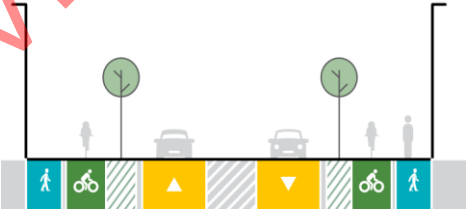
PNEA_S3_O3 - This option integrates better (than the other options) with the urban/suburban developments and provides more opportunities for access for all modes and improves the resilience for all modes. In particular, for the eastern portion of FUZ land (Runciman Road).

5.8 Pukekohe South East Route Refinement

5.8.1 Form and Function

Following the methodology summarised in Section 3.4, a form and function assessment was undertaken. Table 5-39 provides a summary of the assumptions and outcomes of the assessment.

Table 5-39 Pukekohe Local – South-East form and function assumptions and summary

Criteria	Summary
Purpose	Arterial corridor from Pukekohe East Road, Golding Road and a new section to connecting across the NIMT to existing Pukekohe urban area. It serves an east-west function for general traffic, PT and active modes increasing connectivity and access within the FUZ to existing urban Pukekohe.
Cross Section	 <p>24m cross section, 2 lane general traffic, walking and cycling on both sides</p>
Function	<p>P2 - Attracts activity from across a subregion or neighbouring local board area</p> <p>M3 -</p>
Flows (ADT 2048)	<p>With developer connections 12,000-14,000</p> <p>Without developer connections +20,000</p>
Speed	50 kph speed limit
Public transport (indicative 2048)	<p>8-10 buses per hour</p> <p>Priority lanes or priority at intersections required</p>
Freight	Level 1B

5.8.2 Option Development

The South East Arterial was split into three segments for route refinement assessment:

- Segment 1: three options to widen Golding Road – on one side (east or west) or both sides (central)
- Segment 2: three options east-west between Golding Road and the NIMT.
- Segment 3: crossing across the NIMT to the industrial area.

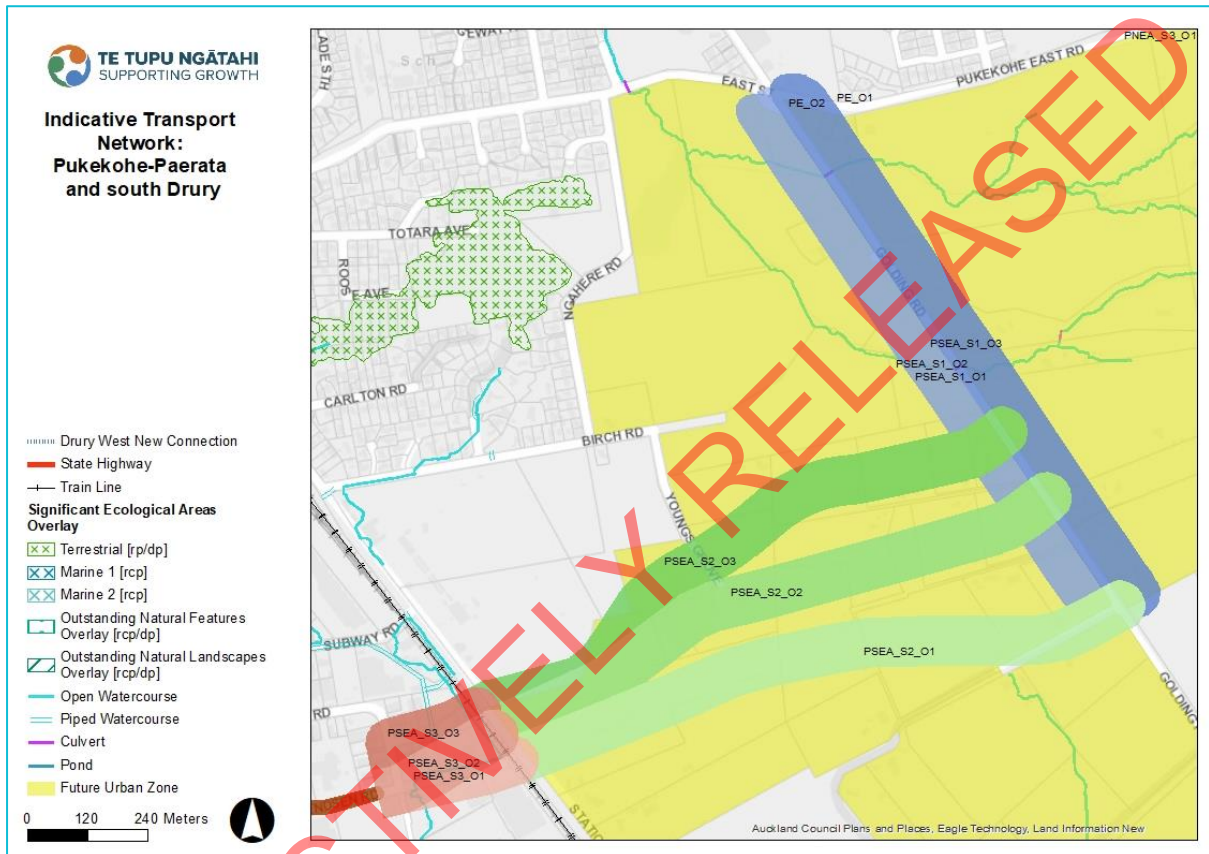


Figure 5-11 – Pukekohe South-East Arterial route refinement options (three segments)

5.8.3 Option Assessment

Options were assessed against the MCA framework by each subject matter expert in Table 5-40. Commentary is provided in Table 5-41.

Table 5-40 Pukekohe Local – South-East Route Refinement MCA scoring

MCA Criteria		Scores								
Options	PSEA_S1_O1	PSEA_S1_O2	PSEA_S1_O3	PSEA_S2_O1	PSEA_S2_O2	PSEA_S2_O3	PSEA_S3_O1	PSEA_S3_O2	PSEA_S3_O3	
Investment objectives										

IO1 – Safety	1	1	1	1	1	1	1	1	1
IO2 – Integration	2	2	2	2	2	2	2	2	1
IO3 - Access	2	2	2	2	2	2	2	2	1
IO4 – Resilience	2	2	2	2	2	2	2	2	2
IO5 – Travel Choice	2	2	2	2	2	2	2	2	2
Cultural									
Heritage	0	0	0	0	0	0	0	0	0
Social									
Land use futures / integration with planned landuse	3	2	2	2	3	2	1	1	1
Urban design	1	1	1	0	1	0	-1	-1	-1
Land requirement / property	-1	-1	-1	-1	-2	-2	-1	-2	-1
Social cohesion	0	0	0	1	2	2	1	2	2
Human health and wellbeing	-1	-1	-1	0	0	0	0	0	0
Environment									
Landscape / visual	-1	-2	-2	-1	-2	-2	-2	-2	-2
Stormwater	-1	-1	-2	-1	-2	-2	-2	-2	-1
Ecology	-1	-2	-2	-2	-3	-3	-3	-2	-1

Natural hazards	-2	-2	-1	-3	-2	-2	-2	-2	-2
Construction impacts									
Embodied carbon emissions	0	0	0	0	0	0	0	0	0
Construction impacts on utilities / infrastructure	-1	-1	-1	-1	-1	-1	-1	-1	-2
Construction Disruption	-2	-2	-2	-1	-1	-1	-3	-3	-3
Construction costs / risk / value capture	-2	-2	-2	-2	-2	-2	-2	-2	-2

