TE TUPU NGĀTAHI
SUPPORTING GROWTH

Drury Arterial Network

Appendix A – Assessment of Alternatives

January 2021

Version 1

WAKA KOTAHI NZ TRANSPORT AGENCY

New Zealand Government

Document Status

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Glossary

Acronym/Term	Description
AUPOIP	Auckland Unitary Plan - Operative in Part
ADT	Average Daily Traffic
ARI	Average Recurrence Interval
AT	Auckland Transport
Council	Auckland Council
DBC	Detailed Business Case
DSI's	Deaths and serious injuries
Freshwater NES	Resource Management (National Environmental Standards for Freshwater) Regulations 2020
FTN	Frequent Transit Network
FULSS	Future Urban Land Supply Strategy
FUZ	Future Urban Zone
GSR	Great South Road
ha	Hectares
IBC	Indicative Business Case
KPIs	Key Performance Indicators
LOV's	Low occupancy vehicles
MCA	Multi-Criteria Assessment
NoR	Notice of Requirement
NoRs	Notices of Requirement
N-S	North-South
OD	Over Dimension
Partners	Collectively refers to Auckland Transport, Waka Kotahi NZ Transport Agency, Manawhenua and Auckland Council
PBC	Programme Business Case
PT	Public Transport
RASF	Roads and Streets Framework
RMA	Resource Management Act 1991
SEA	Significant Ecological Area
SH1	State Highway 1

Acronym/Term	Description
SH22	State Highway 22
TFUG	Transport for Urban Growth
THAB	Terraced Housing and Apartment Building Zone
Waka Kotahi	Waka Kotahi NZ Transport Agency

1 Introduction

1.1 Purpose of this Report

This report supports Waka Kotahi and AT's the Notices of Requirement (NoRs) to designate land for the Drury Arterial Network. The Drury Arterial Network includes five NoRs (the Drury Package) as detailed in **Error! Reference source not found.** and **Error! Reference source not found.**. The NoRs seek to protect land to enable the construction, operation and maintenance of transport infrastructure.

Table 1-1 Drury Arterial Network Projects and Notices of Requirement

Project	Notice (and requiring authority)
State Highway 22 (SH22) Upgrade	NoR D1 (Waka Kotahi) – alteration to designation 6707
Jesmond Road FTN Upgrade	NoR D2 (AT)
Bremner Road FTN Upgrade	
Waihoehoe Road West FTN Upgrade	
Waihoehoe Road East Upgrade	NoR D3 (AT)
Ōpāheke North-South FTN Arterial	NoR D4 (AT)
Ponga Road Upgrade	NoR D5 (AT)
Ōpāheke Road Rural Upgrade	
Ōpāheke Road Urban Upgrade *Designating discrete areas only*	

Under section 171(1)(b) of the RMA, a territorial authority making a recommendation on a NoR must consider whether adequate consideration has been given to alternative sites, routes or methods of undertaking the work if the requiring authority does not have an interest in the land sufficient for undertaking the work, or it is likely that the work will have a significant adverse effect on the environment.

AT and Waka Kotahi do not currently have an interest in all of the land required for the construction and operation of the Drury Arterial Network and so consideration of alternative sites, routes and methods has been undertaken. The purpose of this report is to document the development of alternative options to undertake the works and the process used to assess and compare those options.

This report provides an overview of the corridor options considered during the South Indicative Business Case (IBC) (as it relates to the Drury Package) including the long list and short list phases, and describes the assessment of alternative alignment options undertaken during the Detailed Business Case (DBC) and for the NoRs including the route refinement process through to recommendation of a preferred transport network. This report also provides a summary of the alternative statutory methods considered for implementing the Drury Package.

Error! Reference source not found. outlines the process undertaken through the corridor and route refinement assessment of alternatives.

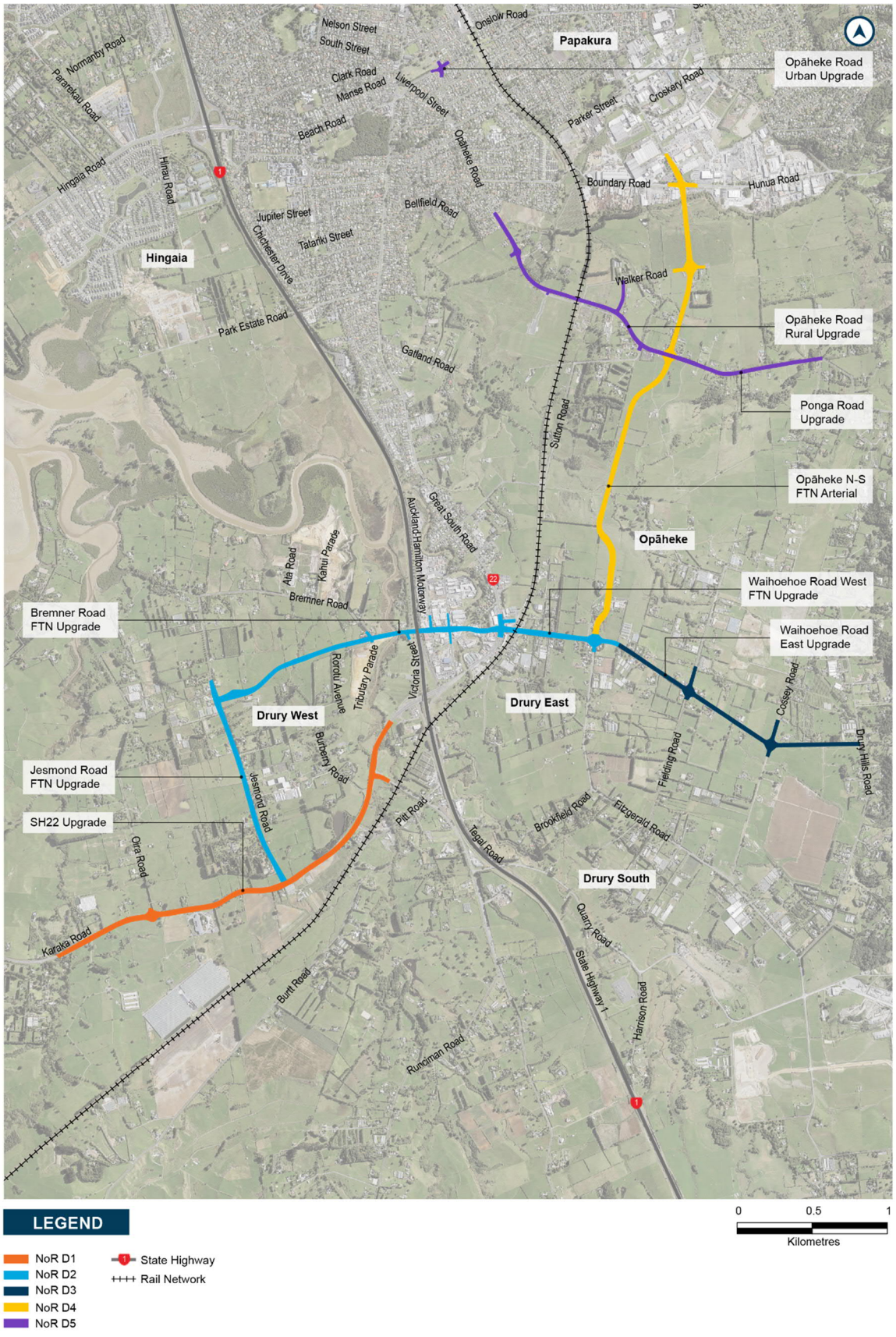


Figure 1-1 Drury Package Overview

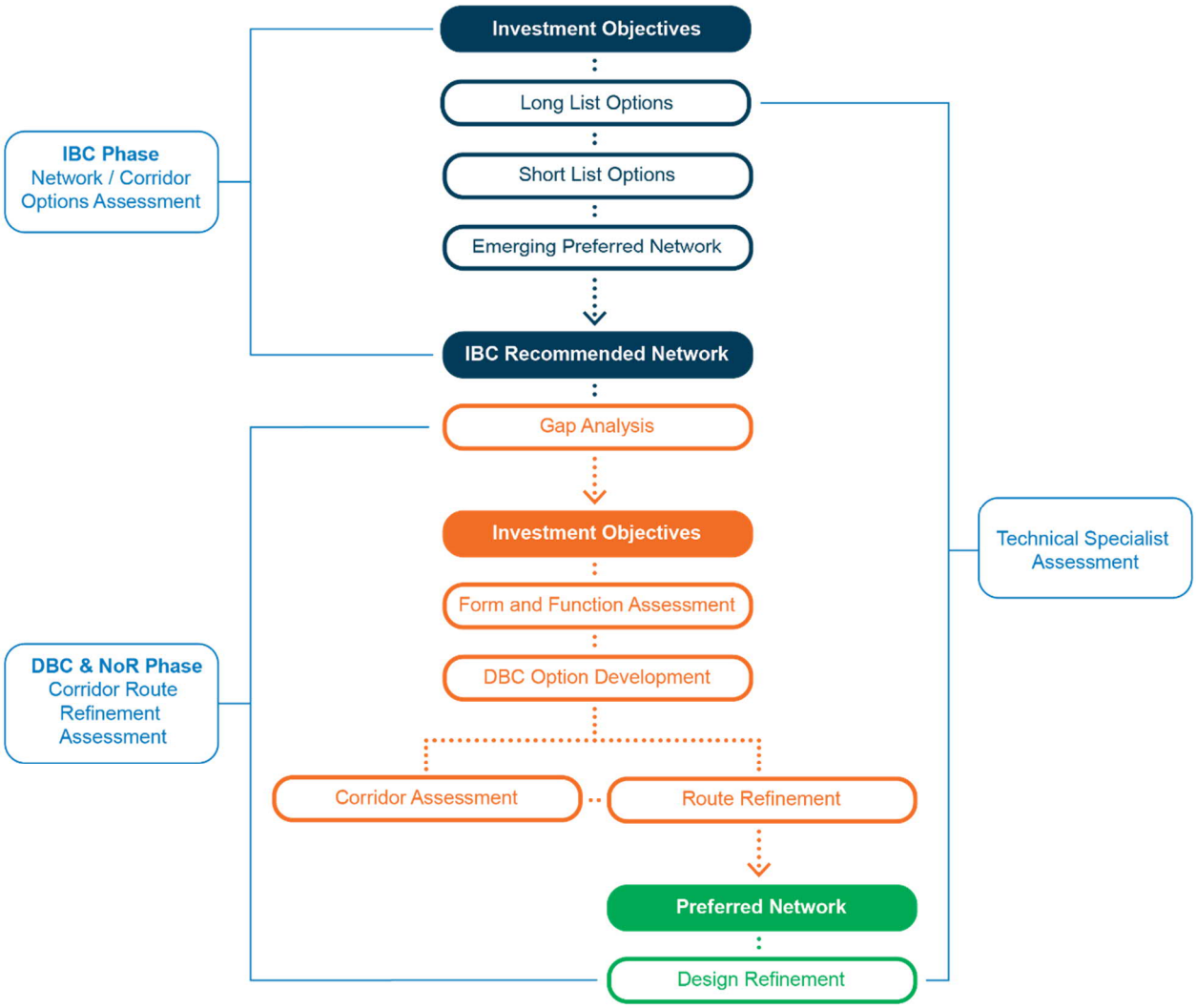


Figure 1-2 Overall Alternatives Assessment Process

1.2 Background

Auckland is New Zealand's largest city, home to approximately 1.69 million people and 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 will 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 (AUPOIP) 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 AUPOIP will 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 AUPOIP zoning, with an increase to 15,000 hectares of land allocated for future urbanisation.

In response to the FULSS, AT, 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:

1. Inability to respond in a timely way to the pace and scale of greenfield development will restrict access to jobs, education and other core services around and in growth areas.
2. Inability of the regional transportation system to cope with the growing demand of greenfield expansion will 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 and will 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 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. Drury-Ōpāheke is within the Southern growth area. Auckland's growth areas including the Southern growth area are shown in Figure 1-3.

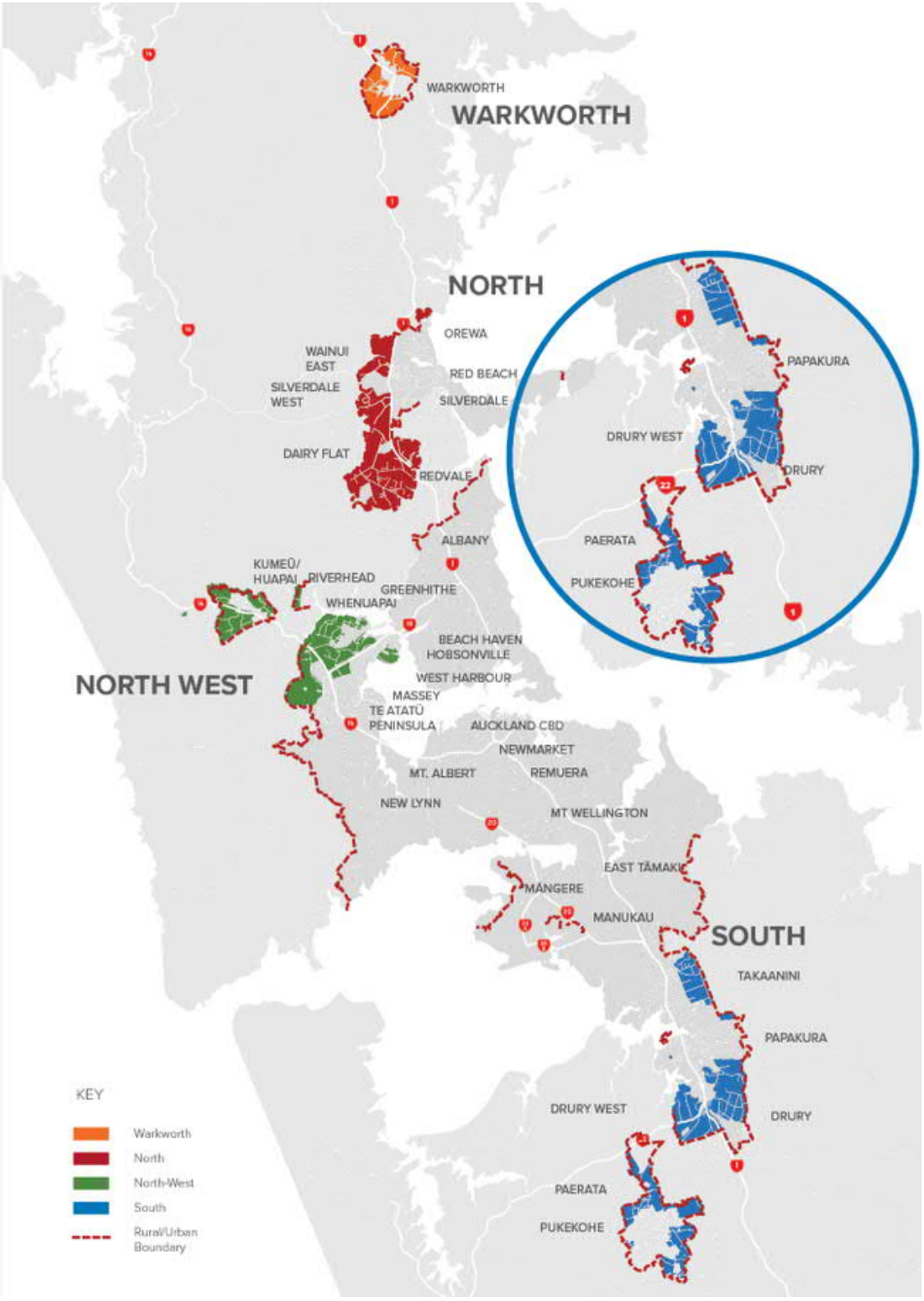


Figure 1-3 Southern Growth Area

1.3 Drury-Ōpāheke – Overview and Issues

Drury-Ōpāheke is within the Southern growth area, as identified in Figure 1-3. The Southern growth area is approximately 20 kilometres south of Auckland's central city and is approximately 30 kilometres in length. It makes up the largest proportion of future growth areas in Auckland (45%) and includes the large future growth areas of Takaanini, Drury-Ōpāheke, Pukekohe-Paerata and Clarks Beach. The bulk of the growth in the Southern growth area is expected to occur in Drury-Ōpāheke which will grow from a current population of just over 3,300 to a population of around 64,000 by 2046. In August 2019 Auckland Council formally adopted the structure plan for Drury-Ōpāheke area as shown in Figure 1-4. The structure plan signals the anticipated future urban land use pattern for Drury-Ōpāheke. The structure plan will form the basis of subsequent plan changes.

The urgency for route protection in the Drury-Ōpāheke area is driven by the rate and scale of committed developments, including Special Housing Areas, the rapid release of land planned by the Council, and pressure from developers who have already submitted private plan changes ahead of the Council's structure plan and subsequently as well. Failure to protect the network ahead of these development plans risk a combination of fragmentation of preferred transport connections, prohibitively expensive property acquisition costs for transport connections, a lack of certainty around private development investment, and a loss in ability to influence good urban form.

Furthermore, over-reliance on the existing strategic transport corridors combined with rapid population growth in and around the Southern growth area will reduce the ability of the transport system to move people and goods efficiently. Specifically, existing demand causes network constraints during peak periods' indicating that as future rapid growth in population occurs in the South, the network will be unable to sustain an acceptable level of service. If not addressed, the existing transport system will constrain the levels of access for residents in both the existing and future urbanised areas, limit development potential, decrease regional productivity and undermine the quality of life for residents and employees in the area.

Failure to integrate transport planning with pace, scale and form of urban development will limit the opportunity for the transport system to positively contribute to quality, connected urban and natural environments in the Drury-Ōpāheke area and Southern growth area as a whole.

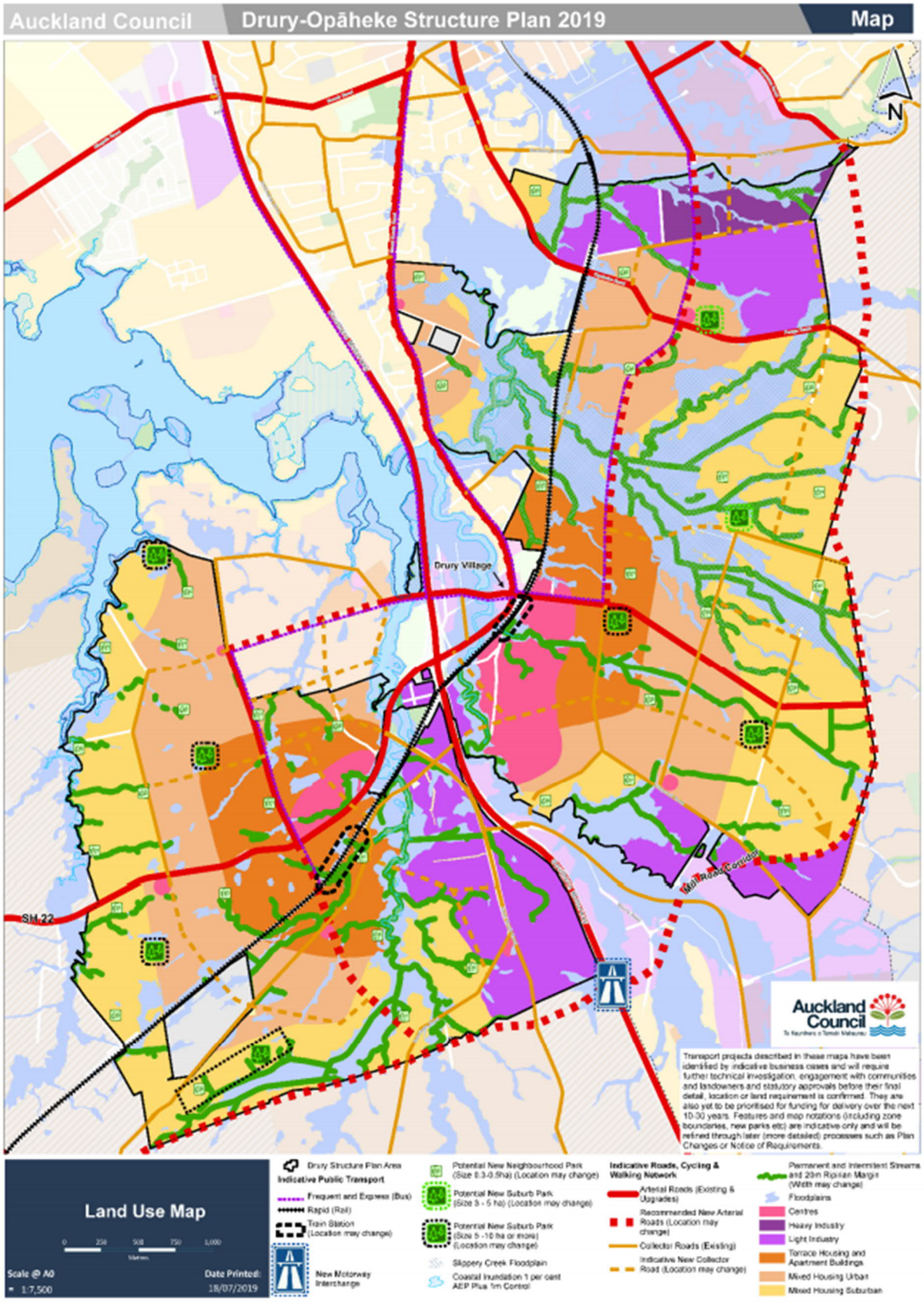


Figure 1-4 Auckland Council Drury-Ōpāheke Structure Plan (Source: Auckland Council, 2019)

1.4 Structure of this Report

The structure of the Report is as follows:

Table 1-2 Report Structure

Section	Heading	Description
1	Introduction	Overview of the Supporting Growth and Drury Package background. Purpose and structure of this report.
2	Alternative Statutory Methods	Consideration of alternative statutory methods of undertaking the work
3	Methodology for Assessing Alternatives	Summary of the methodology applied to the assessment of alternative corridors and alignments for undertaking the works.
4	Corridor Assessment Summary	Summary of the corridor alternatives assessment undertaken to identify the South wide Indicative Strategic Transport Network.
5	Consideration of Further Alternatives Assessment	Overview of the process followed after the confirmation of the Indictive Strategic Transport Network to determine the scope of further alternatives assessment.
6	Route Refinement Assessment Methodology	Overview of the methodology applied to the route refinement alternatives assessment of the Drury Package.
7	Intersection Form Assessment Methodology	Overview of the methodology applied to assess and identify preferred intersection forms
8	Design Refinement	Overview of design refinement undertaken during the route refinement process and once the preferred alignments were confirmed.
9	Approach to Stormwater Infrastructure	Overview of the approach to identifying the need for and options for location of stormwater infrastructure.

10	NoR D1: State Highway 22 Upgrade	Sections 10 through 14 provide an overview of the following for each NoR and the relevant corridors:
		• Summary of the corridor assessment
		• Gap analysis outcomes
		• Form and function assessment
		• Route refinement assessment including:
		  • Option development and assessment
		  • Engagement
		  • Discussion of preferred and discounted options
		  • Intersection form assessment

11	NoR D2: Jesmond to Waihoehoe West FTN Upgrade	
12	NoR D3: Waihoehoe Road East Upgrade	
13	NoR D4: Ōpāheke N-S FTN Arterial	
14	NoR D5: Ponga and Ōpāheke Road Upgrade	
15	Preferred Network	Identification of the preferred Drury Arterial Network
16	Conclusion	Conclusion

2 Alternative Statutory Methods

This section provides an overview of the statutory methods considered to undertake the proposed Drury Package works.

2.1 Assessment of Route Protection Method

The principal objective for the Drury Package is to achieve the route protection of a preferred strategic transport network to support Auckland's projected growth over the next three decades. As part of the consideration of alternative statutory methods, the options for statutory approvals that enable route protection and future implementation were considered in light of a number of contextual elements including project strategic importance, project urgency/timing and project complexity risk profile. The alternative statutory methods considered were as follows:

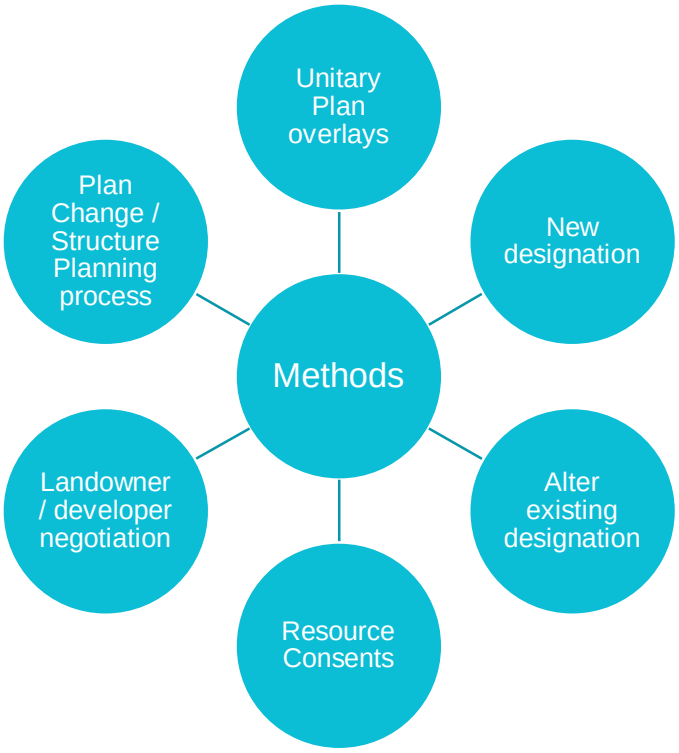


Figure 2-1 Methods considered

Table 2-1 summarises the strengths, weaknesses and suitability of each route protection method for the Drury Arterial Network. In assessing the methods, the planning context, key risks and considerations which may influence the preferred route protection method were reviewed and each method evaluated taking into account the planning environment and identified risks and considerations.

Table 2-1: Summary of possible route protection and consenting methods

Methods	Summary of strengths and weaknesses within local context
Unitary Plan 'Corridor Overlay'	This method involves the inclusion of a new Corridor Overlay in the Unitary Plan to provide for the new transport corridors. Although AUPOIP overlays provide certainty to the community in planning terms, they do not however achieve route protection of the necessary land for the works. Furthermore, the overlays would require a plan change and it may not be an accepted approach by Council where the approach of the AUPOIP overlays is focussed on RMA Section 6 and some 5 matters. Therefore, progressing a new 'Corridor Overlay' within the AUPOIP has not been considered as a viable route protection method for the Drury network.
Resource Consents	A resource consent grants approval to use resources such as the land, water, air and coastal environment. A resource consent, if granted, is not shown in a district plan and does not provide a method to protect the land not already under the ownership of a requiring authority. However, it can be advantageous to also seek resource consents (particularly for construction activities) under the RMA alongside other route protection methods in instances where projects are likely to proceed to construction once route protection is secured. None of the Projects within the Drury Arterial Network are funded or planned to be implemented once route protection is secured, therefore resource consents have not been considered.
Designation	A Notice of Requirement (NoR) to designate land for a public work under the RMA provides a strong level of route protection from incompatible development particularly where development pressure is anticipated along the corridor. Once confirmed it also provides authorisation to undertake and maintain the works. A NoR has interim route protection effect as soon as the notice is lodged with Council which ensures the corridors will be protected from incompatible development from that date. This effectively manages risk of development within the corridor that may otherwise hinder the proposed work. This is particularly important as there is keen developer interest in Drury-Ōpāheke. Developers have submitted private plan changes to Auckland Council (with more likely to follow soon) indicating developers' intention to expedite growth in the area. A designation, if confirmed, is also included in the relevant district plan. This provides certainty and visibility to the public about the intended land use, enabling informed development decisions.
Alteration to existing designations	As SH22 is the only corridor within the Drury Arterial Network that has an existing transport designation, there are limited opportunities to rely on this method throughout the wider Drury Arterial Network. Lodging a NoR for the alteration of an existing designation has the same strengths and potential risks as identified for a new designation. It also provides for an efficient use of an existing corridor reducing private property impacts. An alteration to an existing designation for the recommended network is only available for SH22 (existing Waka Kotahi designation).
Landowner/ developer negotiation	Landowner or developer negotiations can include purchasing a corridor of land and vesting as road within developments, purchase of whole blocks of land or development agreements whereby a developer agrees to "set aside land for future transport corridor" and/or construction at a future point. Infrastructure Funding Agreements (IFA) are the preferred form of landowner/ developer agreement to enable the delivery of transport infrastructure. IFAs

Methods	Summary of strengths and weaknesses within local context
	can provide route protection where a developer is able to agree to design and implementation of a project. For landowner agreements to be undertaken efficiently, the plans and timing of plans of each party involved must be aligned. Although a number of developers are active in the wider Drury-Ōpāheke area, in most cases they do not own all of the relevant land for a single corridor or the network, resulting in a reliance on individual property owners to enter into agreements. Private property owners with no development aspirations that are not part of a broader developer scheme may not have an appetite to negotiate such agreements. Furthermore, in reality, where a number of properties/developers are involved, the final solution is likely to be piecemeal due to the practicality and timeframes required to negotiate agreements with numerous affected landowners for each corridor. This may result in another form of route protection being required to ensure the entire corridor is protected within the relevant time period. Additionally, it is not compulsory for landowners or developers to enter into agreements, significantly reducing the utility of this method for route protection purposes. Developers in the Drury area are actively seeking plan changes to bring forward the development of the FUZ. There is opportunity to enter IFA's with developers for some portions of the Drury Transport Network where developers are active. These areas include Drury East and Drury West. Although opportunities for some agreements exist, the timing of the development plans and the Drury Arterial Network are not confirmed or aligned, therefore the reliance on agreements for corridor route protection across the entire Drury Arterial Network is not considered an appropriate method.
Plan Change/ Structure Planning Process	This method would provide for the Drury Arterial Network through structure plans and plan changes (assumed to be included in the Unitary Plan), or by participation in processes initiated by Council or private plan changes initiated by developers after structure plan processes. Small areas of the Drury Arterial Network area are zoned for development in the AUPOIP including on Bremner Road, Jesmond Road and Ōpāheke Road. The Drury 1 Precinct and Ōpāheke 1 Precinct are both zoned for primarily residential development and have specific Precinct Plans. Therefore, there are no further opportunities available for route protection through plan changes in these areas. Substantial areas are FUZ which remains largely rural but signals it will be urbanised in the future subject to a structure plan and plan change process to rezone it with an appropriate urban zoning. The Drury-Ōpāheke Structure Plan was completed by Auckland Council in August 2019. This covers the majority of the Drury Arterial Network. The recommended network aligns with the Drury-Ōpāheke Structure Plan. In the Drury context, the Structure Plan is not considered an appropriate method for route protection as it does not provide enough certainty in protection of privately-owned land and has no formal statutory weighting. However, if Council advances plan changes, there may be opportunities to work with them to provide a level of protection of the corridors through those plan changes. Private plan changes have been initiated by developers in Drury and they have their own aspirations for transport infrastructure which may not align with those shown in the Structure Plan. However, opportunity for integration and a form of route protection on Waihoehoe Road West, Waihoehoe Road East and a section of Ōpāheke N-S through the identification of routes on precinct plans and suitable precinct provisions is available. The level of route

Methods	Summary of strengths and weaknesses within local context
	protection provided by this opportunity is not as strong as that provided by designations which protects the corridor from incompatible development. Similarly, securing the network via new plan changes is not considered an appropriate method because the land surrounding portions of the network (including Jesmond Road, Bremner Road and Ōpāheke Road) are already zoned for development, are precincts or have established development. Also, a number of private plan changes have been lodged and/or accepted by Auckland Council across the network, so a single plan change solution across the network is not viable.

2.2 Preferred Method

Long term designations were the preferred method as they provide certainty to landowners, they signal the long-term transport system, recognising it may be implemented in stages, and they can enable interim use of the land where appropriate. The following methods were preferred for the Drury Arterial Network:

- An alteration to the existing designation (6707) was the recommended route protection mechanism for the SH22 Upgrade because there is already an existing designation and it provides an efficient and effective mechanism for providing route protection and providing certainty to all parties.
- New designations were the recommended route protection mechanism for the rest of the Drury Package as they provide the most efficient and effective mechanism for providing route protection in a changing urban environment and provide certainty to the community and to affected landowners.
- For the Ōpāheke Road Urban Upgrade corridor, a designation was recommended to protect the discrete areas of private land required for driveway regrading and the Ōpāheke Road / Settlement Road roundabout however the road reserve was not designated as the upgrade works can generally be entirely provided for within the existing road corridor

3 Methodology for Assessing Alternatives

The following sections provide an overview of the alternative sites and routes that have been considered for undertaking the works.

3.1 Overview

The assessment of alternative routes for the Drury Package involved the following stages:

1. The identification of Indicative Strategic Transport Networks (corridors) required to support Auckland's Southern growth areas through the Southern Indicative Business Cases (corridor assessment);
2. Grouping the corridors within the South Indicative Strategic Transport Network into five packages including the Drury Package;
3. Consideration of alternative route alignment options for that Package (route refinement assessment);
4. Further refinement of each route in the Drury Package in order to determine the extent of the designations necessary for each Project (preferred alignment refinement); and
5. Confirmation of the Projects for route protection.

A summary of the corridor assessment for the Drury Arterial Network is provided in Section 4 of this Report.

The option development and evaluation process for these stages is described in detail in Sections 5 to 9 of this Report.

3.2 Assessment Framework

In order to evaluate and compare options, a programme wide assessment framework for the alternatives assessment which included a Multi-Criteria Assessment (MCA), was developed by the Project Team in consultation with AT, Waka Kotahi and Manawhenua, for use in the corridor and route refinement assessment processes.

The MCA was developed for use across the Supporting Growth Programme and has been used in both the IBC and DBC option evaluation process. At the route refinement phase, this option evaluation process was tailored to make it specific to the requirements of the Drury-Ōpāheke programme area.

The MCA framework is a common tool that is often used to assist in the alternatives assessment 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 and adopted by the Project Team involved the following:

- **Assessment criteria:** Transport outcomes and the four well-beings: Cultural, Social, Environmental and Economic. Several sub-criteria were developed under each wellbeing grouping which were assessed by technical specialists.
- **Opportunities:** identifying opportunities that can be taken forward in developing the options. These were identified by the relevant technical specialist.
- **Additional inputs:** Partners, stakeholders, the community and landowner feedback, policy analysis, value for money and resilience.

Options were assessed, and where appropriate, scored as summarised in Table 3-2, at each stage by a multi-disciplinary team, using the MCA framework set out in Table 3-1. Constraints mapping and existing evidence from desktop research were the main sources of information to assist with assessment. In assessing the criteria, guidance was provided by the policy direction of the AUPOIP (e.g. overlays), which could place constraints on the various options identified.

Assessment of the options against the criteria was not the sole means of assessing options but was a tool that informed and was complementary to the decision-making process for the preferred option. The process incorporated input Manawhenua, feedback from the consultation and engagement process and technical experts. Manawhenua representatives have expressed views, provided specialist advice and raised key issues though workshops and hui held throughout the process.

Table 3-1: MCA Framework

#	Transport Outcomes			Measure
	Transport outcomes vary for each Project as identified in the sections below			Options assessed against the transport outcomes. For example, key themes include: • Supporting urban growth • Safety • Connectivity
Well being	**MCA topic**	**#**	**Criteria**	**Measure**
Cultural	**1. Heritage**	1a	Heritage	Extent of effects on: • 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
		1b	Manawhenua	Extent of *effects on sites and places of cultural heritage value to Manawhenua (including Sites and Places of Significance to Manaehenua Schedule, Auckland Unitary Plan)*
Social	**2. Socio – economic impacts**	2a	Land use futures / integration with planned land use	To what extent will the option impact on the future development of land (within the corridor, adjacent to it and impacted by it – i.e. consider all 3 scales), in relation to: • 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 • Ability to consolidate residual land • Access that does not prevent neighbouring development
		2b	Urban design	To what extent does the option support a quality urban environment (both current and future planned state)? particularly relating to: • Context and planned place making considerations • An inviting, pleasant and high amenity public realm • Open space integration • Active interface between public and private realm • Scale of long-term impact on the amenity and character of the surrounding environment.
		2c	Land requirement	Scale of public / private land (m^2 / number of properties / special status of impacted property) required to deliver the option.

		2d	Social cohesion	Impact on, use, connectivity / accessibility for and to the existing urban areas including use and access to: • 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	Human Health and Wellbeing	Will the option potentially affect any sensitive land uses nearby or consented (adjacent residential, childcare centres, hospitals, rest homes, marae and schools)? particularly relating to: • Air Quality • Contaminated land • Noise and vibration
Environment	**3. Natural Environment**	3a	Landscape / visual	The extent of effects on: • 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)
		3b	Stormwater	Impact of operational stormwater (both quantity and quality) on the receiving environment, including: • Potential flooding effects of the option within the catchment • Extent and consequences of likely mitigation measures
		3c	Ecology	Extent of effects on: • Significant indigenous flora; • Significant habitats of indigenous fauna; • Indigenous biodiversity; • Stream / waterway ecology • Marine ecology
		3d	Natural Hazards	Extent of effect on adverse geology; steep slopes; seismic impacts; other resilience risks (low level infrastructure near coastlines, inundation areas)

Economic	**4. Transport**	4a	Transport system integration	Extent the option achieves the following: • Connectivity / integration other transport modes (i.e. trains, buses, walking and cycling networks) • Wider transport system effects/benefits • Improve accessibility • Increase mode shift to public transport
		4b	User safety	Extent of safety effects on all transport users, including: • People in public transport • people walking or cycling • People in private vehicles
	5. Construction impacts	5a	Construction impacts on utilities / infrastructure	Requirements for relocation / design of existing infrastructure, including: • Consideration of safety impacts • Risk of continuity of service over construction • Opportunities for integration with other bulk infrastructure
		5b	Construction Disruption	Construction impacts on people and businesses regarding: • Traffic & noise • Earthworks related effects including dust • Quality of life and amenity • Economic impacts on businesses / community / town centres
	6. Cost & Construction Risk	6a	Construction costs / risk / value capture	Assessed cost for construction of options including: • Complexity and risk in construction (including consideration of constructability) • Complexity in programme • Cost and complexity of safely undertaking works (including works on contaminated land) Extent to which the option can utilise a value capture mechanism to offset construction costs.

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
-	Not scored

Assessment of the options against the criteria was completed by subject matter experts and discussed at several MCA workshops. In addition to the MCA framework, several additional (and important) inputs were included in the assessment framework (refer Table 3-3).

Table 3-3: Other inputs in MCA framework

Project Partner and landowner feedback	• Project partner feedback for each option identifying scale / validity of objections; identified preference/proposed changes to options etc. • Feedback provided by other key stakeholders, the community and landowners
Policy Analysis	• Options alignment with the strategic policy framework including the Unitary Plan, the Auckland Plan and the Drury-Ōpāheke Structure Plan where it assisted in differentiating between options
Indicative costs	• High level indication of costs (including construction and property purchase) where it assisted in differentiating between options
Manawhenua	Provided a qualitative assessment including: • Identification/assessment of cultural issues (Customary practice/Te Taiao (Air, Land, water, Taonga)/Maori communities and wellbeing/Maori land) associated with an option. • Options Assessment commentary including testing criterion scoring for an option. • Other matters related to an option associated with the Manawhenua position.

4 Corridor Assessment Summary

As outlined in **Error! Reference source not found.**, the options assessment process commenced with a corridor assessment. This included an assessment of various network and corridor options to achieve a Strategic Transport Network to support Auckland's Southern growth area. The outcome of this corridor option assessment process was the South Indicative Strategic Transport Network. This section summarises the option development and assessment process for the strategic transport corridors within that network relevant to the Drury Package. It also presents the outcomes of that corridor assessment which were then taken forward for further assessment in the route refinement stage of the alternative assessment process.

4.1 Overview

The alternative corridor assessment process for the Southern growth area is summarised in Figure 4-1.

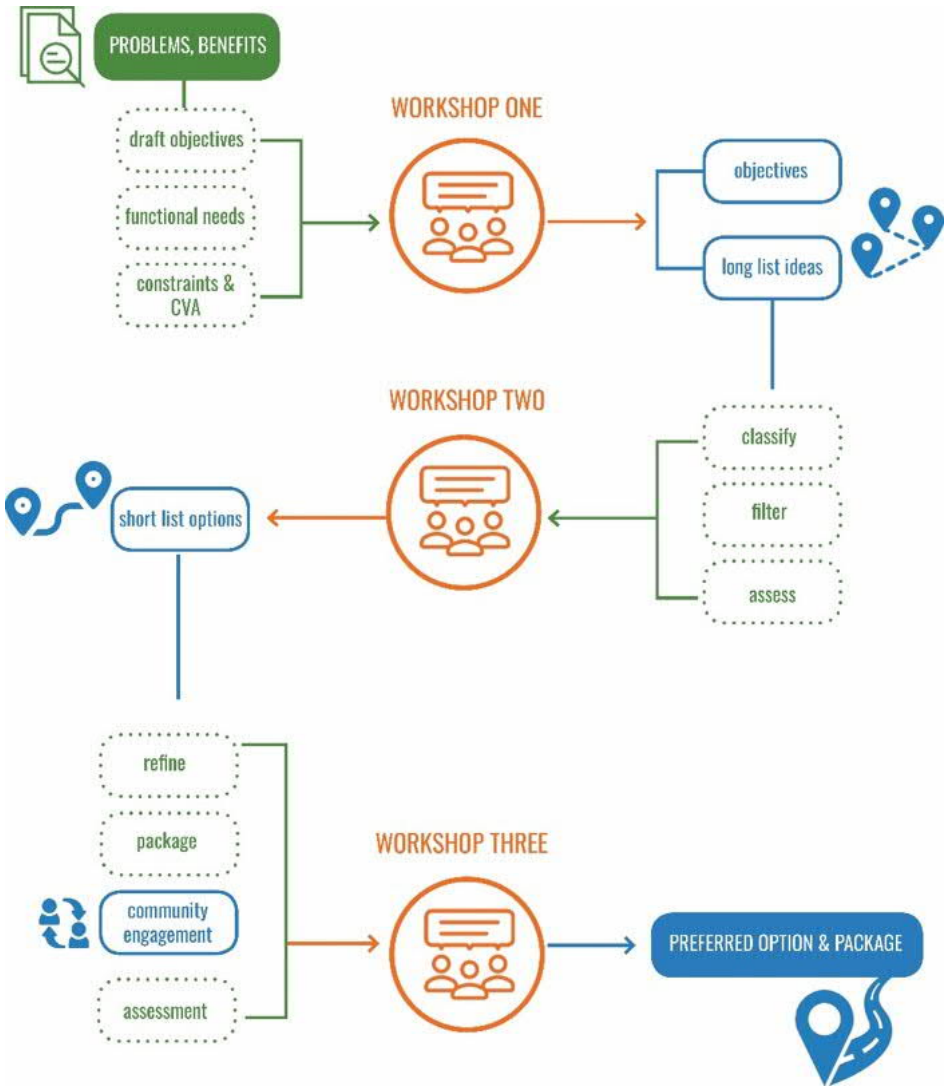


Figure 4-1: Alternative Corridor Assessment Process'

The corridor assessment process included both long list and short list assessment phases to identify an indicative strategic transport network for the Southern growth areas.

The long list assessment phase included development and assessment of a wide range of options against transport outcomes and MCA framework, using the Programme-wide MCA framework described in Section 2. A number of options were then recommended to proceed to the short list. Key project partners (Auckland Council, Manawhenua and KiwiRail) were involved in the development of long list options at Workshop 1 and evaluation of those options at Workshop 2. Refer Section 4.2 for further details on the long list development and assessment.

At the short list stage, options underwent a refinement and packaging process. Public consultation was conducted, and any feedback was considered in the short list evaluation. Key project partners were involved in a short list evaluation to recommend an indicative strategic transport network for the southern growth areas. Refer Section 4.3 for further details on the short list development and assessment.

4.2 Longlist Corridor Assessment

4.2.1 Longlist Option Development

Key steps to the development of the long list options are outlined in Figure 4-2. This process was documented as part of the South IBC Options Assessment undertaken in 2018.

The longlist assessment focused on the performance of the options in a more localised context. This identified those options that progressed through to the next stage of assessment i.e. the short list development and assessment.

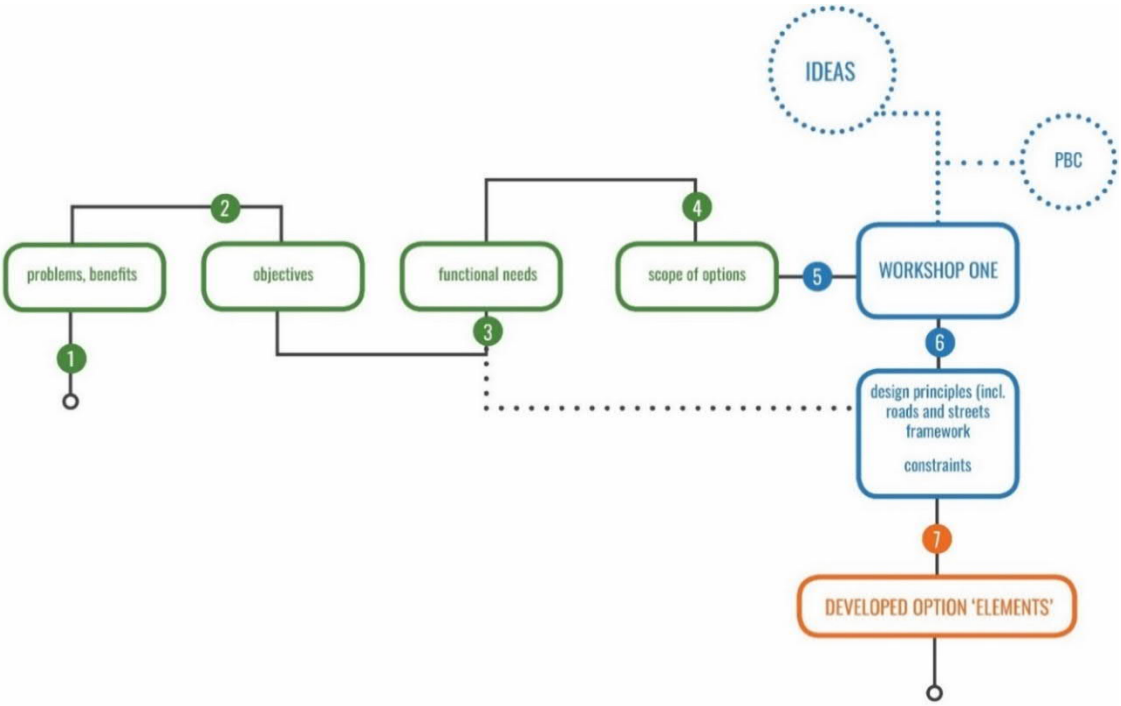


Figure 4-2 Development of Options

For the Southern growth area, around 460 options were initially identified including 88 options for the Ōpāheke- Drury area. These options were filtered to exclude options that were: outside scope, land use options, already part of a designated/consented or funded project, considered business as usual or unfeasible and duplicates of other options.

The remaining 151 options were taken through to the long list MCA process. These options were categorised into groupings relating to their function. The relevant grouping for the Drury Package included:

- Ōpāheke-Drury
  - **East-West connectivity (EW)** – new or upgraded arterials to increase east-west connectivity
  - **Arterial (AR)** – new or upgraded arterial roads providing both north-south connections and east-west connections through this sub area

4.2.2 Longlist Option Assessment

At the commencement of the long list assessment phase, the programme-wide MCA framework was adapted to the context of the Southern growth area. This localisation (described further in 6.3) involved reducing the MCA framework to only those criteria that would be relevant to enable distinctions to be made. Consequently the Project Team determined which criteria would not be assessed in the long list phase for reasons such as insufficient design detail, lack of likely differentiation and the expressed preference by Manawhenua to provide qualitative responses.

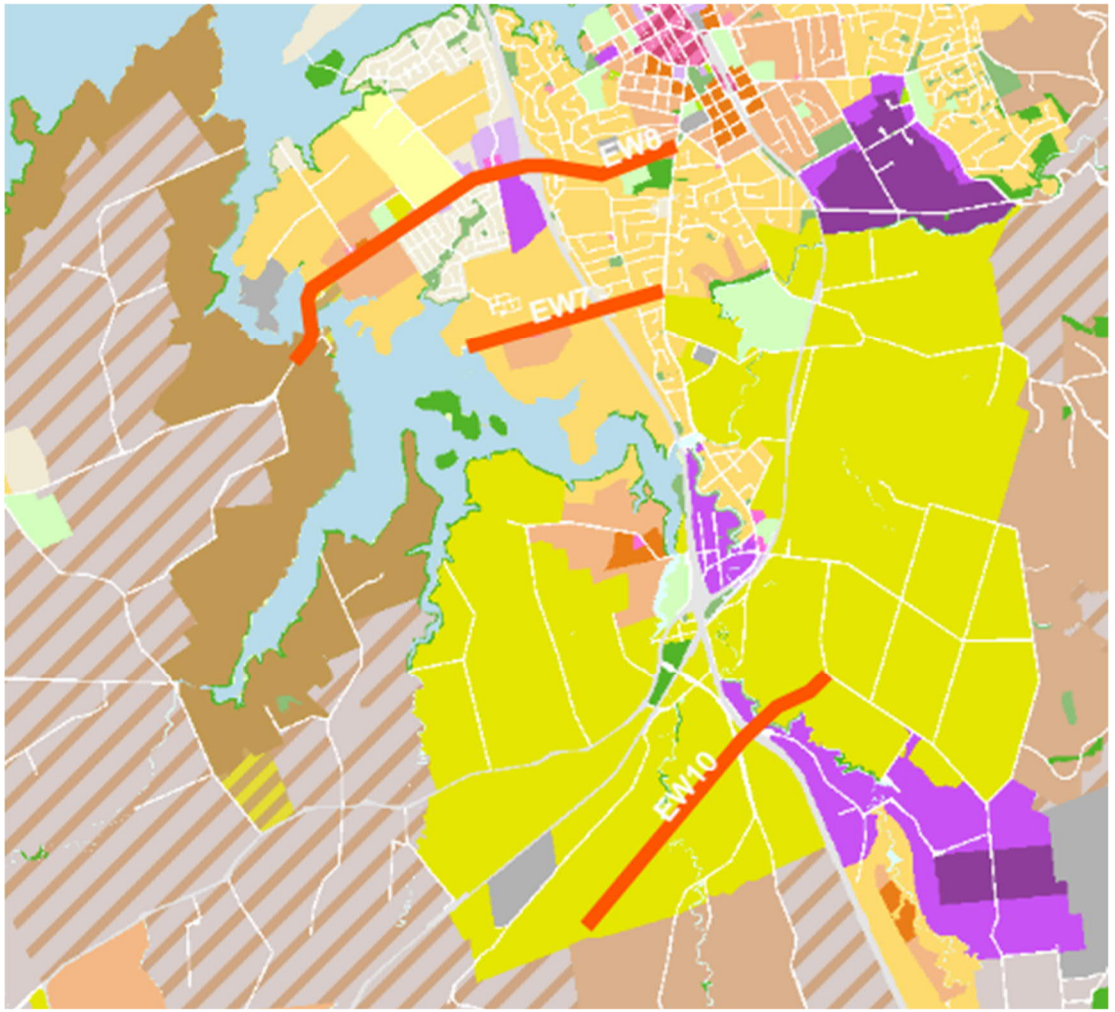
Each of the long list options were assessed using the localised MCA framework. Key steps in the options assessment were detailed in the 2018 South IBC Options Assessment and include:

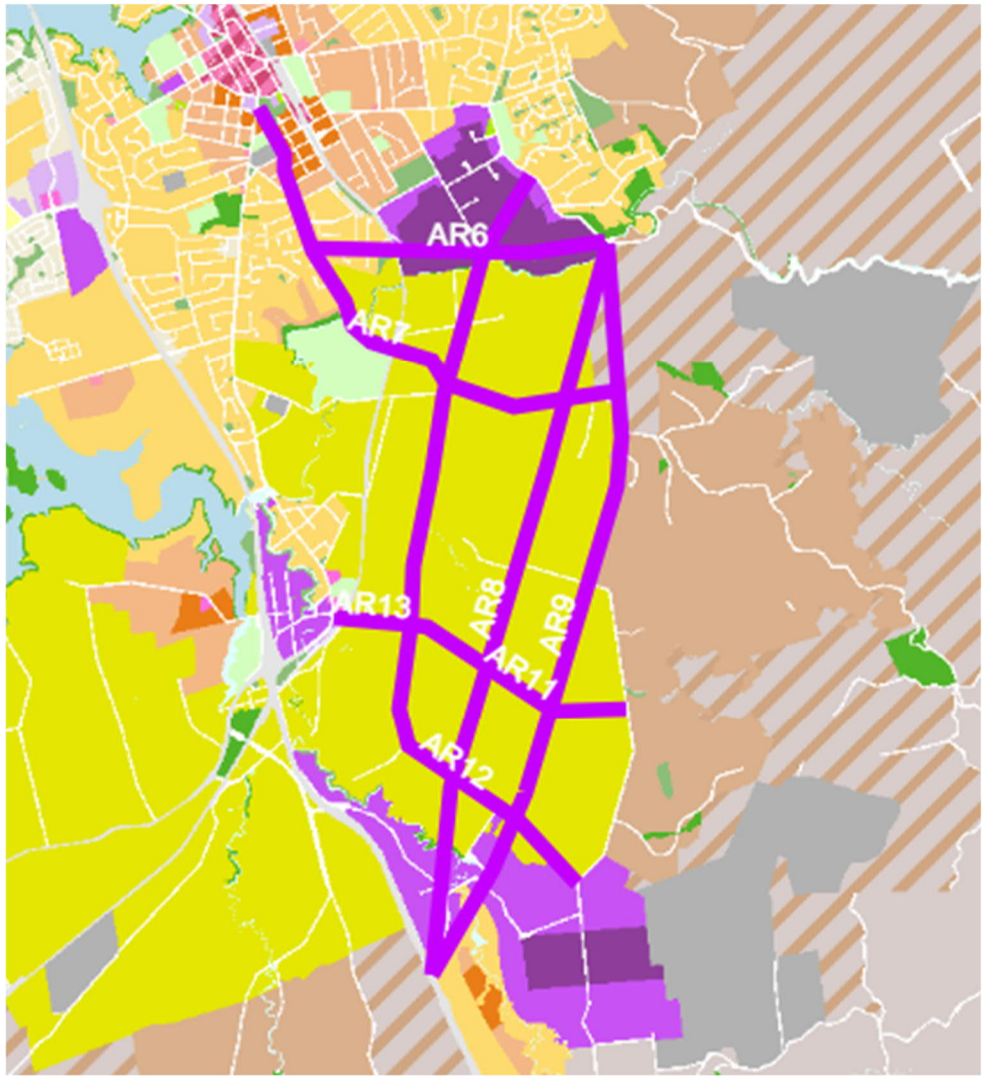
1. Initial scoring and assessment of non-scored criteria by subject experts
2. Manawhenua hui
3. Workshop 2 – collaborative evaluation of options and feedback from Partners
4. Scores refined
5. Long list refinement (amended and additional options) and assessment
6. Identification of Short list.

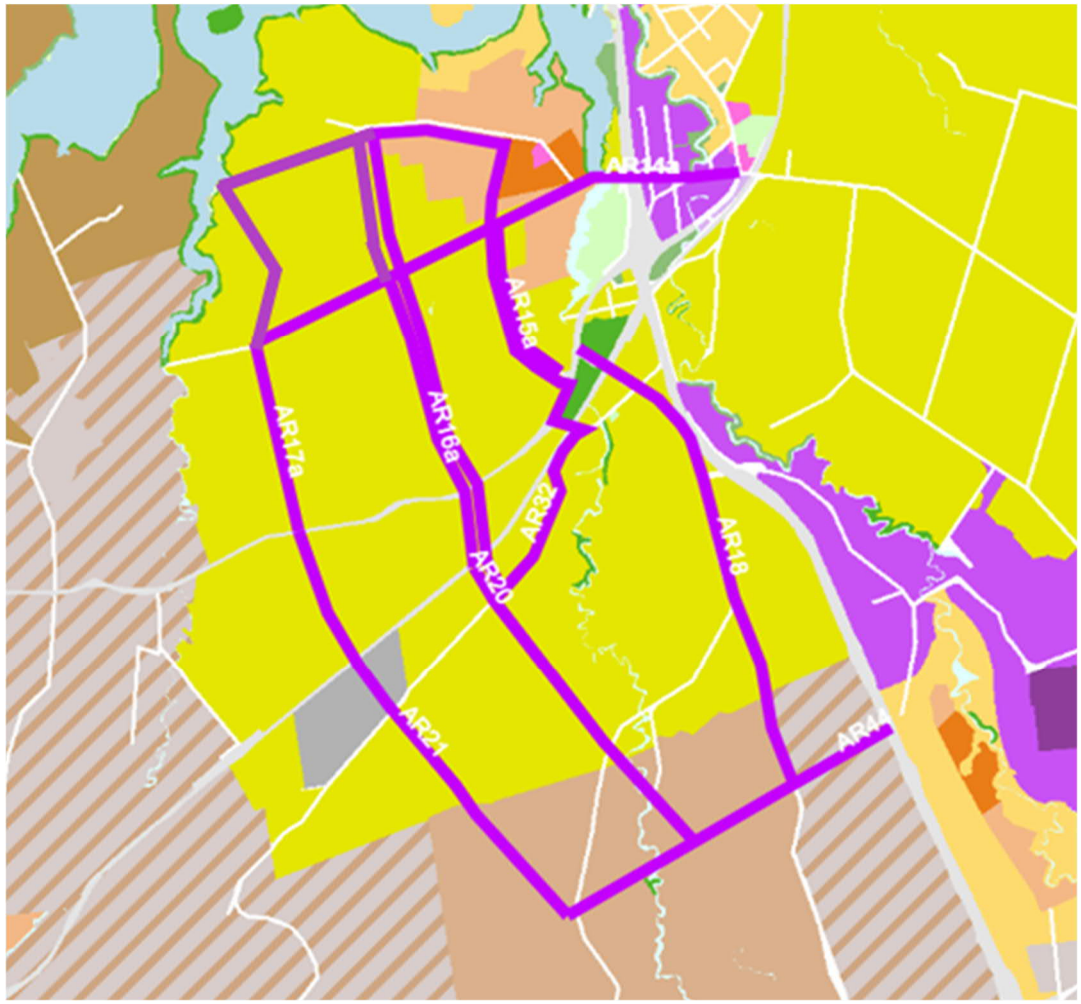
4.2.3 Identification of Short list / Recommendations

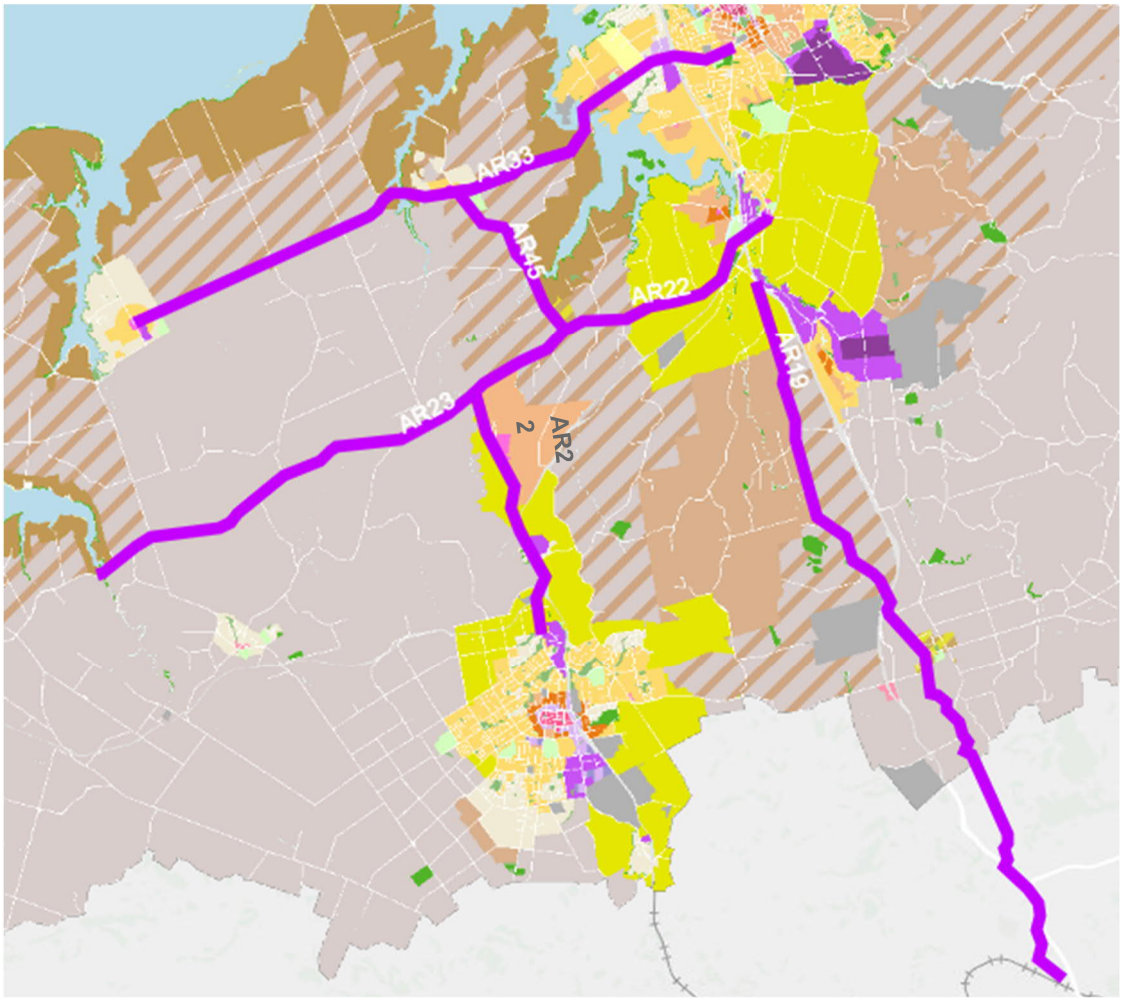
Table 4-1 provides an overview of the options assessed, recommendations and reasoning for progressing options to the short list corridor assessment.

Table 4-1 Long list corridor assessment recommendations

Options	Progress to short list?	Options Figure
Drury Ōpāheke – east west crossings • EW7 • EW8 • EW10	• **EW7** was recommended for the short list, in particular to allow further assessment of public transport (PT) and active mode opportunities. • Although scoring neutrally against the transport outcomes, **EW8** was recommended for the short list for further testing. • **EW10** was recommended for the short list, providing the most benefits against the transport outcomes and land use integration. Potential environmental effects can be further investigated.	

Options	Progress to short list?	Options Figure
Drury Ōpāheke – East Arterials • AR6 • AR7 • AR8 • AR9 • AR10 • AR11 • AR12 • AR13	It was recommended that **all options** proceed to the short list given the broad range of accessibility benefits and limited adverse effects (no option scoring worse than moderate -3 on any criteria).	

Options	Progress to short list?	Options Figure
Drury Ōpāheke – West Arterials (within FUZ) • AR14 • AR14a • AR15 • AR15a • AR16 • AR16a • AR17 • AR17a • AR18 • AR20 • AR21 • AR32 • AR44.	• The "a series" (refinements) **AR14a, 15a, 16a,** and **17a** are recommended for the shortlist over the original alignments. AR14a aligns with developer plans and the future land use. AR15a, AR16a and AR17a provide local benefits by connecting future communities and opportunities for public transport. • **AR18, 20, 21** and **44** are also recommended for the short list. All these arterials provide good connections and facilitate public transport. • AR32 is the only option that is not recommended for the short list as the route is covered by 15a and 16a.	

Options	Progress to short list?	Options Figure
Drury Ōpāheke – west arterials (outside FUZ) • AR19 • AR22A • AR22B • AR22C • AR22D • AR23 • AR33 • AR45.	• Although not scoring particularly well against the transport outcomes, **AR22D** (widen SH22 to four lanes) was recommended for the short list for further testing, especially with its relationship with Pukekohe Expressway options. The other SH22 options did not score well against the transport outcomes and were not recommended to proceed to the short list. • **AR33** was also recommended for the short list to further investigate its need to service growth areas to the west. • Feedback was received at the workshop on the need for **AR45**. It was recommended for the short list in order to further test its role in servicing the growth areas. • AR19 scored negatively on investment objective 3 and a -5 for landscape and visual (traversing two ONFs) so was not recommended for the short list.	

4.3 Shortlist Corridor Assessment

4.3.1 Shortlist Option Development

Following the recommendation of the initial short list the Project Team refined the short list of options to enable further testing and evaluation of the options. Development of the short list of options followed the process summarised below and in Figure 4-3. This process was documented as part of the South IBC Options Assessment undertaken in 2018.

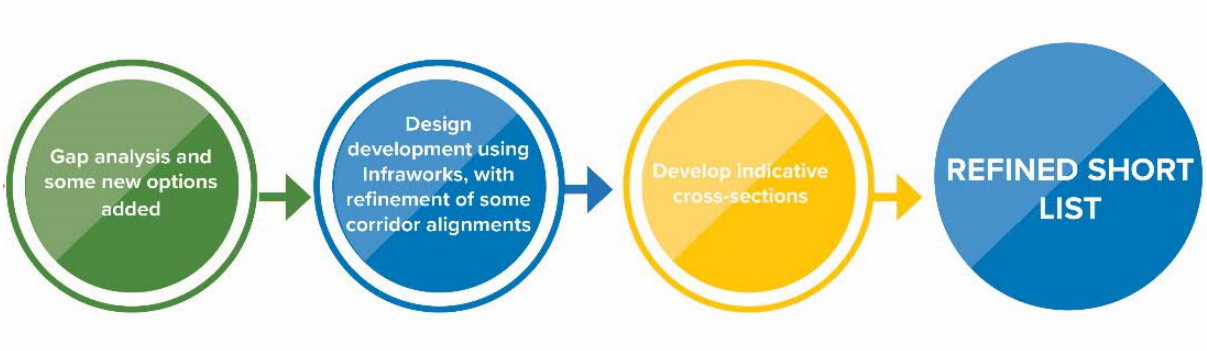


Figure 4-3 Short List Development Process

Based on feedback received at Workshop 2 and the gap analysis undertaken, some additional options were generated. All options were then refined and realigned to enable a design of 100m wide corridor for the short list assessment. This provided a guide as to where the transport corridors could be located, with the exact alignment to be determined.

To enable assessment of the options (including impacts and costs), indicative cross-sections were prepared and provided to specialists. Cross-sections were selected to provide sufficient flexibility to provide for the intended function of the corridor but also allow further refinement of the cross-section.

4.3.2 Shortlist Option Assessment

The same general framework was used throughout the long list and short list corridor assessment. However, a higher level of design detail, technical assessment and specialist input was applied at the short list assessment phase (relative to the long list assessment) and additional consideration of stakeholder and public feedback was made. This process included:

1. Initial draft scoring and assessment of non-scored criteria by subject experts
2. Pre-scoring workshop (challenge workshop)
3. Manawhenua hui to go through the scoring undertaken by subject matter experts and provide an opportunity to score the Manawhenua criteria
4. Stakeholder and Public Feedback
5. Partner Input – Workshop 3
6. Recommendation on Indicative Strategic Transport Network (see Section 4.4)

The same MCA process used at the long list assessment was applied at the short list with the addition of a broader range of criteria to guide option assessment at a more detailed level. Transport

outcomes were assessed by the Project Team transport planners using quantitative and qualitative evaluation against key performance indicators (KPIs) and measures.

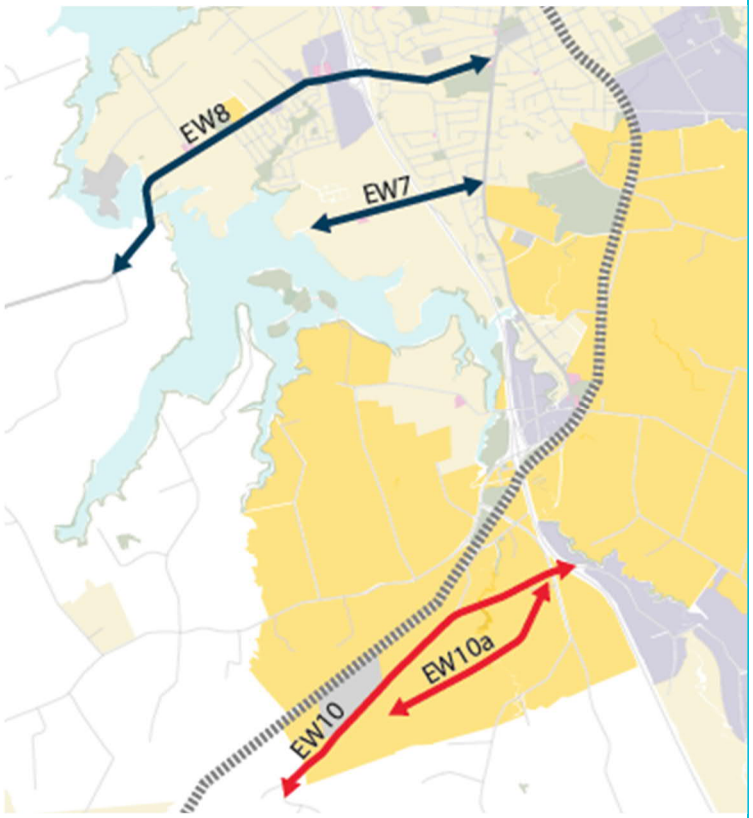
Technical specialists scoring the MCA were fully briefed on the options and MCA process through:

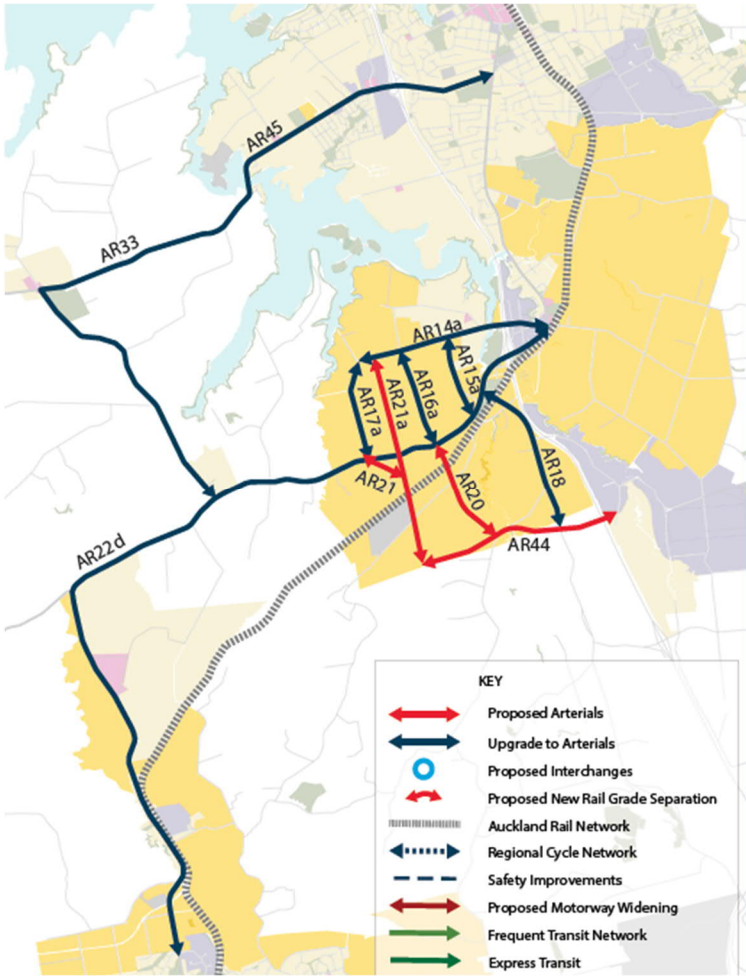
- Distribution of a specialist briefing pack
- Invitation to an overview session on the short list options, on use of the Infraworks tool and GIS viewer.

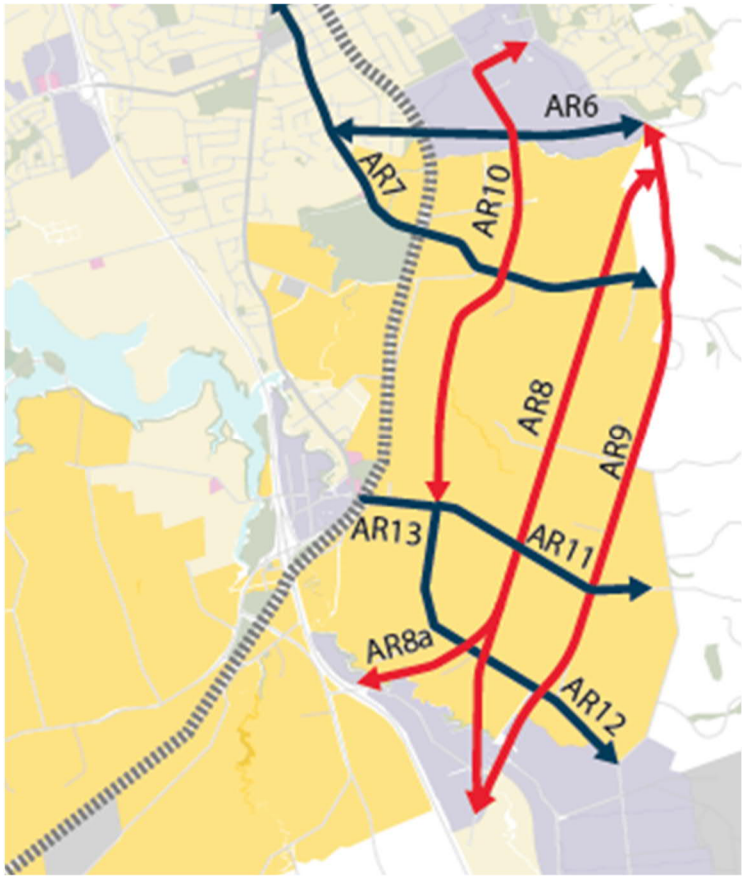
4.3.3 Recommendations

Table 4-2 provides an overview of the options assessed, recommendations and reasoning for identifying the preferred corridors for the Drury Arterial Network. These corridors were taken forward and included in the Indicative Strategic Transport Network identified in Section 4.4.

Table 4-2 Short list corridor assessment recommendations

Options	Recommendation / Reasoning	Options Figure
Drury Ōpāheke – east west crossings • EW8 (upgrade to arterial) • EW7 (upgrade to arterial) • EW10 (proposed arterial) • EW10a (proposed arterial)	None of these options were recommended to be taken forward as part of the Indicative Strategic Transport Network as none of the options scored particularly well against any of the transport outcomes of the Supporting Growth Programme.	

Options	Recommendation / Reasoning	Options Figure
Drury Ōpāheke – west arterials • AR14a (upgrade arterial) • AR15a (upgrade arterial) • AR16a (upgrade arterial) • AR17a (upgrade arterial) • AR18 (upgrade arterial) • AR20 (proposed arterial) • AR21 (proposed arterial) • AR21a (proposed arterial) • AR22d (upgrade arterial) • AR33 (upgrade arterial) • AR44 (proposed arterial) • AR45 (upgrade arterial)	It was recommended that the following options be identified as the preferred options: • **AR14a** - Upgrade and realign Bremner Road from new intersection with Jesmond Road to Great South Road roundabout • **AR16a** - Upgrade Jesmond Road from new connection with Bremner Road to SH22. • **AR20** - Connection from Jesmond Road to the Pukekohe strategic arterial • These options provide good people and public transport movement. They are centrally located providing a good catchment to proposed employment and residential catchments. • **AR22d** (four laning SH22) is recommended in part. Due to the growth in Drury, it is recommended to four lane SH22 from Drury township to Oira Road to increase capacity. Safety improvements are recommended on the rest of SH22. • **AR21a** was presented in emerging preferred options on the public consultation material. Although it scored well through the MCA process, AR16a was preferred utilising the existing Jesmond Road. • **AR33** to upgrade Linwood Road and AR45 to upgrade Blackbridge Road and Hingaia Road whilst not recommended as an upgrade to arterials are identified as requiring safety upgrades. Through further transport assessment it was identified that Walters Road (between Blackbridge and Hingaia Roads) would also require safety upgrades and the alignment of **AR45** has been amended to include this.	

Options	Recommendation / Reasoning	Options Figure
Drury Ōpāheke – east arterials • AR6 (upgrade arterial) • AR7 (upgrade arterial) • AR8 (proposed arterial) • AR8a (proposed arterial) • AR9 (proposed arterial) • AR10 (proposed arterial) • AR11 (upgrade arterial) • AR12 (upgrade arterial) • AR13 (upgrade arterial)	It was recommended the following options be identified as the preferred options: • **AR7** - Upgrade Ōpāheke Road and Ponga Road (Great South Road to Mill Road); • **AR10** - New arterial between Papakura industrial area/ Mill Road, Waihoehoe Road to Great South Road; and • **AR11** - Upgrade Waihoehoe Road (from Mill Rd/Drury Hills Road to Fitzgerald (junction of the new north south road link to Papakura industrial areas). • **AR13** - This has been merged with AR11 to provide a more complete road network instead of a small section of road. • These options provide good people and public transport movement function. AR7 removes a level crossing on Ōpāheke Road making the road run more efficiently. It provides access to the proposed Mill Road and benefits public transport by supporting high demand for bus trips on Ōpāheke Road. It is assessed to have greater network benefit function connecting FUZ areas to Papakura, employment areas to the north and proposed Mill Road. • AR10 increases connectivity and provides good people and public transport movement function through the FUZ. • AR11 and AR13 increase accessibility and together connect strategically into Drury central. They provide a good catchment to proposed employment and a have a good residential catchment. • The options have low potential for adverse environmental impacts (although some thought to stormwater management required) and limited construction impacts. • Option AR12 (upgrade of Fitzgerald Road) was originally shown on the public consultation material as an emerging preferred option. This was later discounted as AR11 (upgrade to Waihoehoe Road) provides a greater people and public transport movement function and is the preferred arterial connection in south-west Drury.	

4.4 Indicative Strategic Transport Network

The Southern IBC recommended the Indicative Strategic Transport Network for south Auckland shown in Figure 4-4. This network was endorsed by the AT board in February 2019 and the Waka Kotahi board in May 2019.

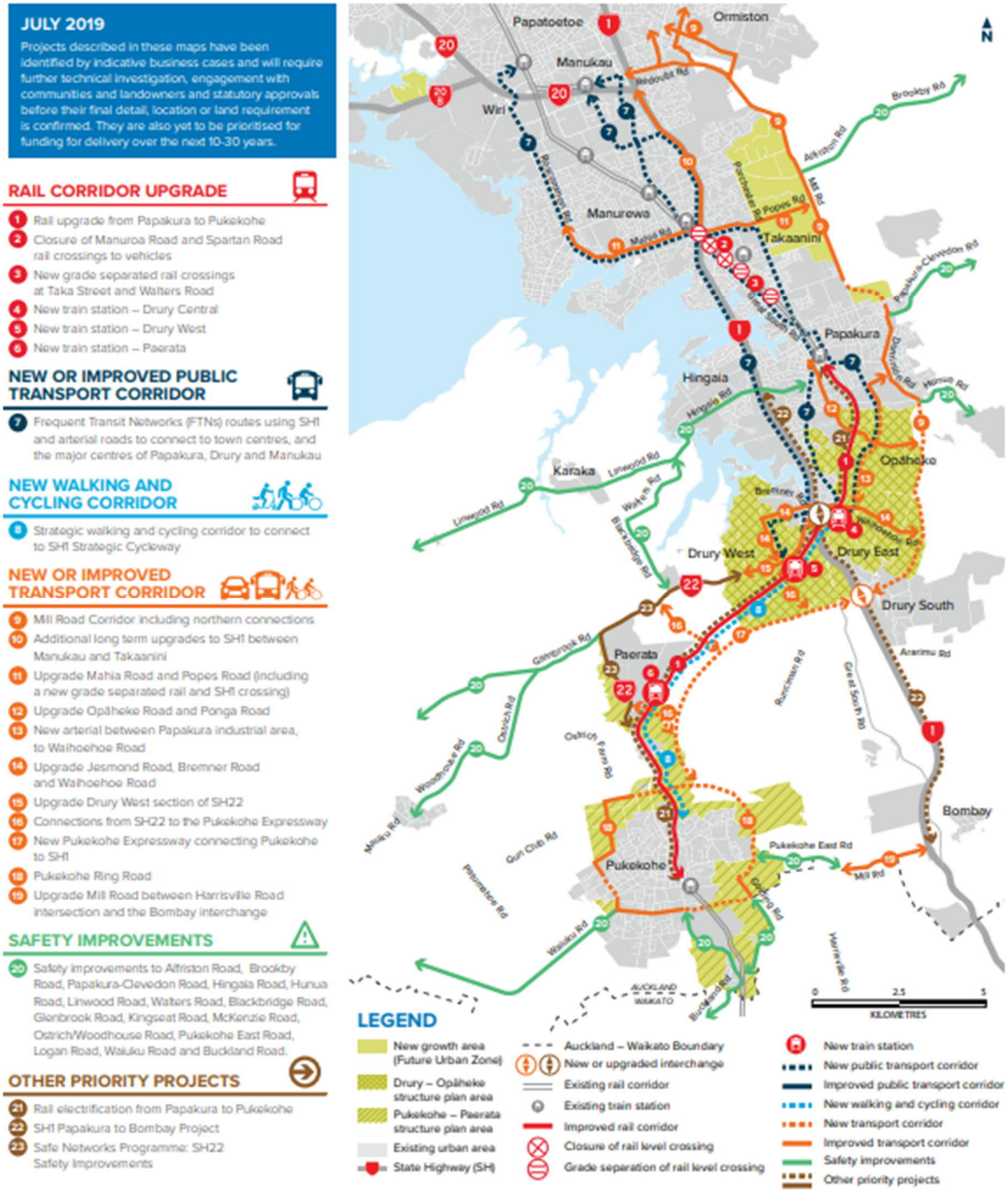


Figure 4-4 Southern growth area – Indicative Strategic Transport Network

The corridors identified in the Indicative Strategic Transport Network were assessed and grouped into five packages to pursue route protection. The recommended network that forms the Drury Arterial Network is outlined in Table 4-3, illustrated in Figure 4-5 and has the following key highlights:

- **Frequent Transit Networks** on a number of strategic corridors to support local access between centres and to train stations
- **A safe and attractive active mode network** with strategic cycle connections and facilities on arterial roads
- **New strategic arterial corridors** to support State Highway 1
- **A new arterial network** at Ōpāheke-Drury will prioritise public transport and active modes enabling transport choice, accessibility and travel behaviour change within existing and new communities.
- The new arterial network will **focus on safety** and support urbanisation of new greenfield areas.

Table 4-3 Corridor Assessment Outcomes - Drury Arterial Network

Shortlist Reference	Option name and description
AR7	**Ōpāheke Road Upgrade and Ponga Road Upgrade** Ōpāheke Road arterial upgrade from the intersection with the new Ōpāheke north-south FTN arterial in the west to Great South Road (GSR) in the north and Ponga Road arterial upgrade from the intersection with the new Ōpāheke north-south FTN in the west to the proposed Mill Road in the east.
AR10	**Ōpāheke North South FTN Arterial** New arterial between the intersection with Waihoehoe Road and Fitzgerald Road in the south to Hunua Road in the north.
AR11	**Waihoehoe Road upgrades** Arterial upgrade of Waihoehoe Road (west) (from Mill Road/Drury Hills Road to Fitzgerald (junction of the new north south road link to Papakura industrial areas) and FTN arterial upgrade of Waihoehoe Road (east) (from Fitzgerald Road to Great South Road).
AR14a	**Bremner Road FTN Upgrade** Upgrade and realign Bremner Road from new intersection with Jesmond Road, through Auranga development, to Great South Road roundabout
AR16a	**Jesmond Road FTN Upgrade** Upgrade Jesmond Road from SH22 in the south to new connection with the proposed east-west Jesmond to Bremner link / “Auranga Road 1” identified in Drury 1 Precinct Plan and within Auranga development.
AR22d	**State Highway 22 Upgrade** Upgrade of SH22 – four lanes from Drury township to Oira Road and safety improvements on the rest of SH22

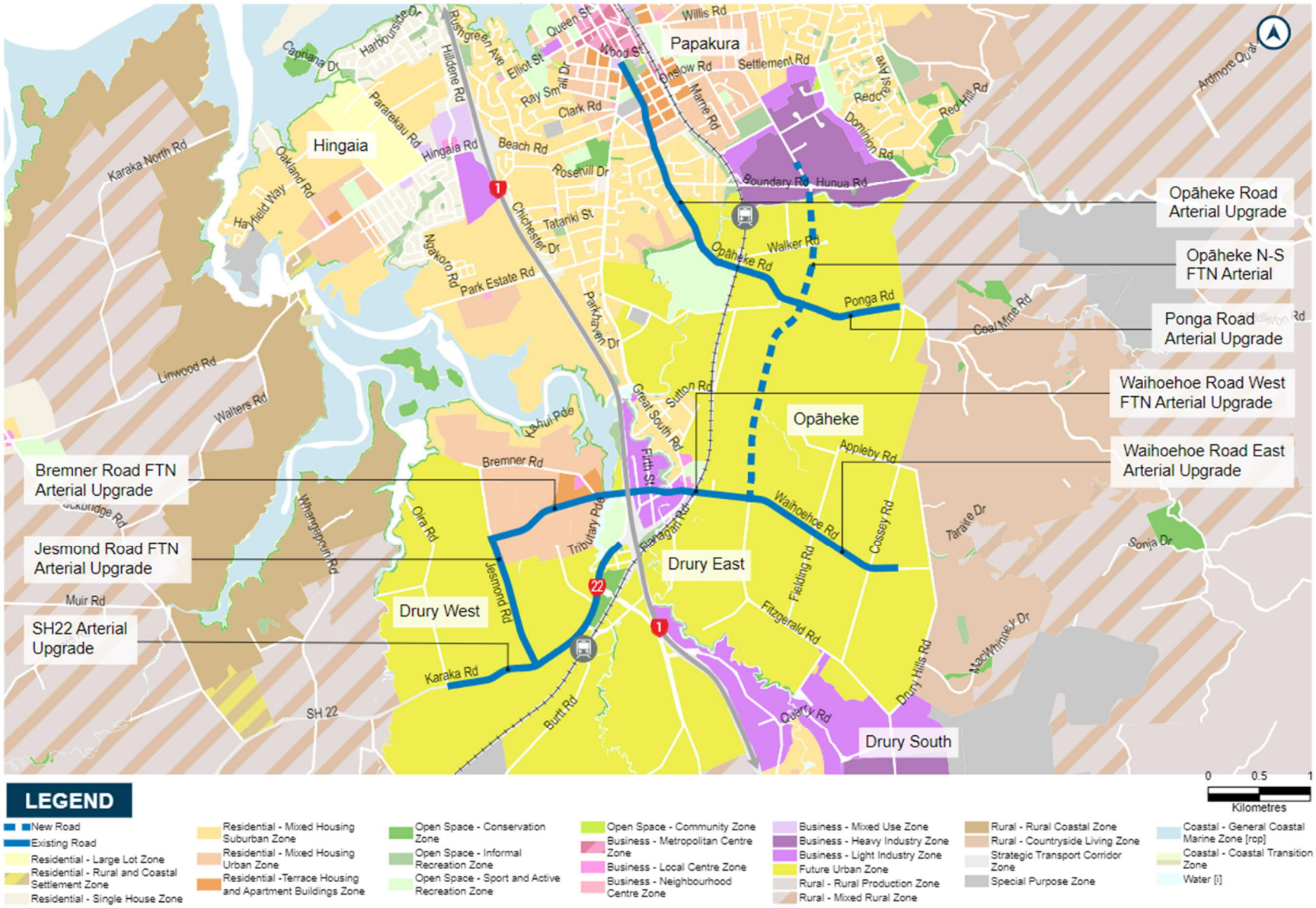


Figure 4-5 Indicative Transport Network – Drury Arterial Network (as per the IBC)

5 Summary of Route Refinement Alternatives - Development and Assessment

5.1 Overview

The progression from the corridor assessment phase to the route refinement phase saw the identification of the preferred network at a 'macro' level during corridor assessment to 'micro' detail at the route refinement phase. An overview of the process followed after the confirmation of the Indicative Strategic Transport Network is provided in Figure 5-1 and described in Sections 5.2 to Section 9.