Table 5-41 Pukekohe Local – South-East route refinement assessment findings summary

Criteria	Summary of performance		
	Segment 1	Segment 2	Segment 3
Investment Objectives	<p>All options would result in safety improvements from taking strategic traffic from Pukekohe East Road and Pukekohe town centre and significantly improve access and access Pukekohe Town Centre and rail station. There would be significant improvements in resilience around Pukekohe town centre and improvements in mode choice through FUZ areas.</p> <p>Limited differentiation in options.</p>	<p>All options will reduce pressure on existing local roads and improve safety. All options provide positive integration for both existing and future land use and significantly improve E-W access. With any of the new alignments there will be a significant improvement in resilience around Pukekohe town centre and improved mode choice particularly through FUZ areas.</p> <p>Limited differentiation in options.</p>	<p>All options will reduce pressure on existing local roads and improve safety. All options provide positive integration for both existing and future land use and significantly improve E-W access. With any of the new alignments there will be a significant improvement in resilience around Pukekohe town centre and improved mode choice particularly through FUZ areas.</p> <p>Limited differentiation in options.</p>
Heritage	No recorded heritage.	No recorded heritage.	No recorded heritage.

Criteria	Summary of performance		
Social	<p>Land use</p> <p>Proposed plan changes on both sides (Birch Land Development Consultants on western side and Traffic Planning Consultants Limited on eastern side). PSEA_S1_O1 (central option) was preferred as it provided better integration opportunities.</p> <p>Urban design</p> <p>Limited differentiation between options. Minimal impact on the character and amenity of the surrounding environment. FUZ on either side will have opportunity to respond to the corridor.</p> <p>Land requirement</p> <p>Limited differentiation between options. Acquisition impact shared by all property owners along the route.</p> <p>Social cohesion</p> <p>Limited differentiation all options upgrade to Golding Road to support improved links between Golding Road and existing industrial development in Pukekohe.</p> <p>Health and wellbeing</p> <p>Limited differentiation between options. Existing corridor limited sensitive receivers identified generally rural land.</p>	<p>Land use</p> <p>PSEA_S2_O2 was the preferred option as a new corridor well integrated with FUZ.</p> <p>PSEA_S2_O1 was not preferred as it interacts with Birch Land Development proposal to the south.</p> <p>PSEA_S2_O3 was not preferred as it interacts with showgrounds special use zoning to the north.</p> <p>Urban design</p> <p>PSEA_S2_O2 was the preferred option as it provides more flexible future development environment and an opportunity to transition the interface with Pukekohe Showgrounds.</p> <p>PSEA_S2_O1 was the least preferred as it leaves a small pocket of industrial land of an awkward shape.</p> <p>Land requirement</p> <p>PSEA_S2_O1 was the preferred option as it had the least number of property acquisitions.</p> <p>Social cohesion</p> <p>PSEA_S2_O1 was the least preferred as it was limited in providing a link between Golding Road and industrial development in Pukekohe.</p> <p>Health and wellbeing</p> <p>Limited differentiation between options. Existing corridor limited sensitive receivers identified generally rural land.</p>	<p>Land use</p> <p>There was limited differentiation between options. While these options would provide a connection from FUZ to the industrial area the existing development limits opportunities for integration.</p> <p>Urban design</p> <p>There was limited differentiation between options, however PSEA_S3_O3 was least preferred as there were more intersections to navigate e.g. active modes.</p> <p>Land requirement</p> <p>PSEA_S3_O1 was not preferred due to concerns over proximity to the Mitre 10 receiving yard and the impact that the bridge over the railway line will have. PSEA_S3_O2 and PSEA_S3_O3 would have a similar impact on properties.</p> <p>Social cohesion</p> <p>PSEA_S3_O1 was the least preferred as it would impact existing industrial development. Impacts to Mitre 10 complex located on the southern boundary of the culvert including loading and servicing.</p> <p>PSEA_S3_O2 and PSEA_S3_O3 would have a similar impact on existing development.</p> <p>Health and wellbeing</p> <p>Limited differentiation between options. Existing corridor limited sensitive receivers identified generally rural land.</p>
Environmental	Landscape and visual	Landscape and visual	Landscape and visual

Criteria	Summary of performance		
	<p>Visual amenity effects limited to properties located along the Golding Road corridor. PSEA_S1_O1 was preferred as road widening along both sides of the road will limit overall loss of amenity.</p> <p>Stormwater</p> <p>PSEA_S1_O2 was the preferred option as downstream widening will have the least effect on flooding. However, two existing culverts were likely to need lengthening and negligible floodplain effects from earthworks were predicted.</p> <p>Ecology</p> <p>PSEA_S1_O1 was the preferred option as it avoids mature indigenous trees along eastern side.</p> <p>PSEA_S1_O3 was the least preferred due to impact on mature indigenous vegetation / trees.</p> <p>Natural Hazards</p> <p>PSEA_S1_O3 preferred as stays away from volcanic explosive centre.</p> <p>PSEA_S1_O1 was the least preferred as crosses settlement-susceptible or liquefiable soils.</p>	<p>PSEA_S2_O2 was located on more complex topography which includes a localised knoll and rising landform. PSEA_S2_O3 was also not preferred as it spans through a number of existing house sites.</p> <p>PSEA_S2_O1 was the preferred option as it avoids stream corridors and visual amenity effects limited to within the localised setting of the route.</p> <p>Stormwater</p> <p>PSEA_S2_O1 was preferred as it has a low impact on floodplains and streams.</p> <p>Ecology</p> <p>PSEA_S2_O1 was the preferred option and would likely result in minor impacts as it is within a highly disturbed landscape.</p> <p>PSEA_S2_O2 and PSEA_S2_O3 were not preferred due to impacts on a stand of mature indigenous forest and potential for species including lizards and bats.</p> <p>Natural Hazards</p> <p>There was limited differentiation between options. Part of alignment located on Q1df alluvial fan deposits variable and potentially adverse soils.</p>	<p>PSEA_S3_O3 was the preferred option as minimal vegetation loss is anticipated. PSEA_S3_O1 and PSEA_S3_O2 were not preferred due to the loss of a daylighted stream corridor. However, it was noted there would be limited visual amenity effects due to the existing urban (industrial) environment.</p> <p>Stormwater</p> <p>PSEA_S3_O3 was the preferred option as downstream widening will have the least effect on flooding. PSEA_S3_O2 was the least preferred as upstream widening will have the largest effect on flooding with the largest floodplain effects from earthworks. PSEA_S3_O1 was also not preferred as it would have a moderate effect on flooding and would require the removal of the artificial channel.</p> <p>Ecology</p> <p>PSEA_S3_O3 was the preferred option as it avoids streams and wetlands. PSEA_S3_O1 and PSEA_S3_O2 were not preferred due to impacts within riparian margin / and stormwater runoff channel.</p> <p>Natural Hazards</p> <p>There was limited differentiation between options. Part of alignment located on Q1df alluvial fan deposits variable and potentially adverse soils.</p>
<p>Construction impacts</p>	<p>Embodied carbon emissions</p> <p>Limited differentiation between options.</p> <p>Construction impacts on infrastructure/utilities</p>	<p>Embodied carbon emissions</p> <p>Limited differentiation between options.</p> <p>Construction impacts on infrastructure/utilities</p>	<p>Embodied carbon emissions</p> <p>Limited differentiation between options.</p> <p>Construction impacts on infrastructure/utilities</p>