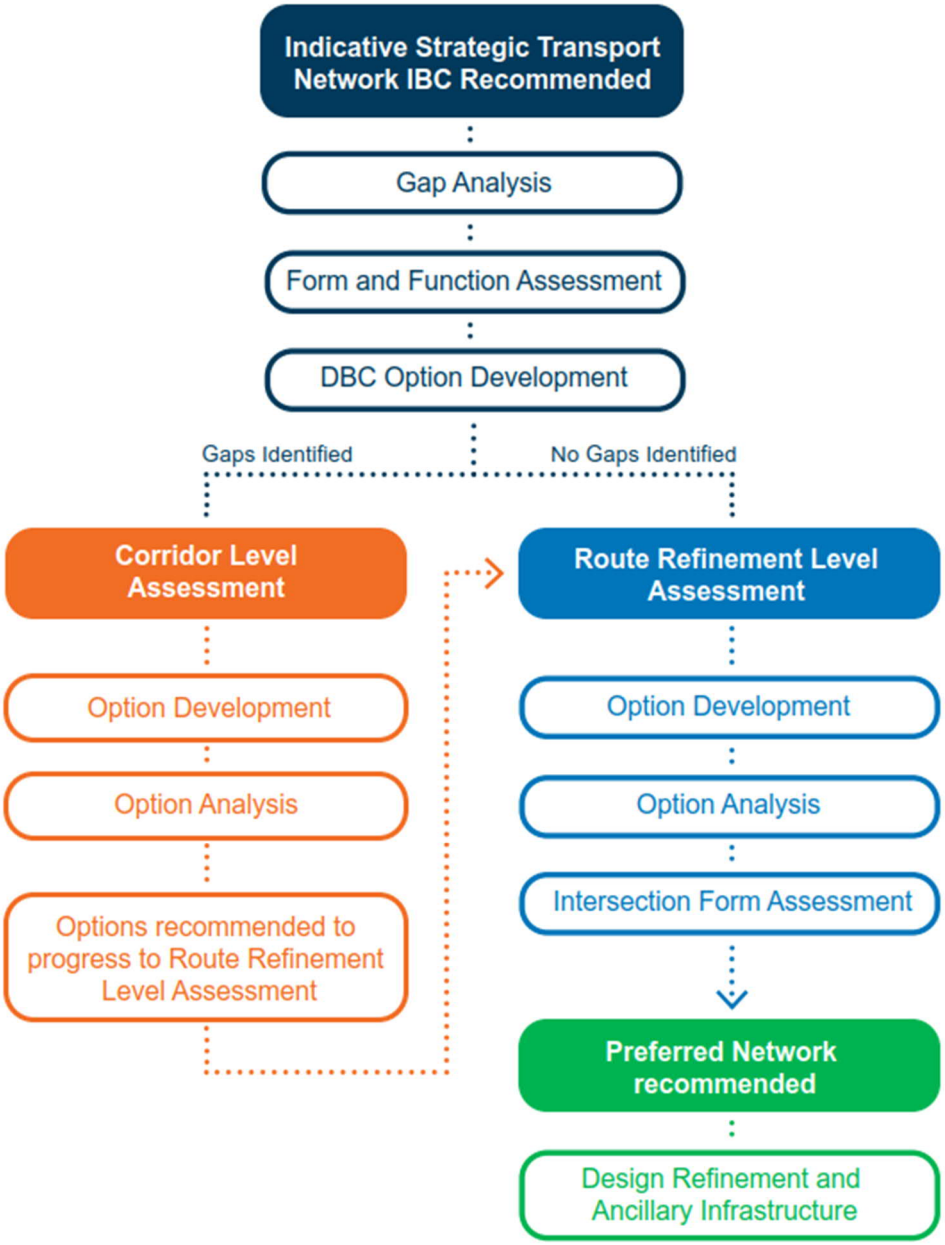


Figure 5-1 Overview of Alternatives Assessment process following corridor identification

5.2 Gap Analysis

In review of the corridor assessment and recommended Indicative Strategic Transport Network, a gap analysis was undertaken to identify the scope of further assessment of alternatives required to determine the preferred alignments of the Drury Arterial Network.

The gap analysis and background review was undertaken to ensure an understanding of how the Indicative Strategic Transport Network was identified, to check if anything had changed since the corridor assessment including policy direction and statutory documents (for example, plan changes), and to identify gaps or issues that required further consideration of alternatives.

The gap analysis included the following:

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

A summary of the gap analysis undertaken for each Project is summarised in each of the NoR sections.

5.3 Form and Function Considerations

To determine the desired function, and therefore the future form of alternative options, a form and function assessment process was followed. This section outlines the form and function assessment process that was undertaken in late 2019. The assessment outcomes for each project are summarised in each of the NoR sections.

5.3.1 Corridor Form and Function

At a programme level, a corridor form and function assessment tool was developed to support consistent decision making. The intent of the tool was 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 key principles of the assessment process included:

- Surrounding place, land use, and corridor movement purpose must be considered first.

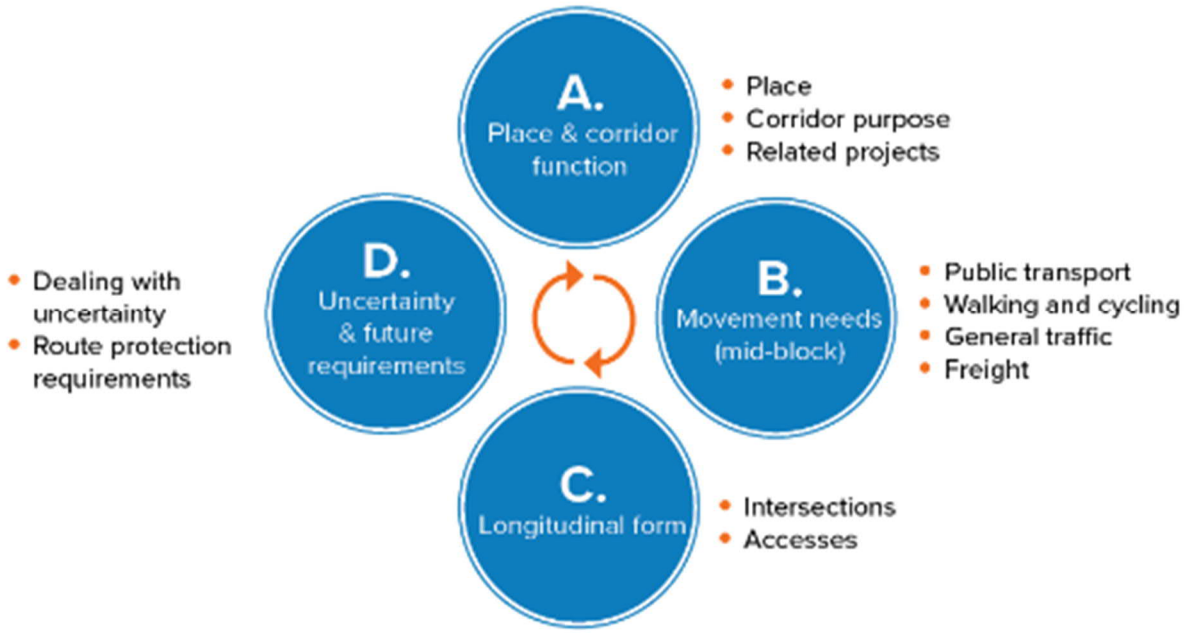
- Public transport, high occupancy vehicle, walking, and cycling needs are given highest priority for corridor space, particularly for commuter and short local trips respectively. For Frequent Transit Network (FTN) routes, there is a range of considerations influencing the suitability of bus priority, including a minimum 15 min frequency, reliability of corridor and intersections, network connectivity, integration with wider PT network and spatial positioning for optimum integration with the place, density and catchment.
- General traffic is considered only once all other modes have been assessed and should only be provided with two lanes up to an approximate daily flow of 15,000 vehicles per day or less than 1,500 vehicles per hour each lane in the peak periods. Four general traffic lanes should only be considered when:

    a. daily flow exceeds 15,000 vehicles per day; *and*
    b. where the Level of Service (LOS) for two general traffic lanes is less than LOS C in the interpeak; *and*
    c. where it can be demonstrated that bus/ HOV lanes have been considered first; *and*
    d. where it can be demonstrated that two general traffic lanes will not be appropriate

- The 'target' level of service for general traffic is LOS C in the interpeak. LOS D or E in the peak is considered acceptable and may encourage mode shift for journeys at these times.

The output of the assessment is a *desired* cross section for the corridor being assessed. Typical cross sections were used for the Supporting Growth Programme. This included a set of standard cross section typologies that could be implemented across the Supporting Growth Programme and its networks.

Figure 5-2: Corridor assessment principles



The form and function assessment undertaken for each Drury Arterial corridor is summarised in each of the NoR sections. Table 5-1 and Figure 5-3 provide an overview of the form and function for the Drury Arterial Network.

Table 5-1 Drury Arterial Network Four-Lane Corridors

Four Lane Arterials	
	

Project	Overview of lanes, active modes and vehicle speed
Jesmond Road FTN Upgrade	Predicted flows: 11,000 ADT Four lanes including bus priority lanes (part of FTN PT spine) Separated cycle lane and footpath – part of the primary cycle network. 50 kph speed limit
Bremner Road FTN Upgrade	Predicted flows: 25,000 ADT Four lanes including bus priority lanes (part of FTN PT spine) Separated cycle lane and footpath – part of the primary cycle network. 50 kph speed limit
Waihoehoe Road West FTN Upgrade	Predicted flows: 25,000 ADT Four lanes including bus priority lanes (part of FTN PT spine) Separated cycle lane and footpath – part of the primary cycle network. 50 kph speed limit
Ōpāheke North-South FTN Arterial	Predicted flows: 14,000 ADT Four lanes including bus priority lanes (part of FTN PT spine) Separated cycle lane and footpath – part of the primary cycle network. 50 kph speed limit
SH22 Upgrade	Predicted flows: 22,000 ADT Four lanes - initially for general traffic, but over time 2 lanes dedicated to priority vehicle lanes. Separated cycle lane and footpath – part of the primary cycle network. 50 kph speed limit

Table 5-2 Drury Arterial Network Two-Lane Corridors

2 Lane Arterials



Project	Cross section
Waihoehoe Road East Upgrade	Predicted flows: 10,000 ADT 2 lanes due to flows and land use. Paths for active modes – part of the secondary cycle network. 50 kph speed limit
Ponga Road Upgrade	Predicted flows: 8,000 ADT 2 lanes due to flows and land use Separated cycle lane and footpath – part of the secondary cycle network but connects to the primary network. 50 kph speed limit
Ōpāheke Road Upgrade	Predicted flows: 14,000 ADT 2 lanes due to flows, existing land use and space constraints. Separated cycle lane and footpath – part of the primary cycle network. 50 kph speed limit

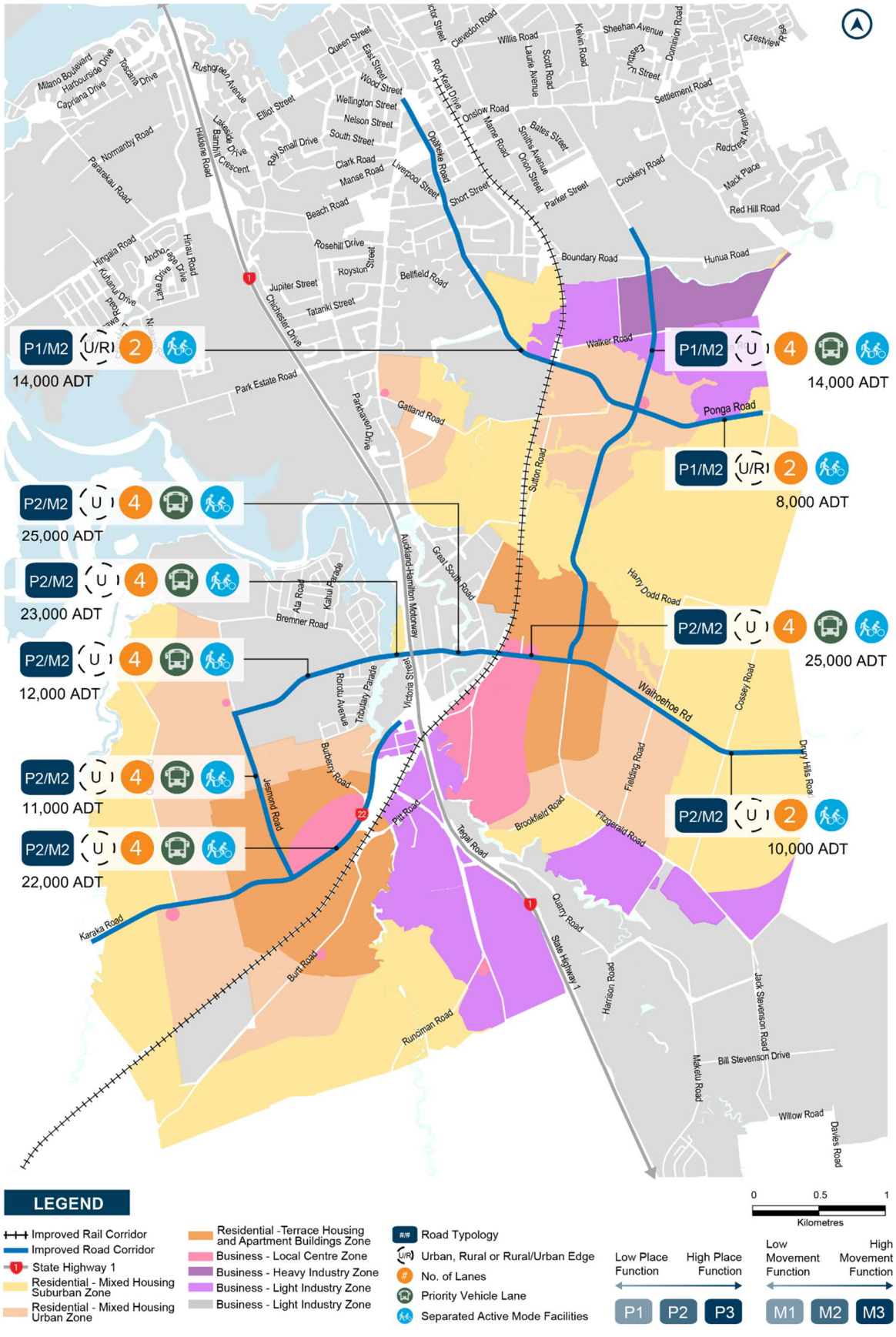

P1/M2 U/R 2
14,000 ADT
P1/M2 U 4
14,000 ADT
P1/M2 U/R 2
8,000 ADT
P2/M2 U 4
25,000 ADT
P2/M2 U 4
23,000 ADT
P2/M2 U 4
12,000 ADT
P2/M2 U 4
25,000 ADT
P2/M2 U 4
11,000 ADT
P2/M2 U 4
22,000 ADT
P2/M2 U 2
10,000 ADT
Milano Boulevard
Harbourside Drive
Capriana Drive
Tuscany Drive
Rushgreen Avenue
Normanby Road
Parakiteau Road
Hillsborne Road
Lakeside Drive
Barnhill Crescent
Elliot Street
Ray Small Drive
Queen Street
East Street
Wood Street
Wellington Street
Nelson Street
South Street
Clark Road
Manse Road
Beach Road
Rosehill Drive
Royston Street
Jupiter Street
Tatanki Street
Chichester Drive
Park Estate Road
Parkhaven Drive
Hingaia Road
Kuhanui Drive
Anchorage Drive
Lake Drive
Hinau Road
Gatland Road
Auckland-Hamilton Motorway
Great South Road
Sutton Road
Ala Road
Kahui Parade
Bremner Road
Rorotu Avenue
Tributary Parade
Victoria Street
Burberry Road
Jesmond Road
Karaka Road
Burtt Road
Pitt Road
Tegal Road
Runciman Road
Quarry Road
State Highway 1
Harrison Road
Brookfield Road
Fielding Road
Fitzgerald Road
Cossey Road
Waihoehoe Rd
Drury Hills Road
Harry Dodd Road
Ponga Road
Boundary Road
Hunua Road
Walker Road
Bellfield Road
Onehunga Road
Liverpool Street
Short Street
Parker Street
Onslow Road
Ronwood Avenue
Ron Keal Drive
Cleveden Road
Willis Road
Laurie Avenue
Scott Road
Kelvin Road
Sheehan Avenue
Dominion Road
Crestview Rise
Settlement Road
Redcrest Avenue
Mack Place
Croskery Road
Red Hill Road
Bates Street
Smiths Avenue
Orion Street
Makaetu Road
Bill Stevenson Drive
Jack Stevenson Road
Willow Road
Davies Road
LEGEND
Improved Rail Corridor
Improved Road Corridor
State Highway 1
Residential - Mixed Housing Suburban Zone
Residential - Mixed Housing Urban Zone
Residential -Terrace Housing and Apartment Buildings Zone
Business - Local Centre Zone
Business - Heavy Industry Zone
Business - Light Industry Zone
Business - Light Industry Zone
Road Typology
Urban, Rural or Rural/Urban Edge
No. of Lanes
Priority Vehicle Lane
Separated Active Mode Facilities
0 0.5 1
Kilometres
Low Place Function
High Place Function
P1 P2 P3
Low Movement Function
High Movement Function
M1 M2 M3

Figure 5-3 Drury Arterial Network Form and Function showing Drury-Ōpāheke Structure Plan

5.4 Approach to the Development of Route Refinement Alternatives

Following the gap analysis and identification of the form and function of each of the corridors, recommendations were made on the approach to further assessment and the development of alternative options for each Project.

The gap analysis identified whether the recommended option from the corridor assessment for each Project required reconsideration in light of any new information relating to that Project. For example, land use changes, new growth projections and any issues identified through engagement with stakeholders. The analysis also identified whether the corridor assessment had sufficiently considered alternatives proportional to the scale of potential effects of each Project.

Where new information was identified, or where the corridor assessment did not sufficiently consider alternative options for Projects that was proportional to the scale of potential effects, additional options assessment would have been required through an additional corridor assessment process to achieve the level of options assessment detail required to progress route protection. Where Projects achieved the above, further options assessment was undertaken through route refinement.

Overall, the gap analysis concluded that for the Drury Arterial Network adequate consideration of alternative corridors was undertaken in the corridor assessment phase and there was no new information or changes since the assessment that required additional options to be assessed. As such, the alternatives assessment process proceeded to the route refinement phase to look at the options for refinement of the recommended corridors in further detail. Table 5-3 provides an overview of the recommendations for further alternatives assessment and the route refinement options to be considered for each element of the Drury Arterial Network. It also outlines the type of assessment that was undertaken for each Project (or element) which is discussed further in Section 6.3. Sections 10 to 14 provide further detail and assessment of each of these Projects.

For proposed upgrades of existing roads, the route refinement process involved an investigation to decide which side of the existing road corridor to widen. For Ōpāheke N-S FTN Arterial, which is a proposed new transport corridor, the route refinement process involved investigating an alignment within or adjacent to the corridor recommended in the corridor assessment. The route refinement process for Bremner Road east included two stages. The first stage investigated alternatives to the large bridge structure as recommended through the corridor assessment. Once the general layout was decided, the second stage investigated which side of the existing roads to widen.

For road widening, three options were considered: widening one side or the other or widening both sides. Depending on the level of potential effects, constraints or opportunities identified during the assessment it was recognised in some instances that the three options should be further refined to include a combination of widening on both sides of the existing road corridor.

Table 5-3 Overview of assessment approach and options developed

Element	Assessment process refer to discussion in section 6)	Options
State Highway 22 Upgrade Drury interchange to just west of Oira Road	Route refinement MCA assessment – qualitative only (not scored)	• Option A (northwest) • Option B (southeast) • Option C (centre)
Jesmond Road FTN Upgrade	Route refinement – investigate which side of the road to widen MCA assessment – qualitative only (not scored)	• Option A (west) • Option B (east) • Option C (centre)
Bremner Road FTN Upgrade – split into the following sections for options assessment:		
• Bremner Road West FTN Upgrade: this section is through the Drury 1 Precinct and Auranga Plan Change 6 area and the alignment has been agreed between stakeholders	No options assessment required. Affected property owners have reached agreement on the preferred alignment in this section via PC 6 to the AUP.	No options assessment required.
• Bremner Road Central FTN Upgrade: section crossing the Ngakoroa Stream and State Highway 1	Route refinement – investigate which side of the road to widen MCA assessment – qualitative only (not scored)	• Option A (north) • Option B (south) • Option C (centre)
• Bremner Road East FTN Upgrade: from the State Highway 1 crossing to a tie in with Great South Road. This also includes the potential upgrade of Creek Street, Firth Street and Norrie Road.	Route refinement – two stages: Stage 1: investigate alternatives to large bridge structure recommended at IBC and the location of intersections and associate layout of local roads Scored MCA assessment	• Option A (upgrade existing roads) • Option B (short bridge, Firth at grade) • Option B1 (medium bridge, Firth at grade) • Option B2 (medium bridge, Firth at grade and intersection with Creek Street) • Option C (long bridge, Firth blocked (rerouted), intersection at Creek) • Option D (long bridge, Firth under, no access from Bremner) • Option D1 (long bridge, Firth under, intersection at Creek)
	Stage 2: Recommendations from Stage 1 (Option B2) taken forward to investigate which side of the existing roads to widen MCA assessment – qualitative only (not scored)	• Option B2 A (north) • Option B2 B (south) • Option B2 C (centre)

Element	Assessment process refer to discussion in section 6)	Options
Waihoehoe Road West FTN Upgrade From Great South Road in the west to the new Ōpāheke North South FTN Arterial in the east.	Route refinement MCA assessment – qualitative only (not scored)	• Option A (north) • Option B (south) • Option C (centre)
Waihoehoe East Upgrade From Ōpāheke N-S FTN Arterial in the west to the future Mill Road corridor in the east	Route refinement MCA assessment – qualitative only (not scored)	• Option A (north) • Option B (south) • Option C (centre)
Ōpāheke North-South FTN Arterial From the intersection of Fitzgerald and Waihoehoe Roads in the south to Hunua Road in the north.	Route refinement MCA assessment – scored	• Option A (central) • Option B (west) • Option C (east)
Ponga Road Upgrade From Ōpāheke Road in the west to the future Mill Road corridor in the east	Route refinement MCA assessment – qualitative only (not scored)	• Option A (north) • Option B (south) • Option C (centre)
Ōpāheke Road Rural Upgrade From Ponga Road in the southeast to near Lorelei Place in the northwest	Route refinement MCA assessment – qualitative only (not scored)	• Option A (northeast) • Option B (southwest) • Option C (centre)
Ōpāheke Road Urban Upgrade From near Lorelei Place in the south to Great South Road in the north	No options assessment required for widening of the corridor as the upgrade generally fits within the existing corridor (see Section 15.1.3.1). However, route refinement of the Ōpāheke Road / Settlement Road intersection (a pinch point) was required. MCA assessment – qualitative only (not scored)	• Option A – signalised intersection with active modes • Option B – roundabout in centre of existing intersection • Option C – roundabout on eastern side (Settlement Road) • Option D – roundabout on southern side (Ōpāheke Road)

6 Route Refinement Assessment Methodology

6.1 Overview

Following the process outlined in Figure 5-1, the route refinement options outlined in Table 4-3 were assessed by the Project Team and confirmed by Waka Kotahi and AT respectively to establish the preferred alignments of the Drury Package for route protection. The route refinement assessment used the MCA framework developed for the Supporting Growth Programme, adapting its use to suit the Drury context and the alternative options being assessed at the route refinement stage. The route refinement process is shown in Figure 6-1.



Figure 6-1 Route Refinement Assessment Process

6.2 Option Assessment Process

The route refinement options for each Project were loaded into the Supporting Growth GIS constraints viewer to enable expert assessment. The viewer contained constraints and local site information with respect to the various options to assist the assessment process. The constraints and information on the GIS were sourced live from the Auckland Council GIS datasets.

Technical specialists were commissioned to assess options using the localised Supporting Growth MCA framework.

Specialists were allocated criteria relevant to their discipline and asked to assess each option against those criteria. They were also asked to complete a summary report to identify any constraints, potential effects and opportunities of the various options. Any opportunities relating to improving an option or an alternative option were taken forward for consideration in option development. Specialists were also asked to indicate where an option would have the greatest level of potential effects on matters within their discipline areas and suggest changes to an alignment or design if necessary, to reduce potential effects.

The GIS viewer was used as an interactive tool and specialists were asked to add comments, identify features or areas of concern on the GIS viewer. The Project Team attended workshops as discussed in Section 6.5.3 to discuss and respectfully challenge the assessments.

6.3 Use of the MCA Framework in the Route Refinement Assessment

There were two approaches to using the MCA framework in the route refinement assessment – either for scoring the options, or for a qualitative assessment of the options. Both approaches used the same MCA framework localised to suit the Drury Arterial Network.

This localisation involved the removal of criteria relating to transport system integration and user safety. These criteria were removed as they repeated themes that were already being assessed under the transport outcomes. Some of the measures relating to size and shape of residual land parcels and access were moved from the land use futures criterion to the land requirement criterion to be assessed by a property specialist. Additionally, the preference of Manawhenua was to provide qualitative responses.

Scoring of options was undertaken where it was thought it would assist in differentiating between the options and where (in places) the options developed were located, in part, outside of the corridor assessment undertaken previously. This was undertaken for Bremner Road East FTN Arterial options (Stage 1) and the Ōpāheke North-South FTN Arterial. The options for these projects (or project sections) involved more complexities than those projects that only involved road widening. Bremner Road East FTN Arterial involved multiple stages of options assessment in order to adequately assess potential stormwater and flooding constraints.

For the projects involving widening of an existing road, the MCA framework was used to guide a qualitative approach to the assessment. This focussed the assessment on the constraints, opportunities or features that would influence which side of the existing road was widened, recognising that the options considered could be refined to involve a combination of widening on either side of the existing road corridor to minimise effects.

6.4 Technical Inputs and Expert Briefing

Subject matter experts from the following technical areas were involved in the assessment of each of the options for the Drury Arterial Network:

- Planning
- Archaeology and Built Heritage
- Ecology
- Landscape and Visual
- Urban Design
- Transport
- Stormwater / Flooding
- Social
- Property
- Construction / Engineering
- Geotechnical / Natural Hazards.

Where appropriate, scoring and qualitative analysis was completed by the subject matter experts and discussed at several MCA workshops.

Prior to each workshop, experts were provided with a briefing pack, which contained the MCA framework and assessment guidelines, an overview of the project and options and a template for a summary report to record their approach, assumptions, findings and recommendations. Further to the briefing pack, a technical specialist briefing was held on 13 August 2019 to brief technical specialists on the alternative options for assessment and assessment process.

Subject matter experts were also given access to the GIS constraints viewer which showed the options and environmental, heritage, social layers and information which could be turned on and off with options. The constraints and information on the GIS were sourced live from the Auckland Council GIS datasets. The GIS viewer was used as an interactive tool and specialists were asked to add comments, identify features or areas of concern on the GIS viewer.

6.5 Project Partner Involvement and Landowner Engagement

Throughout the route refinement assessment process, a range of consultation and engagement was undertaken with Project partners (Auckland Council and Manawhenua). They were involved in the evaluation of the options and provided important feedback at workshops and hui. The various workshops are described in this section and the outcomes of the engagement for each Project is described in Sections 10 to 14.

6.5.1 Ngā Manawhenua

Four hui with specific discussion of the Drury Package alternatives assessment were held with Manawhenua. During the initial workshops the Project Team provided Manawhenua with an overview of the assessment process and the options for assessment for each of the corridors. The Project Team sought feedback and insight from Manawhenua to assist with decision making. During subsequent hui the Project Team presented assessment findings and emerging preferred options for further feedback from Manawhenua.

In addition to the specific hui for the options assessment, a monthly hui for all South Supporting Growth Projects is held to ensure collaboration with Manawhenua. Where required, the options assessment was also discussed at these hui.

6.5.2 Auckland Council

Three workshops specific to the Drury Arterial Network options assessment were held with the Council. During the initial workshops the Project Team provided Council attendees with an overview of the assessment process and the options for assessment for each of the corridors. The Project Team sought feedback and insight from the Council with respect to land use integration matters to assist with decision making. During the second and third workshops, the Project Team presented the emerging preferred options and sought further feedback from the Council.

In addition to the specific workshops for the options assessment, a programme-wide Auckland Council Integration Meeting is held regularly to ensure collaboration and integration with the Supporting Growth programme and the Council's land use planning function. Where required, the options assessment was also discussed at these meetings.

6.5.3 Community Engagement

In December 2019 and January 2020, Project Team sought feedback from landowners within the proposed Drury Package project area on the draft preferred options for the SH22 Upgrade, Jesmond Road FTN Upgrade, Bremner Road FTN Upgrade, Waihoehoe Road West FTN Upgrade and the Ōpāheke N-S FTN Arterial. Letters were sent out to landowners in proximity to each of the corridors and the route refinement options. Landowners were given the opportunity to provide feedback on the draft preferred options which was then considered in finalising the preferred network and contributed to design refinement to further minimise impacts where possible.

Landowner engagement on the Waihoehoe Road East Upgrade, Ponga Road Upgrade and Ōpāheke Road Rural Upgrade corridors was due to be undertaken in April 2020, however due to government restrictions during the Covid-19 Pandemic this engagement was postponed, and engagement methods reconsidered.

In May 2020 public engagement was launched and an opportunity to provide feedback on the preferred options for Waihoehoe Road East Upgrade, Ponga Road Upgrade and Ōpāheke Road Rural Upgrade was provided. Feedback was sought from the public through Social Pinpoint using interactive tools such as surveys and interactive mapping. Social Pinpoint is an interactive online community engagement tool.

In October 2020, community and landowner engagement was undertaken to inform the community and affected landowners about the preferred option for the Ōpāheke Road / Settlement Road

intersection and the Ōpāheke Road Urban Upgrade (part of NoR D5). Letters were sent to landowners directly affected by the upgrade and a letterbox drop in the surrounding area was undertaken to inform the community about the proposal.

The feedback received from landowners generally related to alignment concerns, property acquisition/loss of value/access), loss of amenity, and timing for construction. There was support for the proposed widening of roads to accommodate walking and cycling, however landowners were concerned with ensuring widening of the road was equitable and land from both sides of the road was taken.

6.5.4 Internal Engagement

Workshops were also held with internal stakeholders from AT and Waka Kotahi to discuss the assessment and options. Four workshops specific to the Drury Package options assessment were held with AT and Waka Kotahi. During the initial workshops the Project Team provided AT and Waka Kotahi attendees with an overview of the assessment process and the options for assessment for each of the corridors. The Project Team sought feedback and insight from attendees to assist with decision making. During the second, third and fourth workshops, the Project Team presented the emerging preferred recommended options, discussed previous feedback received and sought further feedback.

6.6 Project Team Workshops

Throughout the options assessment process, workshops were held with the Project Team to discuss findings and undertake decision making. Two key types of workshops were held, and in some cases merged into one workshop. These included an Options Assessment Findings Workshops and Project Team Workshops. The process and purpose of these workshops are detailed below.

Options Assessment Findings Workshops were held once technical specialists had individually assessed each of the options. The purpose of these workshops was to discuss and respectfully challenge results of initial options assessment findings with specialists and the Project Team. During these workshops the scores (where applicable) and/or findings of each specialist was shared with the Project Team and discussed and respectfully challenged. Within the challenge discussion some options (where appropriate) were subject to a land use sensitivity test where assessments or scores were analysed to see if they would remain consistent if the assumed future land use (based on the Ōpāheke-Drury Structure Plan) were to change. Based on discussions in the workshop, where appropriate, changes to scores or assessments were made prior to final recommendations being identified.

The purpose of the Project Team Workshops was to discuss and challenge results of specialist option assessments and make recommendations for emerging preferred options. The discussion and challenge portion of the workshop followed a similar process to the Options Assessment Findings Workshop. Following this a consensus was generally reached on the emerging preferred option based on the technical assessments undertaken and a balance of effects. Through this process opportunities and considerations for design refinement were made to ensure the emerging preferred options were developed further to minimise impacts.

The outcomes of these workshops are detailed in Sections 9 to 13.

7 Intersection Form Assessment Methodology

Once the preferred route refinement options for the Projects were identified, an assessment was undertaken to determine preferred intersection forms across the network.

Considerations for alternative intersection treatments for the Drury Arterial Network included:

- Maintaining existing vehicle 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 was required, Programme Wide guidance was used to determine whether this should be a roundabout or a signalled intersection. The guidance considered a number of factors including operational performance, safety, road environment and different road users. The guidance adopts a 'Safe Systems' approach in line with AT's Vision Zero Policy 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 were 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 7-1.

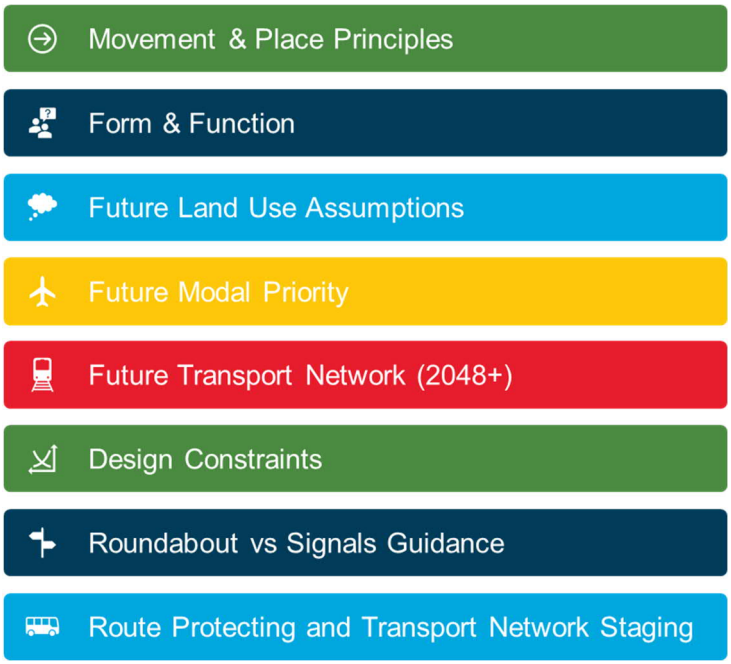


Figure 7-1 Intersection considerations

The intersection form assessment undertaken for each corridor is summarised in each of the NoR sections. Figure 5-3 provides an overview of the form and function for the Drury Arterial Network.

8 Design Refinement

During the route refinement options assessment process, Project Team specialists identified a number of areas where further design considerations could be considered, or refinements should be made to deliver a better outcome. Once a preferred option was selected by the Project Team through the route refinement assessment, designers and specialists worked together to identify and make design refinements with the purpose of either enhancing the route or further minimising adverse potential effects of the preferred option.

This process was particularly useful where each option assessed had both positive and negative effects, allowing a more balanced approached that adopted positive, and avoided negative, effects where possible.

Further design refinement was undertaken following feedback from AEE specialist assessments and site investigations. For some projects, this resulted in additional refinement of the design for example to further reduce effects on a particular environmental feature.

The design and the proposed designation boundaries were also informed through discussion with stakeholders and affected landowners.

Where design refinements were made, they are outlined in the discussion of each of the Project's preferred options.

9 Approach to Stormwater Infrastructure

Alternative stormwater designs were considered for the Drury Arterial Network to inform the necessary designation boundaries for each Project. The land required for stormwater infrastructure to service the corridors is dependent upon the type of stormwater management devices chosen for each corridor. In order to determine the type and location of stormwater infrastructure for each corridor, a design options process was undertaken. This process is summarised below:

1. Identification of appropriate stormwater management devices for each corridor

- The type of stormwater management devices identified for use was based on a number of factors including the surrounding land-use (based on the Drury-Ōpāheke Structure Plan), form of the transport route, road hierarchy and how connectivity to any adjacent properties is to be provided. This approach is summarised in Table 9-1:

Table 9-1 Stormwater System Design Approach Summary

Stormwater Design Environment	Treatment	Conveyance	Attenuation	Diversion
Existing Urban	Proprietary treatment devices or treatment wetland/pond	Pits and pipes	Above ground devices, attenuation wetland/pond or underground tanks	N/A
Future Urban[1]	Proprietary treatment devices or treatment wetland/pond	Pits and Pipes	Above ground devices, attenuation wetland/pond or underground tanks	Cut-off channels as required
Rural	Treatment swales or treatment wetland/pond	Conveyance channels	Attenuation swale or wetland/pond	Cut-off channels as required
Note: [1] Assuming direct 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. Identification of flood attenuation requirements and potential wetland locations

- 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 downstream flood risk
    - Estimate the runoff from maximum probable development (that is, maximum expected impervious areas within the transport corridor)
    - Design of a primary (10-year) network to cater for the runoff
    - Location and sizing of primary (10-year) attenuation devices if required to address any lack of capacity in the downstream network or to reduce the size of stormwater infrastructure (pipes) required.
    - Identification of secondary (100-year) flow paths and floodplains

    - Location and sizing of secondary (100-year) attenuation devices to reduce floodplain and overland flow path extents.
- If it was determined that a stormwater wetland was required, the location of the wetland was identified by ensuring the wetland was placed suitably off-line at a low point along the alignment and close to the corridor for easy access and maintenance while avoiding high value environmental features. Also required was an outlet structure to discharge to a nearby natural stream.

Where environmental constraints had been identified by technical specialists through the route refinement options assessment, these were also considered as part of the design process.

Explanation of the following sections

The following sections provide a summary of the options assessment undertaken for each of the Projects within the Drury Arterial Network (see Figure 0-1):

- Section **Error! Reference source not found.** – NoR D1: State Highway 22 Upgrade
- Section **Error! Reference source not found.** – NoR D2: Jesmond to Waihoehoe Road West FTN Upgrade
- Section **Error! Reference source not found.** – NoR D3: Waihoehoe Road East Upgrade
- Section **Error! Reference source not found.** – NoR D4: Ōpāheke North-South FTN Arterial
- Section **Error! Reference source not found.** – NoR D5: Ponga to Ōpāheke Road Upgrade

Each of the sections describe the following for each corridor within the Projects:

- A summary of the IBC and corridor assessment outcomes
- A summary of the gap analysis undertaken
- A summary of the form and function assessment
- A description of the route refinement options developed for each corridor
- The assessment of alternative route refinement options including a summary of the assessment, engagement with partners and landowners, and the reasoning for the preferred and discounted options.

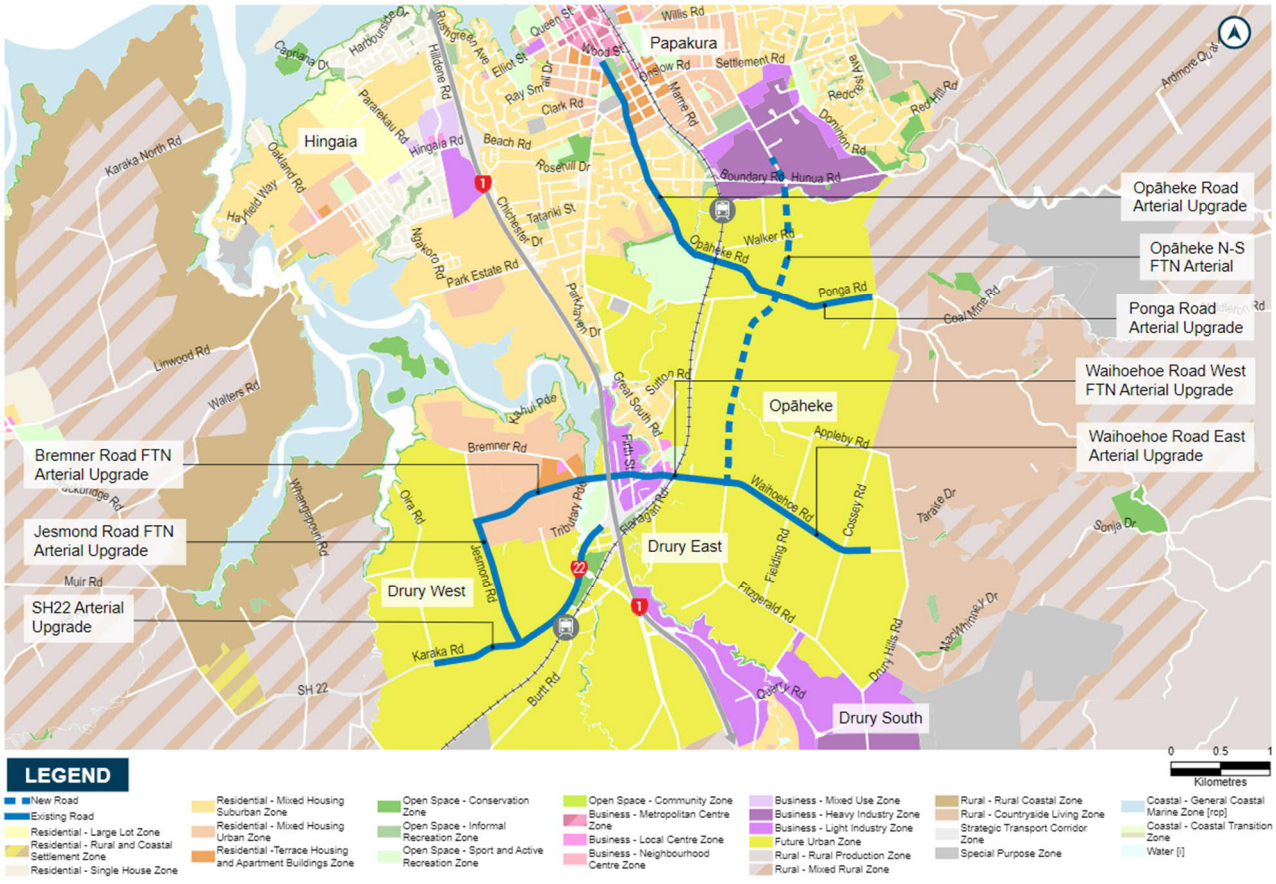


Figure 0-1 Indicative Transport Network – Drury Local (as per the IBC)

10 NoR D1: State Highway 22 Upgrade

10.1 Overview

10.1.1 IBC / Corridor Assessment

TFUG[1] recommended safety improvements on SH22. The Safe Roads project was specifically set up by Waka Kotahi to respond to this and other safety projects. The SH22 Safe Roads DBC was undertaken around the same time as the South IBC. The SH22 Safe Roads DBC also recommended four lanes from Drury interchange to Oira Road. However, the Safe Roads DBC was specifically looking at treatments to address the problems identified by Safe Roads on the existing corridor – not to support the proposed urban growth. Therefore, it was decided the future, long term upgrade (rather than short to medium term safety upgrades) was to be investigated further by the Supporting Growth Programme.

At the IBC phase, a number of upgrades were investigated in Drury west including upgrading Linwood, Blackbridge and Great South Road as well as SH22. Although no specific offline alternative was investigated for SH22, its relationship to the proposed Pukekohe Expressway was acknowledged and the implementation of Pukekohe Expressway was assumed in developing and assessing the alternatives. That is, over time SH22 will change as urbanisation occurs and take on an urban road function – and the proposed Pukekohe Expressway would take a more strategic function in the network for longer distance trips.

The IBC considered a range of options for the existing SH22 corridor, acknowledging that the Safe Roads safety improvements were a committed project, but that those improvements may not be sufficient to service the projected growth.

The SH22 options were:

- Keep SH22 as a strategic road and upgrade parallel local routes
- Upgrades to SH22, including safety improvements and potentially additional lanes to increase capacity
- Do minimum. Safety upgrades to SH22 only
- Widening SH22 to four lanes to increase capacity
- Extend SH22 further west to include Waiuku/Clarks Beach

The widening of SH22 to four lanes progressed to the short list for further investigation, particularly in terms of the relationship with the proposed Pukekohe Expressway.

The IBC noted that the form and function of SH22 will change over time as urbanization occurs and that more thought was required on the form and function, and integration with AC Drury-Ōpāheke Structure Plan as a potentially larger town centre is proposed in Drury East.

The IBC identified some moderate adverse stormwater effects as a result of this widening, due to a number of major stream crossings which require bridging and/or significant culvert work. Adverse

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

effects on terrestrial Significant Ecological Areas (SEA) (including critically endangered Taraire Forest) were also identified.

It was recommended that due to the growth in Drury, SH22 should be upgraded to four lanes from Drury township to Oira Road to increase capacity. Safety improvements were recommended on the rest of SH22.

10.1.2 Gap analysis

A gap analysis was undertaken for SH22 as described in Section 5.2. The below provides a summary on the outcomes of this gap analysis for SH22.

Planning updates, developer aspirations, interdependencies with other projects for SH22 include:

- The intended future land use along the corridor (as per AC's Drury-Ōpāheke Structure Plan) is largely medium to high density residential, town centre and a small area of industrial land use in the east
- Although no new designations have been identified since the IBC phase, Waka Kotahi is the requiring authority for Designation 6707, SH22 along the corridor
- The SH22 Safe Road DBC options assessment was limited to treatments to address the problems identified by Safe Roads - not future, long term upgrades to address growth.
- Ongoing integration with the Waka Kotahi Papakura to Bombay project and plans for the Drury Interchange
- Integration with the AC Drury-Ōpāheke Structure Plan

Through the gap analysis it was concluded that adequate alternatives had been assessed at the IBC phase. There was no additional information that warranted additional investigation of an alternative corridor. Therefore, it was recommended that the corridor recommended at the IBC phase be taken forward for route refinement at the DBC and NoR phase to investigate which side of the road to widen. Recommendations in the gap analysis included to extend the SH22 Upgrade to the edge of the FUZ rather than to Oira Road to align with the extent of the intended future urban development signalled by the Drury-Ōpāheke Structure Plan and to liaise with Auckland Council on structure planning to inform the form of SH22. These recommendations were adopted in developing the route refinement options for the SH22 Upgrade.

10.1.3 Form and Function Assessment

Following the methodology summarised in Section 5.3, a form and function assessment was undertaken for the SH22 Upgrade. Table 10-1 provides a summary of the assumptions and outcomes of the assessment.

Table 10-1 SH 22 Upgrade Form and Function Assumptions and Summary

SH22 Upgrade		
Criteria	Summary	Comments
Place and Movement[2]	P2	Place value classified as P2 using the Roads and Streets Framework (RASF) typology. This typology is justified based on the expected local/town centre near Jesmond Road; and surrounding mix of med/high density residential, with some industrial uses at the eastern end. These changes may potentially activate the street/place environment for a higher justification, dependent on urban design and land use.
	M2	Movement value classified as M2 using the RASF typology. This typology is justified on the downgrade from sub-regional/strategic to district level owing to Pukekohe Expressway supplanting its strategic function. It allows for the urbanisation of the Drury West area and improved safety.
Land use	Low risk of change	Surrounding land use is zoned as FUZ, and the structure plan developed by council is unlikely to change dramatically.
Bus	Yes	After implementation of Pukekohe Expressway, 2 traffic lanes will be given to priority vehicle lanes for PT services and/or transit lanes (one direction each). East of Jesmond Road, bus route number 33 has a proposed frequency of every eight minutes in peak hours. One bus route is proposed run with a 12 minute frequency in peak periods on a very short section between Oira Road and Jesmond Road.
Active Modes	Protected Cycle lanes & Footpath on both sides	Segregated paths planned for active mode. It is identified to form part of the primary cycle network.
Flows	22,000 4 Lanes	Flows and PT expectations justify 4 lanes, with Average Daily Traffic Flows approximated to be 22,000 a day (based on the DBC 2048+ SATURN model) and 29,900 without PEX.
Speed	50km	50kmh along this section as it travels through future urbanised areas.
Freight	OD	Classified as strategic freight 1B route. Freight movements are to be actively encouraged but where competing land uses require active management, ensure that freight movements receive the highest priority for road use. Current Level 1B might change when Pukekohe Expressway replaces SH22 function as strategic freight route. However, SH22 would still be the more direct route to Glenbrook (minor freight generating area and future freight generating area).
Outcome	Based on the above, of the typical cross sections used for the Supporting Growth Programme, a 30m four lane arterial was the preferred.	

[2] Based on the anticipated level of place and movement functions for the corridor



10.2 Route Refinement Option Development

The purpose of the SH22 Upgrade is to improve capacity and safety on SH22 and to provide for the urbanisation of the Drury area. 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, residential areas and rail stations. The aim is to fit widening within the existing designation where possible to reduce land requirement and simplify the statutory process.

Route refinement for the SH22 Upgrade included specialist assessment of three options:

- Option A - widening to the northwest of the existing alignment.
- Option B – widening to the southeast of the existing alignment.
- Option C – widening to both sides of the existing alignment.

Each option utilizes the 30m typical cross section consistent with other Drury Package routes. The three options for the SH22 Upgrade are shown in Figure 10-1.

10.3 Route Refinement Assessment

10.3.1 Assessment

The assessment undertaken for the SH22 Upgrade follows the processes previously discussed in Section 6. The three options were assessed qualitatively against the MCA framework by each subject matter expert. Considerations made and constraints identified are shown in Figure 10-1 and Table 10-2 provides a summary of the qualitative assessment undertaken by technical specialists against the MCA framework. In determining the preferred option, the Project Team took into consideration the MCA assessment and the engagement undertaken with project partners (including Manawhenua and Auckland Council) and landowners.

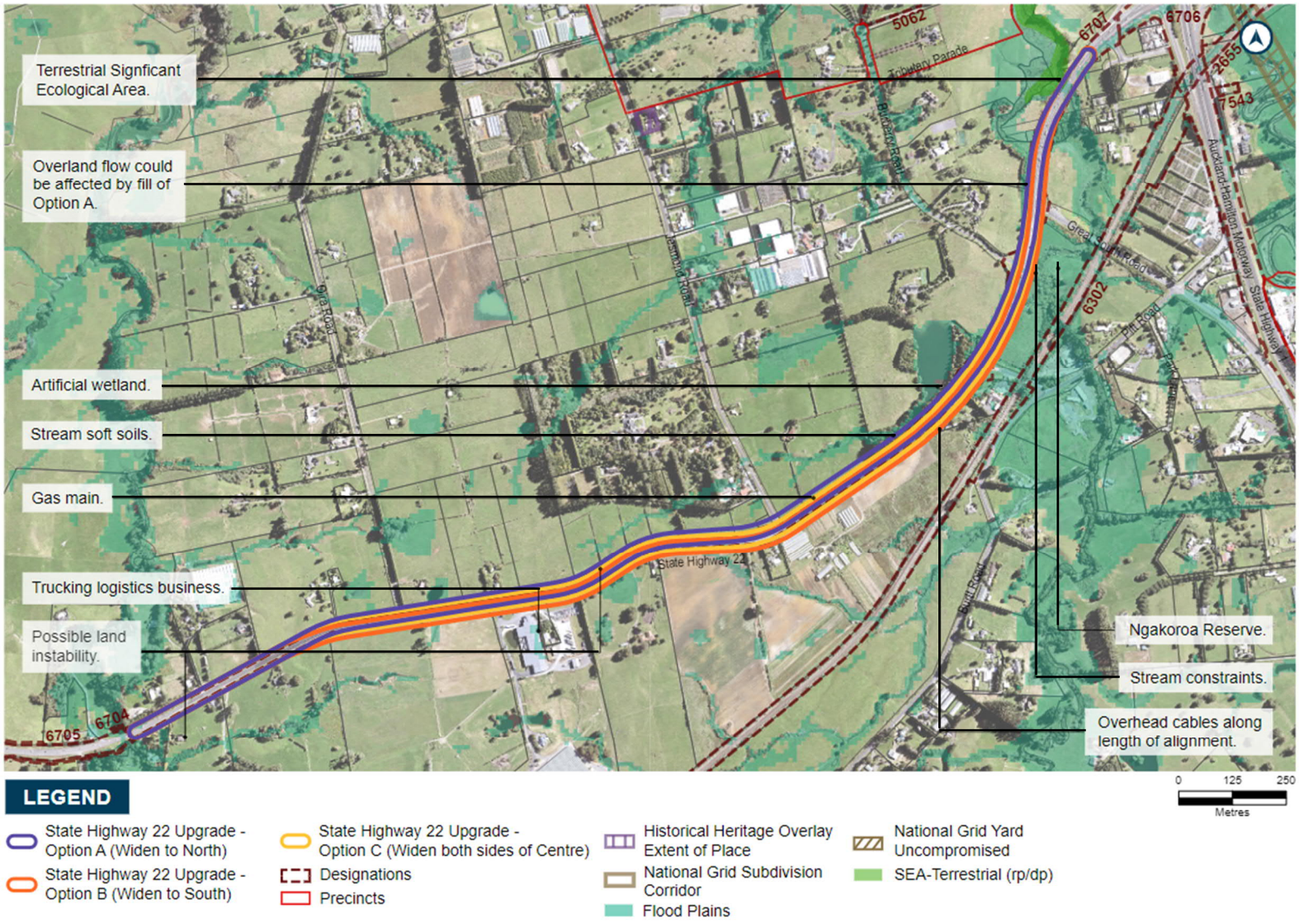


Figure 10-1 State Highway 22 Upgrade Options for route refinement showing constraints and considerations

Table 10-2 SH22 Upgrade Options Assessment Findings Summary

State Highway 22 Upgrade Options Assessment Findings Summary
Performance against transport outcomes *Note: All three options achieve the transport outcomes and there is no differentiation between the three options with regard to these objectives.*
Support imminent growth and the planned town centre in Drury by improving connectivity and accessibility along this section of SH22 This section of SH22 forms an important connection for the Drury area as it urbanises. The current form is not supportive of the anticipated growth, with the main concern being the need for capacity improvements. The benefits of the proposed form upgrade include reducing through traffic movement on local roads, which will help reduce congestion and make both local and arterial roads safer and more efficient. Additionally, this upgrade will provide walking and cycling connections and better accommodate freight and general traffic to support current and future residents. The SH22 Upgrade is both a key gateway for localised trips (including rail stations, centre and strategic east-west movement) and a key connection to SH1. With a proposed centre and train station near the Jesmond Road intersection, safe walking and cycling connections are key to provide for the diverse transport demand and reduce dependence on low occupancy vehicles (LOV's).
Significantly reduce the risk of DSIs from private vehicle crashes and to provide a safe connection for active modes along this section of SH22 The current inadequate form and function of this corridor will be exacerbated in the context of Drury's urbanisation, due to the high speeds and increased traffic volumes. The upgrade will enable safer access (additional segregated walking, cycling provision), resulting in full protection for vulnerable users, decrease in volumes on SH22 (compared to do nothing), reduced risk for death and serious injuries (DSI's). Furthermore, the SH22 Upgrade in conjunction with the urbanisation of Drury East and Drury West will also include a reduction in vehicle speeds along SH22 to 50kph. The reduced speed will result in a reduced risk for death and serious injuries (DSI's). To further reduce speed along and improve safety along SH22, the key intersection controls will also be changed from priority control to signalised/roundabout intersections, resulting in reduced intersection crashes and conflict between users. Additionally, as the preferred option includes widening on both sides, primarily to avoid ecological impacts, it also allows for the minimisation of sight distance issues on Great South Road, therefore showing better alignment with this transport outcome.
Support a more sustainable, high quality, connected urban form along this section of SH22 that responds to the timing, scale and form of urban development The upgrade of SH22 is planned to occur in alignment with the anticipated urbanisation of the Drury West area, to ensure the road form meets the need of the land use context. The consequences of not doing so mean that the nature of the high vehicle speeds and a current lack of active mode provision will result in an unsafe and unattractive street environment, which in turn will preclude/deter the establishment of a compact, walkable urban environment with a town centre.

Wellbeing Assessment	
Heritage	No historic heritage constraints were identified for any of the options (nothing to influence the alignment).
Social	Future Land Use Integration: Widening to the north, and both sides of the existing road would have the greatest impact on land proposed as town centre zone and is likely to impact an artificial pond which is a planned feature of the proposed future town centre. At this location it is preferred to widen to the southeast side of the road (Option B). Social: There are no major differentiating factors between the three options with regard to social impacts. All options impact the Public Reserve; Option A has the least impact on the reserve, Option B has the most impact on the public reserve. Enhancement of the reserve could provide additional benefits and mitigate the impacts. Urban Design: Neither of the three options present any significant differentiators for the future urban design environment. This corridor provides low negative impacts to amenity and quality values. Options B and C reduce the flexibility of development to the land between SH22 and the railway line near the McPherson Road junction by further taking up land and resulting in a narrower developable land parcel. Land Requirement: All options primarily involve partial acquisition only, which by their nature has a lower impact on property. The effects of works required at McPherson junction will be minimised under Option A and therefore have less property impact than Option B and C. Health and wellbeing: There is no major impact on health and wellbeing identified for any options. The current and planned residential houses along corridor are to be considered with widening of corridor.
Environment	Landscape and Visual Amenity: Each of the options would have similar landscape and visual amenity impacts and no differentiating factors were identified. There are no significant landscape features impacted. However, there will be low landscape and visual amenity impacts resulting from widening and upgrading of the crossing at Ngakoroa Stream. A significant ecological area abuts the north-west end of the existing bridge; however, the vegetation appears primarily exotic and modified. Mitigating factors are the low quality of the existing environment and co-location of infrastructure. Stormwater: All three options impact upon overland flow paths but will have manageable stormwater impacts. Option C was assessed to have slightly lesser effects than Option A and B. Ecology: Ecological impacts for all three options would include the loss of significant indigenous vegetation and habitat for native birds, lizards and fish and indirect impacts on the downstream receiving environment through the release of pollutants and sediment. All three options are constrained by Ngakoroa Stream SEA (SEA_T_530b) to the north of the bridge crossing and to the south-east by Ngakoroa Reserve. The three options will have a similar level of impact on the SEA. Natural hazards: No significant geotechnical constraints or instability were identified along the alignment. West of Oira Road, widening to the north/west is preferred from a geotechnical perspective due to steep terrain indicating possible instability.
Economic	Utilities: Overhead power lines on the south side impact all options but may be able to be retained for Option A adding minor complexity and H&S hazard during construction if maintained. Construction: Gas transmission line needs to be worked over for all options. Taking land and widening one side (Option A or B) should be simpler than widening each side (Option C) in terms of temporary traffic management during construction. SH22 has high quality pavement and widening to both sides would likely limit the amount of pavement reconstruction. Access to properties during construction and operation is potentially an issue for all options.

Opportunities
Opportunities identified through the assessment included: • to assist a smoother tie in with Burberry Road. • to enhance amenity and habitats along Ngakoroa Stream and within Ngakoroa Reserve.

10.3.2 Partner, Internal and Landowner Engagement

Throughout the various option assessment workshops, the Project Team engaged with project partners including Manawhenua and Auckland Council, to discuss the options.

During hui on 30 August 2019, Manawhenua suggested widening to the east at the northern extent, to avoid the significant ecological area (Ngakoroa Stream) and to then widen to the west further south (central part of SH22 options) where it starts to straighten, to avoid loss of stream and impact on Ngakoroa Reserve. Manawhenua also identified that the developers of Auranga town centre intend to develop around the artificial wetland so suggested widening to the east in that location.

During workshops with Auckland Council on 5 September and 11 November 2019, the Council raised a general preference by Council and Local Boards for minimising the use of park/reserve land for infrastructure, supporting an option widening to the northwest (Option A).

Internal engagement workshops were held with AT and Waka Kotahi on 12 September, 14 October and 17 December 2019. During these workshops a suggestion was made to widen to the west at the Great South Road overbridge to improve sight distances to signals. The opportunity to realign Burberry Road to tie into the Great South Road intersection was also highlighted. Concern was raised that six lanes may be required to allow safe distances between intersections. Waka Kotahi identified an area of land owned by the Department of Conservation.

In December 2019 and January 2020, the Supporting Growth Programme sought feedback from landowners within the proposed Drury Arterial Network projects area on the draft preferred option for the SH22 corridor. Overall, there was a general level of support for the proposed network from the feedback received. Key themes raised by landowners with specific reference to SH22 include loss of property and vehicular access for existing properties adjoining the corridor, concern on the uncertainty on the preferred alignment and a preference for equitable share of land requirement from both sides of the road. These key themes were considered in finalising the preferred option and contributed to design refinement to further minimise impacts where possible, particularly on private and AC property.

10.3.3 Preferred Option

Following the MCA assessment and consideration of feedback received from project partners and the community, a preferred option for the SH22 Upgrade was identified. The preferred option was determined to be a combination of the options widening varying sections of the corridor to both the north-west and south-east and widening both sides. This was to ensure impacts on various sensitive environmental factors are reduced where possible. This also reflected feedback received from Manawhenua. The preferred option was chosen because:

- The option minimises impact on significant ecological areas and Ngakoroa Stream in the north
- The option reduces impact on Ngakoroa Reserve located to the south east of the corridor
- The option reduces impact on streams (south east) and overland flow paths
- This option avoids impacting an artificial pond which is a planned feature of the future town centre and may involve more complex construction

- The options allow areas of suspected instability to be avoided where possible
- Minimises sight distance issues on Great South Road by widening to the west at this point
- Where there are no differentiating constraints, widening to both sides is preferred to minimise pavement reconstruction.

Through the assessment, it was noted that there were no evident differentiators between the three options with regard to archaeology and built heritage, social, urban design, landscape and visual amenity and health and wellbeing.

All route refinement options provided the same level of achievement against the transport outcomes as outlined in Table 10-2.

Throughout design refinement specific consideration was made to steepening fill embankments to minimise impacts on Ngakoroa Steam and minimise the Project footprint and associated impact on private properties. Property access was also a key consideration during design refinement.

Subsequent to the preferred option being identified, a revised national freshwater policy statement and new freshwater regulations came into effect (the National Policy Statement for Freshwater Management 2020 and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020), which gives greater protection to natural inland wetlands and streams. Given this new policy direction, the Project Team reconsidered the potential effects of the preferred options on identified natural inland wetlands and streams. Generally, the alignment and design refinement process for each proposed designation has sought to avoid or minimise impacts on high value natural wetlands and streams, unless there is a functional requirement for any such impacts or other high value environmental constraints. There will be further opportunities to minimise any impacts within the Project alignment during the detailed design of the Projects. As a result, no further design refinement is required at this stage.

10.3.4 Discounted Options

The following table summarises the reasons for discounting the three options individually.

Table 10-3 Discounted Options - SH22 Upgrade

Option	Reasoning
Option A	This option was discounted (in part) for the following reasons: • Slightly more impact on overland flow paths • Impact on significant ecological area • Impact on artificial pond, potential habitat of threatened and at-risk species and a planned feature of the future centre
Option B	This option was discounted (in part) for the following reasons: • Results in a greater impact on public reserve • Results in greater property impact due to works required at McPherson junction. • Slightly more impact on overland flow paths

Option	Reasoning
Option C	This option was discounted (in part) for the following reasons: • Impact on significant ecological area • Results in greater property impact due to works required at McPherson junction. • Temporary traffic management during construction more complex

10.3.5 Intersection Form

Along the preferred corridor, there are three intersections to be upgraded. A summary of the assessment (described in Section 7) undertaken for these intersections is shown in Table 10-4, outlining the recommended outcomes for each.

Table 10-4 SH22 Upgrade Intersection Form Assessment

Intersection		Form		Modal Priority			Justification/ Constraints/ Triggers	Preferred Form
Name	Arms	Lanes	Speed	PT	Active Mode	Freight		
Jesmond Rd / SH22 Intersection	Jesmond ↓	4	50km/h	FTN	High	Low	• FUZ land-use (Town centre and residential) and proximity to train station increases active mode modal priority • High-quality bus priority North-South and East-West through intersection (Jesmond is part of the FTN, SH22 proximity to Drury West station, and Northern Connection has PT lanes connects to Drury West station) • Grade-separation of active modes considered but not considered suitable here due to typography and high urban density • Proximity to Drury West Station and connection with SH22 will make this intersection a high conflict zone between all modes (walking and cycling needs more protection).	Signalised Intersection
	SH22 ←→	4	50km/h	Med	High	Med		
	Northern Connector ↑	4	50km/h	High	High	Low		

Intersection		Form		Modal Priority			Justification/ Constraints/ Triggers	Preferred Form
Name	Arms	Lanes	Speed	PT	Active Mode	Freight		
SH22 / Oira Road	Oira Road ↓	2	50km/h				• Part of Safe Roads project – identified this intersection as being a roundabout • Local centre on south side of Karaka Road • Lower density residential adjacent to this intersection suggests a lower active mode demand, put still within cycling catchment of Drury West Town Centre	Roundabout
	Karaka Road ↔	4	50km/h	High	Med	Med		
SH22 / Great South Road Intersection	Great South Road	2	50km/h	High	Med	Med	• FUZ land-use (Town centre and residential) and proximity to train station increases active mode modal priority • Proximity to Drury West Station, town centre, light industry and connection with SH22 & SH1 will make this intersection a high conflict zone between all modes • Staging, future collector network and tension between bus priority, car, accommodating walking and cycling safely	Signalised Intersection
	SH22	4	50km/h	High	Med	Med		
	New Collector	2	Low					

10.4 SH22 Upgrade Summary

As outlined, through the assessment process and feedback from project partners and landowners, the preferred option for the SH22 Upgrade is a combination of widening to the north-west, to the south-east and in some places widening on both sides to ensure impacts on environmental constraints are minimised where possible.

Through the intersection form assessment, it was recommended signalised intersections be implemented at the SH22 / Jesmond Road intersection and the SH22 / Great South Road intersection, and a roundabout be implemented at the SH22 intersection with Oira Road.

11 NoR D2: Jesmond to Waihoehoe West FTN Upgrade

In order to adequately assess alternatives, the Project was separated into three key sections for options assessment, as shown in Figure 11-1, including:

- Jesmond Road FTN Upgrade;
- Bremner Road FTN Upgrade, subsections include:
  - Bremner Road FTN Upgrade – West section (Jesmond Road to Bremner link)
  - Bremner Road FTN Upgrade – Central section;
  - Bremner Road FTN Upgrade – East section; and
- Waihoehoe Road West FTN Upgrade.

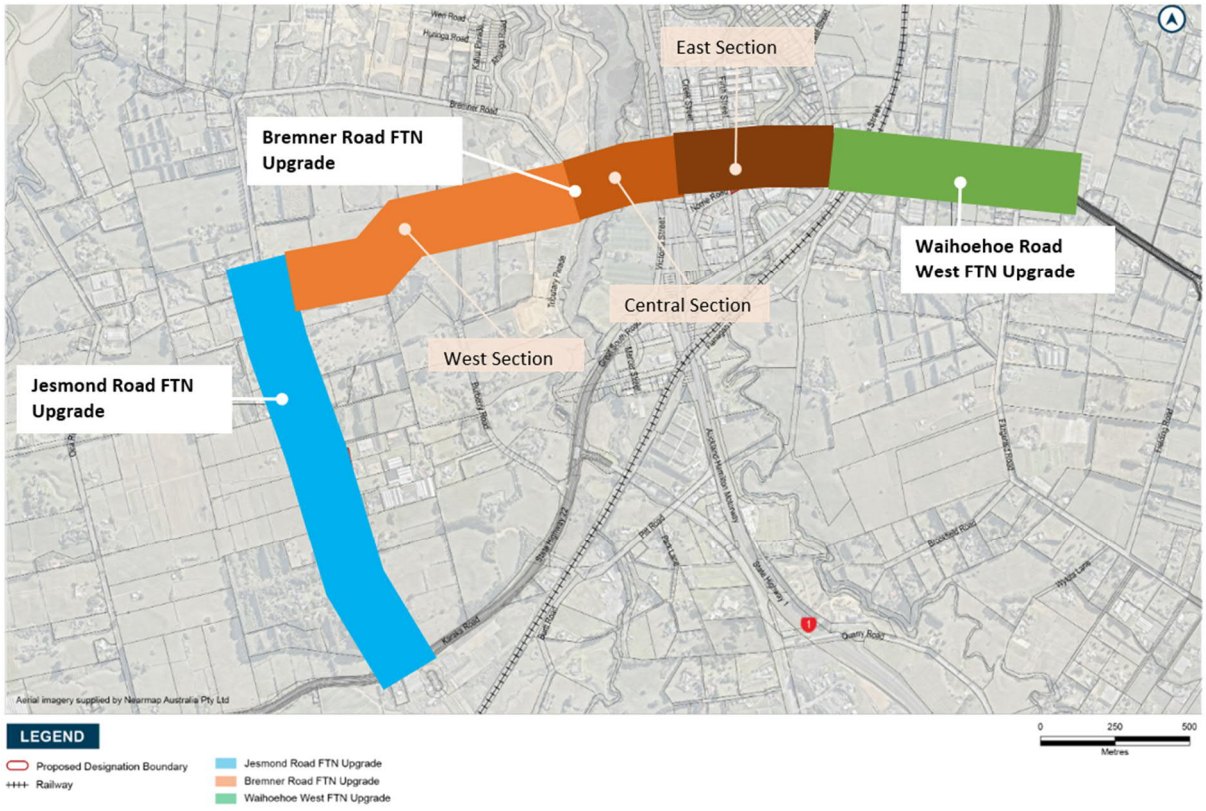


Figure 11-1 Overview of NoR D2 Alternative Assessment Sections

11.1 Jesmond Road FTN Upgrade

11.1.1 Overview

11.1.1.1IBC / Corridor Assessment

TFUG recommended upgrading Oira Road rather than Jesmond Road, due to the location of Oira Road connecting two “indicative” town centres which were proposed at the time. Since the TFUG recommended network, the Auckland Council draft Ōpāheke-Drury Structure Plan has developed, and the proposed land use has changed. By the time of the IBC, Jesmond Road was better aligned with the proposed town centre and Drury west train station, and therefore the IBC recommended upgrade of Jesmond Road instead of Oira Road.

Since TFUG, the former Bremner Road Special Housing Area was expanded by the Drury 1 Precinct (Auranga A), granted in August 2016. Structure planning for Auranga Plan Change 6 (Operative in Part) identified Bremner-Jesmond as the key links and as a high frequency bus route connecting with SH22 and rail stations. As recommended in the IBC, the upgrade of Jesmond Road aligns with the initial growth areas in Drury west (rather than upgrading Oira Road as indicated in TFUG).

The upgrade of Jesmond Road was identified in the IBC as having good people and public transport movement, with its central location providing a good catchment to proposed residential and employment. Upgrading of Jesmond Road would improve accessibility and act as a good north south link, which could connect to Bremner Road to form a key public transport and active mode spine through Drury west. Positive land use integration and alignment opportunities for serving the FUZ were identified in the IBC. Potential heritage impacts were also identified due to the presence of AUPOIP scheduled sites and other historic heritage sits concentrated in the Drury Village and Ngakoroa Stream area.

A number of new and upgraded arterials in Drury west were investigated at the IBC phase. The figures below show the options investigated at the short and long list of the IBC.

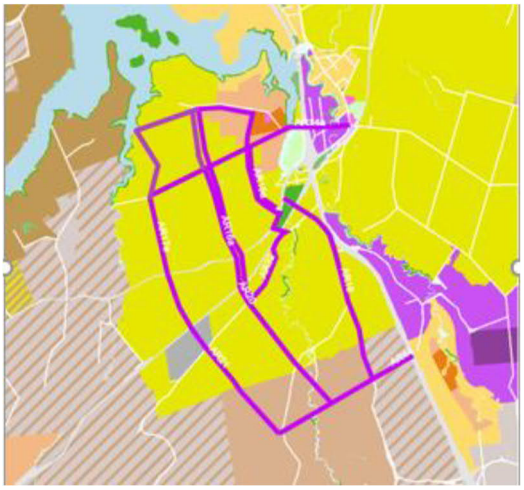


Figure 11-2: IBC Drury West Long List Options

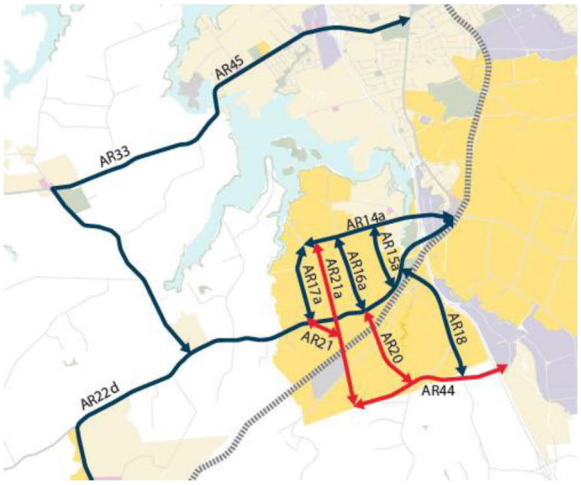


Figure 11-3: IBC Drury West Short List Options

11.1.1.2 Gap analysis

A gap analysis was undertaken for Jesmond Road as described in Section 5.2. The below provides a summary of this analysis.

Planning updates, developer aspirations, interdependencies with other projects for Jesmond Road include:

- The intended future land use along the corridor (as per AC's Drury-Ōpāheke Structure Plan) is largely medium to high density residential and town centre in the south
- At the time of the gap analysis, Plan Change 6 was subject to an outstanding appeal concerning the alignment of the new road between Jesmond and Bremner Roads. Mediation was undertaken in February 2019 and was ongoing at the time of the gap analysis.
- The gap analysis identified the need to consider whether the Jesmond Road extension was part of the Drury Local DBC or Strategic South package of works, and whether the connecting infrastructure from the rail stations was included. It was recommended that for the Drury Local Projects, Jesmond Road stops at the SH22 tie in and that the Jesmond Road extension and connecting infrastructure (to both stations) be included within the Strategic South DBC and Rail DBC packages. Ongoing integration with the other South DBCs will be undertaken.

The gap analysis concluded that adequate corridor assessment was undertaken at the IBC phase with a number of existing and new roads investigated. There was no additional information that warranted additional investigation of an alternative corridor. The ongoing development in Drury west strengthens the recommendation of Jesmond Road as a key route.

The gap analysis recommended that the Jesmond Road corridor was to be taken forward to route refinement at the DBC to investigate which side of the road to widen for the Jesmond Road FTN Upgrade. If the rail station location changed substantially, the connection with Jesmond Road would need to be reviewed. In working with the Rail team, the location of the rail station has not changed significantly from the IBC to necessitate the FTN being relocated off Jesmond Road.

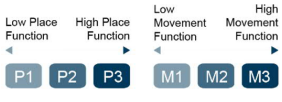
11.1.1.3 Form and Function Assessment

Following the methodology summarised in Section 5.3, a form and function assessment was undertaken for the Jesmond Road FTN Upgrade. Table 11-1 provides a summary of the assumptions and outcomes of the assessment.

Table 11-1 Jesmond Road FTN Upgrade Form and Function Assumptions and Summary

Jesmond Road		
Criteria	Summary	Comments
Place and Movement[3]	P2	Place value classified as P2 using the RASF typology. This typology is justified based on the expected medium-high housing density (according to structure plan) and future town centre, which may potentially activate the street/place environment for a higher justification. However, this is dependent on urban design and land use.
	M2	Movement value classified as M2 using the RASF typology. This typology is justified on the intended function, creating an arterial road with an FTN function providing links to the surrounding strategic road network - (SH22/SH1), Great South Road via Bremner. It provides a north-south connection through the Drury West future urban area and forms part of the FTN.
Land use	Low risk of change	Surrounding land use is zoned as FUZ, and the structure plan developed by council is unlikely to change dramatically.
Bus	Yes	Two priority vehicle lanes for PT services and/or transit lanes (one direction each) forming part of the FTN, to compliment FTN on Bremner Road to provide a connected and seamless FTN link. FTN has two services: '37 Drury and Ōpāheke' (7 min during peaks) and '33 - Otahuhu to Drury' South (10 min during peaks). The Frequent Transit Network (FTN) is triggered by exceeding the minimum 15 min frequency threshold and also reinforced by the reliability of corridor and intersections, network connectivity, spatial positioning for optimum integration with place/density/catchment.
Active Modes	Protected cycle lanes & footpath on both sides	Segregated paths planned for active modes. It is identified to form part of the primary cycle network. This corridor will be an important link for encouraging active modes to access to the train station and town centre.
Flows	11,000 4 Lanes	Although flows are not predicted to reach 15,000 trips per day, where 4 lanes should be considered, the FTN function of the corridor suggests the need for bus priority lanes in order to avoid being materially affected by generally traffic. Therefore, flows and PT expectations justify four lanes (including two bus lanes), with Average Daily Traffic Flows approximated to be 11,000 trips per day (based on the DBC 2048+ SATURN model)
Speed	50km	50kmh along this section as it travels through urbanised areas.
Freight	No priority	Less than 15% of the trips predicted to use this route in 2048 are freight (HCVs), therefore priority facilities such as freight lanes are not recommended
Access	Manage Access	Due to the FTN expectations, consider options to manage access and conflicts
Outcome	Based on the above, of the typical cross sections used for the Supporting Growth Programme, a 30m four lane FTN arterial was the preferred.	

[3] Based on the anticipated level of place and movement functions for the corridor



11.1.2 Route Refinement Option Development

The purpose of the Jesmond Road FTN Upgrade is to improve accessibility and act as a good north south link, which could connect to Bremner Road to form a key public transport and active mode spine through Drury west. Route refinement for the Jesmond Road FTN Upgrade included specialist assessment of three options from the intersection with SH22 to the intersection with Bremner Road:

- Option A – widening to the west of the existing road
- Option B – widening to the east of the existing road
- Option C – widening to both sides of the existing road.

The three options for the Jesmond Road FTN Upgrade are shown in Figure 11-4.

11.1.3 Route Refinement Assessment

11.1.3.1 Assessment

The assessment undertaken for the Jesmond Road FTN Upgrade follows the processes previously discussed in Section 6. The three options were assessed qualitatively against the MCA framework by each subject matter expert. Considerations made and constraints identified are shown in Figure 11-4 and Table 11-2 provides a summary of the qualitative assessment undertaken by technical specialists against the MCA framework. In determining the preferred option, the Project Team took into consideration the MCA assessment and the engagement undertaken with project partners (including Manawhenua and Auckland Council) and landowners.

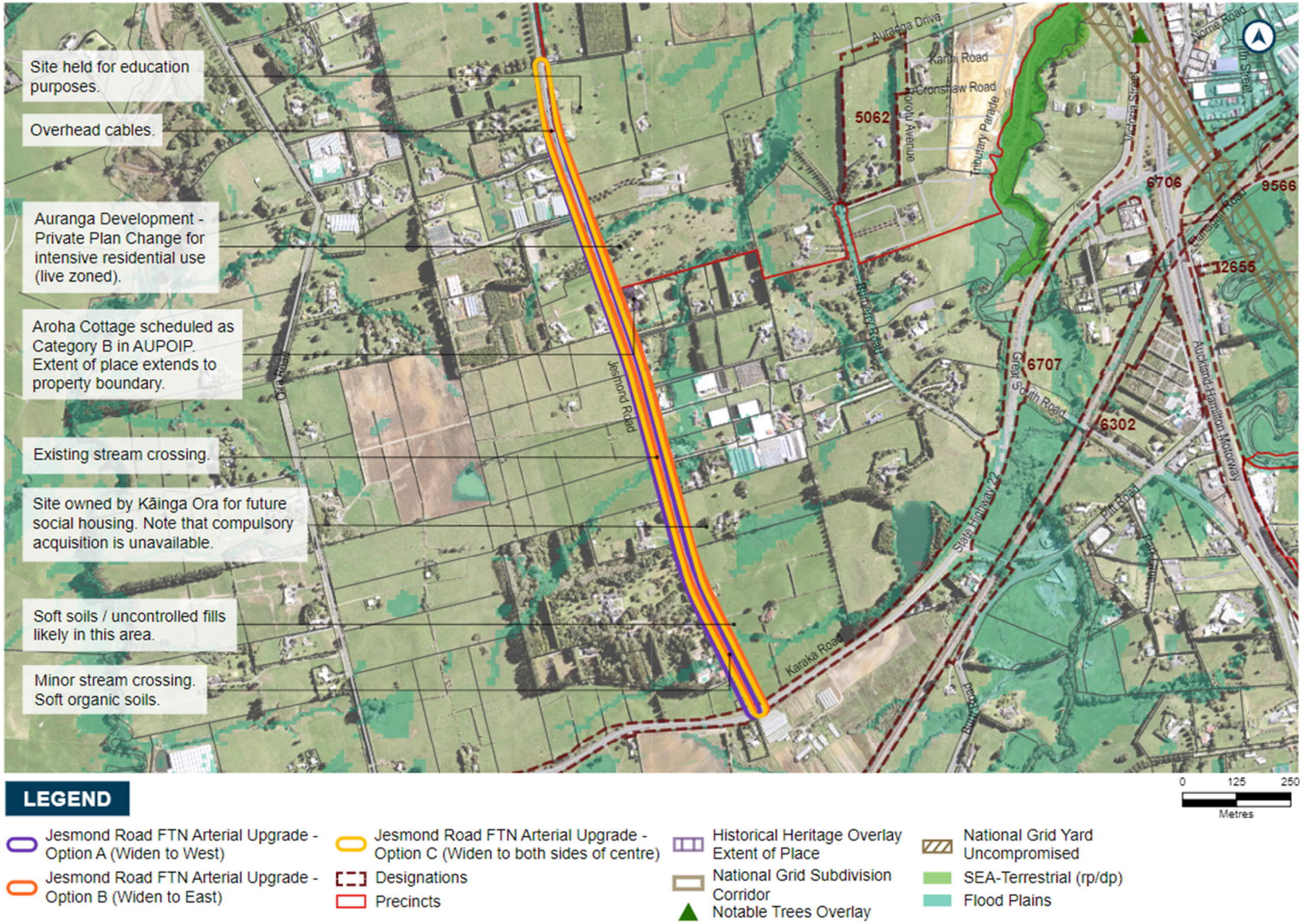


Figure 11-4 Jesmond Road FTN Upgrade Options for route refinement showing constraints and considerations

Table 11-2 Jesmond Road FTN Upgrade Options Assessment Findings Summary

Jesmond Road FTN Upgrade – Intersection with SH22 to intersection with Bremner Road	
Performance against transport outcomes *Note: All three options achieve the transport outcomes and there is no differentiation between the three options with regard to these objectives.*	
Support growth and a more sustainable, quality urban form in Drury by improving connectivity to/through the Drury West Area The overall Jesmond Road corridor upgrade is supportive of this objective, providing a key linkage for the Drury West area to key destinations: Drury West town centre at the SH22/Jesmond Intersection, Drury West train station, and the wider network connections via rail and FTN, such as Manukau, Puhinui, and beyond. The form and function of this enhances connectivity for multiple modes, forming part of the primary cycle network and FTN, unlocking safe and sustainable choices and improving connectivity to/through the Drury area to support current and future residents. These factors are integral to supporting sustainable, quality urban form. ***Achieve a transformational mode shift for trips to key destinations in Drury (incl. rail stations, centre and the strategic north-south PT network) by providing high quality, safe and attractive PT and active mode facilities on Jesmond Road*** The form of this corridor supports the above transport outcome through the provision of high quality, safe and attractive PT and active mode facilities. As discussed above, this is integral to supporting the anticipated growth and land-use adjacent to the corridor, to encourage mode shift and avoid reliance on LOV's.	
Wellbeing assessment	
Heritage	All options impact upon the Aroha Cottage extent of place. However, Option A is recommended to avoid Aroha Cottage Extent of Place and building as much as possible.
Social	Future Land Use Integration: Widening to the west is preferred as it reduces impacts upon Kāinga Ora and MoE owned land where future development is planned. Widening to the west also reduces impacts on live zoned land and Drury 1 Precinct in the northern extent of the corridor. This land is likely to be developed for residential development in the near future. Social: There are no significant differentiators between the three options. However, Option A would best support future and existing land uses that serve the community (MOE, Kāinga Ora and heritage site) as it requires the least amount of land where these services are located. Urban design: There is little differentiation between the options with regard to urban design. Option C provides more opportunity to integrate with adjacent land use due to smaller embankments. Land requirement: Option A has the least impact on MoE, Kāinga Ora sites and the least properties requiring full acquisition. This option is also likely to have less overall property impacts as many joint right-of-way's and accesses to rear properties can be avoided with this option. Widening to the west also avoids live zoned property at the northeast of Jesmond Road (Auranga development) and does reduce the development potential of these sites (with residential development presumed to occur in the near future). Health and wellbeing: There is no major impact on health and wellbeing identified for any options. The current and planned residential houses and future school along corridor are to be considered with regard to construction impacts.

Environmental	Landscape and Visual Amenity: No impacts on landscape and visual amenity were identified for any of the options as the future scenario in which the road would be created will be significantly different from the existing. There are no landscape features impacted. Stormwater: No notable constraints from flooding or overland flow paths and no differentiation between options. Ecology: All options would require upgrade of three existing culverts resulting in loss of stream and habitat for native fish. No differentiation between options. Natural hazards: No significant geological constraints were identified along the alignment.
Economic	Utilities: Overhead cables are located on the eastern side of the alignment but are likely to be relocated when urbanised. This was not seen as a significant constraint or differentiator to influence the preferred alignment. Construction: Option A and B are both seen to have similar, and less complex construction as widening one side is simpler than widening both as one lane can be kept open during construction.
Opportunities	
For all options, the upgrade of Jesmond Road presents an opportunity to restore the riparian habitat along streams and improvement of habitat for native species.	

11.1.3.2 Partner, Internal and Landowner Engagement

Throughout the various option assessment workshops, the Project Team engaged with project partners including Manawhenua and Auckland Council, to discuss the options.

Feedback from Manawhenua was received at two hui, on 30 August and 3 October 2019. Manawhenua noted the existing streams but that none of them were major enough for waka route. Manawhenua see this as an opportunity for stream enhancement, and to replace culverts with bridges.

During workshops with Auckland Council on 5 September and 11 November 2019, Council suggested contacting Auckland Council heritage specialist to discuss the Aroha Cottage scheduled site (specifically its history of being relocated and heritage values).

Internal engagement workshops were held with AT and Waka Kotahi on 12 September, 14 October and 17 December 2019. During these workshops AT and Waka Kotahi indicated the oak trees and non-native vegetation at the southern extent of Jesmond Road on the western side may be worth retaining. They noted that Auckland Council research for the structure plan indicated that there was a lack of mature vegetation in the area. Attendees identified a preference of widening to the west due to live zoned land on the east (Auranga Development).

In December 2019 and January 2020, the Supporting Growth Programme sought feedback from landowners within the proposed Drury Arterial Network project area on the draft preferred option for the Jesmond Road corridor. Overall there was a general level of support for the proposed network from the feedback received. Key themes raised by landowners with specific reference to Jesmond Road include amenity, loss of property and functionality of homes, need for certainty of property impacts and preference for equitable share of land requirement from both sides of the road, certainty on the timing of implementation and queries on the Council's Draft Structure Plan and what this means for property owners. These key themes were considered in finalising the preferred option and

contributed to design refinement to further minimise impacts where possible, particularly on property requirements.

11.1.3.3 Preferred Option

Following the MCA assessment and consideration of feedback received from project partners (including Manawhenua and Auckland Council) and landowners, a preferred option for the Jesmond Road FTN Upgrade was identified.

The preferred option (Option A) is to generally widen to the west of the existing road corridor. The preferred option was chosen because:

- This option reduces impact on MoE and Kāinga Ora land and maintains the area of land available at these sites for community facilities (school and social housing).
- This option reduces impact on Te Aroha Cottage scheduled heritage site.
- This option reduces overall property impacts as there are less properties requiring full acquisition and less impact on access.
- This option reduces impact on live zoned properties which is more likely to be developed in the near future (does not decrease the footprint for development). This land would also likely be more expensive

Through the assessment, it was noted that there were no evident differentiators between the three options with regard to urban design, landscape and visual amenity, health and wellbeing, stormwater and flooding, ecology, natural hazards and utilities.

All route refinement options provided the same level of achievement against the transport outcomes as outlined in Table 11-2.

During design refinement specific consideration was given to the direction of widening at the southern extent of Jesmond Road, at the intersection with SH22. The alignment was shifted to the east at this location to reduce property impacts. Consideration was also given to a natural wetland on the corner of Jesmond Road and SH22.

Subsequent to the preferred option being identified, a revised national freshwater policy statement and new freshwater regulations came into effect (the National Policy Statement for Freshwater Management 2020 and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020), which gives greater protection to natural inland wetlands and streams. Given this new policy direction, the Project Team reconsidered the potential effects of the preferred options on identified natural inland wetlands and streams. Generally, the alignment and design refinement process for each proposed designation has sought to avoid or minimise impacts on high value natural wetlands and streams, unless there is a functional requirement for any such impacts or other high value environmental constraints. There will be further opportunities to minimise any impacts within the Project alignment during the detailed design of the Projects. As a result, no further design refinement is required at this stage.

11.1.3.4 Discounted Options

The following table summarises the reasons for discounting the remaining two options.

Table 11-3 Discounted Options - Jesmond Road FTN Upgrade

Option	Reasoning
Option B	This option was discounted for the following reasons: • Results in greater impact on Scheduled Historic Heritage extent of place – Te Aroha Cottage • Results in greater land requirements within Ministry of Education and Kāinga Ora land • Greater impact on live-zoned properties and greater full acquisitions
Option C	This option was discounted for the following reasons: • Results in greater impact on Historic Heritage extent of place – Te Aroha Cottage • Results in greater land requirements within Ministry of Education and Kāinga Ora land • Greater impact on live-zoned properties • Temporary traffic management during construction more complex

11.1.3.5 Intersection Form

Along the preferred corridor, there are two intersections to be upgraded. A summary of the assessment (described in Section 7) undertaken for these intersections is shown in Table 11-4, outlining the recommended outcomes for each.