Criteria	Summary of performance		
	<p>All options were similar with a number of services requiring protection or relocation.</p> <p>Construction disruption</p> <p>Disruption to local traffic (temporary traffic management including lane narrowing) due to works on Golding Road.</p> <p>Construction costs</p> <p>All options have the same length and involve road widening and were scored the same.</p>	<p>All options were similar and crossed local power at isolated locations only and crosses rail line and local roads.</p> <p>Construction disruption</p> <p>There was limited differentiation between options. All alignments cross the rail line at Station Road. Co-ordination with KiwiRail is required to minimise disruption.</p> <p>Construction costs</p> <p>All options have a similar length requiring road widening.</p>	<p>PSEA_S3_O3 was the least preferred as the protection or relocation of more local services would be required compared to Option 1 and 2 due to running through Austen Place.</p> <p>Construction disruption</p> <p>There was limited differentiation between options. All alignments cross the rail line at Station Road. Co-ordination with KiwiRail is required to minimise disruption.</p> <p>Construction costs</p> <p>All options have a similar length requiring road widening.</p>
Engagement	<p>Partner</p> <ul style="list-style-type: none"> • Key feedback from SME workshops included: • Interaction with a number of private plan changes • Golding Road is a key connection to Waikato • Discussion on freight movement • Support for increased accessibility over the NIMT <p>Manawhenua support upgrade of Golding Road.</p> <p>Public</p> <p>In general, there was support for the Pukekohe Arterials during public consultation. The sentiment from the community is that the arterials are needed to remove traffic and congestion from the centre of Pukekohe and provide an alternative route for users that will connect existing and new residential areas.</p> <p>There was a request to look at options further south (in Waikato) to connect further east on Mill Road. In particular, for freight movements.</p>		

5.8.4 Discarded Options

Table 5-42 summarises the reasons for discounting the options individually.

Table 5-42 Options to be discarded

Option	Reason
PSEA_S1_O2	reduced integration opportunities with planned and future development
PSEA_S1_O3	reduced integration opportunities with planned and future development, had the greatest effect on the floodplain and on mature and native vegetation

Option	Reason
PSEA_S2_O1	likely to impact on proposed urban development due to topography on Golding Road intersection and Pukekohe Showgrounds
PSEA_S2_O3	affects a greater number of properties, may impact the Pukekohe Showgrounds and impacts on a stand of mature indigenous forest
PSEA_S3_O1	Significant property impacts including on a large commercial centre including the access
PSEA_S3_O3	results in a less direct connection including more intersections to navigate particularly for active modes, and requires additional existing services to be relocated adding to construction cost

5.8.5 Preferred Option

The preferred options for Pukekohe SE Arterial are:

Segment 1 - PSEA_S1_O1 was the preferred option (widening on both sides) as it is better integrated with future development, shares property impacts equally, reduced impacts on mature and native vegetation.

Segment 2 – PSEA_S2_O1 (southern) was preferred as better integrates with future development, affects the least number of properties, does not require any stream crossings.

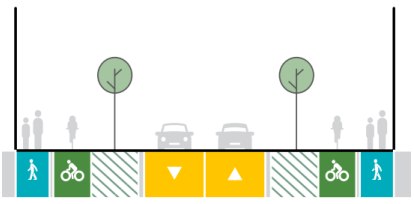
Segment 3 – PSEA_S3_O2 was preferred because it provides a direct connection and reduces impacts on large commercial centre including the access.

5.9 Pukekohe South West Route Refinement

5.9.1 Form and Function

Following the methodology summarised in Section 3.4, a form and function assessment was undertaken. Table 5-43 provides a summary of the assumptions and outcomes of the assessment.

Table 5-43 Pukekohe Local – South-West form and function assumptions and summary

Criteria	Summary
Purpose	Arterial corridor from Manukau Road in the east to Helvetia Road west in Pukekohe. It is a primary east-west road which helps in detracting general traffic and freight away from the town centre. Its primary function is for general traffic, freight and a focus on increasing active mode connectivity.
Cross Section	 <p>20m cross section, two general vehicle lanes, active modes.</p>

Criteria	Summary
Function	P2 - Attracts activity from across a subregion or neighbouring local board area M2 - Medium strategic network significance with increasing volume of users
Flows (ADT 2048)	8,000-14,000
Speed	50 kph speed limit
Public transport (indicative 2048)	12 buses per hour
Freight	Level 2

5.9.2 Option Development

Following the identification of a preferred route for the South West Arterial at the corridor assessment stage (see Section 4.5.5) there was a further assessment to determine the upgrade of existing roads reflecting the existing urban environment.

Due to the spatial constraints along this corridor, as it is completely within the existing built up urban area of Pukekohe, options were developed to utilise the existing road reserve and had a bespoke options assessment process.

The options developed included:

- A 20m cross-section with active modes on both sides of the road. Three options were developed:
 - Option 1: a 6.8m uni directional cycle facility on each side
 - Option 2: a 6.5m uni directional cycle facility on each side
 - Option 3: a 5.25m uni directional cycle facility on each side
- Two-way cycleway on northern / eastern side only (3.2m cycleway on one side, 1.8m walking facility and 1.2m berm on each side) – Option 4.
- Two-way cycleway on southern / western side only (3.2m cycleway on one side, 1.8m walking facility and 1.2m berm on each side) – Option 5.

The South West Arterial alignment was separated into three sections for assessment purposes as shown in Figure 5-12.

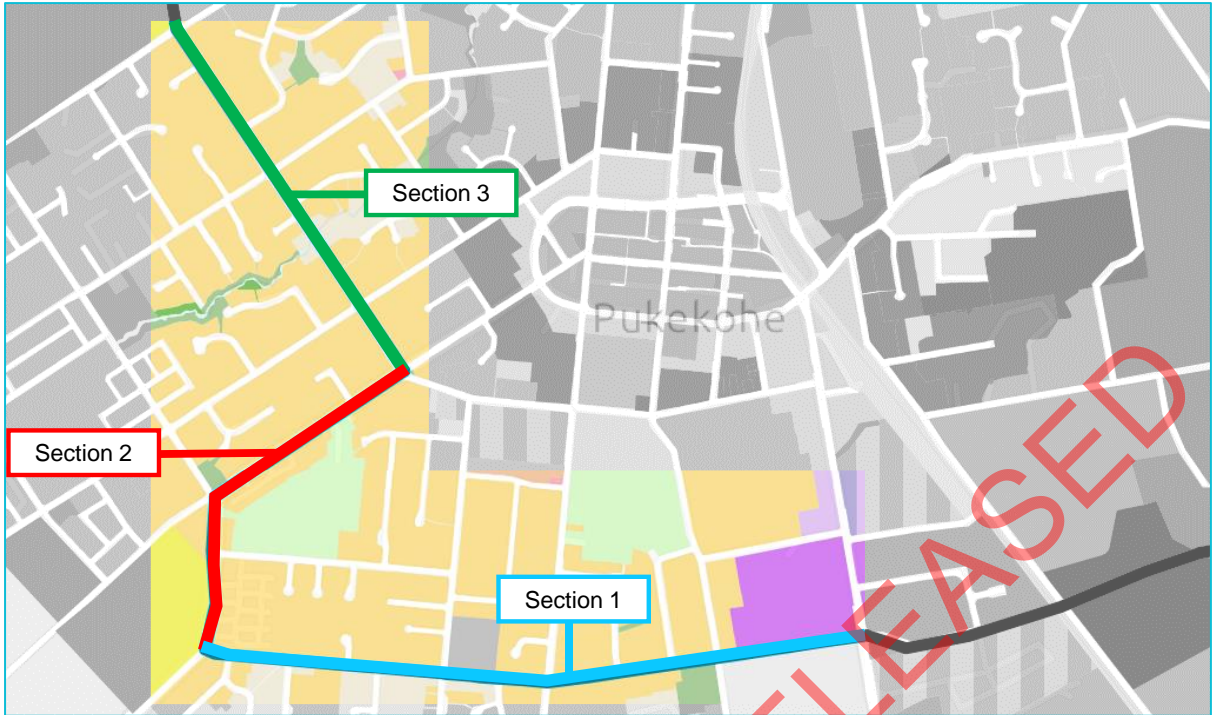


Figure 5-12 Sections assessed for South West Corridor

5.9.3 Option Assessment

The assessment process is set out in Figure 5-13 and included a comparative analysis of the level of service for active modes, property impacts and construction cost.