Table 11-4 Jesmond Road FTN Upgrade Intersection Form Assessment

Intersection		Form		Modal Priority			Justification/Constraints/Triggers	Preferred Intersection Form
Name	Arms	Lanes	Speed	PT	Active Mode	Freight		
Jesmond Rd / Bremner Rd Intersection	Jesmond (existing) ↓	2	Low	Low	Med		• PC6 agreement constrains footprint. • FUZ land-use (mixed-use and schools) increases active mode modal priority • High-quality bus priority and expected future school trips	Signalised Intersection
	← Bremner	4	50km/h	FTN	High	Low		
	Western Collector →	2	Low	Low	Med			
	Jesmond Upgrade ↑	4	50km/h	FTN	High	Low		
Jesmond Road / SH22 intersection included within the SH22 Corridor. See Section 10.3.5.								

11.1.4 Jesmond Road FTN Upgrade Summary

As outlined, through the assessment process and feedback from project partners (including Manawhenua and Auckland Council) and landowners, the preferred option for the Jesmond Road FTN Upgrade is Option A, generally widening to the west of the existing road corridor, with the exception of the southern end where the alignment shifts east, to minimise impacts where possible.

Through the intersection form assessment, it was recommended that signalised intersections be included at the Jesmond Road intersections with the new Bremner Road (Jesmond to Bremner Link) and SH22.

11.2 Bremner Road FTN Upgrade

11.2.1 Overview

11.2.1.1 IBC / Corridor Assessment

TFUG recommended a new alignment for Bremner Road in the Programme Business Case preferred transport network plan prepared in 2016. The TFUG recommendation is similar to the recommended alignment for Bremner Road (east) that was developed in the IBC prepared in 2018.

A number of existing and new roads were investigated in the IBC to support the Ōpāheke-Drury future urban zone as shown in Figure 11-5 and Figure 11-6. Upgrades to the existing Bremner Road west were assessed as well as a new alignment through the Plan Change 6 area. An east west connection over SH1 via Quarry Road was also investigated as an upgraded motorway crossing and a new arterial with a new SH1 crossing further south in Drury. Utilising existing infrastructure was an important consideration for this alignment, especially for crossing SH1. Upgrading the existing Bremner Road bridge crossing of SH1 to tie into the Auranga development was recommended in the IBC as well as an upgrade to Bremner Road east to remove the Firth Street/ Norrie Road ‘dog-leg’ to connect directly to Great South Road and the proposed Drury Central rail station and town centre off Waihoehoe Road.

Figure 11-5 and Figure 11-6 show the long list and short list options considered in the IBC.

The corridor recommended through the IBC involved a new 330m long viaduct (crossing Firth Street and Norrie Road to near Great South Road) to connect to Waihoehoe Road and cross the rail line. The viaduct over the Hingaia Stream was to address flooding of the existing Drury village and provide resilience for the ARI 100 flood event.

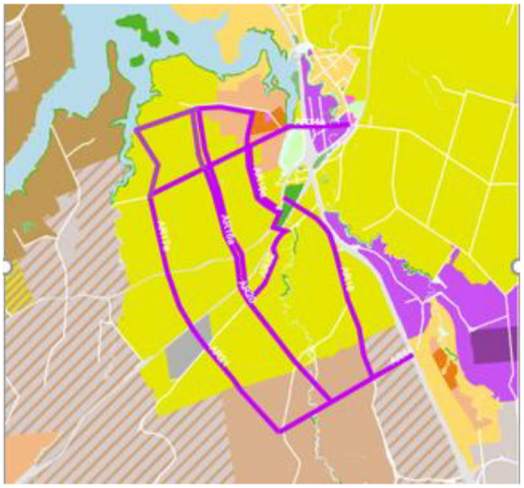


Figure 11-5 IBC Drury West Long List Options

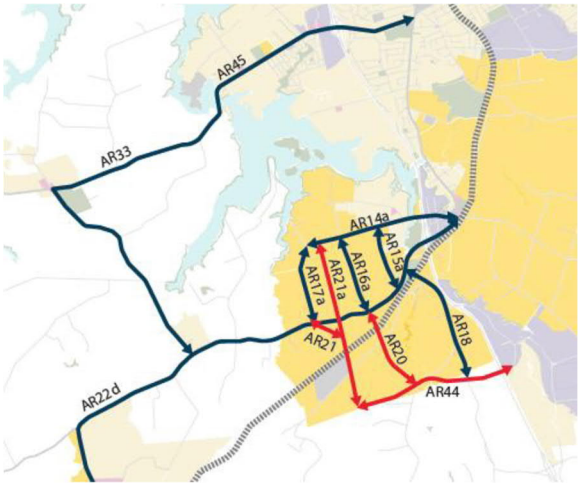


Figure 11-6 IBC Drury West Short List Options

11.2.1.2 Gap analysis

A gap analysis was undertaken for Bremner Road as described in Section 5.2. The below provides a summary on the outcomes of this analysis.

Planning updates, developer aspirations, interdependencies with other projects for Bremner Road include:

- The land use along the section between Jesmond and Bremner Roads (as per AUPOIP zoning through recent plan changes) is largely medium to high density residential. The remainder of the corridor is unlikely to change from its current uses which is business – light industrial. This area is outside of the AC Drury Ōpāheke Structure Plan.
- At the time of the gap analysis, Plan Change 6 was subject to an outstanding appeal concerning the alignment of the new road between Jesmond and Bremner Roads. Mediation was undertaken in February 2019 and was ongoing at the time of the gap analysis.
- Although no new designations have been identified since the IBC phase, Waka Kotahi is the requiring authority for Designation 6706, SH 1 which bisects the alignment. MoE has a site designated for a school on Burberry Road (which is adjacent to the Jesmond to Bremner link – Auranga Road 1) and have plans to designate a future school site on the corner of Jesmond Road.
- The Waka Kotahi Papakura to Bombay project proposes to widen SH1 under the Bremner Bridge and the bridge needs to be lengthened and raised. Ongoing integration with this project will be undertaken.

From the gap analysis, the corridor recommended through the IBC was taken forward for further refinement as the Bremner Road FTN Upgrade. It provides the most direct connection between Drury east and west and provides improved accessibility to the proposed train station and large town centre, especially for public transport and walking and cycling.

Several other recommendations were made from the gap analysis for consideration through route refinement:

1. Western section (Auranga Road 1): As the indicative alignment for the Jesmond to Bremner Link was decided through Plan Change 6 proceedings and is included in the precinct plan, no further options assessment is required. This alignment is proposed to be designated as part of NoR D2.

However, AT has sufficient interest in the land for undertaking the work and no further assessment of alternatives for the alignment of the road is necessary.

2. Eastern section (large viaduct through existing business area): Due to the cost and environmental concerns such as flooding and visual effects, further investigation of alternatives was recommended to be undertaken (see 0).

11.2.1.3Form and Function Assessment

Following the methodology summarised in Section 5.3, a form and function assessment was undertaken for the Bremner Road FTN Upgrade. Table 11-5 provides a summary of the assumptions and outcomes of the assessment.

Table 11-5 Bremner Road FTN Upgrade Form and Function Assumptions and Summary

Bremner Road FTN Upgrade (Jesmond Road – Great South Road)		
Criteria	Summary	Comments
Place and Movement[4]	P2	Place value classified as P2 using the RASF typology. This typology is justified based on the medium housing density on both sides (within Auranga/PC6 boundaries) suggesting some levels of activation of the street/place environment.
	M2	Movement value classified as M2 using the RASF typology. This typology is justified based on the function of the road - a PT and active modes spine road to connect Drury West and Drury Central - and based on expected ADT and speed environment.
Land use	Medium	Some risk due to the involvement with Auranga and developer contributions.
Bus	Bus Lanes	A PT spine road to connect Drury West and Drury Central. It is expected that 15 buses per hour (37 Drury and Ōpāheke (7 min) and 374 Ōpāheke East (10 min)). The Frequent Transit Network (FTN) is triggered by exceeding the minimum 15 min frequency threshold and also reinforced by the reliability of corridor and intersections, network connectivity, integration with wider PT network and spatial positioning for optimum integration with place/density/catchment.
Active Modes	Protected Cycle lanes & Footpath on Western side	The corridor will provide an active mode spine road to connect Drury West and Drury Central. This route will require cycling facilities as it will be part of the primary cycle network.
Flows	25,000 4 Lanes	Flows and PT expectations justify 4 lanes, with Average Daily Traffic Flows approximated to be 25,000 trips per day (based on the DBC 2048+ SATURN model, taking the highest number for the three Bremner sections)
Speed	50km	50kmh along this section as it travels through FUZ and urbanised areas.
Freight	No, No priority	No over dimension (OD) requirements
Outcome	Based on the above, of the typical cross sections used for the Supporting Growth Programme, a 30m four lane FTN arterial was the preferred.	

[4] Based on the anticipated level of place and movement functions for the corridor



11.2.2 Route Refinement Option Development

The Bremner Road FTN Upgrade has been split into three sections for options assessment purposes. The sections are shown in Figure 11-7 and include:

- **Bremner Road FTN Upgrade – West section** (Jesmond Road to Bremner link): This section is through the Drury 1 Precinct and Auranga Plan Change 6 area and the alignment has been agreed through mediation in the Private Plan Change 6 proceedings of which AT were party to. No options assessment required.
- **Bremner Road FTN Upgrade - Central section**: This section crosses the Ngakoroa Stream and State Highway 1. Three options were developed to investigate which side of the road to widen (north, south or both sides)
- **Bremner Road FTN Upgrade – East section**: This section is from the State Highway 1 crossing to a tie in with Great South Road. This also includes the potential upgrade of and tie ins with Creek Street, Firth Street and Norrie Road.
    - Options were developed to focus on opportunities to address connectivity, reduce bridge structures and land requirement, and increase resilience. The options also aim to minimise impacts on the scheduled historic church and cemetery located on Norrie Road. Additional options were also developed as the Project Team were going through the options assessment process (as discussed further below). These were developed to mitigate specific effects that became apparent through specialist assessment. These included flooding and stormwater, transport outcomes (especially connectivity with the local network) and property impacts.
    - Once a preferred layout was decided on, three options were developed to investigate which side of the existing roads to widen (north, south or both sides).



Figure 11-7 Bremner Road FTN Upgrade Assessment Sections

11.2.3 Route Refinement Assessment – Bremner Road FTN Upgrade Central section

The purpose of the Bremner Road FTN Upgrade is to provide a direct east-west movement between Drury east and west for the FTN. This will connect communities, proposed town centres and the proposed Drury central train station. Route refinement for the Bremner Road FTN Upgrade Central section included specialist assessment of three options:

- Option A – widening to the north of the existing road
- Option B – widening to the south of the existing road
- Option C – widening to both sides of the existing road

The three options for the Bremner Road FTN Upgrade Central section are shown in Figure 11-8.

11.2.3.1 Assessment

The assessment undertaken for the Bremner Road FTN Upgrade Central section follows the processes previously discussed in Section 6. The three options were assessed qualitatively against the MCA framework by each subject matter expert. Considerations and constraints identified are shown in Figure 11-8.Table 11-6 provides a summary of the qualitative assessment undertaken by technical specialists against the MCA framework. In determining the preferred option, the Project Team took into consideration the MCA assessment and the engagement undertaken with project partners (including Manawhenua and Auckland Council) and landowners.

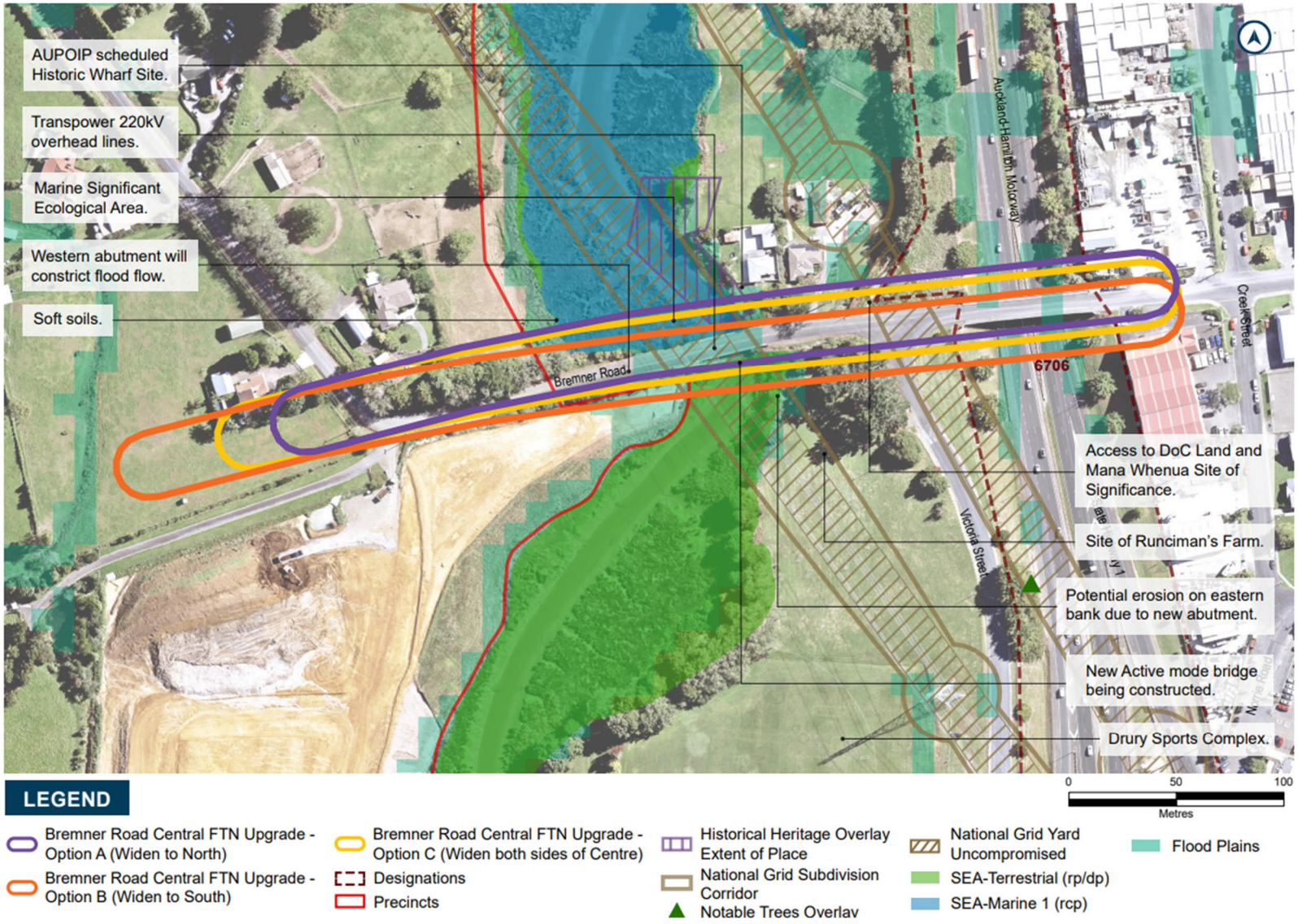


Figure 11-8 Bremner Road FTN Upgrade Central section Options for route refinement showing constraints and considerations

Table 11-6 Bremner Road FTN Upgrade Central Options Assessment Findings Summary

Bremner Road FTN Upgrade Central Corridor – Options Assessment Findings Summary	
Performance against transport outcomes *Note: All three options achieve the transport outcomes and there is no differentiation between the three options with regard to these objectives.*	
Support growth and a more sustainable, quality urban form in Drury by improving connectivity to/through the Drury West Area The overall Bremner Road corridor is supportive of this objective, providing a more direct east-west linkage for the wider Drury area to key destinations, including Drury Central train station and centre. The form and function of this corridor enhances connectivity for multiple modes, forming part of the primary cycle network and FTN, unlocking safe and sustainable choices and improving connectivity to/through the Drury area to support current and future residents. These factors are integral to supporting sustainable, quality urban form, especially in contrast to the existing road which will no longer be appropriate as the Drury area urbanises. The new section of Bremner Road will also shorten the local connection between Drury West and Drury East. ***Achieve a transformational mode shift for trips to key destinations in Drury (including rail stations, centre and the strategic north-south PT network) by providing high quality, safe and attractive PT and active mode facilities on Bremner Road*** The form of this corridor supports this transport outcome through the provision of high quality, safe and attractive PT and active mode facilities. As discussed above, this is integral to supporting the anticipated growth and land-use adjacent to the corridor, to encourage mode shift and avoid reliance on LOV's.	
Wellbeing assessment	
Heritage	Option A and C would impact on the scheduled item of historic heritage at 51 Bremner Road. Option B has potential to impact heritage sites (on the northern side). All options could have potential impacts on new archaeological site recorded: Runciman Farm recorded within 100m of Bremer Road (R12/113) since the IBC phase.
Social	Future Land Use Integration: Widening to the north, and both sides of the existing road would have the greatest impact on land proposed as town centre zone and is likely to impact an artificial pond which is a planned feature of the proposed future town centre. At this location it is preferred to widen to the southern side of the road. Social: There are no significant differentiators between the three options. However, Option B has a greater impact on the reserve land and the Drury Sports Complex. With any option, access should be maintained to the sports fields. Urban Design: All three options present no significant differentiators for the future urban design environment as the existing corridor provides low positive contributions to amenity and quality values. Land requirement: All options affect Council reserve land. Option B has less property effects overall as it is not likely to impact the houses at 31 and 37 Bremner Road. Options A and C are both expected to impact these properties. Health and Wellbeing: No differentiating factors between the three options. For all options dust and noise has the potential to impact both the residential development and users of the sports complex this will need to be managed.

Environmental	Landscape and Visual Amenity: All three options would likely cause modification to the stream embankment landform and vegetation loss. Option A has a larger impact on vegetation in the coastal marine area than Option B and C however does not appear to impact the waking and cycling bridge (in construction at the time of assessment). Both Option B and C will impact on vegetation in the Coastal marine area. Stormwater: Bridge levels and the new western approach / bridge abutment for all options will obstruct the passage of flood flows. No differentiation of stormwater effects between the three options. Ecology: All options result in a loss of significant indigenous vegetation and habitat for native birds and fish and would have indirect impacts on the receiving environment such as pollution, erosion sediment and disturbance. Option B has the least impacts on SEAs (MSEA located on the north side and TSEAs located on south side of the Ngakoroa Bridge). However, endangered species potentially located on the southern side (to be investigated further). Natural hazards: No differentiation between options. No significant geotechnical constraints can be identified along the alignment. Noted that the ground consists of historic and recent alluvium consisting of very soft materials that are likely to require ground improvement.
Economic	Utilities: High voltage overhead power (Transpower). Will need to be worked around (construction) for all options. As such, there are no differentiators between the options. Construction: Access to properties during construction is potentially an issue for all. Option C will have some complexity with bridge staging. Transpower overhead lines may need to be relocated for all options.
Opportunities	
• The upgrade of Bremner Road Central presents the opportunity to enhance and restore indigenous habitat along stream margins and mitigate any landform modification. There is opportunity to minimise impact on SEA habitat and reinforce stream embankment landform through design, such as bridging or use of retaining walls (instead of embankments) and a bridge design that “floats” above the stream corridor. • Archaeological research opportunities were also identified through the assessment.	

11.2.3.2 Partner, Internal and Landowner Engagement

Throughout the various option assessment workshops, the Project Team engaged with project partners including Manawhenua and Auckland Council, to discuss the options.

Feedback from Manawhenua was received at two hui, on 30 August and 3 October 2019. Manawhenua indicated the Ngakoroa Stream was a major travel route for Maori therefore there is potential for undiscovered archaeological remains. A heritage/archaeological investigation was requested to be undertaken. Option B was preferred by Manawhenua, to avoid effects on marine significant ecological areas. Reclamation of the coastal marine area is not supported by Manawhenua.

During workshops with Auckland Council on 5 September and 11 November 2019, Council suggested contacting Council parks specialists to discuss future plans for the Drury sports fields (Victoria Street). The Project Team had a meeting with Auckland Council Parks to discuss development plans on Wednesday 26th February 2020.The Local Board have future plans for greenways adjacent to the Ngakoroa Stream (this could connect with the future upgraded corridor).

Internal engagement workshops were held with wider AT and Waka Kotahi teams on 12 September, 14 October and 17 December 2019. During these workshops, attendees reached a general agreement that widening to the south (Option B) is preferred. It was also suggested that joint consultation with the Department of Conservation be undertaken with the business case project teams for Bremner Road and the Papakura to Bombay project. The Project Team had a meeting with the Department of Conservation to discuss the Drury Arterial Network on 10th March 2020.

In December 2019 and January 2020, the Supporting Growth Programme sought feedback from landowners within the proposed Drury Arterial Network area on the draft preferred option for the Bremner Road Central corridor. Minimal specific feedback was received on the Bremner Road Central section, however feedback received on this section of the network supported the connectivity it would provide to the area.

11.2.3.3Preferred Option

Following the MCA assessment and consideration of feedback received from project partners including Manawhenua and Auckland Council and landowners, a preferred option for the Bremner Road FTN Upgrade Central section was identified.

The preferred option (Option B) is to widen generally to the south of the existing road corridor. The preferred option was chosen because:

- This option reduces impacts in the coastal marine area in line with policy direction of the New Zealand Coastal Policy Statement and AUPOIP
- This option has the least impact on the Marine 1 Significant Ecological Area –, which was preferred by Manawhenua
- This option avoids scheduled archaeological sites to the north of the existing road
- It has the least property impacts
- This option enables more developable land in the FUZ
- This option provides for a better interface with the Auranga development

There were no evident differentiators between the three options with regard to social, urban design, landscape and visual amenity, health and wellbeing, stormwater and flooding, natural hazards and utilities.

All route refinement options provided the same level of achievement against the transport outcomes as outlined in Table 11-6.

Subsequent to the preferred option being identified, a revised national freshwater policy statement and new freshwater regulations came into effect (the National Policy Statement for Freshwater Management 2020 and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020), which gives greater protection to natural inland wetlands and streams. Given this new policy direction, the Project Team reconsidered the potential effects of the preferred options on identified natural inland wetlands and streams. Generally, the alignment and design refinement process for each proposed designation has sought to avoid or minimise impacts on high value natural wetlands and streams, unless there is a functional requirement for any such impacts or other high value environmental constraints. There will be further opportunities to minimise any impacts within the Project alignment during the detailed design of the Projects. As a result, no further design refinement is required at this stage.

11.2.3.4Discounted Options

The following table summarises the reasons for discounting the remaining two options.

Table 11-7 Discounted Options - Bremner Road FTN Upgrade Central

Option	Reasoning
Option A	This option was discounted for the following reasons: • Greater impact on the CMA and SEA M1 (vegetation and habitat) • This option would impact on the scheduled item of historic heritage at 51 Bremner Road • Greater property impact
Option C	This option was discounted for the following reasons: • Greater impact on the CMA and SEA M1 (vegetation and habitat) • This option would impact on the scheduled item of historic heritage at 51 Bremner Road • Greater property impacts • Impacts on existing walking and cycling bridge • Complexity of bridge construction staging and traffic management

11.2.3.5Intersection Form

Along the preferred Bremner Road FTN Upgrade Central corridor, one intersection needs to be upgraded. A summary of the assessment (described in Section 7) undertaken for this intersection is shown in Table 11-8, outlining the recommended outcome.

Table 11-8 Bremner Road FTN Upgrade Central Intersection Form Assessment

Intersection		Form		Modal Priority			Justification/Constraints/Triggers	Preferred Intersection Form
Name	Arms	Lanes	Speed	PT	Active Mode	Freight		
Bremner Upgrade / Bremner Old Intersection	Bremner Upgrade ←→	4	50km/h	FTN	Med	Med	• Signalised intersection existing and agreed in Drury 1 Precinct Proximity to floodplain and Ngakoroa Stream (Significant Ecological Area).	Signalised Intersection
	Bremner Old ↓	2	Low	Low	Low	Low		
	New Collector ↑	2	Low	Low	Low	Low		

11.2.4 Route Refinement Assessment – Bremner Road FTN Upgrade East section

11.2.4.1 Overview

The gap analysis recommended investigating alternative options to the recommended IBC option of a large bridge structure crossing the Hingaia Stream and floodplain. The first stage of route refinement looked at these alternative options, which also led to different configurations of the intersections and layout of the adjoining local roads (stage 1a). This assessment was undertaken through a scored MCA as it was thought that this would assist to differentiate between options. Stage 1b undertook additional analysis on costs, flooding effects, resilience and transport to expand on the assessment of two options against the MCA framework in Stage 1a.

Once the general layout was recommended through Stage 1, further route refinement was undertaken to decide which side of the existing roads to widen (Stage 2). In Stage 2 options were assessed qualitatively against the MCA framework. The stages of assessment are illustrated in Figure 11-9 and summarised as follows:

- **Stage 1a:** Assessment of seven route refinement options
- **Stage 1b:** Further assessment of two route refinement options from Stage 1a
- **Stage 2:** From the preferred option from Stage 1b, three options were developed to assess which side of the existing roads to widen

Each of these stages are discussed in further detail in the following sections.

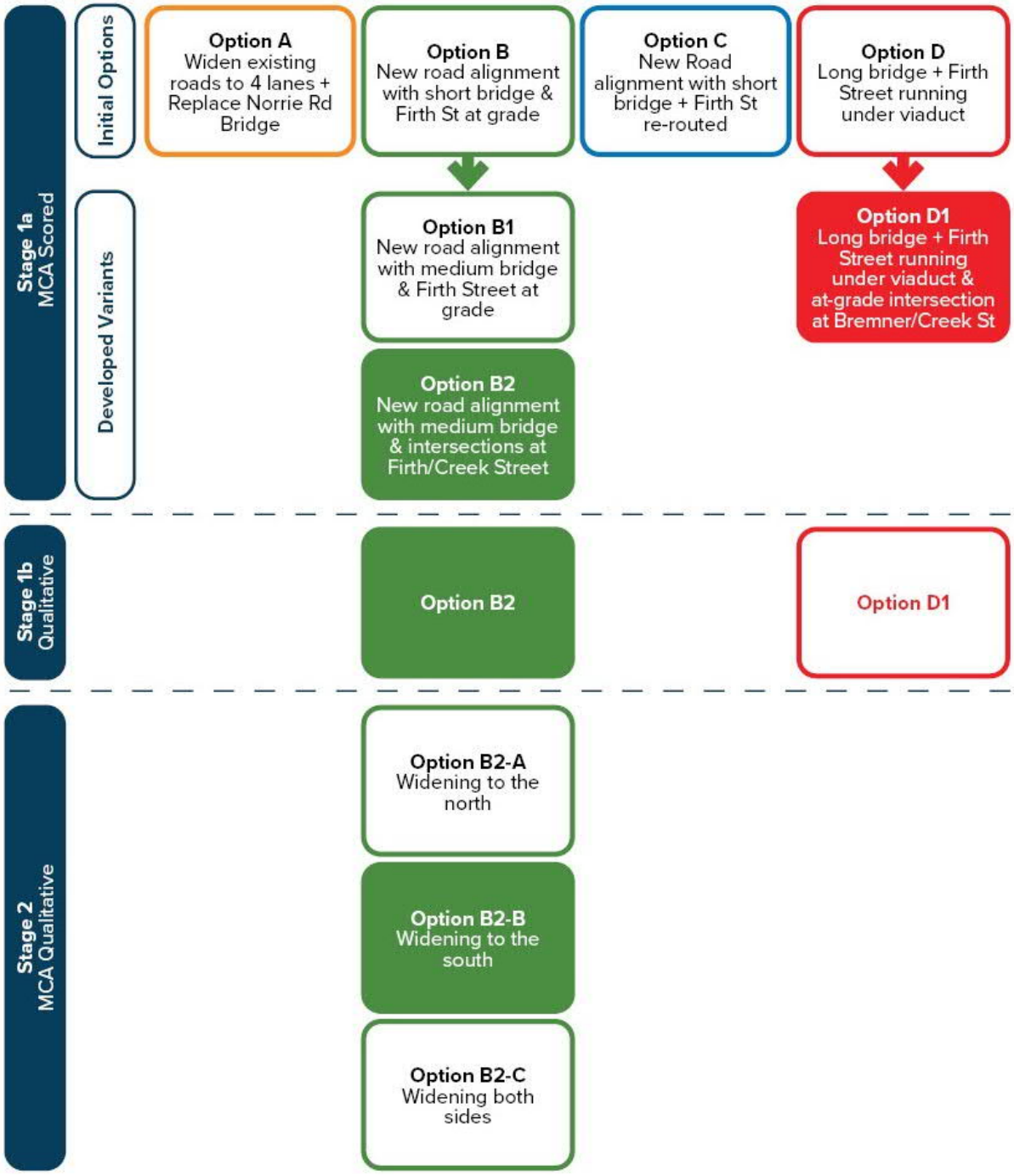


Figure 11-9 Bremner Road FTN Upgrade East Process

11.2.4.2 Stage 1a

The purpose of the Bremner Road FTN Upgrade East connection is to provide a direct east-west movement between Drury east and west for the FTN. This will connect communities, proposed town centres and the proposed Drury central train station. Initially, four options were developed for assessment (Options A – D). However, additional refined options were developed in response to feedback from internal specialist and team workshops. Options are detailed in Table 11-9.

Table 11-9 Bremner Road FTN Upgrade East Stage 1a Options

Option	Description
Option A – Upgrade of existing roads	• widen existing roads on the same layout to four lanes • replacement of Norrie Road bridge
Option B – Short bridge, Firth Street at grade	• new road alignment with a short bridge over Hingaia Stream • new local road connection between Firth and Creek Street • existing Norrie Road Bridge removed
Option C – Short bridge, Firth Street rerouted A "medium bridge" option was not developed for Option C (as it was for Option B) because of the additional network upgrades required at Firth Street and Norrie Road.	• new road alignment with an embankment and new bridge over Hingaia Stream • new local road connection between Firth and Creek Street • existing Norrie Road Bridge removed
Option D – Long bridge, Firth Street under	• viaduct • grade separation of Firth Street • a new local road connection between Firth St and Creek St • existing Norrie Road bridge removed
Option B1 – Medium bridge, Firth Street at grade Option B1 was developed after an internal specialist workshop as a variant of Option B aiming to mitigate some of the adverse flooding/stormwater effects	• new road alignment with a medium bridge (90m) over Hingaia Stream • new local road connection between Firth and Creek Street • existing Norrie Road Bridge removed
Option B2 – Medium bridge (90m), intersections at Firth and Creek Street Option B2 was developed as a variant of B1 after an internal team workshop to try to avoid the need for a new local connection between Creek and Firth Streets:	• new road alignment with a 90 m bridge over Hingaia Stream • two intersections on Bremner Road with Creek Street and Firth Street • existing Norrie Road Bridge removed.
Option D1 – long bridge (200m), Firth Street under Viaduct Option D1 was developed as a variant of Option D after an internal workshop aiming to increase the connectivity of the local business area to Bremner Road and also to avoid the need for a new local connection between Creek Street and Firth Street.	• 200m viaduct • grade separation of Firth Street • at grade intersection at Bremner Road / Creek Street • existing Norrie Road Bridge removed

The seven options for the Bremner Road FTN Upgrade East section are shown in the figures below.