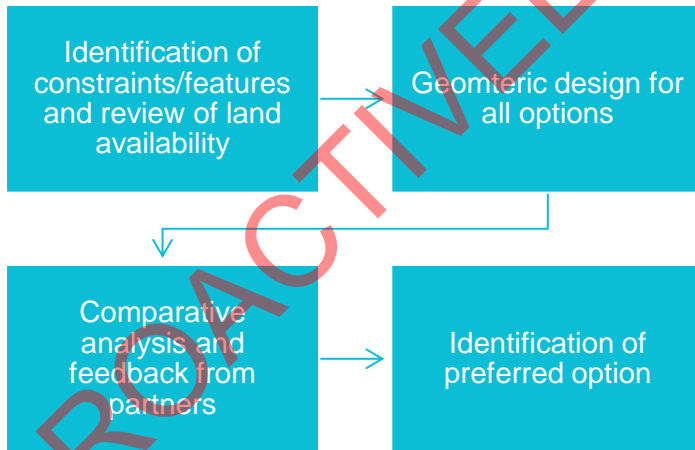


Figure 5-13 Comparative assessment for Pukekohe South West Arterial

The comparative assessment involved rating each of the scenarios against the key indicators: walking safety, cycling safety, property impact and cost. The options were assessed either positively (ticks), indicating a positive outcome, with the higher number of ticks representing the highest benefit or their level of disbenefit (crosses), with the higher number of crosses representing the level of disbenefit. Table 5-44 provides a summary of the comparative assessment undertaken for the Pukekohe South West Arterial.

Table 5-44 Summary of comparative assessment for South West Corridor

Criteria	Summary											
	Section 1				Section 2				Section 3			
	Cycle safety	Walking safety	Property	Cost	Cycle safety	Walking safety	Property	Cost	Cycle safety	Walking safety	Property	Cost
Option 1 Uni-directional cycleway (6.8m)	√√√√	√√√√	XXXX	XXXX	√√√√	√√√√	XXX	XXXX	√√√√	√√√√	XXXX	XXXX
Option 2 Uni-directional cycleway (6.5m)	√√√√	√√√√	XXXX	XXXX	√√√√	√√√√	XXX	XXXX	√√√√	√√√√	XXXX	XXXX
Option 3 Uni-directional cycleway (5.25m)	√√√√	√√√√	XX	XXX	√√√√	√√√√	XX	XXX	√√√√	√√√√	XXX	XXX
Option 4 Bi-directional cycleway on North / East side	√√√	√√√√	XX	X	√√√	√√√√	√√√	X	√√√	√√√√	XX	XX
Option 5 Bi-directional cycleway on South / West side	√√√	√√√√	XX	X	√√√	√√√√	XX	X	√√√	√√√√	XX	X

Partner Feedback

SMEs provided the following feedback at workshops:

- Recognition of the highly constrained area and support to assess alternatives to reduce property impacts.
- Principle support for bi-directional cycleway to reduce property impacts in the existing urban area.
- A request to consider the provision of lighting and trees within the cross section and integration with future bus stops.

5.9.3.1 Discarded Options

Table 5-45 summarises the reasons for discounting the options individually.

Table 5-45 Options to be discarded

Option	Reason
Option 1	High property impacts and large cost for construction
Option 2	High property impacts and large cost for construction
Option 3	High property impacts and large cost for construction

5.9.4 Preferred Option

Option 4 was recommended for segments 1 and 2 and Option 5 was recommended for segment 3.

Options 4 and 5 (both being a bi-directional cycle facility on one side of the road) were preferred as they best utilise the existing road reserve, minimise impacts on property along the route, reduce costs, while still ensuring adequate accessibility.

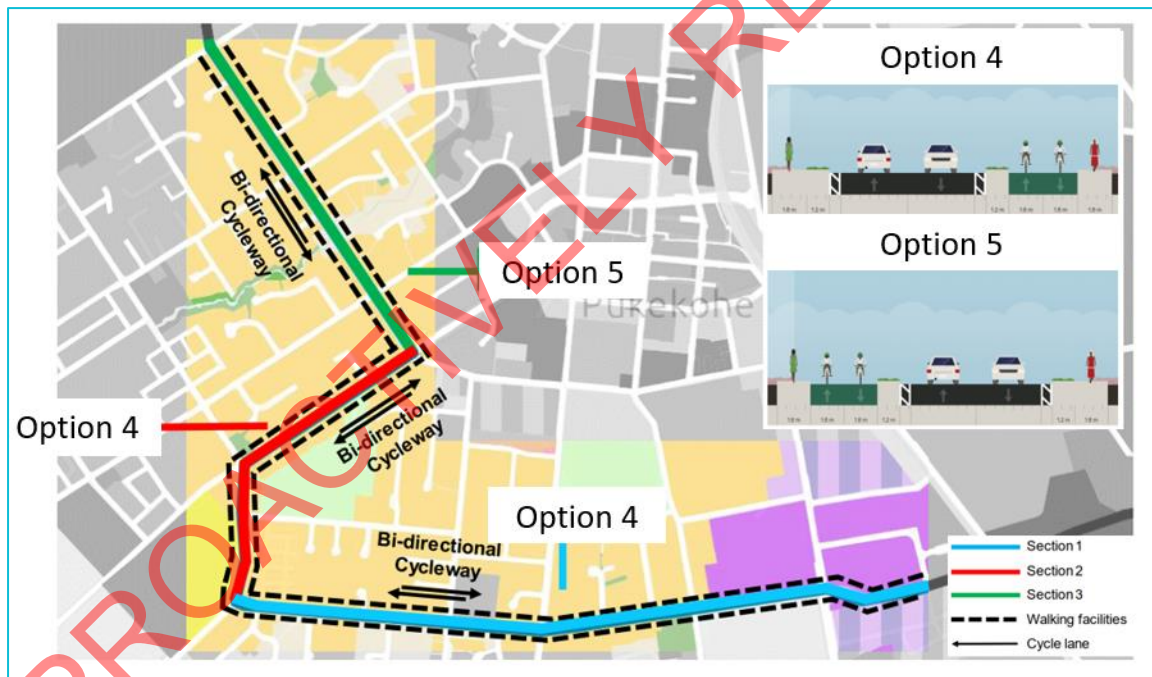


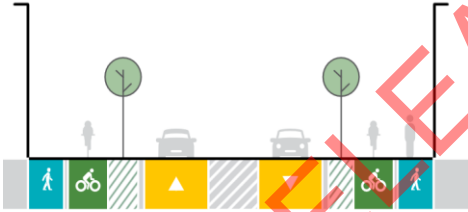
Figure 5-14 Preferred Option for South West Corridor

5.10 Pukekohe North West Route Refinement

5.10.1 Form and Function

Following the methodology summarised in Section 3.4, a form and function assessment was undertaken. Table 5-46 provides a summary of the assumptions and outcomes of the assessment.