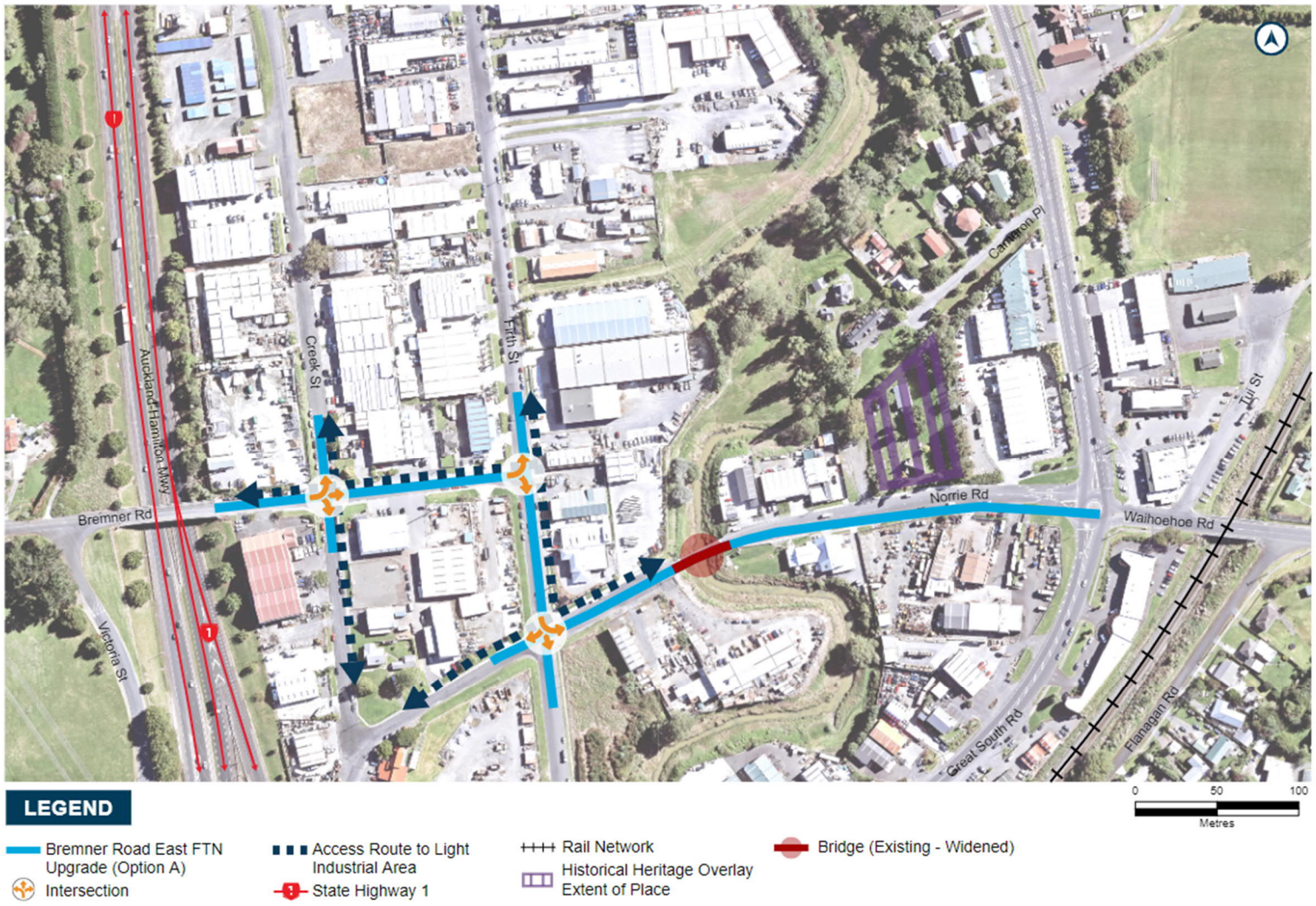


Figure 11-10: Option A - Upgrade of existing roads

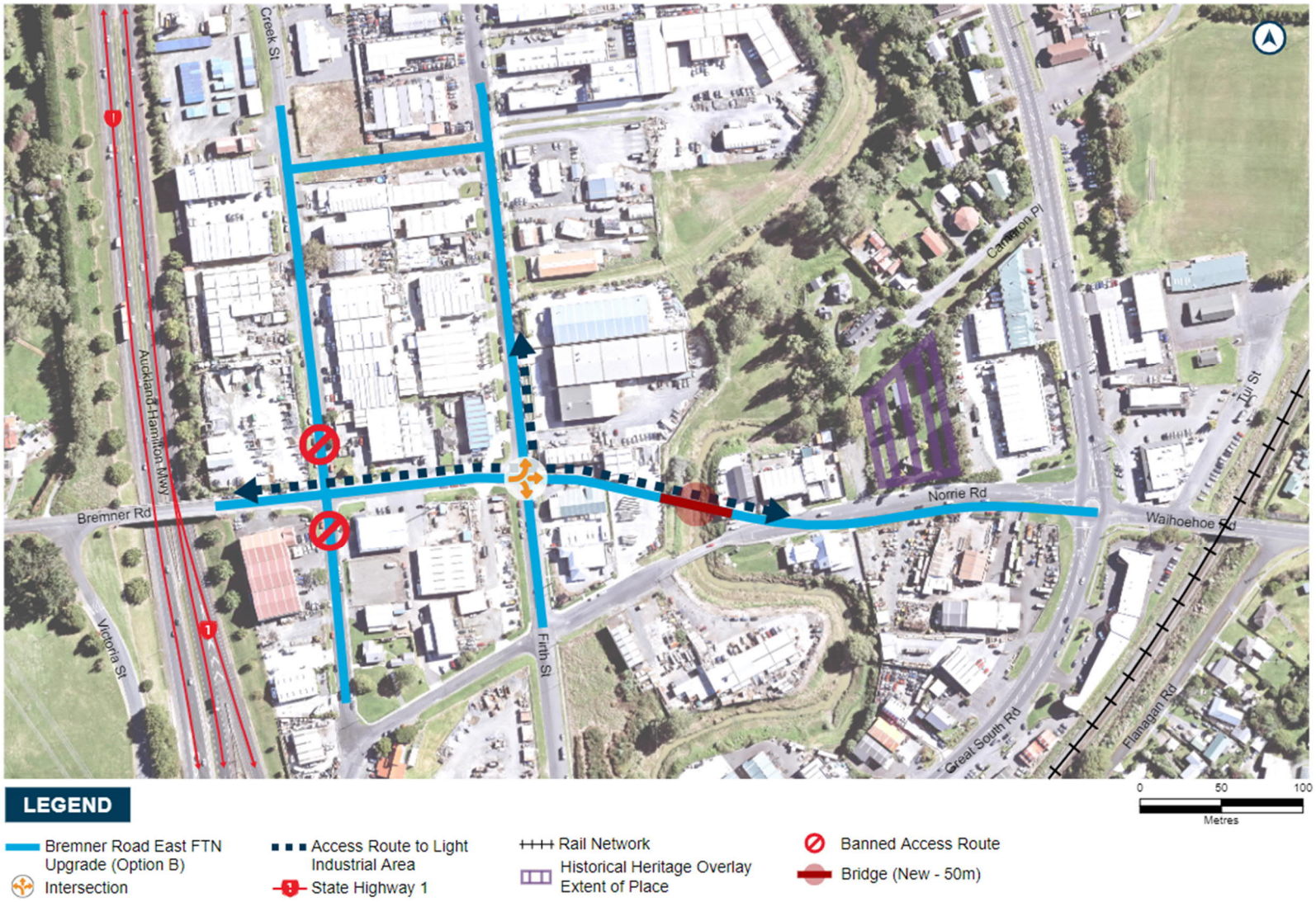


Figure 11-11: Option B – Short bridge, Firth Street at grade

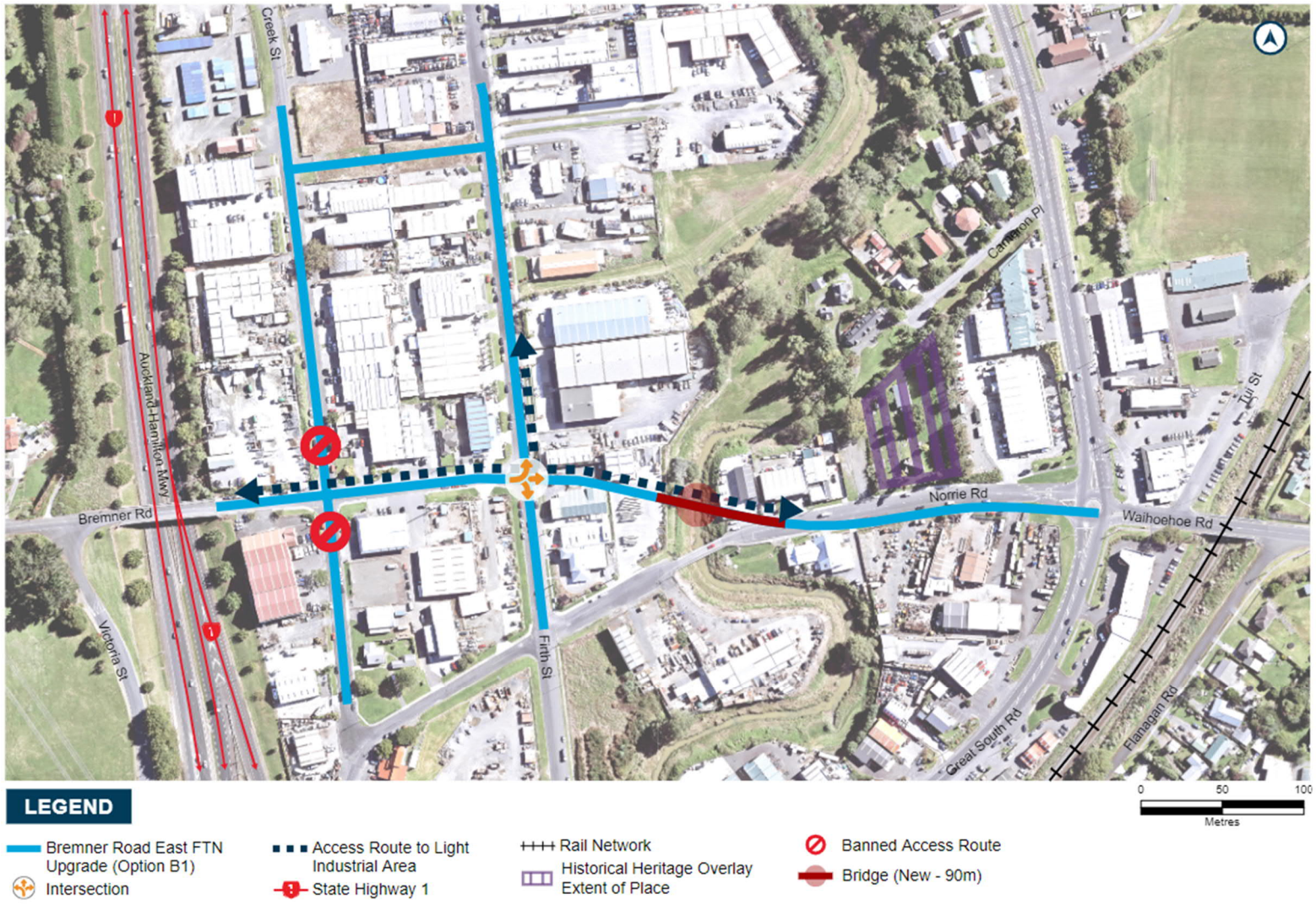


Figure 11-12: Option B1 – Medium bridge, Firth Street at grade

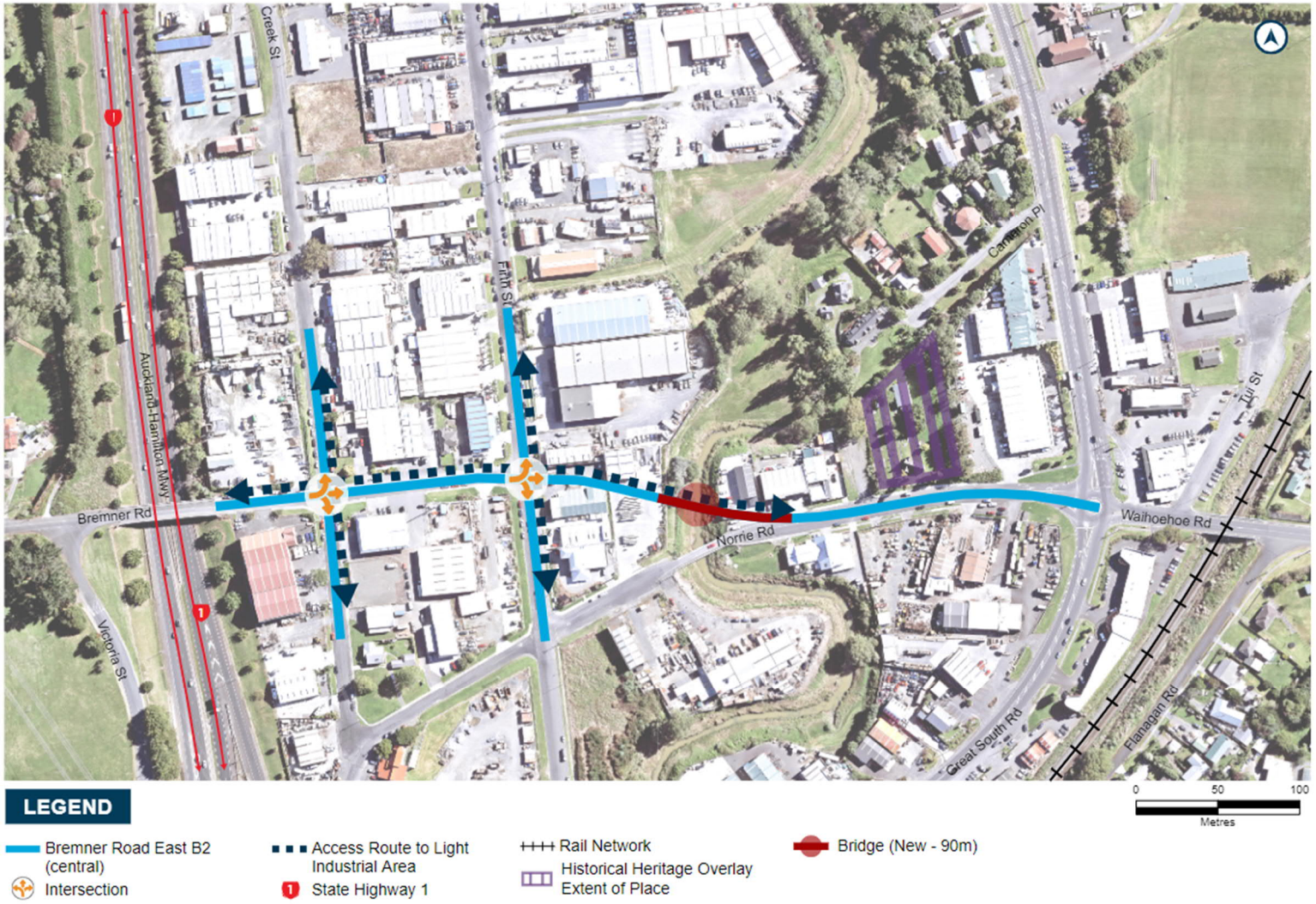


Figure 11-13: Option B2 – Medium bridge, intersections at Firth and Creek Street



Figure 11-14: Option C – short bridge, Firth Street rerouted

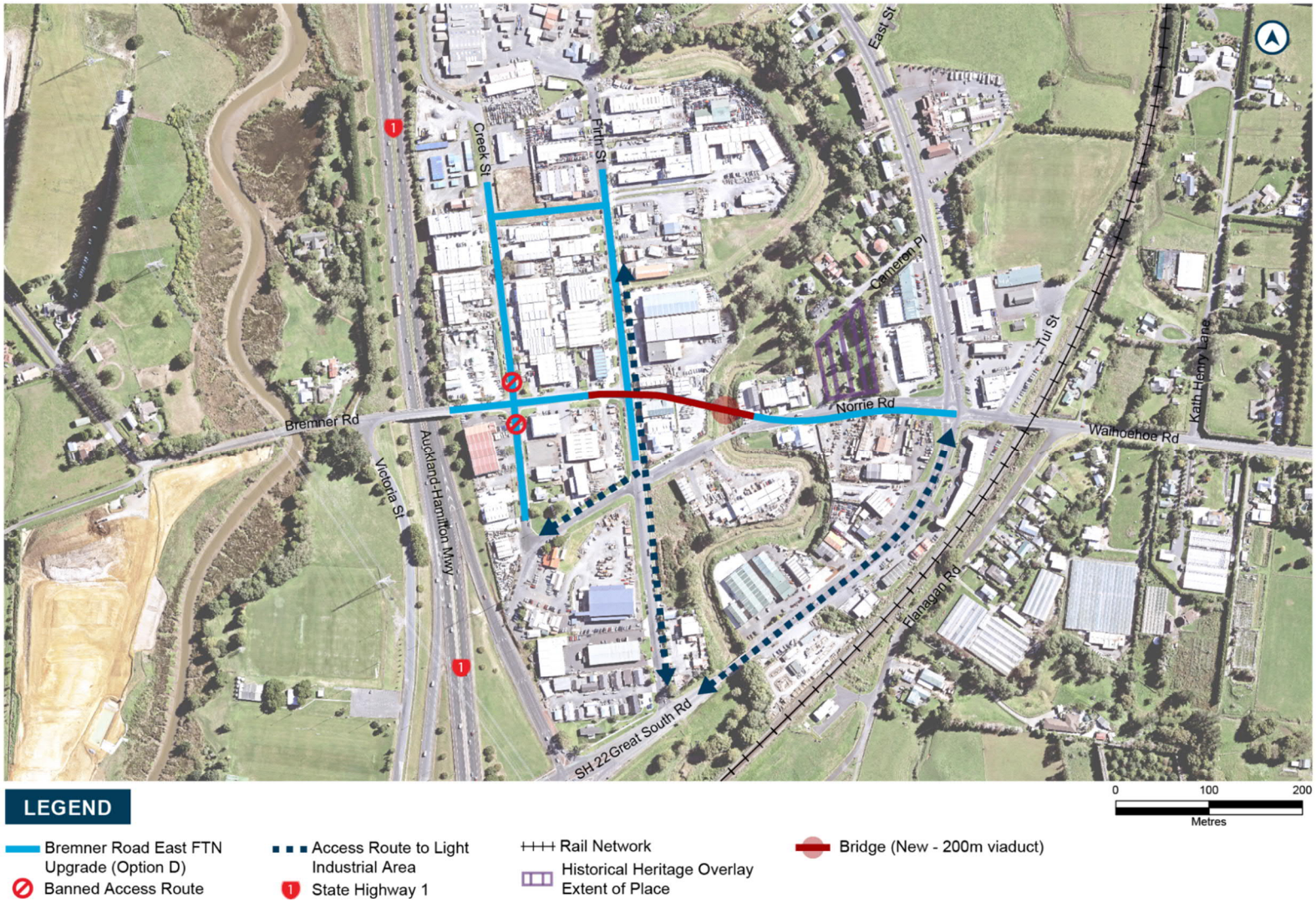


Figure 11-15: Option D – long bridge, Firth Street under

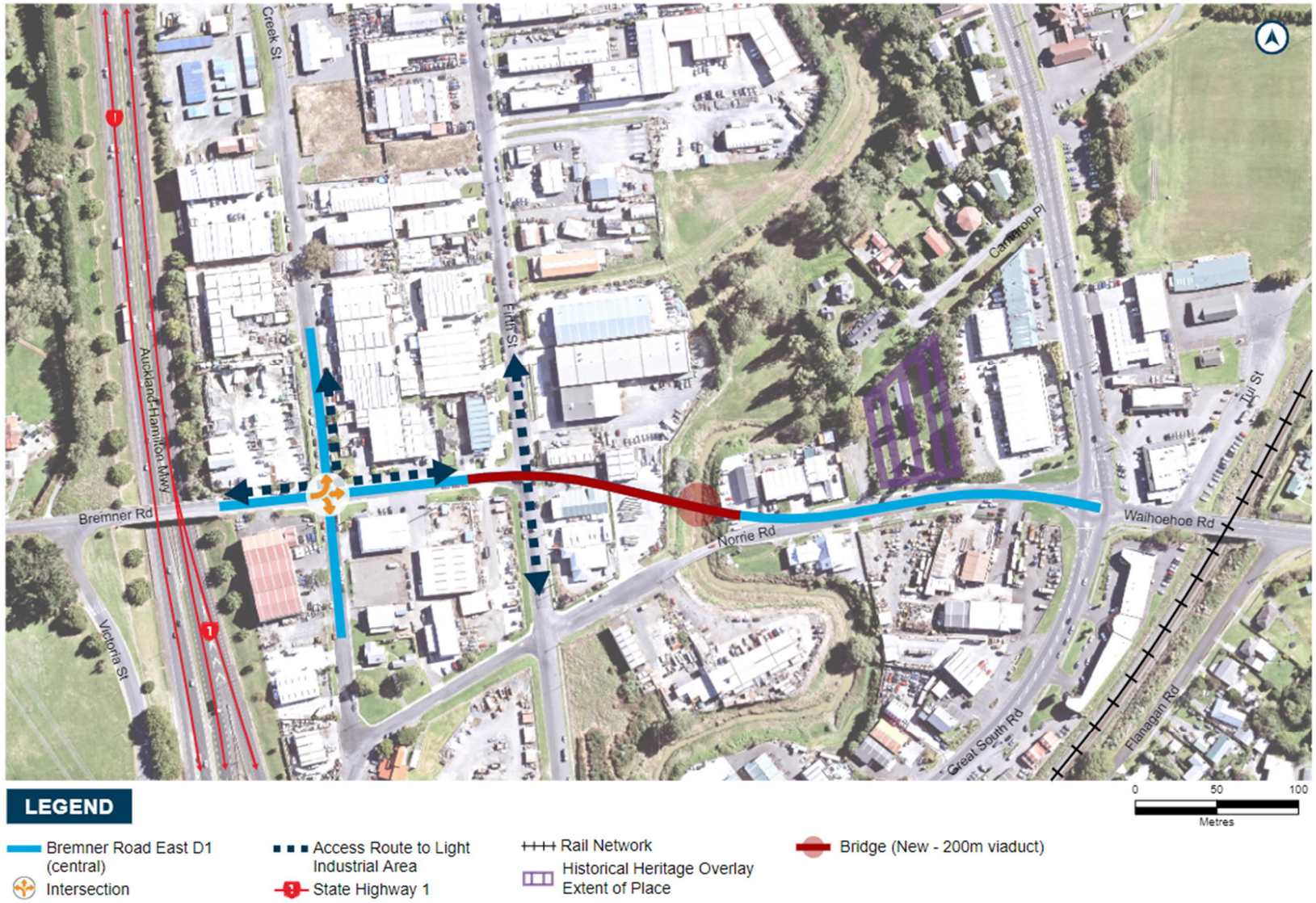


Figure 11-16: Option D1 – long bridge, Firth Street under

Assessment

All options were scored against the MCA framework and reasons for the score recorded. In summary, Table 11-10 below demonstrates a heatmap and scores of each option considered and Table 11-11 provides a summary of the qualitative assessment undertaken by technical specialists against the MCA framework to support the scoring. The shades of green represent what was identified in the MCA as a score above '0' and is associated with a positive impact (lower score) with dark green representing a greater positive, whereas shades of orange represent what was identified in the MCA as a score below '0' and is associated with a negative impact (higher score) with darker orange representing a greater negative.

Table 11-10 Bremner Road FTN Upgrade East MCA Assessment

MCA Criteria		Option A	Option B	Option B1	Option B2	Option C	Option D	Option D1
I.O.1	Connectivity to existing light industry area	2	2	2	2	2	-1	2
	Connectivity through movement	0	2	2	1	2	3	2
I.O.2	Active mode safety	1	3	3	2	3	3	3
	Active mode attractiveness	1	3	3	2	3	2	3
	PT safety	0	1	1	1	1	2	1
	PT attractiveness	0	3	3	2	3	4	3
1a. Heritage		-3	-3	-3	-3	-3	-3	-3
2a. Land use futures		1	2	2	3	2	2	3
2b. Urban design		0	2	2	2	1	1	1
2c. Land requirement		-1	-2	-2	-2	-2	-2	-1
2d. Social cohesion		1	1	1	1	1	0	1
2e. Human Health and Wellbeing		0	0	0	0	0	-1	-1
3a. Landscape / visual		-1	1	1	0	1	1	0
3b. Stormwater		-2	-3	-2	-2	-3	-1	-1
3c. Ecology		-1	-1	0	0	-1	0	0
3d. Natural Hazards		0	-1	-1	-1	-1	-1	-1
5a. Construction impacts on utilities / infrastructure		-2	-2	-2	-2	-2	-2	-2
5b. Construction Disruption		-2	-2	-2	-2	-2	-2	-2
6a. Construction costs / risk / value capture		-2	-2	-2	-2	-3	-3	-3

Table 11-11 Bremner Road FTN Upgrade East Stage 1a Options Assessment Findings Summary

Bremner Road FTN Upgrade East – Stage 1a Options Assessment Findings Summary
Performance against transport outcomes
Support growth and a more sustainable, quality urban form in Drury by improving connectivity to/through the Drury area With reference to connectivity to existing light industry area, all options score positively, except for Option D. Option D does not provide direct access to Creek Street or Firth Street from Bremner Road. Local access is limited to one access point from SH22, which reduces accessibility. The other options all provide access to either Creek Street, Firth Street, or both. Connectivity through movement is neutral for Option A as the staggered intersections retain the existing dog leg and are likely to cause congestion. With regard to connectivity through movement, Option D is the most positive (+3) scoring option for connectivity through movement as there is direct and consistent east west facility without any intersections interrupting the flow of traffic along the corridor. ***Achieve a transformational mode shift for trips to key destinations in Drury (incl. rail stations, centres and the strategic north-south PT network) by providing high quality, safe and attractive PT and active mode facilities on Bremner Road*** All options score neutral to positively for this transport outcome. Option A scores least positively, with noted difficulty for bus manoeuvrability and conflict points caused by the staggering of intersections. Options B, B1, C and D1 score the most positively, providing for direct and reliable public transport and separated active mode facilities. Option D had the most positive score for public transport attractiveness (+4) as there are no intersections along the corridor. Option A has the least positive (0) public transport attractiveness as there are three closely located intersections and the dogleg route reduces the reliability of public transport services.
Transport assessment
All options excluding Option A include the removal of the Norrie Road Bridge. The removal of Norrie Road Bridge in these options is required as the existing bridge is not fit for purpose to serve as an east west movement for higher traffic flows and would not accommodate frequent bus movements. Due to the existing and likely future bridge levels, maintaining the Norrie Road Bridge with the proposed new bridge in each of these options would give rise to vehicular safety issues. Option A retains a dog leg east-west movement, which is neither direct nor continuous, and is likely to impede traffic flow along the corridor. The staggered connection is likely to cause traffic delays and congestion, as well as poor connectivity for pedestrians, cyclists and buses. Option B provides a direct and continuous route to Great South Road, providing a more seamless east-west movement for all road users. This option requires a new east-west road connection between Creek Street and Firth Street as a result of closing Creek Street. Options B1 and B2 are similar to Option B. Option B2 does not require the additional connection between Creek Street and Firth Street. Option B2 instead has two signalised intersections, which will impact on journey time of east-west movements. Dedicated right turning bays will be required to reduce the likelihood of right turning movements along Bremner Road (impacting the east-west flow of traffic and rear end crashes). As a result, this would form a five or six lane configuration along Bremner Road between Creek Street and Firth Street. The two signalised intersections along Bremner Road introduces two conflict points for pedestrians, cyclists and buses. An opportunity was identified to make changes to the Option B2 design which involves closing off Creek Street (south of Bremner Road) to form a T intersection (three-legged). This change could increase the positive

effects for active mode safety and active mode attractiveness (to +3, compared to +2 for Option B2). The likely benefits of this opportunity change to the design includes:

- Minimises conflicts at the intersection of Bremner Road / Creek Street for vehicles, pedestrians and cyclists
- Reduces delays at the intersection of Bremner Road / Creek Street
- Reduces the footprint of the Bremner Road / Creek Street intersection.
- Allows for a continuous active mode link between Bremner Bridge and Firth Street, south of Bremner Road which improves safety and attractiveness for active modes
- Potential to provide an emergency egress should flooding occur at Firth Street.

Option C is similar to Options B, B1 and B2 in providing a direct and continuous route to Great South Road and has one conflict point. A new east-west connection to the north of Bremner Road is required to maintain access to the industrial area due to the closure of Firth Street.

Option D provides the most direct and continuous east-west connection with no intersections along the corridor and is likely to have the least intersection delays. Option D is most attractive to pedestrians, cyclists and buses as there are no conflict points. Option D limits access to the industrial area from Bremner Road, requiring vehicles to detour via Great South Road and then to Firth Street. A new east-west connection would be required north of Bremner Road.

Option D1 also provides a direct and continuous east-west connection, with one intersection. Both Creek Street and Firth Street will provide access to the industrial area so an additional east-west connection north of Bremner Road is not required. Grade separation of Firth Street and Bremner Road allows for the north-south movement to occur along Firth Street.

Wellbeing assessment	
Historic heritage	All options minimise impacts on the scheduled St John's Church and cemetery site on the north side of Norrie Road. However, they will all have moderate adverse effects due to impacts on the former Drury Cheese Factory on the southern side of the road. The former Drury Cheese Factory is a recorded site (on the Cultural Heritage Inventory) but is not a scheduled heritage structure in the Auckland Unitary Plan. All options will impact on this site. Relocation of the former Drury Cheese Factory within the property is not possible but relocation to another site could be possible (subject to an assessment of built heritage value). All options scored negatively (-3) for historic heritage. There are no significant differentiators between the three options with regard to historic heritage. An opportunity has been identified to undertake a built heritage assessment on the Drury Cheese Factory.
Social	Future Land Use Integration: Options B2 and D1 score most positively (+3) for integration with planned future land use. These options provide a direct connection between residential, town centres and train stations, as well as integrating with the light industrial area. Option D1 provides an opportunity for development potential under the viaduct. Option A is the only option to score negatively (-1) as it retains the dog leg and is likely to cause conflict between buses and active modes and light industrial land use, as well as limiting development potential. Social: There are no significant differentiators for social cohesion. The surrounding area is an existing industrial area and all options will disrupt, reduce viability or remove existing businesses from the area and alter existing access. All options have very similar effects on the adjoining properties. By shifting the alignment to the north, or to the south, would likely enable one side of the road to remain unaffected by property acquisition. There are opportunities to improve east-west connectivity and improve industrial traffic entering and exiting Bremner Road, improving business efficiency. A small number of businesses may experience issues with access and connectivity.

Social	Urban Design: Options B, B1 and B2 score most positively for urban design, due to moderate positive opportunities for high quality urban design solutions. Options B, B1 and B2 provide for a well-connected interface between the public and private realm, and opportunity for placemaking at the Firth Street and Bremner Road intersection. Option B2 offers limited opportunity to develop a desirable urban form between intersections at Creek Street and Firth Street. Option A scores neutral as a result of low negative impacts for high quality urban design solutions. Options C, D and D1 provide low positive impacts (scoring +1) for urban design, as there is limited opportunity for an active or desirable interface between the public and private realm due to the differences in road/bridge level and limited opportunities for placemaking. Options D and D1 sever the developments to the north and south of the long bridge. Land Requirement: All options score negatively for land requirement, as businesses will be affected in terms of access and land required. Partial and full acquisitions will be required. Options A and D1 score least negatively (-1) as these options have the least land take requirements. Option A will affect a lot of small businesses through partial acquisitions and embankments hindering access to buildings and parking areas but the businesses on the east of Firth Street primarily remain intact. Option D1 will completely remove some businesses but will not require land take for a Creek Street and Firth Street connection north of Bremner Road. There is also potential for development of land underneath the viaduct (depending on height and construction). Other options all score -2 due to impacts on businesses and access. Options B, B1, B2, C and D all require acquisition of land from 56 Firth Street through to 28 Creek Street (which is not required for Options A and D1). Human Health and Wellbeing: Options D and D1 score very low adverse (-1) for human health and wellbeing as a result of potential change in amenity for businesses that will be operating under or adjacent to the bridge/flyover. All other options score neutral for human health and wellbeing as there are no sensitive land users and minimal change to the current light industrial environment.
Environmental	Landscape and Visual Amenity: Options B, B1, C and D all score very low positive (+1) for landscape and visual amenity effects, as greening of the corridor is anticipated to result in a positive change to the visual amenity of the area for users and adjacent properties. Option D will have a low visual impact on users and adjacent properties from the bridge structure/flyover. However, the scale of the bridge is not out of place within the large industrial landholdings. Options B2 and D1 are neutral, as the amenity of the street environment is worse than other options due to the additional intersection. Option A has the least favourable scoring (-1) as a result of compromised amenity for people using active modes that will share the corridor with industrial traffic. All options provide opportunities for enhancement, particularly around the stream environment. Stormwater: Stormwater impacts are negative for all options. Options D and D1 have the least negative (-1) scores as the new alignment will be raised above the flood plain. Options B and C score most negatively (-3), as the mitigation required for the blocked passage of flood flows will require land take of property south of Norrie Road Option B will also require openings in the bridge abutments. Options A, B1 and B2 score negatively (-2), as part of the alignment is flooded. Ecology: Ecology impacts scored a neutral (0) for Options B1, B2, D and D1. The impact on Hingaia Stream is considered to be neutral from these options and the design will allow the natural regulation of the stream. There are opportunities with these options for stream planting. Options A, B and C scored very low adverse (-1) for impacts on the Hingaia Stream and floodplain. The proposed bridge piers and embankments of Options B and C may inhibit water flow and fish movement. Widening of the existing bridge in Option A may lead to loss of additional stream embankment. Option A is considered the least favoured option. Natural Hazards: Option A scored neutral for natural hazards as there are no significant geotechnical constraints along the alignment. All other options scored very low adverse (-1) as ground improvements are likely required alongside significant earthworks to stabilise embankment construction.

Economic	Utilities: There are no significant differentiators for construction impacts on utilities and infrastructure (all options scoring -2). All options will affect underground and overhead services to similar extents, and there are opportunities for relocating and replacing existing services. Construction: There are no significant differentiators between the options for construction disruption. All options scored negatively (-2) as there will be significant disruption to the existing industrial environment and the businesses located there. Temporary relocation or closures may be required during construction for all options. Costs and Construction Risk: Construction costs and risk score negatively for all options. Options C, D and D1 score least favourably (-3). Option C will require significant culverts, retaining walls and fill, as well as a large construction footprint. Options D and D1 will require retained abutments and fill, as well as large land requirement and construction complexity. Options A, B, B1 and B2 all scored -2, as the works will require detours, traffic management and land.

Opportunities

- Climate change opportunities were identified for options D and D1, as these options provide flooding resilience for the future FTN route through the light industrial area. Existing flooding issues are predicted to worsen with future urbanisation, as such, these options raise the alignment above the future floodplain.
- Opportunities to reduce carbon footprint through a reduction in concrete structures and longer construction timeframes
- Opportunity for all options to retain Norrie Road Bridge for walking and cycling facilities. However, removing Norrie Road Bridge has positive impacts on flooding in the wider area.

Partner and Internal Engagement

Throughout the various option assessment workshops, the Project Team engaged with project partners including Manawhenua and Auckland Council, to discuss the options.

Feedback from Manawhenua was received at two hui, on 30 August and 3 October 2019. Manawhenua expressed preferences for Option B1, D or D1 due to stormwater constraints and these options having the most direct transport connection. Manawhenua indicated stormwater management was a key concern for the alignment through the floodplain and upstream/downstream effects. Ngāti Tamaoho indicated a preference for bridges instead of reclaiming land or culverting, and that stormwater treatment devices should be located outside of the floodplain. Ngāti Tamaoho indicated an opportunity for a green corridor to be established underneath the bridge of Option D1.

During workshops with Auckland Council on 5 September and 11 November 2019, Council advised that the floodplain mapping has recently been updated and that flood plains were more extensive than the previous modelling. The modelling indicates that a larger area in the existing Drury industrial area will be susceptible to flooding.

The future of the industrial area was discussed with the Council. There was acknowledgement that the urban environment in the area is likely to change with the adjacent urbanisation. However, that change is uncertain, especially due to flooding issues. Council also advised that during structure plan consultation, feedback from the local community was that they were fond of the Norrie Road Bridge (which is proposed to be removed as part of the upgrade).

Two internal engagement workshops were held with AT and Waka Kotahi attendees, on 12 September and 14 October 2019.

During the first workshop, which was to discuss Stage 1 Options, attendees suggested that the Drury Central station should be confirmed before the FTN route is decided to ensure integration of the network. The National Policy Statement for Freshwater Management (NPS-FM)(the version dated 2014, which was the current version at the time of the workshop) was also discussed, and that there may be no more piping of streams (bridging only). The 2020 NPS-FM was also considered in subsequent stages of Project development as described in section 0. Discussions around flooding impacts included whether embankments of B1 would cause a dam and that flooding risk analysis should be undertaken looking at the resilience of the FTN network.

It was suggested that the options should allow for buses to turn right to get on to Great South Road via Firth Street (so they can turn at Firth or Creek Streets). Option D does not provide for this. It was identified that Option D lacks local connectivity and that existing employment on Great South Road should be supported by the FTN. Positive feedback was received on Options D and D1 as they provide for a safe active modes connection. Feedback from the second workshop is discussed in Stage 2.

Preferred Options

Following the assessment from subject matter experts and consideration of feedback received from project partners (including Manawhenua and Auckland Council), two options, Option B2 and Option D1, were identified to be taken forward for further assessment for the Bremner Road East FTN Upgrade.

Through the assessment, it was noted that there were no evident differentiators between the seven options with regard to archaeology and built heritage, social, utilities and construction criteria. All options provide opportunities for enhancement, particularly around the stream environment.

Option B2 was progressed for the following reasons:

- This option supports growth and a more sustainable, quality urban form in Drury by improving connectivity to/through the Drury area
- This option does not require the additional connection between Creek Street and Firth Street
- An opportunity was identified to make changes to the Option B2 design which involves closing off Creek Street (south of Bremner Road) to form a T intersection (three-legged). The likely benefits of this opportunity include:
    - Minimises conflicts at the intersection of Bremner Road / Creek Street for vehicles, pedestrians and cyclists
    - Reduces delays at the intersection of Bremner Road / Creek Street
    - Reduces the footprint of the Bremner Road / Creek Street intersection
    - Allows for a continuous active mode link between Bremner Bridge and Firth Street, south of Bremner Road which improves safety and attractiveness for active modes
    - Potential to provide an emergency egress should flooding occur at Firth Street
- This option provides a direct connection between residential, town centres and train stations, as well as integrating with the light industrial area.
- This option provides for a well-connected interface between the public and private realm, and opportunity for placemaking at the Firth Street and Bremner Road intersection.
- This option has neutral impacts on ecology as it will allow the natural regulation of the stream.

Option D1 was progressed for the following reasons:

- This option supports growth and a more sustainable, quality urban form in Drury by improving connectivity to/through the Drury area
- This option provides for direct and reliable public transport connections
- This option provides a direct connection between residential, town centres and train stations, as well as integrating with the light industrial area
- This option provides an opportunity for development under the viaduct
- This option has the least land take requirement
- This option has the least impact on stormwater and flooding effects as the new alignment will be raised above the flood plain
- This option has neutral impacts on ecology as it will allow the natural regulation of the stream.

Discounted Options

The following table summarises the reasons for discounting the remaining options.

Table 11-12 Discounted Options - Bremner Road FTN Upgrade East Stage 1a

Option	Reasoning
Option A	This option was discounted for the following reasons: • This option does not improve through traffic connectivity, likely to cause congestion • This option would introduce difficulty for bus manoeuvrability, and conflict points caused by the staggering of intersections • This option has the least positive public transport attractiveness • Retaining the dog leg alignment would limit development potential • Similar land acquisition to Option D1, many small businesses affected • This option will result in compromised amenity for people using active modes that will share the corridor with industrial traffic • A section of this alignment would be flooded • Widening of the existing bridge may lead to loss of additional stream embankment.
Option B	This option was discounted for the following reasons: • Greater land acquisition required • Equal largest impact on stormwater and flooding as the mitigation required for the blocked passage of flood flows will require land take of property south of Norrie Road and openings will be required in the bridge abutments • The proposed bridge piers and embankments of this option may inhibit water flow and fish movement • Ground improvements are likely required alongside significant earthworks to stabilise embankment construction
Option C	This option was discounted for the following reasons: • Limited opportunity for an active or desirable interface between the public and private realm due to the differences in road/bridge level and limited opportunities for placemaking. • Greater land acquisition required • Equal largest impact on stormwater and flooding as the mitigation required for the blocked passage of flood flows will require land take of property south of Norrie Road

Option	Reasoning
	• This option will require significant culverts, retaining walls and fill, as well as a large construction footprint. • The proposed bridge piers and embankments of this option may inhibit water flow and fish movement. • Ground improvements are likely required alongside significant earthworks to stabilise embankment construction.
Option D	This option was discounted for the following reasons: • This option does not provide direct access to Creek Street or Firth Street from Bremner Road limiting access to the industrial area, requiring vehicles to detour via Great South Road and then to Firth Street. • Ground improvements are likely required alongside significant earthworks to stabilise embankment construction. • Limited opportunity for an active or desirable interface between the public and private realm due to the differences in road/bridge level and limited opportunities for placemaking. • Greater land acquisition required • This option could cause a change in amenity for businesses that will be operating under or adjacent to the bridge/flyover. • This option would have a low visual impact from the bridge structure/flyover. However, the scale of the bridge is not out of place within the large industrial landholdings • This option will require retained abutments and fill, as well as large land requirement and construction complexity. • Ground improvements are likely required alongside significant earthworks to stabilise embankment construction.
Option B1	This option was discounted for the following reasons: • Greater land acquisition required • A section of this alignment would be flooded • Ground improvements are likely required alongside significant earthworks to stabilise embankment construction.

11.2.4.3 Stage 1b: Additional Assessment

Following completion of the initial MCA stage, two options were identified for further analysis. These options include Option B2 and Option D1 as described in Table 11-9 and shown in Figure 11-13 and Figure 11-16 respectively.

Building on the information through the options assessment, additional analysis was undertaken to assist in making a recommendation between two preferred options as both benefits and disbenefits were recognised with the two options as outlined in Table 11-13.

Table 11-13 Benefits and disbenefits of Option B2 and D1

	Option B2 Medium bridge, intersections at Creek Street and Firth Street	Option D1 Long bridge, Firth Street grade separated, intersection at Creek Street
Benefits	• Full access for local business area (with intersections at Creek and Firth Streets) • Reduced costs compared to Option D1 because of the shorter bridge structure	• Least impacts on flooding and stormwater (longer bridge span over Hingaia Stream, and raises route out of the floodplain) • As the road is out of the floodplain it provides the most resilience (less disruption) for the transport route • Full access for local business area (intersection at Creek Street, grade separation of Firth Street) • Provides a direct connection with only one intersection. This increases reliability of the frequent bus network and walking and cycling.
Disbenefits	• Two closely spaced intersections potentially reduce the reliability of the frequent bus network, and increased walking and cycling crossing points. • Firth Street intersection remains in the floodplain which may cause disruption in flood events. • Bridge embankments in the floodplain. Potential to worsen flooding and stormwater effects (to be investigated)	• The most expensive option because of the longer bridge structure

One of the benefits of option D1 was its resilience from flooding events as it was raised out of the Hingaia Stream floodplain. The original assessment indicated that option B2 could have adverse effects from locating embankments within the floodplain. This could potentially worsen flooding effects upstream and downstream on properties. However, the frequency and duration of the flooding in this area weren't well understood without doing further analysis. It was also recognised that the cost of option D1 would be quite a lot more than option B2 and concern was raised on whether Option D1 would be worth the additional cost without knowing how frequently the road flooded and for how long. It was also thought the function of the intersections in option B2 could be improved – which was a disbenefit of the option. These queries required further investigation before making a recommendation. The following items were investigated further to assist in determining between the two options:

- Costs: the cost difference between the options (including construction and property acquisition)
- Flooding:
    - The frequency and duration of flooding of Bremner Road/ Firth Street intersection for Option B2 (and the likely disruption of this)
    - Potential flooding impacts on upstream and downstream properties and likely mitigation required.

- Network resilience: the cost of the potential disruption to the FTN route due to flooding for Option B2 compared to the additional construction cost of Option D1.
- Transport: Optimisation of two closely spaced intersections. Are there re-routing options in flooding events for Option B2.

This additional analysis is discussed in the sections below.

Cost Estimates

The approach to cost estimation used for the IBC was adopted as the basis for developing the comparative costs for these options. This involved the application of a generic 30m cross section along the length of the corridor. The bridge was assumed to be 24m wide, accommodating four traffic lanes and active mode facilities.

The options have been developed in Concept Station to provide an outline of the footprint and scope of works. The earthworks volumes and bridge extents were extracted directly from the design model.

The two options follow the same general alignment, and the property impacts were assumed to be the same for both options for this assessment.

The resultant costs (to an indicative business case estimate level) are set out below.

Table 11-14 Comparative Cost estimates for Bremner Road FTN Upgrade East Options

Bremner East Option	P_{50} Expected Estimate ($ million)
Option B2	68
Option D1	85
Difference	**17**

The difference in project costs is approximately $17M with option D1 being more expensive. This is primarily associated with the increased bridge length from 90m to 200m. There are other minor differences in the cost associated with the additional earthworks and construction of the Firth St intersection for Option B2.

Flooding Effects

Flood modelling was undertaken to investigate flooding effects of Options B2 and D1. In both options the existing Norrie Road bridge will be removed. This currently obstructs flood flows in the Hingaia Stream.

Existing Situation

Flow is generally contained in the Hingaia Stream channel at the site until peak flows reach about 110 m^3/s. This is approximately 50% of the 100-year ARI peak flow (or about the 10-year ARI event). At this point, flood flow starts to break out of the channel both upstream and downstream of the bridge and make its way west towards Firth Street. The flood flows just reach the underside of the existing Norrie Road Bridge at RL5.5m. Some property flooding starts to occur within Drury Village, both upstream and downstream of the site and Firth Street starts to flood.

When flows get to approximately 75% of the 100-year ARI event (or about the 50-year event), Firth Street becomes flooded from flow breaking out of the channel. Flood levels immediately upstream of the Norrie Road Bridge in the Hingaia Stream channel reach RL6.9m and the bridge is overtopped.

Once the flows have built to 100% of the 100-year ARI event, Firth Street remains inundated and flood levels at the upstream side of Norrie Road Bridge reach RL8.20m.

Effect of removing Norrie Road bridge

Removing Norrie Road bridge will result in up to approximately 50% of the 100-year ARI peak flow (or about the 10-year ARI event) being accommodated at this location. The removal of Norrie Road Bridge has no impact on flood risk in the surrounding area as the flow is generally contained in the channel at this site and, at this flow, does not reach the bridge deck.

Removing the Norrie Road bridge will not influence the frequency of flooding on Firth Street. This is because flood waters breakout from the left channel and flow towards Firth Street both upstream and downstream of the bridge location when the channel is full, but before floodwaters reach the height of the bridge deck.

In larger events, removing the Norrie Road bridge will reduce flood levels upstream in the channel compared to the existing situation. This reduction is in the order of half a meter in the 100-year ARI event. The reduction in flood level extends upstream to near the rail crossing (near the Drury interchange), generally reducing to neutral at that point.

Option B2

The proposed bridge for Option B2 has been set at a height so that it is completely clear of the 100 ARI floodplain. This gives the proposed new Bremner Road alignment a 100-year ARI standard of protection at that bridge. Where the new alignment ties back to the existing ground levels at the Firth Street intersection, however, the road will be subject to flooding in about the 10-year ARI event. This will be due to flows breaking out from the stream channel towards Firth Street as they do in the existing situation. The duration of this flooding is likely to be less than an hour for the 10-year event and around five hours in the 100-year event.

The upstream 100-year ARI flood levels reduce slightly compared to the existing situation. This reduction extends upstream as far as the railway crossing.

Option D1

The proposed bridge for Option D1 has been set at a height so that it is completely clear of the 100-year ARI floodplain as well as the lead up to the bridge on the eastern side. This gives the proposed new Bremner Road alignment a 100-year ARI standard of protection at that bridge and for the full proposed new alignment. Firth Street (which passes under the proposed new bridge and remains on its existing alignment) will be subject to flooding in in about the 10-year ARI event as is currently the case. This will be due to flows breaking out from the stream channel towards Firth Street as they do in the existing situation.

The upstream 100-year ARI flood levels show a slight reduction compared to the existing situation. This reduction extends upstream as far as the railway crossing.

Summary and Opportunity

The flooding assessment can be summarised as follows:

- Both options would provide an improvement in terms of flood risk protection to the roading network compared to the existing situation.
- Both options can be designed to achieve neutral (or potentially beneficial) effects on flood risk to surrounding properties. A key point is that Option B2 has the same effects (neutral or potentially positive effects) as Option D1.
- For Option B2, the intersection of Bremner Road / Firth Street will have some flooding in 10-year event. The duration of this flooding is likely to be less than an hour for the 10-year event and around five hours in the 100-year event.
- Option D1 will provide an increased level of flood protection for the road compared to the existing situation (completely out of the 100-year floodplain) which is betterment (i.e. value for money decision rather than mitigation of an effect). Firth Street (which passes under the proposed new bridge and remains on its existing alignment) will be subject to flooding in in about the 10-year ARI event as is currently the case.
- There is the opportunity to raise the level of the road slightly for Option B2 to reduce flooding at the Bremner Road /Firth Street intersection. This may increase the footprint. Again, this is betterment and an investment decision.

Flood Resilience

A high-level assessment was undertaken to understand the resilience benefit of the additional flood protection provided by Option D1 over Option B2. For Option B2 the intersection of Bremner Road and Firth Street remains in the floodplain. Option D1 raises the transport corridor out of the floodplain.

The below summarises the key points from the assessment:

- The Firth Street/ Bremner Road intersection would start to flood in the 10-year event but only for a short amount of time (i.e. a 1 hour closure every 10 years)
- In a more significant 100-year event, the road would be closed for around 5 hours (i.e. a 5 hour closure every 100 years)

The economic assessment for resilience has been carried out assuming a 1 day closure each year for Option B2, which reflects a very conservative approach. This has determined that the benefits of keeping this route open (Option D1) are generally in the range of $0.5m to $2m over a 40-year period.

Therefore, the benefits associated with resilience are not expected to be significant when considering the additional cost of $17M associated with the longer bridge structure in Option D1.

Transport Assessment

A summary of the transport considerations for Options B2 and D1 is set out below.

Both options provide direct and consistent east-west through movement and maintain connectivity to the adjacent light industrial area. They provide safe and attractive public transport connection and active mode facilities.

Option B2

Option B2 has two signalised intersections along the corridor which would impact on the journey time of E-W movements. The distance between Creek Street and Firth Street is approximately 110m. If significant queuing occurs between the two intersection, this would impede traffic from the industrial area from entering Bremner Road. The signalised intersections would need to be coordinated to address queuing and delay issues, particularly during peak hours.

The two signalised intersections would require dedicated right turn bays to reduce the likelihood of right turning movements along Bremner Road impacting the E-W flow of traffic and rear end crashes. As a result, this would form a five or six lane configuration along Bremner Road between Creek Street and Firth Street.

The industrial area can be accessed from the intersection of Bremner Road / Creek Street and Bremner Road / Firth Street.

The two signalised intersections along Bremner Road introduce two conflict points for pedestrians, cyclists and buses, although the signalised crossing points would provide for the safe crossing of pedestrians and cyclists.

The Creek Street intersection is approximately 80m from the Southern Motorway. If future bus ramps are implemented on Bremner Road to SH1, queuing along the western approach of the Creek Street signals may delay buses on the off ramp from entering Bremner Road. This however would be dependent on the configuration of the entry lanes on the western approach of the signals.

The performance of the proposed intersections at Creek Street and Firth Street will be investigated further in developing the preferred option, although an opportunity has been identified to close the southern section of Creek Street (south of Bremner Road) to form a T-intersection as shown in Figure 11-17. Bremner Road could still be accessed via the Bremner Road/Firth Street intersection.

The likely benefits of closing the southern section of Creek Street include that it:

- Minimises conflicts at the intersection of Bremner Road / Creek Street for vehicles, pedestrians and cyclists
- Reduces delays at the intersection of Bremner Road / Creek Street
- Reduces the footprint of the Bremner Road / Creek Street intersection
- Allows for a continuous active mode link between Bremner Bridge and Firth Street, south of Bremner Road which improves safety and attractiveness for active modes
- Could provide an emergency egress should flooding occur at Firth Street.

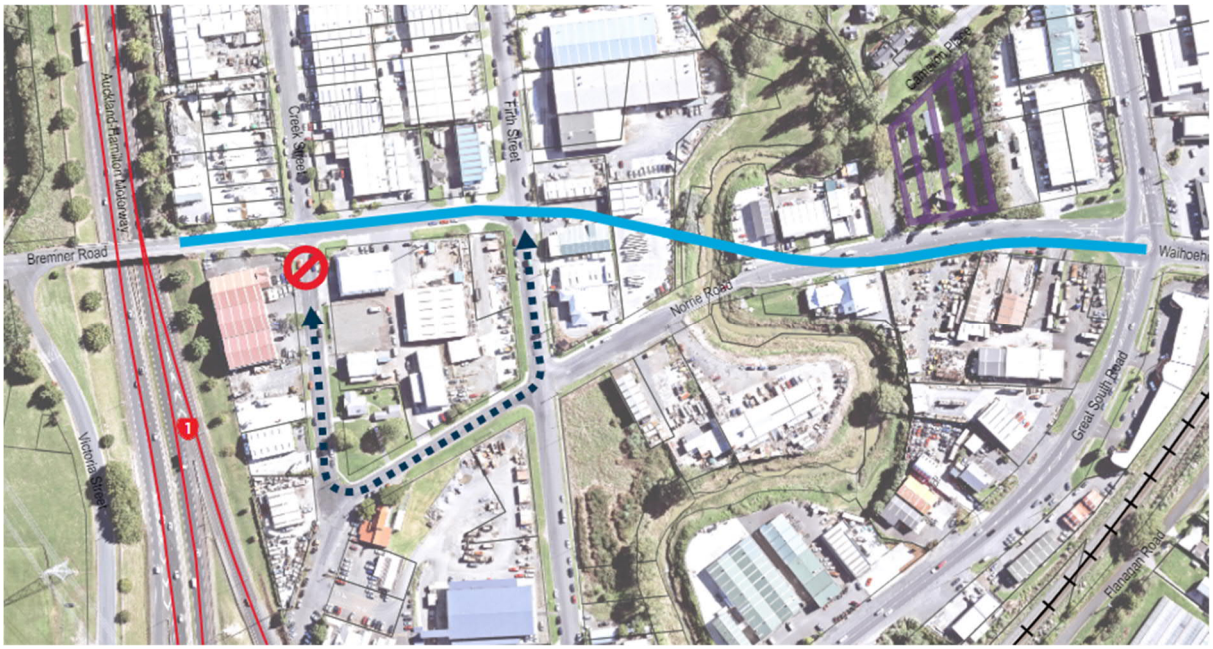


Figure 11-17 Opportunity to close Creek Street south

Option D1

Option D1 provides a direct and continuous route to Great South Road, with only one intersection proposed along the road corridor at Bremner Road / Firth Street. The E-W movement is more seamless and safer for all road users.

The industrial area can be accessed from the intersection of Bremner Road / Creek Street and Firth Street / Great South Road. Internal movements within the industrial area is provided from Creek Street and Firth Street. The grade separation of Firth Street and Bremner Road allows for N-S movement to occur along Firth Street.

The performance of the proposed at grade intersections at Creek Street will be investigated further in developing the preferred option. However, the intersection is likely to require right turn bays on Bremner Road to minimise the likelihood of right turn movements impeding E-W traffic at the intersection.

Creek Street is the primary access to the industrial area from Bremner Road. The increase in local traffic on the road network linking to the Creek Street southern approach would require localised road upgrades. This is likely to result in additional costs for implementation.

Creek Street is approximately 80m from the Southern Motorway. If future bus ramps are implemented on Bremner Road to SH1, queuing along the western approach of the Creek Street signals may delay buses on the off ramp from entering Bremner Road. This however would be dependent on the configuration of the entry lanes on the western approach of the signals.

If Creek Street was to operate as a priority intersection this would the flow of E-W traffic movements and cause delays to traffic related to the industrial area, in particular right turn movements as they are required to wait for gaps along Bremner Road.

Partner and Internal Engagement

The Project Team has engaged with project partners throughout the options assessment process including Manawhenua and Auckland Council. The following feedback builds upon the Stage 1 feedback previously identified and provides a summary of landowner engagement undertaken during Stage 2.

During the second internal engagement workshop with AT and Waka Kotahi, attendees indicated they would like to see the flood frequency modelling before being able to decide on a preferred option. The net costs, frequency of disruptions to the network, cost of delays (to businesses and reputation), clean up and maintenance costs would all be factors in decision-making. Attendees expressed safety concerns for Option B2 due to opportunities for conflict at the two intersections. A T-junction was suggested through closure of the southern approach on Creek Street, as well as a right turn lane into Creek Street north to improve the function of two closely spaced intersections. A two-lane busway running along the south side of Bremner Road to integrate with the train station was also suggested for Option B2. Option D1 was considered expensive, however, there was indication that the mitigation from the shorter bridge may also be expensive and require additional property purchase. Safety issues with the existing and proposed concrete plant were raised. Severance concerns and interaction with the Papakura to Bombay project were also commented on.

Preferred and Discounted Option

Following the further assessment described above, Option B2 was identified as the preferred option for Bremner Road FTN Upgrade East. Option B2 was recommended because:

- It provides a direct and accessible corridor. The two closely spaced intersections can be optimised to reduce conflicts and provide priority for public transport and walking and cycling
- There is an opportunity for the Creek Street intersection to be a signalised T.
- It will have neutral (or potentially positive) flooding effects
- The benefits of the additional resilience of Option D1 are small compared to the additional cost of $17 million.
- It provides an opportunity to raise the road level to increase resilience.
- Likely re-routing is available in a flood event if a temporary south access can be gained via Creek Street, depending on flood levels.

Option D1 was discounted for the following reasons:

- This option was the most expensive option due to the longer bridge structure
- Completely bridging the floodplain would not provide the additional benefits compared to B2 anticipated in the Stage 1a assessment
- The benefits of the additional resilience of this option were small compared to the cost.

11.2.4.4 Stage 2

A workshop was held with the project team to further inform the design of Option B2. The design recommendations included:

- Optimise intersection form – T-intersection at Bremner/Creek Street
- Reduce property impacts (access and acquisition)
- Reduce impacts on archaeological features and built heritage
- Work with stormwater specialist(s) to further refine the design to mitigate stormwater/flooding effects
- Telecom mast likely needed to be relocated

Following these recommendations, three options to investigate which side of the existing roads to widen as part of Option B2 were developed and assessed for Bremner Road FTN Upgrade East as follows:

- Option A – widening to the north of the existing roads
- Option B – widening to the south of the existing roads
- Option C – widening to both sides of the existing roads.

The three options for Bremner Road FTN Upgrade East are shown in Figure 11-18.

Assessment

The assessment undertaken for Bremner Road FTN Upgrade East Stage 2 route refinement follows the processes previously discussed in Section 6. Three options for route refinement of Option B2 were assessed qualitatively against the MCA framework. Considerations and constraints identified are shown in Figure 11-18 and Table 11-15 provides a summary of the qualitative assessment undertaken by technical specialists against the MCA framework. In determining the preferred option, the Project Team took into consideration the MCA assessment and the engagement undertaken with project partners, including Manawhenua and Auckland Council and landowners.

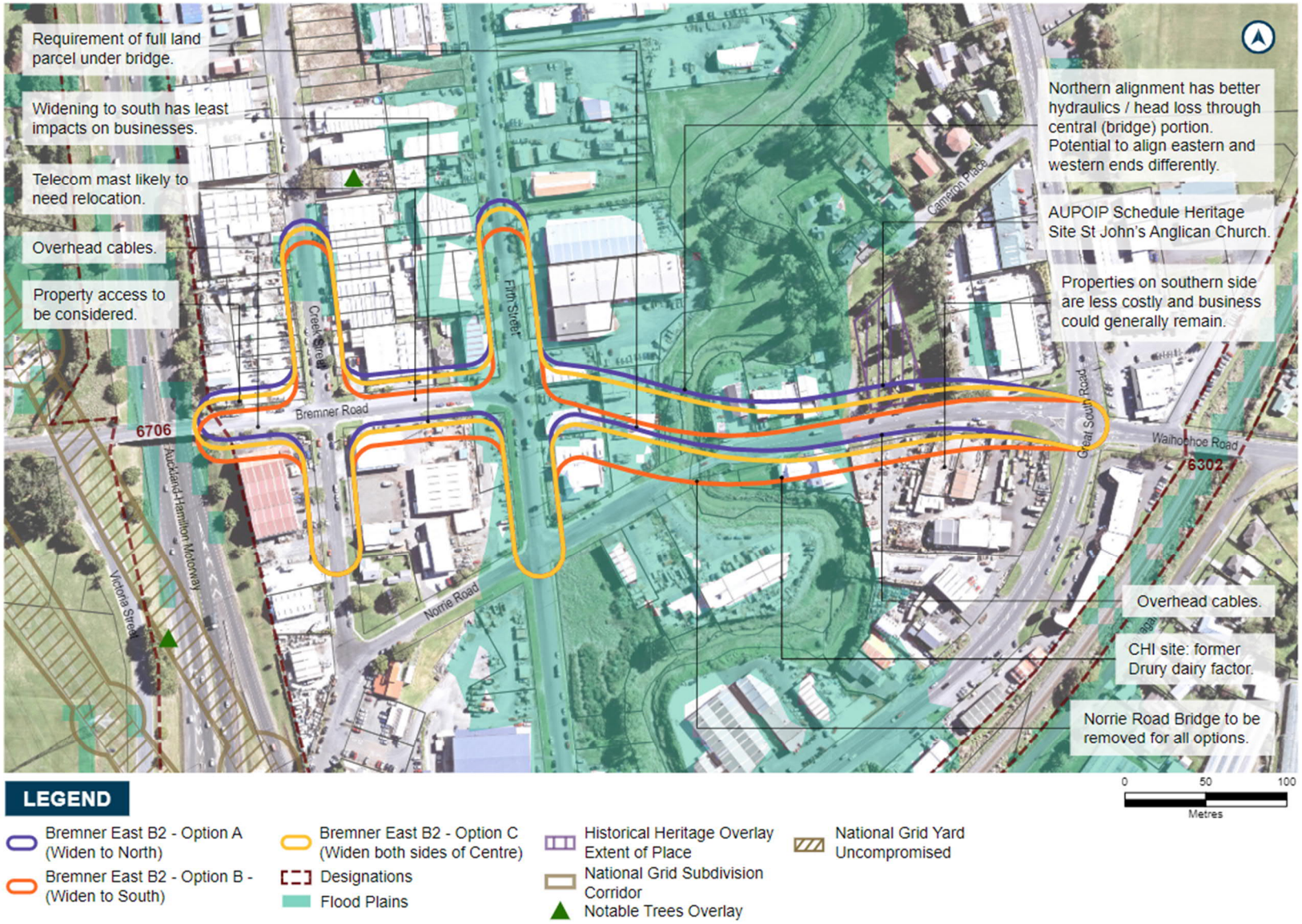


Figure 11-18 Bremner Road FTN Upgrade East Options for route refinement showing constraints and considerations

Table 11-15 Bremner Road FTN Upgrade East Stage 2 Options Assessment Findings Summary

Bremner Road FTN Upgrade East – Stage 2 Options Assessment Findings Summary	
Performance against transport outcomes *Note: All three options achieve the transport outcomes and there is no differentiation between the three options with regard to these objectives.*	
Support growth and a more sustainable, quality urban form in Drury by improving connectivity to/through the Drury Area. The overall Bremner Road corridor will provide a more direct east-west link for the wider Drury area to key destinations, including the light industrial zoning, Drury Central centre and train station. The form and function of this corridor will enhance connectivity for multiple modes, forming part of the primary cycle network and FTN unlocking safe and sustainable choices and improving connectivity to/through the Drury area to support current and future residents. These factors are integral to supporting sustainable, quality urban form, especially in contrast to the existing road, which will no longer be appropriate as the Drury area urbanises further. Option B2 has been chosen as the preferred option for multiple reasons, including scoring positively against transport outcomes. The option provides a direct, continuous, and more seamless east-west route to Great South Road for all road users. The opportunity to make Creek Street intersection a signalised T enhances this alignment with this outcome further, especially enhancing the function of the road for active mode users. Additionally, this option does not sever the access to the existing light industrial area. ***Achieve a transformational mode shift for trips to key destinations in Drury (incl. rail stations, centre and the strategic north-south PT network) by providing high quality, safe and attractive PT and active mode facilities on Bremner Road.*** The corrido form supports this outcome through the provision of multi-modal facilities and improved travel choices, connecting with the rest of Bremner Road to provide seamless east-west connectivity. This is particularly for the FTN through the Drury area and to Drury Central Rail Station, improving connectivity to the wider south network. Despite having two closely spaced intersections, there is an opportunity optimise the closing of Creek Street to form a T intersection, which includes benefits such as: • Reduction in conflicts for vehicles, pedestrians and cyclists - addressing safety • Provide priority for public transport and walking and cycling – addressing attractiveness • Allows for a continuous active mode link – addressing both safety and attractiveness • Reduces delays at the intersection of Bremner Road / Creek Street – beneficial for public transport	
Wellbeing assessment	
Historic Heritage	Option A would impact on a scheduled heritage item, St John's Church and Cemetery, at 9 Norrie Road, with potential significant adverse effects on graves and setting of church, and potentially on church itself, which is located within the buffer. Option B would impact on the unscheduled cheese factory at 12 Norrie Road, but St John's Church/Cemetery could be avoided. Relocation of the cheese factory within the property would not be possible, but relocation to another site could be considered subject to an assessment of built heritage value. Mitigation through detailed recording prior to removal should also be considered. Option C would have potential impacts on St John's Church Cemetery, at 9 Norrie Road, as well as impact on the unscheduled cheese factory at 12 Norrie Road. Mitigation of effects on cheese factory could be conserved as above. Option B was recommended to avoid adverse effects on the scheduled extent of place of St John's Church and Cemetery, with mitigation of effects on the former cheese factory at 12 Norrie Road determined following a built heritage assessment.

Social	Social Cohesion: The road widening and realignment of all options will disrupt, reduce viability or remove businesses from the area and alter accesses. St Johns Anglican church and cemetery would be a constraint for Option A encroaching into the northern side of Norrie Road as it is both a gathering place for the community and because of the cultural and social significance of the cemetery (historical significance assessed above). Improved services to local businesses will result from all options, although a smaller portion of businesses may experience issues with access and connectivity and experience impacts to business operations. All options would improve connectivity from west to east (vice versa) and improve industrial traffic entering and exiting Bremner Road, improving business efficiency. Urban Design: There are no significant differentiators between the options for the future urban design environment. All options provide moderate to high positive opportunities for high quality urban design solutions, examples include: • supporting a well-connected active interface between the public and private realm at the Bremner-Firth and Bremner-Creek junctions. • supporting the extension of the public realm connection down to the Hingaia Stream using the low and medium bridge. • supporting the opportunity for placemaking through the design of urban form around the Bremner-Firth and Bremner-Creek junctions. • generally supporting local and regional way-finding legibility All options provide low negative opportunities for high quality urban design solutions including the 6 lane wide Bremner Road offering limited opportunity to develop a desirable urban form between the junctions at Creek and Firth streets. Land Requirement: At the eastern end of Norrie Road Option B is recommended as the effects on the properties to the south are less costly and businesses can generally remain (if access is reinstated). Option B preserves the businesses and church and graveyard on the northern side of Norrie Road. Full acquisition of 23 Norrie Road is likely required for all options. Immediately west of the Hingaia Stream the alignment would need to remain to the south or move to Option A to have the least impacts on businesses. Between Firth and Creek streets Option B has the least impacts on businesses. A southern alignment better preserves access to 5 and 3/11 Bremner Road. West of Creek Street: Option C has the least impact on businesses on both sides. Some alternative access arrangements would be required. Health and Wellbeing: For all options there would be minimal change to current light industrial environment. Potentially contaminated land will need to be managed during construction. Flood resilience is critical for all options. Business Disruption: For all options the biggest impact for business within proximity of the construction will be during the construction phase. This could include temporary impacts on access to businesses (for staff, suppliers and customers), traffic delays (both during commutes to and from work and for suppliers/distributors or couriers related to the day to day operations), economic impacts (dependent on disruptions this could impact productivity and or patronage). Management strategies and consultation with businesses prior and during this phase will be important to mitigate potential effects. Overall, there are no significant differentiators with regard to social impact and all options need to take into account business operations and access.

Environmental	Landscape and Visual Amenity: There are no differentiating factors between the three options with regard to landscape and visual amenity effects. All options will have a similar visual amenity impact to adjacent industrial properties, and people travelling through the corridor. All options will still provide greening to help to soften the utilitarian nature of the area and improve visual amenity. Existing land use is industrial with a low amenity street environment. As such the existing environment has a low sensitivity to change as outlined in the Stage 1 assessment. Stormwater: Stormwater treatment will be required for all new impervious surfaces and given the lack of nearby unoccupied space, the corridor will need to allow for this or land for a centralised wetland is required. This could possibly be sited on residual land from a land parcel acquired on the western side of the bridge. Option A is preferred as it has better hydraulics/head loss through central (bridge) portion. There is potential to better align the eastern and western ends with the existing road network. It has more space on any land parcel to the south-west to site a wetland. Option B would have the worst hydraulics and similar space on residual land parcels to the north west to site a wetland. Option C has intermediate hydraulics/head loss. The existing Norrie Road bridge should be removed under all options. Ecology: There is no significant differentiators between the three options as ecological constraints, effects and opportunities are similar for each option. Potential effects include the loss of habitat for native fish and macroinvertebrates, by the shading of exotic vegetation which currently lines the stream. Option A would impact mature trees within the grounds of St John's Anglican Church. There are also potential indirect impacts on the downstream receiving environment (SEA) through the release of pollutants and sediment. Where the existing Norrie bridge is removed, stream banks should be stabilised and restored with native planting. There is a slight preference for Option B as it avoids the mature trees associated with St John's Anglican Church and its graveyard.
Economic	Utilities: Option A is recommended as it is likely to avoid relocation of the telecoms mast which would create an additional cost to relocate. The service provider may be open to this and may see this as an opportunity to upgrade. This goes for all utilities e.g. local power lines may be undergrounded. Construction: Option A is recommended when considering construction impacts. Option A and Option B have similar construction advantages for the section from Firth Street to SH1. However, Option B has several disadvantages for the Norrie Road section and the new bridge that would require Norrie Road to be closed during construction. The closure of Norrie Road during construction is not a significant issue as access to the area can be maintained via GSR/Firth Street. As such, either Option A or B could be considered similar in terms of construction, however Option B provides slight disadvantages. Option C has similar issues on Norrie Road, requires more complex staging for the Bremner Road section and complicates the SH1 over bridge construction.

Opportunities

The upgrade of Bremner Road East gives rise to a range of opportunities. These include:

- Depending on further investigation of built heritage values, for Options B and C, the CHI building impacted (cheese factory) could potentially be relocated.
- At the eastern end of Norrie Road, the alignment could be moved slightly further south to build a slip road to 13-15 Norrie Road maintaining access (retaining wall instead of batter).
- For all options, there is an opportunity for the Council to change the zoning of the business – industrial area to develop with the proposed high intensity residential and town centre adjacent to it (depending on flooding constraints)
- For all options, there is an opportunity for the creation of a recreation area by Hingaia Stream and opportunities for stream enhancement and restoration of indigenous habitat along the esplanade reserve.
- For all options, there is an opportunity to move the eastern and western ends of the alignment independently to better tie in to the existing roading network

- There is the potential to coordinate with utility providers in relation to their planned upgrades, dependent on timing.

Landowner Engagement

In December 2019 and January 2020, the Supporting Growth Programme sought feedback from landowners within the proposed Drury Arterial Network project area on the draft preferred option for the Bremner Road FTN Upgrade East corridor. Key themes raised by landowners with specific reference to the Bremner Road FTN Arterial Upgrade include concerns over established industrial businesses, loss of property reducing subdivision capacity, loss of property access and the protection of, and access to Saint John's Anglican Church as an historic heritage, archaeological, wahi tapu and Maori Church worshipping site. These key themes were considered in finalising the preferred option and contributed to design refinement to further minimise impacts where possible, particularly with regard to avoiding the Saint John's Anglican Church and minimising property requirements.

Preferred Option

From the assessment, it was recommended that the existing Bremner Road (east) and Norrie Road be widened to the south (Option B) for the following reasons:

- This option reduces property impacts overall (including access and potential for redevelopment)
- This option avoids impact on the scheduled heritage item (St John's Anglican Church and Cemetery) noting that the former cheese factory at 12 Norrie Road (an Auckland Council CHI building) will be impacted because of this, with mitigation of effects on the cheese factory to be determined following a built heritage assessment
- This option avoids the removal of mature trees associated with St John's Anglican Church and its graveyard.

Through the assessment, it was noted that there were no evident differentiators between the three options with regard to business disruption, urban design, landscape and visual amenity, health and wellbeing, and ecology. All route refinement options provided the same level of achievement against the Transport outcomes as outlined in Table 11-15.

Subsequent to the preferred option being identified, a revised national freshwater policy statement and new freshwater regulations came into effect (the National Policy Statement for Freshwater Management 2020 and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020), which gives greater protection to natural inland wetlands and streams. Given this new policy direction, the Project Team reconsidered the potential effects of the preferred options on identified natural inland wetlands and streams. Generally, the alignment and design refinement process for each proposed designation has sought to avoid or minimise impacts on high value natural wetlands and streams, unless there is a functional requirement for any such impacts or other high value environmental constraints. There will be further opportunities to minimise any impacts within the Project alignment during the detailed design of the Projects. As a result, no further design refinement is required at this stage.

Discounted Options

The following table summarises the reasons for discounting the remaining two options.

Table 11-16 Discounted Options - Bremner Road FTN Upgrade East Stage 2

Option	Reasoning
Option A	This option was discounted for the following reasons: • It would impact on a scheduled heritage item and gathering place for the community, St John's Anglican Church and Cemetery, at 9 Norrie Road, with potential significant adverse effects on graves and setting of church, and potentially on church itself and its users • It would impact mature trees within the grounds of St John's Anglican Church • This option has greater property impacts overall
Option C	This option was discounted for the following reasons: • This option has potential impacts on St John's Anglican Church Cemetery, at 9 Norrie Road, as well as impact on the unscheduled cheese factory at 12 Norrie Road • This option has greater property impacts overall • This option requires complex staging for the Bremner Road section and complicates the SH1 over bridge construction.

Intersection Form

Along the preferred Bremner Road FTN Upgrade East corridor, there are three intersections to be upgraded. A summary of the assessment (described in Section 7) undertaken for these intersections is shown in Table 11-17, outlining the recommended outcomes for each.

Table 11-17 Bremner Road FTN Upgrade East Intersection Form Assessment

Intersection		Form		Modal Priority			Justification/Constraints/Triggers	Preferred Intersection Form
Name	Arms	Lanes	Speed	PT	Active Mode	Freight		
Great South Road / Bremner / Waihoehoe Intersection included within the Waihoehoe Road West Corridor. See Section 12.3.5.								
Bremner Upgrade / Creek St Intersection	Bremner Upgrade ↔	4	50km/h	FTN	High	Med	Intersection density to Firth & Bremner Rd and SH1 too close for roundabout control. High-quality bus priority east-west.	Signalised Intersection
	Creek St ↓↑	2	Low	Low	Med	Med		

Intersection		Form		Modal Priority			Justification/Constraints/Triggers	Preferred Intersection Form
Name	Arms	Lanes	Speed	PT	Active Mode	Freight		
Bremner Upgrade / Firth St Intersection	Bremner Upgrade ←→	4	50km/h	FTN	High	Med	Intersection density to Firth & Creek Rd & SH1 too close for roundabout control high-quality bus priority east-west. Proximity to flood plain and bridges	Signalised Intersection
	Firth St ↓↑	2	Low	Low	Med	Med		

Bremner Road FTN Upgrade East Conclusion

The preferred option for Bremner Road FTN Upgrade East was determined through three stages and levels of options assessment:

- **Stage 1a:** Assessment of seven route refinement options
- **Stage 1b:** Further assessment of two route refinement options from Stage 1a
- **Stage 2:** From the preferred option from Stage 1b, three options were developed to assess which side of the existing roads to widen

In stage 1a seven options were assessed and scored against the MCA framework. Two options, Option B2 and Option D1, were identified to be taken forward for further assessment for the Bremner Road FTN Upgrade East.

In Stage 1b, additional analysis was undertaken to assist in making a recommendation between two preferred options as both benefits and disbenefits were recognised for each option. Costs, flooding effects, network resilience and transport outcomes were further analysed to identify a preferred option. Option B2 was recommended because it provides a direct and accessible corridor, it will have neutral (or potentially positive) flooding effects and it provides an opportunity to raise the road level to increase resilience. Additionally, the benefits of the additional resilience of Option D1 were small compared to the additional cost.

In Stage 2, three options to investigate which side of the existing roads to widen as part of Option B2 were developed and assessed against MCA criteria. The assessment recommended that the existing Bremner Road (east) and Norrie Road will be widened to the south (Option B) as it reduces property impacts, avoids impact on St John's Anglican Church and Cemetery and mature trees associated with its graveyard.

11.2.5 Bremner Road FTN Upgrade Summary

As outlined, through the assessment process and feedback from project partners (including Manawhenua and Auckland Council) and landowners, the preferred option for the Bremner Road FTN Upgrade East is Option B2-B and the preferred option for Bremner Road FTN Upgrade Central is Option B, both widening to the south of the existing roads to reduce impacts where possible.

Through the intersection form assessment it was recommended that signalised intersections be implemented at the Bremner Road intersections with the Jesmond to Bremner Link, Creek Street, Firth Street and Great South Road.

11.3 Waihoehoe Road West FTN Upgrade

11.3.1 Overview

11.3.1.1IBC / Corridor Assessment

TFUG did not recommend upgrading Waihoehoe Road, but instead recommended upgrading Fitzgerald Road with a connection to Mill Road south.

A number of arterials were investigated in Drury west at the IBC phase, and as part of that investigation, upgrading Waihoehoe Road was reconsidered. Ultimately, at the IBC phase, the Waihoehoe Road upgrades scored slightly higher through the MCA assessment than upgrading Fitzgerald Road. Upgrading Waihoehoe Road provides a greater people and public transport movement function than upgrading Fitzgerald Road, so this option was discounted.

The IBC also indicated upgrading Waihoehoe Road could have potential improvements to freight movements and provide a link between centres, the existing Drury township and proposed rail stations. Upgrading of Waihoehoe Road was generally supported in public consultation for the IBC. Upgrading Waihoehoe Road was considered to increase accessibility and connect strategically into Drury Village, providing a good catchment to proposed employment and residential catchments.

The figures below show the long list and short list options considered in the IBC.

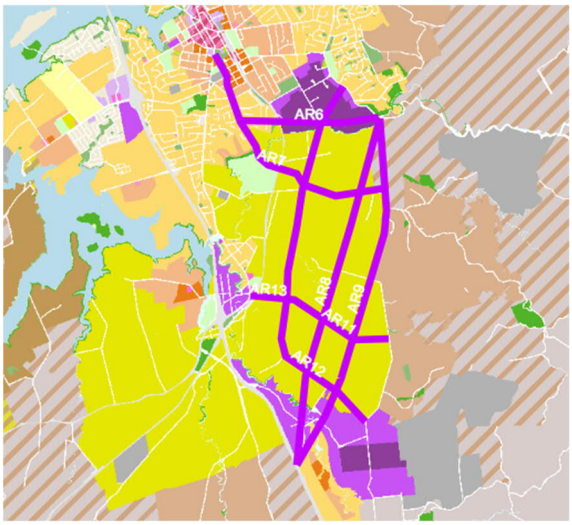


Figure 11-19: IBC Drury East Long List Options

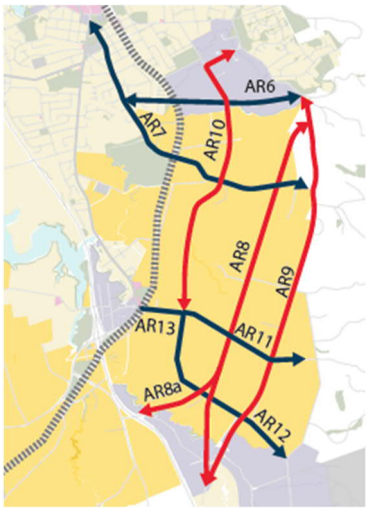


Figure 11-20: IBC Drury East Short List Options

11.3.1.2 Gap analysis

A gap analysis was undertaken for Waihoehoe Road as described in Section 5.2. The below provides a summary on the outcomes of this gap analysis for Waihoehoe Road.

Planning updates, developer aspirations, interdependencies with other projects for Waihoehoe Road include:

- The intended future land use along the corridor (as per AC's Drury-Ōpāheke Structure Plan) is largely medium to high density residential and large town centre in the west
- Although no new designations have been identified since the IBC phase, KiwiRail is the requiring authority for Designation 6302, NIMT Railway Line which bisects Waihoehoe Road in the west. First Gas Ltd. is the requiring authority for Designation 9104, Pukekohe to East Tamaki Gas Pipeline, which bisects Waihoehoe Road
- Developer aspirations at the time of the gap analysis included development at Drury south with Stevenson's business land, ongoing works at Drury South Crossing (mixed use precinct). Classic Homes have a live zoned residential area and intend to build 800 homes. Kiwi Properties also have aspirations to develop a town centre in the future near Waihoehoe Road (west). There is increasing interest by other developers in Drury east.

Through the gap analysis it was concluded that adequate alternatives had been assessed at the IBC phase. There was no additional information that warranted additional investigation of alternative corridor. Therefore, it was recommended that the corridor recommended at the IBC phase be taken forward for route refinement at the DBC to investigate which side of the road to widen.

The Waihoehoe Road Corridor was taken forward to the DBC as two separate projects as shown in Figure 11-21 and include:

- **Waihoehoe Road West FTN Upgrade**: From the intersection of Fitzgerald and Waihoehoe Roads in the east to Great South Road in the west. Route refinement is required.
- **Waihoehoe Road East Upgrade**: From Fitzgerald Road in the west to Drury Hills Road in the east. Route refinement is required.

This section provides the assessment of alternatives undertaken for the Waihoehoe Road West FTN Upgrade. The alternatives assessment for the Waihoehoe Road East Upgrade is provided in section 12.

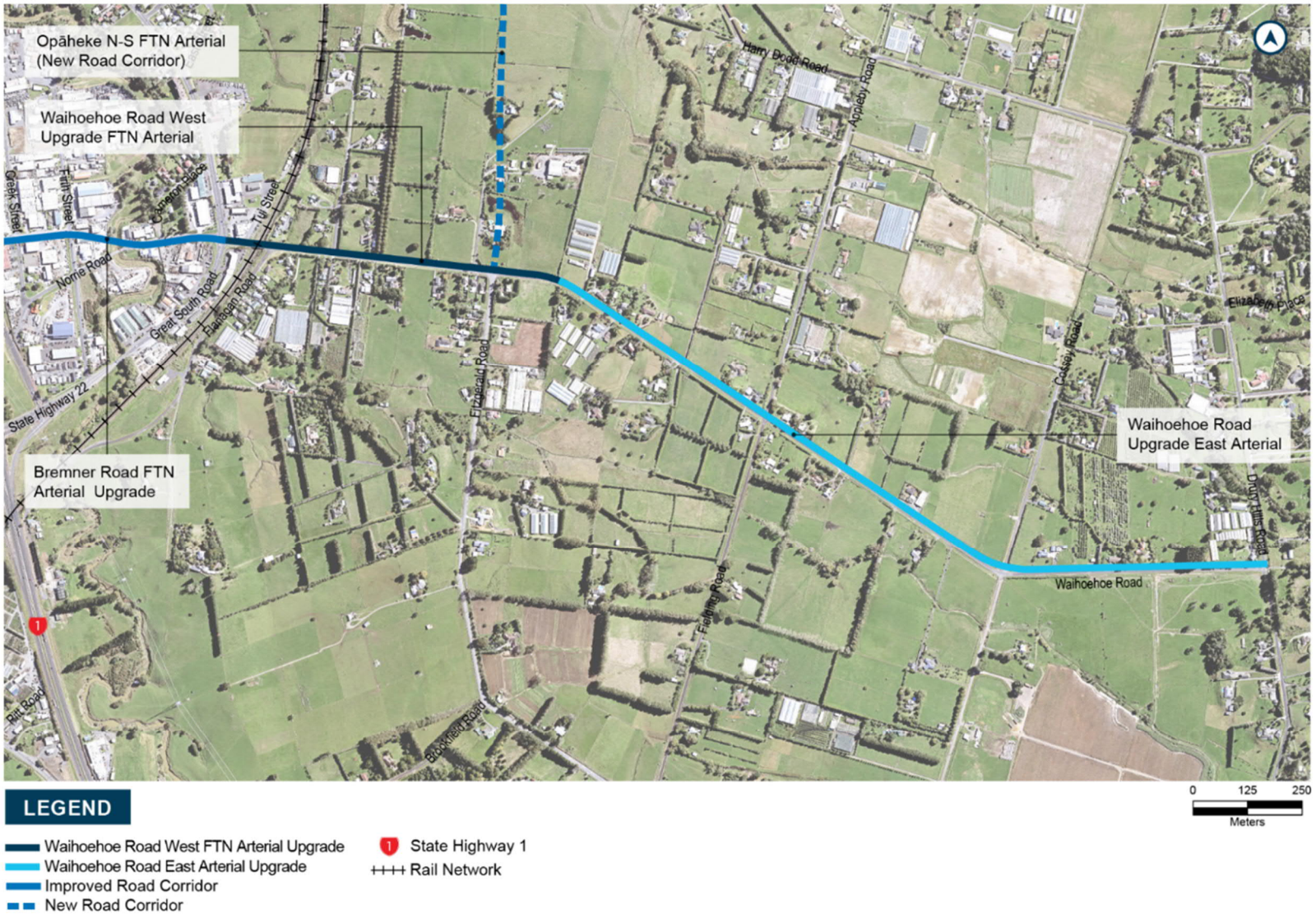


Figure 11-21 Waihoehoe Road Project Sections

11.3.1.3Form and Function Assessment

Following the methodology summarised in Section 5.3, a form and function assessment was undertaken for the Waihoehoe Road West FTN Upgrade. Table 11-18 provides a summary of the assumptions and outcomes of the assessment for the Waihoehoe Road West FTN Upgrade.

Table 11-18 Waihoehoe Road West FTN Upgrade Form and Function Assumptions and Summary

Waihoehoe Road West FTN Upgrade (West of N-S Arterial)		
Criteria	Summary	Comments
Place and Movement[5]	P2	Place value classified as P2 using the RASF typology. This typology is justified based on the expected town centre and higher housing density (according to structure plan), which may potentially activate the street/place environment for a higher justification. However, this is dependent on urban design and land use.
	M2	Movement value classified as M2 using the RASF typology. This typology is justified based on the function of the road creating an east-west link connecting two strategic north-south corridors. It provides links to the Drury Town Centre, surrounding residential areas and connections to local employment.
Land use	Low risk of change	Low risk of land use change but sequencing of urbanisation could change (be expedited).
Bus	Bus priority	21 buses per hour are expected. The Frequent Transit Network (FTN) is triggered by exceeding the minimum 15 min frequency threshold and also reinforced by the proximity to planned rail station, reliability of corridor and intersections, network connectivity, integration with wider PT network and spatial positioning for optimum integration with place/density/catchment.
Active Modes	Protected Cycle lanes & Footpath on both side	Segregated active mode lanes to be provided for, as it is assumed this route will be part of the primary cycle network. This corridor will be an important link for encouraging active modes to access to the train station and town centre.
Flows	25,000 4 Lanes	Flows justify 4 lanes, with Average Daily Traffic Flows approximated to be 25,000 trips per day (based on the DBC 2048+ SATURN model).
Speed	50km	Travels through FUZ planned for residential and existing residential areas
Freight	No priority	Not a strategic freight route. However, Drury Town Centre is identified as a future freight generating area.
Outcome	Based on the above, of the typical cross sections used for the Supporting Growth Programme, a 30m four lane FTN arterial was the preferred.	

[5] Based on the anticipated level of place and movement functions for the corridor



11.3.2 Route Refinement Option Development

The purpose of the Waihoehoe Road West FTN Upgrade is to provide a link between centres, the existing Drury township and proposed rail stations. There is also potential for improvements to freight movements. Route refinement for the Waihoehoe Road West FTN Upgrade included specialist assessment of three options:

- Option A – widening to the north of the existing road
- Option B – widening to the south of the existing road
- Option C – widening to both sides of the existing road

The three options for the Waihoehoe Road West FTN Upgrade are shown in Figure 11-22. Each option utilizes the 30m typical cross section consistent with other four lane Drury Arterial Network.

11.3.3 Route Refinement Assessment – Waihoehoe Road West FTN Arterial Upgrade

11.3.3.1 Assessment

The assessment undertaken for the Waihoehoe Road West FTN Upgrade follows the processes previously discussed in Section 6. The three options were qualitatively assessed against the MCA framework by each subject matter expert. Considerations made and constraints identified are shown in Figure 11-22 and Table 11-19 provides a summary of the qualitative assessment undertaken by technical specialists against the MCA framework. In determining the preferred option, the Project Team took into consideration the MCA assessment and the engagement undertaken with project partners including (Manawhenua and Auckland Council) and landowners.



Figure 11-22 Waihoehe Road West FTN Upgrade Options for route refinement showing constraints and considerations

Table 11-19 Waihoehoe Road West FTN Upgrade Options Assessment Findings Summary

Waihoehoe Road West FTN Upgrade – Options Assessment Findings Summary	
Performance against transport outcomes *Note: All three options achieve the transport outcomes and there is no differentiation between the three options with regard to these objectives.*	
Support growth and a more sustainable, quality urban form in Drury by improving connectivity to/through the Drury area The Waihoehoe Road upgrade will support the urbanisation of the Drury West area, resulting in improved connectivity and urban form outcomes. The upgrade will unlock safe and sustainable east-west mode choices. It will also improve connectivity to/through the Drury West area with walking, cycling and public transport (west of Drury West station only) provision added to the existing corridor. This will to support current and future residents in Drury growth areas. Waihoehoe Road also connects to future strategic N-S freight (Mill Rd), N-S FTN corridors (Great South Rd) and Drury Central station. ***Achieve a transformational mode shift for trips to key destinations in Drury (incl. rail stations, centres and the strategic north-south PT network) by providing high quality, safe and attractive PT and active mode facilities on Waihoehoe Road*** The upgrade will enable multi-modal access (additional walking, cycling and public transport (west only) provision), resulting in transformational mode shift for trips to key destinations in Drury (incl. Drury Central rail stations, centre and the strategic north-south PT network). Furthermore, Waihoehoe Road forms part of the future strategic public transport network on Waihoehoe East, connecting Drury Central station to wider east-west and north-south PT networks. This will and enable access to economic and social opportunities for current and future residents in Drury growth areas and wider trips using the station.	
Wellbeing assessment	
Heritage	No historic heritage constraints were identified for any of the options. Therefore, historic heritage is not a differentiator between the options.
Social	Future Land Use Integration: A town centre is proposed on either side (north and south) of Waihoehoe Road west. Widening to either side of the road will impact on land proposed for the future town centre., However, widening to the south will have greater impact on land proposed for high density development surrounding the Drury Central Rail Station. Therefore, widening to the north is preferred. Social: There are no key differentiating factors between the three options. All options intersect the future town centre and connect the THAB zone to the town centre, Drury village and rail station. All options will have general construction impacts on businesses in the existing Drury local centre. Urban design: There are no significant differentiators for the future urban design environment between the three options. This corridor would incur low negative impacts to the interfaces between public and private realm uses. Land requirement: Option A has the least property impacts as it is less likely to require full property acquisition. Full purchases would be required for Options B and C. Health and Wellbeing: There is no major impact on health and wellbeing identified for any options. The current and planned residential houses along corridor are to be considered with corridor widening.

Environmental	Landscape and Visual Amenity: No impacts on landscape and visual amenity were identified for any of the options as the future scenario in which the road would be created will be significantly different from the existing. There are no landscape features impacted. Larger roadside trees will be removed however it is assumed replacement trees will be provided. Stormwater: There are no significant constraints from flooding or overland flow paths along the route. All options would have similar levels of effects. Ecology: All options will have no direct impacts on habitats considered to have ecological value. Natural hazards: No significant geotechnical constraints or land instability were identified.
Economic	Utilities: Overhead power lines on the south side may have to be relocated for all options. Option A has slightly less impacts on utilities. Construction: Widening to one side as per Option A or B allows a section of the new bridge to be constructed and traffic switched before closing the old bridge and replacing. Widening to both sides would not be possible without closing Waihoehoe Road for bridge demolition works. Earthworks and bridge construction are similar between option A and B.
Opportunities	
• The upgrade of Waihoehoe Road West provides the opportunity to plant native vegetation along the corridor to improve foraging resource for native birds and to increase habitat connectivity in the wider landscape. There is also an opportunity to retain larger mature trees as an amenity feature.	

11.3.3.2 Partner, Internal and Landowner Engagement

Throughout the various option assessment workshops, the Project Team engaged with project partners including Manawhenua and Auckland Council, to discuss the options.

Feedback from Manawhenua was received at two hui, on 30 August and 3 October 2019. Manawhenua did not identify a preference of any option. At the second hui, Ngāti Tamaoho expressed their desire for the existing industrial sites that connect / go through the awa to be removed. Te Ākitai Waiohua expressed concerned about the potential social impact of a rail station being located on a large number of properties.

A workshop with Auckland Council representatives was held on 5 September 2019, and integration with proposed rail upgrades was discussed. No specific feedback was received on the options for the Waihoehoe Road West FTN Upgrade.

Internal engagement workshops were held with AT and Waka Kotahi on 12 September, 14 October and 17 December 2019. During these workshops, attendees discussed access to the rail station from Waihoehoe Road. There was also acknowledgement that widening to the north (Option A) might be preferred to avoid impacts on existing dwellings in the south east.

In December 2019 and January 2020, Supporting Growth sought feedback from landowners within the proposed Drury Package project area on the draft preferred option for the Waihoehoe Road West FTN Upgrade. Minimal specific feedback was received on the Waihoehoe Road West FTN Upgrade. However, feedback received on this section of the network supported the connectivity it would provide to the area. Concern was also raised about the removal of mature trees. These key themes were considered in finalising the preferred option and contributed to design refinement to further minimise impacts where possible, within the constraints of the corridor.

11.3.3.3Preferred Option

Following the MCA assessment and consideration of feedback received from project partners (including Manawhenua and Auckland Council), stakeholders and landowners, a preferred option for the Waihoehoe Road West FTN Upgrade was identified.

The preferred option (Option A) is to widen generally to the north of the existing road corridor. The preferred option was chosen because:

- This option reduces property impacts – it has the least impact on property access, and requires the least full property acquisitions.
- This option has less impact on land proposed for high density development surrounding the proposed Drury Central Rail Station
- This option allows for more flexibility for the rail network (potential station site and four tracking) by providing more room for station connections and curvature of tracks under Waihoehoe Bridge.
- This option means the Waihoehoe Bridge can remain open during construction reducing traffic impacts and construction programme
- This option has slightly less impact on existing utilities.

Through the assessment, it was noted that there were no evident differentiators between the three options with regard to archaeology and built heritage, social, urban design, landscape and visual amenity, health and wellbeing, stormwater and flooding, ecology and natural hazards.

All route refinement options provided the same level of achievement against the Transport outcomes as outlined in Table 11-19.

During design refinement, specific consideration was made to ensuring access to Tui Street.

Subsequent to the preferred option being identified, a revised national freshwater policy statement and new freshwater regulations came into effect (the National Policy Statement for Freshwater Management 2020 and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020), which gives greater protection to natural inland wetlands and streams. Given this new policy direction, the Project Team reconsidered the potential effects of the preferred options on identified natural inland wetlands and streams. Generally, the alignment and design refinement process for each proposed designation has sought to avoid or minimise impacts on high value natural wetlands and streams, unless there is a functional requirement for any such impacts or other high value environmental constraints. There will be further opportunities to minimise any impacts within the Project alignment during the detailed design of the Projects. As a result, no further design refinement is required at this stage.

1.1.1.1 Discounted Options

The following table summarises the reasons for discounting the remaining two options.

Table 11-20 Discounted Options - Waihoehoe Road West FTN Upgrade

Option	Reasoning
Option B	This option was discounted for the following reasons: • Greater property impacts i.e. property access, full acquisition • Slightly more impact on utilities

Option	Reasoning
	• Technical implications for future rail electrification, four tracking (due to curvature of rail track under the bridge) and future rail station • Greater impact on land proposed for high density development surrounding the proposed Drury Central rail station
Option C	This option was discounted for the following reasons: • Greater property impacts i.e. full acquisitions • Slightly more impact on utilities • Temporary traffic management during construction more complex. Widening to both sides would not be possible without closing Waihoehoe Road for bridge demolition works.

11.3.3.4 Intersection Form

Along the preferred Waihoehoe Road West FTN Upgrade corridor, there are two intersections to be upgraded. A summary of the assessment (described in Section 7) undertaken for these intersections is shown in Table 11-21, outlining the recommended outcomes for each.

Table 11-21 Waihoehoe Road West FTN Upgrade Intersection Form Assessment

Intersection		Form		Modal Priority			Justification/Constraints/ Triggers	Preferred Intersection Form
Name	Arms	Lanes	Speed	PT	Active Mode	Freight		
Great South Road / Bremner / Waihoehoe Intersection	Norrie Rd →	4	50km/h	FTN	High	Med	• FUZ land-use (Town centre, light industry and residential) and proximity to train station increases active mode modal priority • Proximity to railway bridge (+future 4 tracking) • High-quality bus priority North-South and East-West. • Proximity to Drury Central Station and connection with SH22 will make this intersection a high conflict zone between all modes (walking and cycling needs more protection). • Grade-separation of active modes considered but not considered suitable here due to town centre and high urban density	Signalised Intersection
	SH22 ↓↑	4	50km/h	Med	High	High		
	Waihoehoe Road ←	4	50km/h	FTN	High	Med		

Intersection		Form		Modal Priority			Justification/Constraints/ Triggers	Preferred Intersection Form
Name	Arms	Lanes	Speed	PT	Active Mode	Freight		
							• Potential ped signals just south for rail access hence operationally preferred to coordinate signals	
Ōpāheke N-S FTN Arterial / Waihoehoe Intersection	Ōpāheke N-S FTN Arterial ↓↑	4	50km/h	FTN	High	Med	• Proximity to Drury Central Station with high-quality bus priority east-west (interim) and north-east-west (long term).	Roundabout
	Waihoehoe Road (West)	4	50km/h	FTN	High	Med		
	Waihoehoe Road (East)	2	50km/h	Med	Med	Low		

1.1.2 Waihoehoe Road West FTN Upgrade Summary

As outlined, through the assessment process and feedback from project partners including Manawhenua and Auckland Council the preferred options were identified. The preferred option of the Waihoehoe Road West FTN Upgrade is to widen generally to the north (Option A). Through the intersection form assessment it was recommended that a signalised intersection be implemented at the Waihoehoe Road intersection with Great South Road.

12 NoR D3: Waihoehoe Road East Upgrade

12.1 Overview

12.1.1 IBC / Corridor Assessment

During the IBC Waihoehoe Road was assessed as one corridor including both the Waihoehoe Road West FTN Upgrade (NoR D2) and the Waihoehoe Road East Upgrade (NoR D3). A summary of this assessment was provided in section 11.3.1.1 and is not repeated here.

12.1.2 Gap analysis

During the IBC Waihoehoe Road was assessed as one corridor including both the Waihoehoe Road West FTN Upgrade and the Waihoehoe Road East Upgrade. A summary of the IBC to DBC gap analysis is provided in section 11.3.1.2 and is not repeated here. As previously identified, the Waihoehoe Road Corridor was taken forward to the DBC as two separate projects. The sections below provide the assessment of alternatives undertaken for the Waihoehoe Road East Upgrade.

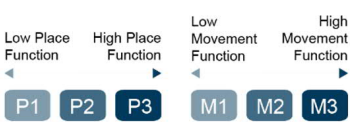
12.1.3 Form and Function Assessment

Following the methodology summarised in Section 5.3, a form and function assessment was undertaken for the Waihoehoe Road East Upgrade. Table 11-18 provides a summary of the assumptions and outcomes of the assessment.

Table 12-1 Waihoehoe Road East Upgrade Form and Function Assumptions and Summary

Waihoehoe Road East Upgrade (East of N-S Arterial)		
Criteria	Summary	Comments
Place and Movement[6]	P2	Place value classified as P2 using the RASF typology. This typology is justified based on future planned for high/medium density residential both sides in the western section transitioning to low/medium density residential both sides towards the eastern section. There is a low risk of land use change.
	M2	Movement value classified as M2 using the RASF typology. This typology is justified based on the function of the road creating an east-west link connecting two strategic north-south corridors, providing future access to residential areas and Drury Central Station.
Land use	Low risk of change	Low risk of land use change but sequencing of urbanisation could change (be expedited).

[6] Based on the anticipated level of place and movement functions for the corridor



Criteria	Summary	Comments
Bus	No bus	No bus routes are currently proposed to use Waihoehoe Road East in the long term, however, services may use it in the medium term until the final road network is developed and final bus routes can be implemented. Services may also use the road in the long term during diversions.
Active Modes	Protected Cycle lanes & Footpath on both side	Segregated paths planned for active mode. They are identified to form part of the secondary cycle network.
Flows	10,000 2 Lanes	Flows justify 2 lanes, with Average Daily Traffic Flows approximated to be 10,000 trips per day (based on the DBC 2048+ SATURN model).
Speed	50km	Travels through FUZ planned for residential and existing residential areas
Freight	No priority	Less than 15% of the trips predicted to use this route in 2048 are freight (HCVs), therefore priority facilities such as freight lanes are not recommended
Outcome	Based on the above, of the typical cross sections used for the Supporting Growth Programme, a 24m two lane arterial was the preferred.	