Table 5-46 Pukekohe Local – North-West form and function assumptions and summary

Criteria	Summary
Purpose	Arterial corridor connecting SH22 to Ward St in Pukekohe. It is the primary north-south route for all modes in Pukekohe West.
Cross Section	 <p>24m cross section, 2 lane general traffic, walking and cycling on both sides</p>
Function	<p>P2 - Attracts activity from across a subregion or neighbouring local board area</p> <p>M2 - Medium strategic network significance with increasing volume of users</p>
Flows (ADT 2048)	6,000-10,000
Speed	50 kph speed limit
Public transport (indicative 2048)	10-12 buses per hour
Freight	Level 2/3

5.10.2 Option Development



Figure 5-15 Summary of North-West options

5.10.3 Option Assessment

Options were assessed against the MCA framework by each subject matter expert as set out in Error! Reference source not found..Commentary is provided in Table 5-48.

Table 5-47 Pukekohe Local – North-West Route Refinement MCA scoring

MCA Criteria		Scores					
	Segment 1 (widening of Helvetia Road)			Segment 2 (east west connection)			
Options	PNWA_S1_O 1 (Centre)	PNWA_S1_O 2 (East)	PNWA_S1_O 3 (West)	PNWA_S2_O 1 (Butcher Rd)	PNWA_S2_O 2 (Heights Rd)	PNWA_S2_O 3 (New)	
Investment objectives							
IO1 – Safety	1	1	1	2	1	2	
IO2 – Integration	2	2	2	1	1	1	
IO3 - Access	2	2	2	2	1	2	

IO4 – Resilience	1	1	1	2	1	2
IO5 – Travel Choice	2	2	2	2	1	2
Cultural						
Heritage	0	0	0	0	0	0
Social						
Land use futures / integration with planned landuse	3	2	2	3	1	3
Urban design	1	1	1	0	1	0
Land requirement / property	-1	-1	-1	-1	-1	-2
Social cohesion	-1	-1	-1	2	0	2
Human health and wellbeing	-1	-1	-1	0	0	-1
Environment						
Landscape / visual	-2	-1	-3	-1	-1	-3
Stormwater	-1	-2	-1	-1	-1	-2
Ecology	-2	-2	-2	-3	-1	-3
Natural hazards	-4	-4	-4	-2	-1	-2
Construction impacts						
Embodied carbon emissions	0	0	0	0	0	0
Construction impacts on utilities / infrastructure	-2	-2	-2	-2	-1	-1
Construction Disruption	-2	-2	-2	-2	-2	-1

Construction costs / risk / value capture	-2	-2	-2	-2	-2	-2
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Table 5-48 Pukekohe North West route refinement assessment findings summary

Criteria	Summary of performance	
	Segment 1	Segment 2
Investment Objectives	<p>There was limited differentiation between options (widening Helvetia Road).</p> <p>All options have positive safety effects from taking strategic traffic from Pukekohe town centre and improved integration with urban environments., multi-modal access for all road users and improvements to resilience.</p>	<p>Option PNWA_S2_O2 (Heights Rd) was least preferred (to upgrade Heights Road). It has a less direct connection to SH22 and the NE quadrant and wider strategic network.</p> <p>PNWA_S2_O1 and O3 provide better opportunities for active modes and public transport as are more integrated with the FUZ.</p>
Heritage	No recorded heritage.	No recorded heritage.
Social	<p>Land use</p> <p>Includes area within private plan change. Opportunity for developer to deliver part.</p> <p>Urban design</p> <p>All options involve minimal earthworks. However, are likely to result in heavy traffic through the middle of a residential area reducing amenity.</p> <p>Land requirement</p> <p>All options require at least one full acquisition. There was limited differentiation between options. However, widening on both sides of the road shares more equally the property impacts.</p> <p>Social cohesion</p> <p>There was limited differentiation between options and as a two lane arterial it is unlikely there would be significant severance effects.</p> <p>Health and wellbeing</p> <p>Existing industrial and residential receivers. There were limited differentiation between options.</p>	<p>Land use</p> <p>Includes area within private plan change. PNWA_S2_O1 and PNWA_S2_O3 mainly existing roads and integrates best with FUZ.</p> <p>Urban design</p> <p>Preference for PNWA_S2_O2 due to minimal impact on character.</p> <p>PNWA_S2_O1 and PNWA_S2_O3 have the potential to isolate the industrial area between the alignment and the railway.</p> <p>Land requirement</p> <p>PNWA_S2_O1 and PNWA_S2_O2 require only partial acquisitions. PNWA_S2_O3 is the least preferred.</p> <p>Social cohesion</p> <p>Two lane arterial it is unlikely there would be significant severance effects. PNWA_S2_O1 and PNWA_S2_O3 this route provides an improved connection with local shops on Paerata Road.</p> <p>Health and wellbeing</p> <p>Existing corridor limited sensitive receivers. PNWA_S2_O2 considered the need to consider access to the cemetery from Heights Road. PNWA_S2_O3 has existing residential receivers located on Butchers Road.</p>

Criteria	Summary of performance	
<p>Environmental</p>	<p>Landscape and visual</p> <p>PNWA_S1_O1 effects vegetation along both sides of road. The alignment proximate to an identified Notable Trees within the AUP on the western side of the road. PNWA_S1_O3 includes loss of vegetation along the western side of road including northern corner.</p> <p>PNWA_S1_O2 was preferred due to the limited loss of established vegetation along the eastern side of the road.</p> <p>Stormwater</p> <p>PNWA_S1_O1 would have a moderate effect on flooding.</p> <p>PNWA_S1_O2 required upgrades to existing culverts and the upstream widening would have the largest effect on flooding.</p> <p>PNWA_S1_O3 was preferred as downstream widening of the road would have the least effect on flooding.</p> <p>Ecology</p> <p>No stream or natural wetland impacts. Historical wetlands appear to have been entirely drained and converted to pasture (historically would have been a peat bog / fen). Likely to impact stormwater ponds (potential for At Risk - Declining Copper skink and Dabchick on ponds) on east side and mature Totara (at property 130 Helvetia Rd, Gun Club Rd and 166 Heights Rd) on west side. PNWA_S1_O3 is the preferred option as minimises the impacts on ecology.</p> <p>Natural Hazards</p> <p>Preference is for PNWA_S1_O1.</p> <p>Options involved partial new construction through swamp/tuff crater, with associated soft/compressible soils. All options cross unnamed fault and anthropogenic fill.</p>	<p>Landscape and visual</p> <p>The alignment follows more complex topography (steep slopes and catchments). PNWA_S2_O2 was the preferred option as involves reduced loss of vegetation.</p> <p>PNWA_S2_O3 includes steeper slopes and gullies and loss of vegetation associated with the stream margins, shelter belts and planting lining Gun Club Road.</p> <p>PNWA_S2_O1 also involves loss of groupings of trees along the existing road edge.</p> <p>Stormwater</p> <p>PNWA_S2_O1 was preferred as it would have a minimal effect on flooding.</p> <p>PNWA_S2_O2 has no interaction with culverts or floodplains.</p> <p>PNWA_S1_O3 was the least preferred as it had higher flood effects.</p> <p>Ecology</p> <p>PNWA_S2_O2 was preferred as it avoids all streams, potentially impacts to wetlands at junction with SH22 and impacts likely restricted to mature exotic trees.</p> <p>PNWA_S2_O3 includes impacts to several stands of mature vegetation and riparian vegetation. PNWA_S2_O3 includes impacts to indigenous forest and potentially the SEA.</p> <p>Natural Hazards</p> <p>Preference is for PNWA_S2_O2 mostly over terrain underlain by volcanic soils. PNWA_S2_O1 crosses a geological fault. PNWA_S2_O3 includes geology which may include some soft compressible layers or possibly some loose materials subject to liquefaction.</p>
<p>Construction impacts</p>	<p>Embodied carbon emissions</p> <p>Limited differentiation between options.</p> <p>Construction impacts on infrastructure/utilities</p> <p>All options have a similar road corridor length requiring road widening.</p> <p>Construction disruption</p>	<p>Embodied carbon emissions</p> <p>Limited differentiation between options.</p> <p>Construction impacts on infrastructure/utilities</p> <p>All options have a similar road corridor length requiring road widening. PNWA_S2_O1 will require relocation or strengthening of a gas pipeline. PNWA_S2_O1 requires a significant</p>

Criteria	Summary of performance	
	<p>All options require protection or relocation of all services.</p> <p>Construction costs</p> <p>All options include disruption to local traffic.</p>	<p>bridge crossing over the Glenbrook line and Butcher Road will need to be raised impacting SH22.</p> <p>Construction disruption</p> <p>All options require protection or relocation of all services.</p> <p>Construction costs</p> <p>All options include disruption to local traffic.</p>
Engagement	<p>Partners</p> <p>Key feedback from SMEs at workshops included:</p> <ul style="list-style-type: none"> • Acknowledgement of the construction/engineering challenges due to rail crossings (Glenbrook line) and topography. • Proposed plan changes in the area. Opportunities to work with developers. <p>Public</p> <p>In general, there was support for the Pukekohe Arterials during public consultation. The sentiment from the community is that the arterials are needed to remove traffic and congestion from the centre of Pukekohe and provide an alternative route for users that will connect existing and new residential areas.</p> <p>Specifically for the NW Arterial, sentiment was mixed. Feedback indicated that people clearly do want a solution for traffic congestion but disagree with the proposal's route connecting future urban areas, including housing developments. Feedback also raised concerns of heavy vehicle (freight) movements through what is perceived as an already congested route or through existing (or proposed) residential areas.</p> <p>A request was made for a more western arterial in the rural zone. In particular for freight. This request was progressed by the project team as it did not support the future urban zone and the planned urban growth.</p>	

5.10.3.1 Discarded Options

Table 5-49 summarises the reasons for discounting the options individually.

Table 5-49 Options to be discarded

Option	Reason
PNWA_S1_O2	Impacts several stands of mature indigenous trees along east side of Helvetia Road.
PNWA_S1_O3	Impacts vegetation along the western side of road.
PNWA_S2_O1	More complex to construct with new rail crossings and more complex topography (steep slopes and catchments) and is adjacent to SEA and indigenous vegetation.
PNWA_S2_O2	More complex to construct with more complex topography (steep slopes and catchments). The topography will limit its attractiveness for active mode users, less direct connection to SH22 and NE quadrant. It is also adjacent to SEA and indigenous vegetation.

5.10.4 Preferred Option

PNWA_S1_O1 is preferred as it is better integrated with future development, shares potential property acquisition evenly on both sides of the road, and provides opportunity to reduce impacts on features.

PNWA_S2_O3 is preferred because it is less complex to construct, provides more benefits for active modes and PT, reduces impacts on vegetation, uses existing roads (including a paper road), and reduces impacts on existing residential.

Further design considerations include making the alignment as direct as possible but making best use of existing roads including paper road.



PROACTIVELY RELEASED

5.11 Mill Road / Pukekohe East Road Upgrade Route Refinement

5.11.1 Form and Function

Following the methodology summarised in Section 3.4, a form and function assessment was undertaken. Table 5-50 provides a summary of the assumptions and outcomes of the assessment.

Table 5-50 Mill Road / Pukekohe East form and function assumptions and summary

Criteria	Summary	Summary
	Pukekohe East Road	Mill Road
Purpose	Existing arterial section from the north-eastern ring road to Belgium Road. It has a high east-west function for general traffic and freight but also needs to accommodate buses and active modes.	Mill Road (Pukekohe) forms a primary east-west connection from SH1 to Pukekohe urban areas. This corridor is a strategic connection for traffic and freight, with a major rural active mode connection and has the potential to take on a State Highway function.
Cross Section	 <p>24m cross section, 2 lane general traffic, walking and cycling on one side</p>	 <p>30m cross section, 4 General Traffic, walking and cycling on one side</p>
Function	<p>P2 - Attracts activity from across a subregion or neighbouring local board area</p> <p>M3 - High strategic significance with higher volume of users</p>	<p>P1 - Predominantly local function with a small catchment of users</p> <p>M3 - High strategic significance with higher volume of users</p>
Flows (ADT 2048)	<p>With developer connections: 12,000-14,000</p> <p>Without developer connections: +20,000</p>	30,000-32,000
Speed	50 kph speed limit	80 kph speed limit
Public transport (indicative 2048)	<p>8-10 buses per hour</p> <p>Priority at intersections required</p>	N/A
Freight	Level 1B	Level 1B

5.11.2 Option Development

Three options were developed for the widening of Mill Road Bombay (to four lanes) – to widen on one side (north or south) or both sides (centre). The widening of Mill Road Bombay is proposed to

Harrisville Road. From this point, Pukekohe East Road is proposed to have an active mode upgrade into Pukekohe. As this is within the rural zone, a shared path will be placed on one side of the existing road. Two options were developed for the shared path to be placed on the north or south side.

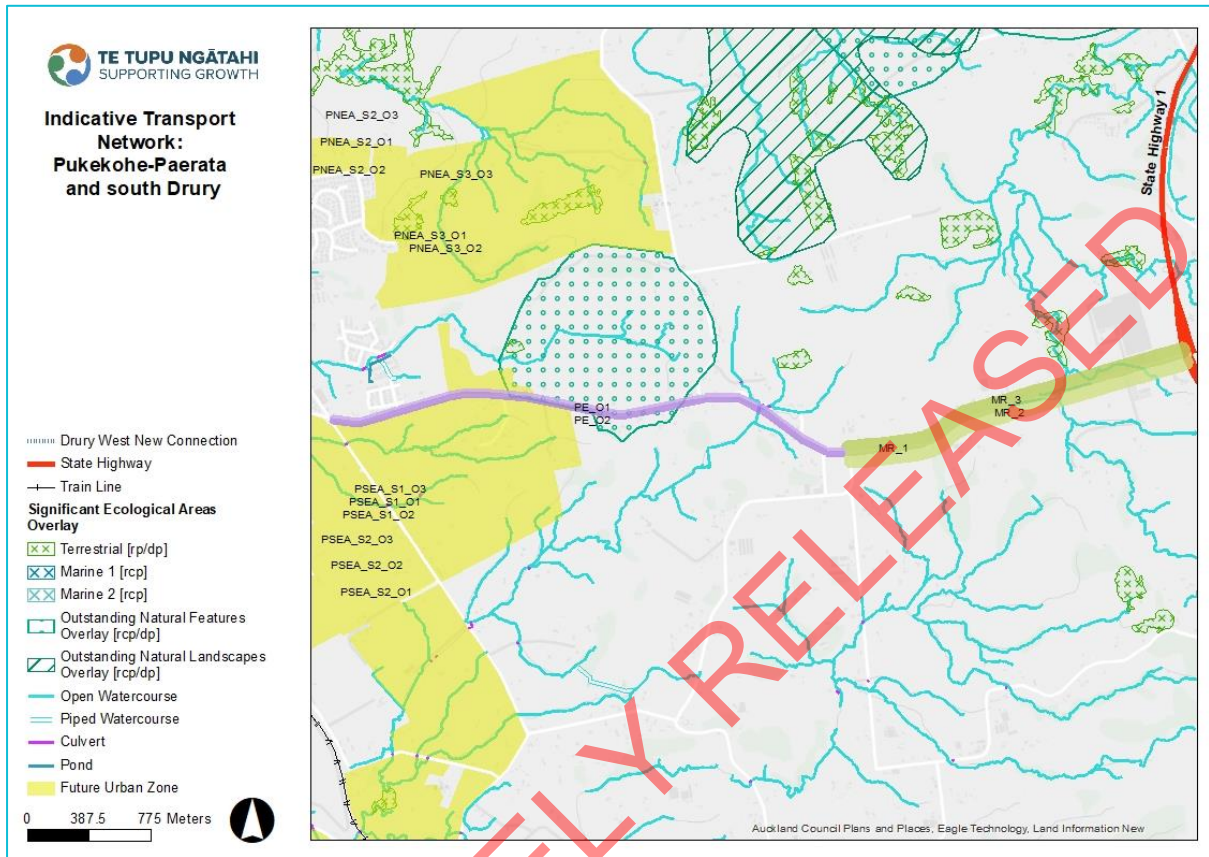


Figure 5-16 Mill Road Bombay Route Refinement Options

5.11.3 Option Assessment

Options were assessed against the MCA framework by each subject matter expert as set out in Table 5-51. Commentary is provided in Table 5-52.

Table 5-51 Mill Road Bombay and Pukekohe East Road Upgrade Route Refinement MCA scoring

MCA Criteria	Scores				
	Mill Road			Pukekohe East Road	
Options	MR_1 Centre	MR_2 South	MR_3 North	PE_O1 (north)	PE_O2 (south)
Investment objectives					
IO1 – Safety	1	1	1	2	2
IO2 – Integration	0	0	0	2	2
IO3 - Access	1	1	1	2	2
IO4 – Resilience	3	3	3	2	2

IO5 – Travel Choice	1	1	1	2	2
Cultural					
Heritage	0	0	0	0	0
Social					
Land use futures / integration with planned land use	3	1	2	1	1
Urban design	0	0	0	1	2
Land requirement / property	-1	-2	-2	-1	-1
Social cohesion	0	-1	0	-1	0
Human health and wellbeing	0	0	0	0	0
Environment					
Landscape / visual	-2	-3	-3		
Stormwater	-1	-2	-1	-1	-1
Ecology	-3	-3	-3	-3	-3
Natural hazards	-1	-1	-1	-3	-2
Construction impacts					
Embodied carbon emissions	0	0	0	0	0
Construction impacts on utilities / infrastructure	-2	-2	-2	-2	-2
Construction Disruption	-3	-3	-3	-2	-2
Construction costs / risk / value capture	-2	-2	-2	-2	-2

Table 5-52 Mill Road Bombay route refinement assessment findings summary

Criteria	Summary of performance	
	Mill Road	Pukekohe East Road
Investment Objectives	There was limited differentiation between options. All options provide increased reliance in the network, will take strategic traffic from SH1 to Pukekohe and south to Waikato and have positive safety benefits. As is located in the rural zone, there is no place and movement conflict.	PE_O2 was the preferred option as it provides access to key destinations and crossings from SH1 to Golding Road.

Criteria	Summary of performance	
	All options improve active mode access and provide network-wide improvement in resilience.	
Heritage	No recorded heritage.	No recorded heritage.
Social	<p>Land use</p> <p>All options provide an improved connection to the local centre at the intersection of SH1. MR_1 was preferred as it upgrades both sides of the road.</p> <p>MR_2 was not preferred as it was considered to have the potential for more significant impacts to the local centre and MR_3 would similarly impact on growers on the northern side of Mill Road.</p> <p>Urban design</p> <p>All options were considered to impact on the existing character and amenity as the upgrade of the existing road is within the Rural Zone reducing the ability for future development to respond to the corridor.</p> <p>Land requirement</p> <p>MR_1 was the preferred option as would limit the impact on the BP Service Station complex as well as the hothouse facility at 187 Mill Rd. MR_2 would impact BP Service station and potential issues with contaminated land. MR_3 would impact NZ Hothouses complex at 187 Mill Rd.</p> <p>Social cohesion</p> <p>MR_2 was the least preferred due to the impact on the local centre at the intersection with SH1. MR_1 and MR_3 were equally preferred.</p> <p>Health and wellbeing</p> <p>There was limited differentiation between options. This is an existing corridor in the rural area with limited receivers there are some houses and community facilities.</p>	<p>Land use</p> <p>PE_O2 was preferred as it would better integrate with FUZ to the south of Pukekohe East Road.</p> <p>Urban design</p> <p>PE_O2 was preferred as it provides connection to future growth areas and existing activity in Bombay on south side of road.</p> <p>Land requirement</p> <p>Both Options will have an impact on large properties at the SH1 interchange. PE_O2 was slightly preferred due to impacts on the commercial development.</p> <p>Social cohesion</p> <p>PE_O2 was preferred as PE_O1 had the potential to impact on Pukekohe East Hall.</p> <p>Health and wellbeing</p> <p>Small number of existing rural residential receivers unlikely to be impacted by walking and cycling upgrades.</p>
Environmental	<p>Landscape and visual</p> <p>MR_1 was the preferred option. There would be some vegetation loss and loss of stream corridors north and south of the road. The southern and northern options would also directly impact properties close to the existing road.</p> <p>Stormwater</p> <p>There were no significant difference to hydrologic or water quality effects between</p>	<p>Landscape and visual</p> <p>Both options could impact on the Pukekohe Tuff Ring (ONF). PE_O2 is the preferred option as it avoid the majority of the tuff ring on the north side of Pukekohe East Road.</p> <p>Stormwater</p> <p>No major difference to Active Mode Path (AMP) on either the northern or southern side with regard to stormwater effects.</p>

Criteria	Summary of performance	
	<p>options. MR_1 was likely to have a medium impact on flood effects. MR_2 was the least preferred as upstream widening have the greatest impact on flood effects. MR_3 was the preferred option as widening downstream would have the least impact on flood effects.</p> <p>Ecology</p> <p>A stand of mature Kauri trees is located the south of the existing road corridor. All options were likely to impact potential bat habitat. MR_2 was the preferred option based on the least earthworks. However, protection of the Kauri trees are significant and should be protected.</p> <p>Natural Hazards</p> <p>MR_2 was the preferred option. All options avoid areas of soft soil. MR_3 was least preferred as extends further into the valley of the Ngakaroa stream tributary and likely to encounter more alluvium of a variable nature and likely to entail greatest volume of earthworks.</p>	<p>Ecology</p> <p>Overall preferred as less potential impact on wetlands, streams and mature indigenous vegetation.</p> <p>Natural Hazards</p> <p>Both options cross the mapped St Stephens Fault. PE_O2 was slightly preferred as PE_O1 had a greater risk of land instability.</p>
Construction impacts	<p>Embodied carbon emissions</p> <p>No difference between options.</p> <p>Construction impacts on infrastructure/utilities</p> <p>All options require protection or relocation of all services and there was limited differentiation between options.</p> <p>Construction disruption</p> <p>All options include disruption to local traffic (temporary traffic management including lane narrowing) due to works on Mill Road.</p> <p>Construction costs</p> <p>All options have the same road corridor length and bridge structure length requiring road widening and construction of structures.</p>	<p>Embodied carbon emissions</p> <p>No difference between options</p> <p>Construction impacts on infrastructure/utilities</p> <p>All options require protection or relocation of all services and there was limited differentiation between options.</p> <p>Construction disruption</p> <p>All options include shoulder closure of a high speed road and there was limited differentiation between options.</p> <p>Construction costs</p> <p>All options have extensive cut and fill and there was limited differentiation between options.</p>
Engagement	<p>Partners</p> <p>Key feedback from SMEs during workshop included:</p> <ul style="list-style-type: none"> To continue interface discussions with Waka Kotahi P2B team and the future Bombay Interchange upgrade. Manoeuvring space is required within the BP complex. 	

Criteria	Summary of performance
	<p>Ngāti Te Ata would not oppose upgrading Pukekohe East Road (which is within the extent of the ONF area). This upgrade could provide an opportunity for more visibility of the tuff ring (through a walking / cycling path and viewing platform).</p> <p>Public</p> <p>Through public engagement, strong support was received for the upgrade of Mill Road and Pukekohe East Road. Feedback acknowledged that this road is a key strategic route into Pukekohe, with some pieces of feedback directing that the four-lane upgrade should be applied to the entire route.</p>

5.11.4 Discarded Options

Table 5-53 summarises the reasons for discounting the options individually.

Table 5-53 Options to be discarded

Option	Reason
MR_2	Greater impacts on grower operation on north side of corridor and properties adjacent to the existing road. Impacts on native and mature vegetation.
MR_3	Impacts on local centre at intersection of SH1 and properties adjacent to the existing road. Impacts on native and mature vegetation.
PE_O1	Greater impacts on commercial development and social infrastructure. A greater impact on ecology (wetlands) and a greater risk of land instability. PE_O1 also did not provide the same connectivity to future growth areas and existing activity at SH1.

5.11.5 Preferred Option

The preferred option for Mill Road is MR_1 (central widening) as it has less impact on local centre at the SH1 interchange and potential effects on ecological features on either side of the corridor can be reduced through design.

Further considerations for design include:

- Investigation of stormwater treatment whether swales or kerb and channel (with wetlands) or a mixture of these.
- Integration with Waka Kotahi Papakura to Bombay project (SH1).
- Reduce impacts on ecological features on south and north side. In particular, likely significant kauri trees on southern side of road reserve.
- Reduce property effects where possible.

The preferred option for Pukekohe East Road is PE_O2 as it better integrates with future growth areas and existing activity in Bombay on south side of the road. PE_O2 also avoid the reduces impacts on Pukekohe East Tuff Ring an ONF. Widening to the south side also provides an opportunity to work with developers within the FUZ

Further considerations for design include:

- Sensitive design and consideration of the Pukekohe East Tuff Ring (ONF).

PROACTIVELY RELEASED

6 Pukekohe DBC Emerging Preferred Network

The emerging preferred network is shown in Figure 6-1. The recommended transport network for the Pukekohe DBC includes the following components:

- Drury West Arterial
- South Drury Connection
- SH22 Connection
- Drury-Paerata Link
- Paerata Arterial
- Paerata connections: Paerata Rail Station Connection and Sim to Sim Connection
- Pukekohe North-East Arterial
- Pukekohe South-East Arterial
- Pukekohe South-West Upgrade
- Pukekohe North-West Arterial
- Mill Road and Pukekohe East Road Upgrade

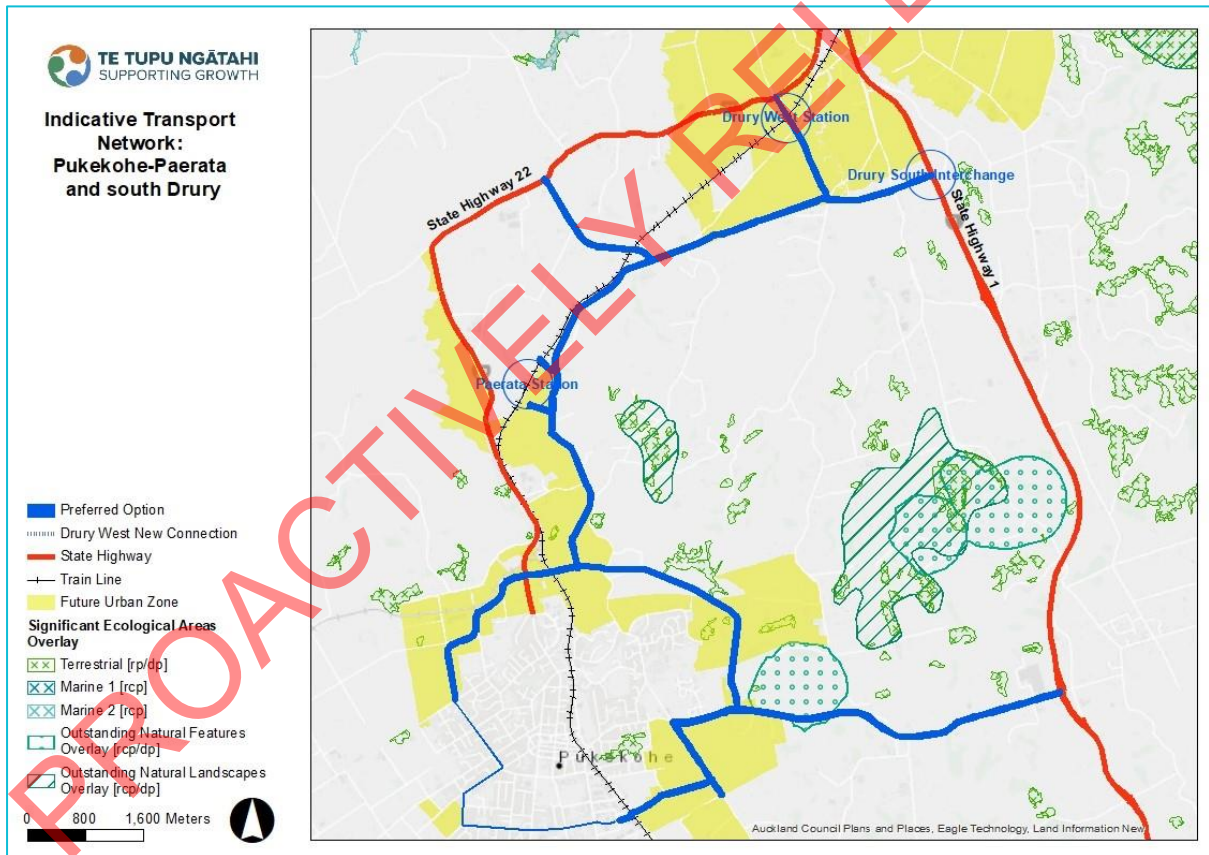


Figure 6-1 Emerging Preferred Network