12.2 Route Refinement Option Development

The Waihoehoe Road East Upgrade aims to provide a link between centres, the existing Drury township and proposed rail stations. Route refinement for the Waihoehoe Road East Upgrade included specialist assessment of three options described below. Each option utilizes the 24m typical cross section consistent with other two lane arterial upgrades:

- Option A – widening to the north of the existing road
- Option B – widening to the south of the existing road
- Option C – widening to both sides of the existing road

The three options for the Waihoehoe Road East Upgrade are shown in Figure 12-1.

12.3 Route Refinement Assessment

12.3.1 Assessment

The assessment undertaken for the Waihoehoe Road East Upgrade follows the processes previously discussed in Section 6. The three options were assessed qualitatively against the MCA framework by each subject matter expert. Considerations made and constraints identified are shown in Figure 12-1 and Table 12-2 provides a summary of the qualitative assessment undertaken by technical specialists against the MCA framework. In determining the preferred option, the Project Team took into consideration the MCA assessment and the engagement undertaken with project partners (including Manawhenua and Auckland Council), stakeholders and landowners.

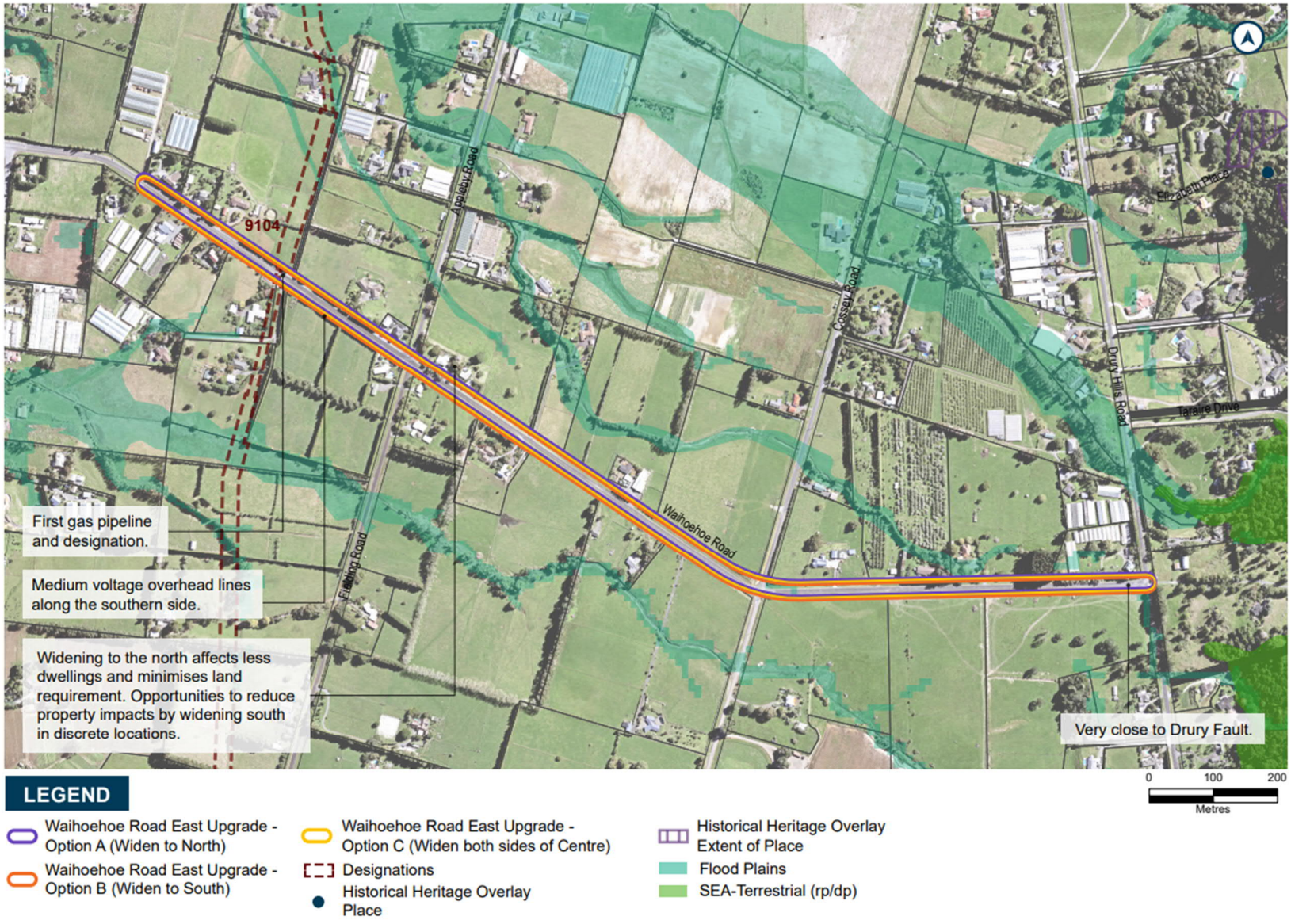


Figure 12-1 Waihoehoe Road East Upgrade Options for route refinement showing constraints and considerations

Table 12-2 Waihoehe Road East Upgrade Options Assessment Findings Summary

Waihoehe Road East Upgrade	
Performance against transport outcomes *Note: All three options achieve the transport outcomes and there is no differentiation between the three options with regard to these objectives.*	
Support growth and a more sustainable, quality urban form in Drury by improving connectivity to/through the Drury area The Waihoehe Road upgrade will support the urbanisation of the Drury West area, resulting in improved connectivity and urban form outcomes. The upgrade will unlock safe and sustainable east-west mode choices. It will improve connectivity to/through the Drury West area with walking, cycling and public transport (west of Drury West station only) provision added to the existing corridor to support current and future residents in Drury growth areas. Waihoehe Road also connects to future strategic N-S freight (Mill Rd), N-S FTN corridors (Great South Rd) and Drury Central station. ***Achieve a transformational mode shift for trips to key destinations in Drury (incl. rail stations, centres and the strategic north-south PT network) by providing high quality, safe and attractive PT and active mode facilities on Waihoehe Road*** The upgrade will enable multi-modal access (additional walking, cycling and public transport (west only) provision), resulting in transformational mode shift for trips to key destinations in Drury (incl. Drury Central rail stations, centre and the strategic north-south PT network). Furthermore, Waihoehe Road forms part of the future strategic public transport network on Waihoehe East, connecting Drury Central station to wider east-west and north-south PT networks and enable access to economic and social opportunities for current and future residents in Drury growth areas and wider trips using the station.	
Wellbeing assessment	
Heritage	No differentiation between each option with regard to historic heritage.
Social	Future Land Use Integration: There are no differentiating factors between the three options. Social: From a social impact perspective there is not a clear difference in impacts between options, due to the location of this project in the FUZ. All options will provide better multimodal connection to Drury Village and for all options there will be temporary disruption to access to services, amenities and possible employment within Drury Village and Papakura during construction. Urban design: No differentiation between each option with regard to urban design. Land requirement: Option A is the preferred option where the alignment adjoins the larger parcels used for farming or grazing or where the improvements are set well back from the road. But at other locations, Option B is preferred to avoid improvements on the northern side, or where the contour rises from the road. At some 'pinch points' a combination of Options A and C are preferred. There is not likely to be any full land title purchases, but some improvements and businesses (lessees) may be impacted. Health and Wellbeing: There is no major impact on health and wellbeing identified for any options. The current and planned residential houses along corridor are to be considered with corridor widening at the time of plan changes / subdivisions in the area.
Environmental	Landscape and Visual Amenity: No differentiating factors between the options. No significant constraints or factors that would influence the alignment. Stormwater: No differentiating factors between the options with regard to stormwater.

	Ecology: No differentiators between the three options. All options do not impact on any streams or areas of significant or indigenous habitat. There is potential loss of exotic vegetation, of limited value for common native birds and lizards across all options. Natural hazards: No differentiating factors between the options with regard to natural hazards.
Economic	Utilities: Works on most existing utilities will be required with all three options. Option A has reduced impacts on a First Gas valve site at 211 Waihoehoe Road. Construction: All three options are similar in terms of construction complexity. Widening to the north (Option A) or south (Option B) has a slight advantage enabling existing traffic to be maintained while enabling a wider working area to construct the new area of road. However, widening both sides (Option C) decreases the scale of property access modification work required.
Opportunities	
• The upgrade of Waihoehoe Road East presents, through all options, the opportunity to plant native vegetation along the corridor to improve foraging resource for native birds and lizards and to increase habitat connectivity in the wider landscape. It also presents the opportunity to retain larger, mature trees as an amenity feature along the alignment. Potential also exists to coordinate with utility providers in relation to their planned upgrades (dependent of timing).	

12.3.2 Partner, Internal and Community Engagement

Throughout the various option assessment workshops, the Project Team engaged with project partners including Manawhenua and Auckland Council, to discuss the options.

The three options and the emerging preferred option were shared with Manawhenua at hui on 20 February 2020. No specific concerns or comments were raised by Manawhenua.

An internal engagement workshop was held with AT and Waka Kotahi representative on 19 February 2020 to present the emerging preferred option and seek feedback. No concerns or feedback were given during the workshop for the Waihoehoe Road East Upgrade.

A workshop was held with representatives from Auckland Council on 22 January 2020 to present the options and identify the emerging preferred option. Council concurred widening generally to the north is most suitable for this alignment.

In May 2020 community engagement was launched and an opportunity to provide feedback on the preferred options for the Waihoehoe Road East Upgrade, Ponga Road Arterial and Ōpāheke Road Arterial was provided. Feedback was sought from the public through Social Pinpoint using interactive tools such as surveys and interactive mapping. Specific feedback on the preferred option for Waihoehoe Road East was not given however feedback from respondents on Social Pinpoint was generally neutral, and there was general support for roundabouts over signalised intersections.

12.3.3 Preferred Option

Following the MCA assessment and consideration of feedback received from project partners including Manawhenua and Auckland Council, a preferred option for the Waihoehoe Road East Upgrade was identified.

The preferred option (a combination of Option A and Option B) is, west of Cossey Road, to widen generally to the north of the existing road corridor and east of Cossey Road, to widen generally to the south of the existing road corridor. The preferred option was chosen because:

- This combination of options has less property impacts overall as less dwellings are impacted due to the alignment adjoining larger parcels used for farming and/or existing dwellings are sufficiently set back from the road and proposed works.
- This option has reduced impacts on a First Gas valve site at 211 Waihoehoe Road.

Through the assessment, it was noted that there were no evident differentiators between the three options with regard to archaeology and built heritage, social, urban design, landscape and visual amenity, health and wellbeing, stormwater and flooding, ecology, natural hazards and utilities.

Although, not a deciding factor, widening to the north at the western end of the alignment does have additional benefits of consistency in which side of the road is widened with the preferred option for the Waihoehoe Road West FTN Upgrade.

All route refinement options provided the same level of achievement against the transport outcomes as outlined in Table 12-2.

Subsequent to the preferred option being identified, a revised national freshwater policy statement and new freshwater regulations came into effect (the National Policy Statement for Freshwater Management 2020 and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020), which gives greater protection to natural inland wetlands and streams. Given this new policy direction, the Project Team reconsidered the potential effects of the preferred options on identified natural inland wetlands and streams. Generally, the alignment and design refinement process for each proposed designation has sought to avoid or minimise impacts on high value natural wetlands and streams, unless there is a functional requirement for any such impacts or other high value environmental constraints. There will be further opportunities to minimise any impacts within the Project alignment during the detailed design of the Projects. As a result, no further design refinement is required at this stage.

12.3.4 Discounted Options

The following table summarises the reasons for discounting Option C.

Table 12-3 Discounted Option - Waihoehoe Road East Upgrade

Option	Reasoning
Option C	This option was discounted for the following reasons: • Temporary traffic management during construction more complex. • Impacts on a First Gas valve site at 211 Waihoehoe Road.

12.3.5 Intersection Form

Along this corridor, there are four intersections to be upgraded. A summary of the assessment (described in Section 7) undertaken for these intersections is shown in Table 12-4, outlining the recommended outcomes for each.

Table 12-4 Waihoehoe Road East Upgrade Intersection Form Assessment

Intersection		Form		Modal Priority			Justification/Constraints/Triggers	Preferred Intersection Form
Name	Arms	Lanes	Speed	PT	Active Mode	Freight		
Ōpāheke N-S FTN Arterial / Waihoehoe Intersection included within the Waihoehoe Road West Corridor. See Section **0**.								
Waihoehoe East / Appleby Road Intersection	Waihoehoe Road East ←→	2	50 km/h	Low	Med	Med	Roundabout works better for single lane approaches as an overall design	Roundabout
	Appleby Rd ↓↑	2	Low		Low	Low		
Waihoehoe East / Cossey Rd Intersection	Waihoehoe East ←→	2	50 km/h	Low	Med	Med	Roundabout works better for single lane approaches as an overall design	Roundabout
	Cossey Road ↓↑	2	50 km/h		Low	Low		

12.4 Waihoehoe Road East Upgrade Summary

As outlined, through the assessment process and feedback from project partners including Manawhenua and Auckland Council a preferred option was identified. The preferred option for Waihoehoe Road East Upgrade is, west of Cossey Road, to widen generally to the north of the existing road corridor and east of Cossey Road, to widen generally to the south of the existing road corridor (a combination of Option A and Option B).

Through the intersection form assessment it was recommended that roundabouts be implemented at the Waihoehoe Road intersections with Ōpāheke N-S, Appleby Road and Cossey Road.

13 NoR D4: Ōpāheke North-South FTN Arterial

13.1 Overview

13.1.1 IBC / Corridor Assessment

TFUG recommended a new north south connection and FTN along a similar alignment to the IBC recommendation (AR10 as shown in Figure 13-2). The proposed Mill Road corridor was further to the west.

The IBC investigated multiple arterials in Drury. Two other north-south arterials were investigated at the long list and short list and were discounted at the short list. These were located on the eastern side closer to the proposed Mill Road corridor and generally looked to upgrade existing roads. Alignments to the east were discounted at the IBC phase due to their proximity to Mill Road, and the desire to avoid both severance effects and rat running. The extent of floodplain required to be crossed and the consequent reduction in developable land served is further reason not to move the corridor significantly to the east of the corridor recommended at the IBC.

The corridor recommended at the IBC phase spans a large section of floodplain and multiple bridges were proposed. Although a range of potential ecological impacts were noted because of stream crossings, which will require bridges, the IBC recommended option was preferred due to the increase in north south connectivity it would provide for general traffic and for its PT function as part of the FTN. The connection would provide good people and public transport movement function through the FUZ. The recommended option did not impact upon any recorded heritage sites.

The figures below show the long list and short list options considered in the IBC.

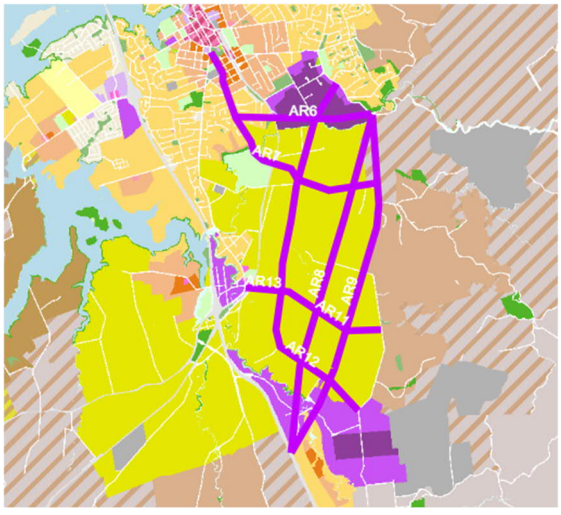


Figure 13-1: IBC Drury East Long List Options

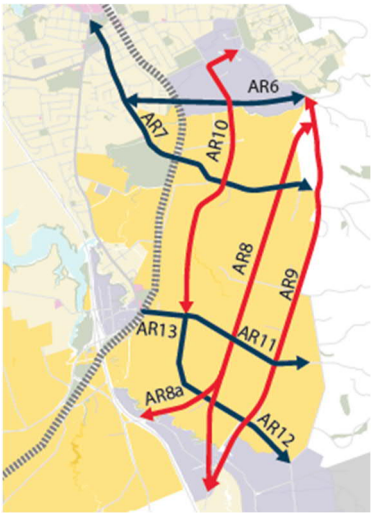


Figure 13-2: IBC Drury East Short List Options

13.1.2 Gap analysis

A gap analysis was undertaken for the Ōpāheke N-S FTN Arterial as described in Section 5.2. The below provides a summary on the outcomes of this gap analysis.

Planning updates, developer aspirations and interdependencies with other projects include:

- The intended future land use along the corridor (as per AC's Drury-Ōpāheke Structure Plan) is largely medium to high density residential and industrial land use in the north
- Although no new designations have been identified since the IBC phase, First Gas Ltd. is the requiring authority for Designation 9104, Pukekohe to East Tamaki Gas Pipeline, which bisects Waihoehoe Road
- A new Ōpāheke North-South arterial would need to be aligned with the proposed Mill Road corridor providing a north south connection with a local focus (rather than strategic) and focus on FTN as well.

Through the gap analysis, it was investigated whether the DBC should re-examine the corridor of the Ōpāheke N-S FTN Arterial between SH1 in the east and the proposed Mill Road corridor in the west. It also examined whether an Ōpāheke N-S FTN Arterial should retain the intersections with Hunua Road in the north and Fitzgerald Road in the south.

The Ōtūwairoa Stream floodplain is the major constraint to development in the Drury-Ōpāheke area and is not included as developable area in the Drury-Ōpāheke Structure Plan. The consequence of this is that a road alignment which crosses the floodplain at the narrowest point will serve the largest potential catchment (new developable area). Maximising developable area around the corridor has clear benefits in terms of maximising public transport accessibility provided by the FTN.

The NIMT rail line is located approximately 600m to the west of the corridor recommended by the IBC. Movement of the corridor further to the west would introduce a similar problem of land severance and limitation of developable area associated with locating too closely to Mill Road in the east of the development area. Additionally, movement of the corridor west is further constrained by the location of a Counties Power transmission lines, which will further constrain the developable area. Accordingly, it was recommended not to move the corridor further west.

The Ōpāheke N-S FTN Arterial corridor recommended by the IBC connects to Hunua Road/Boundary Road in the north. This connection provides optimum connectivity to future public transport networks (future FTN through Papakura and Takanini). It also provides a critical freight connection (via Hunua Rd to future Mill Rd) for planned future light and heavy industry and is expected to have a key local freight role accessing Papakura industrial area in the northern section. Additionally, it provides optimum north-south connectivity between Ōpāheke to Papakura for walking, cycling and private motor vehicles.

The Ōpāheke N-S FTN Arterial corridor recommended by the IBC connects to Fitzgerald / Waihoehoe Roads in the south. The intended land use indicated in the AC Drury-Ōpāheke Structure Plan shows that Fitzgerald Road has a mix of high density residential, industrial and town centre land uses. Fitzgerald Road extends further south to connect with the industrial area through FUZ area. Therefore, it was recommended at the IBC to connect the proposed Ōpāheke N-S FTN Arterial with Fitzgerald Road to improve north south connectivity through the FUZ area, but also to relieve some of the demand from Mill Road.

Although the exact location of Drury Central rail station is still being investigated, the proposed station is likely to be located within 700 meters from the Ōpāheke N-S FTN Arterial which is ideal for public transport and active mode users. However, the uncertainty of the rail station rules out the option of connecting the Ōpāheke N-S FTN Arterial to Flanagan Road which runs along the rail line. Flanagan Road does not connect to any existing or proposed transport network and will not improve transport connectivity of the area. Therefore, through this analysis, the connection with Fitzgerald Road was recommended as a better choice due to recommended arterial spacing and the wider connectivity benefits.

The recommendation through the gap analysis was to take the general alignment of the IBC recommended corridor with northern connection at Hunua/Boundary Roads and southern connection at Fitzgerald/Waihoehoe Roads for further route refinement through the DBC.

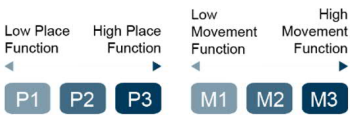
13.1.3 Form and Function Assessment

Following the methodology summarised in Section 5.3, a form and function assessment was undertaken for the Ōpāheke N-S FTN Arterial. Table 13-1 provides a summary of the assumptions and outcomes of the assessment.

Table 13-1 Ōpāheke N-S FTN Arterial Form and Function Assumptions and Summary

Ōpāheke N-S FTN Arterial (Hunua Road to Waihoehoe Road)		
Criteria	Summary	Comments
Place and Movement[7]	P1	Place value classified as P1 using the RASF typology. This typology is justified based on the majority of the route passing through low/medium density residential, industrial areas at the northern end and some medium/high density residential areas in the southern section.
	M2	Movement value classified as M2 using the RASF typology. This typology is justified based on the intended function: a north-south corridor to supplement Mill Road and Great South Road, providing connections to the Papakura Industrial area and planned Drury Town Centre. It also forms part of the FTN.
Land use	Low risk of change	Surrounding land use is zoned as FUZ however a large proportion of this land is within a flood plain. The structure plan developed by council is unlikely to change dramatically.
Bus	Yes	2 priority (one direction each) vehicle lanes for PT services and/or transit lanes. Route 37 runs on this corridor with 7 minutes frequency in peak hours. The Frequent Transit Network (FTN) is triggered by exceeding the minimum 15 min frequency threshold and also reinforced by the reliability of corridor and intersections, north-south network connectivity, integration with wider PT network and spatial positioning for optimum integration with place/density/catchment.
Active Modes	Protected Cycle lanes & Footpath on both sides	Segregated paths planned for active mode. It is identified to form part of the primary cycle network.

[7] Based on the anticipated level of place and movement functions for the corridor



Ōpāheke N-S FTN Arterial (Hunua Road to Waihoehoe Road)		
Flows	14,000 4 Lanes	Although flows are not predicted to reach 15,000 trips per day, where 4 lanes should be considered, the FTN function of the corridor indicates the need for bus priority lanes in order to avoid being materially affected by general traffic. Therefore, flows and PT expectations justify four lanes (including two bus lanes), with Average Daily Traffic Flows approximated to be 14,000 trips per day (based on the DBC 2048+ SATURN model).
Speed	50km	50kmh along this section as it travels through urbanised areas.
Freight	No priority	The Ōpāheke N-S FTN Arterial is not classified as strategic freight route but provide a localised freight function for freight movement between Drury, Ōpāheke, Papakura and wider connectivity to Mill Road.
Outcome	Based on the above, of the typical cross sections used for the Supporting Growth Programme, a 30m four lane FTN arterial was the preferred.	

13.2 Route Refinement Option Development

The Ōpāheke North-South FTN Arterial aims to increase connectivity and provide good people and public transport movement function through the future urban zone supporting SH1, Great South Road and the Mill Road Corridor. Route refinement for the Ōpāheke North-South FTN Arterial included specialist assessment of three options described below:

- Option A - central alignment
- Option B – western alignment
- Option C – eastern alignment.

The three options for the Ōpāheke North-South FTN Arterial section are shown in Figure 4-4.

13.3 Route Refinement Assessment

13.3.1 Assessment

The assessment undertaken for Ōpāheke N-S FTN Arterial follows the processes previously discussed in Section 6. The MCA framework was used to score these options, as it was thought that the scoring would help in differentiating the options, being a new greenfields alignment and with some of the options going outside of the corridor recommended at the IBC phase.

The three options were assessed and scored against the MCA framework by each subject matter expert and reasons for the score recorded. Considerations and constraints identified are shown in Figure 4-4. In summary, Table 13-2 demonstrates a heatmap and scores of each option considered and Table 13-3 provides a summary of the qualitative assessment undertaken by technical specialists against the MCA framework to support the scoring. The shades of green represent what was identified in the MCA as a score above ‘0’ and is associated with a positive impact (lower score) with dark green representing a greater positive, whereas shades of orange represent what was identified in the MCA as a score below ‘0’ and is associated with a negative impact (higher score). with darker orange representing a greater negative.

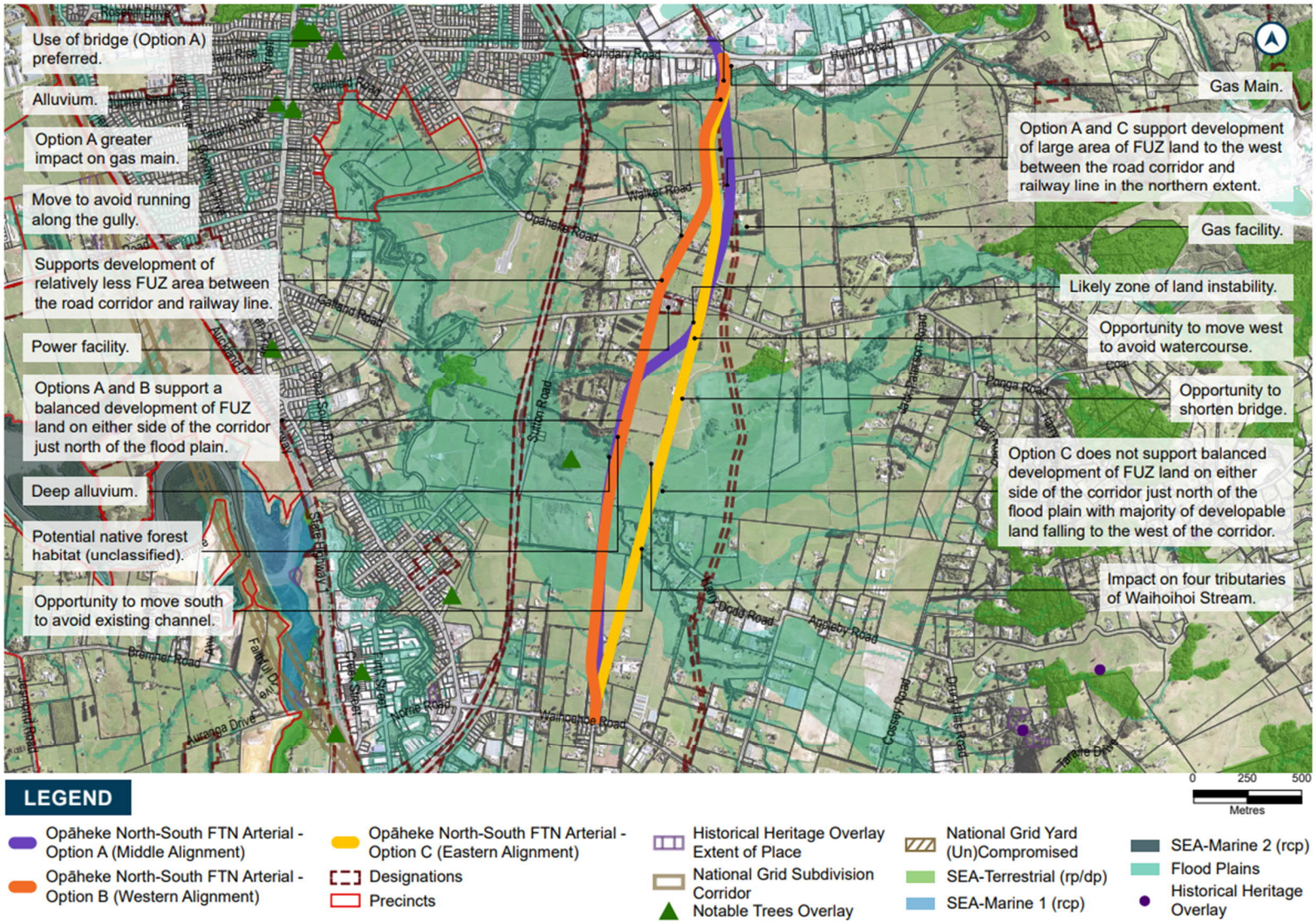


Figure 13-3 Ōpāheke N-S FTN Arterial Options for route refinement showing constraints and considerations

Table 13-2 Ōpāheke N-S FTN Arterial MCA Scoring

MCA Criteria		Option A	Option B	Option C
I.O.1	Connectivity to centres / Directness	3	3	3
	Cohesive, legible, efficient hierarchy integrates with Strategic, Collector, networks	4	4	4
I.O.2	PT Safety	3	3	3
	PT Attractiveness	3	3	3
	Active mode safety	3	3	3
	Active mode attractiveness	3	3	3
	Resilience: Provide alternative modes	3	3	3
	Resilience: Provide alternative Routes	3	4	4
1a. Heritage		-1	-1	-1
2a. Land use futures / integration with planned land use		3	3	3
2b. Urban design		2	1	-1
2c. Land requirement		-2	-1	-2
2d. Social cohesion		1	1	1
2e. Human Health and Wellbeing		0	0	0
3a. Landscape / visual		-2	-2	-2
3b. Stormwater		-1	-2	-2
3c. Ecology		-2	-2	-2
3d. Natural Hazards		0	-1	-1
5a. Construction impacts on utilities / infrastructure		-2	-1	-1
5b. Construction Disruption		-1	-1	-1
6a. Construction costs / risk / value capture		-3	-3	-2

Table 13-3 Ōpāheke N-S FTN Arterial Options Assessment Findings Summary

Ōpāheke North-South FTN Arterial Options Assessment Findings Summary	
Performance against transport outcomes *Note: All three options achieve the transport outcomes and there is no differentiation between the three options with regard to these objectives.*	
Enable quality urbanisation in the Drury-Ōpāheke growth area by providing and additional N-S arterial connection between proposed centres The Ōpāheke N-S FTN Arterial provides for another N-S connection, that more centrally connects Drury's centre, with employment areas in Papakura. This provides an alternative to SH1, more targeted to local travel needs between centres, supplemented by the FTN nature of the route. Option A is more supportive of urbanisation, both along the corridor and in the Drury-Ōpāheke growth area, by being more supportive of developable land, and tying in with the proposed local centre on Ponga Road. ***Improve transport choice and network resilience by providing a safe and attractive multi-modal transport connection between Drury and Papakura*** The Ōpāheke N-S FTN Arterial increases the transport choice available for N-S movements in Drury, as with SH1, providing more regional movement, and with Mill Road only really providing for strategic general traffic. The Ōpāheke N-S FTN Arterial on the other hand supports network resilience by attracting more of the local Drury/Ōpāheke trips, with multimodal choice due to the FTN focus. It provides safe, segregated active mode facilities, forming part of the primary cycle network. However, the nuances between options A, B and C's alignment with this transport outcome were not significant in determining the preferred option.	
Transport Assessment	
There are minimal differentiating factors between all options as the proposed alignments for each option do not significantly vary. All options will support north and south movement in the Drury-Ōpāheke growth area providing an additional north-south arterial connection between proposed town centres. All options will also provide increased transport choice and network resilience by providing a safe and attractive multi modal transport connection between Drury and Papakura.	
Wellbeing assessment	
Heritage	All options scored to have a very low adverse effect (-1) on historic heritage. There are no known constraints within the extent of any of the options, with only minor potential for affecting unrecorded subsurface archaeological sites. Therefore, historic heritage is not a differentiating factor between the options.
Social	Future Land Use Integration: Option C is less integrated with a local centre proposed on Ponga Road. In the northern extent of the corridor, Option A and C support development of a large area of FUZ land to the west between the road corridor and the NIMT rail line. Comparatively, Option B supports relatively less FUZ area between the road corridor and the NIMT rail line. North of the floodplain, Options A and B support a balance of development of FUZ land on either side of the corridor. Option C does not support balanced development of FUZ land on either side of the corridor at this location with majority of developable land falling to the west of the corridor. Option A supports the development of the largest and most balanced area of future urban zoned land and is therefore preferred. Social Cohesion: All options were identified to have a very low positive impact (scoring +1) with no differentiating factors between the options. All options provide positive impacts through the provision of multimodal connections for communities between Papakura and Drury providing improved access to education and employment opportunities. Business operations and residential amenities may be disrupted during construction including access for all options. Urban Design: Option A provides moderate positive contributions for high quality urban design solutions (scoring a +2). This option supports the development of a large area of future urban zoned land, to the west between the road corridor and railway line in the northern stretch. Option A also

	supports a balanced development of future urban zoned land on either side of the corridor just north of the flood plain. Option B has a low positive contribution (scoring +1) to high quality urban design solutions similar to Option A. However, Option B supports a smaller area of future urban zoned land to the west. Option C overall provides low impacts for high quality urban design solutions (scoring -1). It supports a large area of future urban zoned land but does not support balanced development of future urban zoned land on either side of the corridor.
Social	Land Requirements: All options require land acquisition. Option B is considered to have the least property impacts, scoring to have a very low adverse impact (-1). Option B coincides with more property boundaries along its alignment which would more easily allow development to occur on either side of the alignment. Options A and C were scored to have a low adverse impact (-2). All options avoid the electricity easement running from Hunua Rd to Appleby Road. Health and wellbeing: All options were seen to have a neutral impact (scoring 0) on health and wellbeing. For all options where it is not currently industrial the area is scheduled to become urban (mainly residential) and existing houses will experience a change in amenities associated with urbanisation that will be congruent with the proposed road.
Environmental	Landscape and Visual Amenity: All three options scored to have a low adverse impact (-2) on landscape features and visual amenity. The impact on landscape features Is limited due to the existing modified context and the future urban zoning. For all options, there will be low/ moderate amenity and visual impacts on future residential areas. This is due to the extent of embankments required along the corridor and their height (4 – 5m) from existing ground level. The arterial will essentially be at the same height as a two-story dwelling for most of its length giving it an appearance more akin to a regional expressway. The dominance of the arterial corridor and reduced visual and physical permeability are key issues. Stormwater: Option A was seen to have the least adverse impact on stormwater (scoring a very low adverse score of -1). Option B and C were found to have the worst impact on stormwater (scoring a low adverse impact of -2). All three options require crossing a floodplain. However, Option A crosses the flood plain further west than Option C and it avoids some of the gully filling effects/culverts of both Options B and C. Ecology: All options scored to have low adverse impacts (-2) on ecology. All three options would cause a loss of significant indigenous terrestrial vegetation and habitat for native birds and fish. They would all likely have indirect impacts on the downstream receiving environment through the release of pollutants and sediment. Natural Hazards: Option A scored neutral for natural hazards with Option B and C scoring very low adverse (-1). With regard to geotechnical constraints, for all options, on the northern extent of the site, adjacent to the existing Hunua Road, a well-developed stream alignment may lead to significant construction times being required for any fill embankments. A similarly well-developed stream system can be found between the existing Ponga Road and Harry Dodd Road. No significant instability can be observed for all options.
Economic	Utilities: Options B and C scored very low adverse (-1) for construction impacts on utilities and infrastructure. All options scored very low adverse (-1) for construction disruption. Within Option A, the skew in the alignment will likely increase the complexity of construction. The gas transmission line interacts with all three alignments near Hunua Rd but continues to impact Option A past Walker Road. Construction: Option B will require extra traffic management/detours and construction staging to shut or realign Sutton Road to enable the new FTN alignment and also runs close to the electrical assets on the corner of Sutton/Ponga. It is assumed a similar length structure is needed to span the flood plain for all three options but Option C crosses more tributary streams likely minor increase the requirement for access and environmental protection.

	Costs and Construction Risk: Both Options A and B have a moderate adverse impact (scoring -3) on cost and construction risk considerations. The skew in the alignment of Option A increases the complexity as well as the interaction with the gas transmission line. Option B runs close to electrical assets and will require extra traffic management on Sutton Road. Option C would have a low adverse impact on cost and construction risk considerations (scoring -2). However, Option C crosses more tributary streams, therefore, would likely require a minor increase to the requirements for construction access and environmental protection.

Opportunities

Future opportunities for all of the options identified through the options assessment included:

- The flood plains offer an opportunity to buffer the impact of the elevated structure and embankments from surrounding residential development. The flood plains could also be converted to wetland habitat, active or passive recreational space.
- There is also potential to improve habitat for native species, which could include the removal of old farm or road culverts that are inhibiting fish migration.

13.3.2 Partner, Internal and Landowner Engagement

Throughout the various option assessment workshops, the Project Team engaged with project partners including Manawhenua and Auckland Council, to discuss the options.

Feedback from Manawhenua was received at two hui, on 30 August and 3 October 2019. Manawhenua did not have an option preference however, they recommended that bridges need to cross the entire floodplain and embankments should be minimised. Their preference was to amend the design to keep embankments out of the floodplain. Manawhenua also noted the desire to avoid kahikatea trees that were known in the area.

During workshops with Auckland Council on 5 September and 11 November 2019, the Council advised that the flood plains have an underlying residential zone in the Ōpāheke-Drury Structure Plan. However, at this stage, this area has not been included in yield calculations as developable land. This will be assessed further at the plan change phase. Once this area is zoned, consent will be able to be sought for development in a floodplain, but parts of the floodplain may be incapable of development. The Council identified that within the structure plan, a local centre is proposed on Ponga Road. Connection of this centre with the corridor is preferred.

Internal engagement workshops were held with AT and Waka Kotahi on 12 September, 14 October and 17 December 2019. During these workshops it was identified that options to the east (Options A and C) provide a more balanced catchment of the new FTN corridor. Concern was raised about the complex intersections of Option B with existing roads. Concerns of the impact on residual land between the new road and the gas line were also raised.

In December 2019 and January 2020, the Supporting Growth Programme sought feedback from landowners and stakeholders within the proposed Drury Arterial Network project area on the draft preferred option for the Ōpāheke N-S FTN Arterial corridor. Overall there was a general level of support for the proposed network from the feedback received. Key themes raised by landowners and stakeholders with specific reference to Ōpāheke N-S FTN Arterial include uncertainty on changes to Hunua Road, loss of property, impact to site access and form and function. These key themes were

considered in finalising the preferred option and contributed to design refinement to further minimise impacts where possible, particularly on property requirements.

13.3.3 Preferred Option

Following the MCA assessment and consideration of feedback received from project partner including Manawhenua and Auckland Council, stakeholders and landowners, a preferred option for the Ōpāheke N-S FTN Arterial was identified.

The preferred option (Option A) central alignment is recommended with some small design changes to be made during design refinement. The preferred option was chosen because:

- This option crosses the flood plain at the narrowest point and reduces some of the effects of filling this area (e.g. culverts).
- This option supports the development of a large and balanced area of future urban zoned land.
- This option reduces the number of tie ins required with existing roads.
- This option alignment integrates with the proposed local centre on Ponga Road.
- This option reduces impact on the Counties Power Substation.

Through the assessment, it was noted that there were no evident differentiators between the three options with regard to transport, archaeology and built heritage, social, landscape and visual amenity, health and wellbeing and ecology.

All route refinement options provided the same level of achievement against the Transport outcomes as outlined in Table 13-3.

13.3.3.1 Initial Design Refinement

During initial design refinement, specific consideration was made to bridge spans to minimise impacts on streams and existing utilities and avoid known poor ground conditions where possible. Changes to the alignment or design included:

- Alignment moved slightly to the east at the southern extent to reduce impacts on Counties Power transmission lines
- Alignment moved slightly to the east near the Counties Power substation to reduce impacts on this.
- Alignment moved slightly to the west at the northern extent to minimise some impacts on the Frist Gas transmission line
- Alignment moved to the west near the central section to reduce impacts on stream tributaries.

13.3.3.2 National Policy Statement for Freshwater Management 2020

Subsequent to the preferred option being identified, a revised national freshwater policy statement and new freshwater regulations came into effect (the National Policy Statement for Freshwater Management 2020 and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020), which gives greater protection to natural inland wetlands and streams. Given this new policy direction, the Project Team reconsidered the potential effects of the preferred options on identified natural inland wetlands and streams. Generally, the alignment and design refinement process for each proposed designation has sought to avoid or minimise impacts on high value natural wetlands and streams, unless there is a functional requirement for any such

impacts or other high value environmental constraints. There will be further opportunities to minimise any impacts within the Project alignment during the detailed design of the Projects. As a result, no further design refinement is required at this stage.

13.3.3.3 Further Design Refinement

Following identification of the preferred option and initial design refinement, engagement with Oyster Capital Ltd (Oyster) was undertaken on the southernmost section of the proposed Ōpāheke N-S FTN Arterial which is within the proposed Waihoehoe Precinct Plan Change area (PC50). Oyster and the Project Team agreed that there was an opportunity to align the Ōpāheke N-S FTN Arterial with a collector road proposed by Oyster. This will better integrate with Oyster's development plans in the proposed PC50 area. The interim collector road within PC50 will be upgraded in the future to the four-lane FTN arterial when required.

Oyster and the Project Team agreed on an alignment within the properties that Oyster has an unconditional agreement to purchase. The realignment of this section of Ōpāheke N-S Arterial through the PC50 area is a minor deviation from the preferred Ōpāheke N-S FTN Arterial option (Option A).

This realignment was provided to the Project technical specialists to assess. Most of the technical specialists advised that there was no material change in effects from the initial preferred option. However, there were some improved environmental outcomes including through removing a stream crossing and minimising impacts on wetlands, as well as improved future land use integration with the development plans of Oyster for the proposed PC50. In addition, the realignment is entirely within land under agreement for purchase by Oyster and does not adversely impact any other property.

Based on the above assessment, the realigned southernmost section of Ōpāheke N-S FTN Arterial was recommended to be taken forward for route protection.

13.3.4 Discounted Options

The following table summarises the reasons for discounting the remaining two options.

Table 13-4 Discounted Options - Ōpāheke N-S FTN Arterial

Option	Reasoning
Option B	This option was discounted for the following reasons: • This option has greater impact on stormwater and flooding requiring increased fill and culverts in the gully. • This option has geotechnical constraints that may impact construction times for fill embankments. • This option is aligned close to the electrical assets on the corner of Sutton/Ponga • This option would require extra construction traffic management/detours and construction staging
Option C	This option was discounted for the following reasons: • This option does not support the balanced development of future urban zoned land on either side of the corridor • This option has greater impact on stormwater and flooding requiring increased fill and culverts

Option	Reasoning
	• This option crosses more tributary streams which would have additional environmental protection and controls working around and over streams • This option has geotechnical constraints that may impact construction times for fill embankments.

1.1.3 Intersection Form

Along this corridor, there are three intersections to be upgraded. A summary of the assessment (described in Section 7) undertaken for these intersections is shown in Table 13-5, outlining the recommended outcomes for each.

Table 13-5 Ōpāheke N-S FTN Arterial Intersection Form Assessment

Intersection		Form		Modal Priority			Justification/Constraints/Triggers	Preferred Intersection Form
Name	Arms	Lanes	Speed	PT	Active Mode	Freight		
Ōpāheke N-S Arterial / Hunua Intersection	Ōpāheke N-S Arterial (south)	4	50km/h	FTN	Med	Med	• Proximity to industrial activity, higher freight movements will like trigger more in-roundabout conflict with other lane-users. • Roundabout presents major constraints. Would require significant realignment of Hunua Road (north leg) and impacts to properties. • High-quality bus priority North-South. • Special consideration should be considered land use context and gateway to strategic freight network.	Signalised intersection
	Hunua (north-east)	2	50km/h	Med	Med	High		
Ōpāheke N-S Arterial / Walker Road Intersection	Ōpāheke N-S Arterial ↓↑	4	50km/h	FTN	Med	Med	• High-quality bus priority North-South. • Provides east-west connectivity for existing properties and is part of the future collector network as indicated in the Drury-Ōpāheke Structure Plan.	Roundabout
	Walker Road (East-West) ← →	2	<50km/h	Low	Med	Low		
Ōpāheke N-S Arterial / Ponga Intersection	Ponga Road (East-West) ← →	2	50km/h	Med	Med	Med	• High-quality bus priority North-South. • Staging considerations as land transition between (semi-rural to FUZ)	Roundabout
	Ōpāheke N-S Arterial ↓↑	4	50km/h	FTN	Med	Med		
Ōpāheke N-S Arterial / Waihoehoe Intersection included within the Waihoehoe Road Corridor. See Section 0.								

13.4 Ōpāheke N-S FTN Arterial Summary

As outlined, through the assessment process and feedback from project partners including Manawhenua and Auckland Council, the preferred option for the Ōpāheke N-S FTN Arterial Upgrade is Option A (central alignment). Some small changes were made during design refinement to reduce impacts on streams and existing utilities, avoiding known poor ground conditions where possible, and to provide improved future land use integration (through the proposed PC50 area).

Through the intersection form assessment, it was recommended that signalised intersections be implemented at the Ōpāheke N-S FTN Arterial intersections with Waihoehoe Road and Hunua Road. Roundabouts were recommended at the Ōpāheke N-S FTN Arterial intersections with Walker Road and Ponga Road /Ōpāheke Road.

14 NoR D5: Ponga and Ōpāheke Road Upgrade

In order to adequately assess alternatives, the Project was separated into three sections for options assessment, as shown in Figure 14-1, including:

- Ponga Road Upgrade;
- Ōpāheke Road Upgrades including:
    - Ōpāheke Road Rural Upgrade; and
    - Ōpāheke Road Urban Upgrade including the assessment of the Ōpāheke Road / Settlement Road intersection.

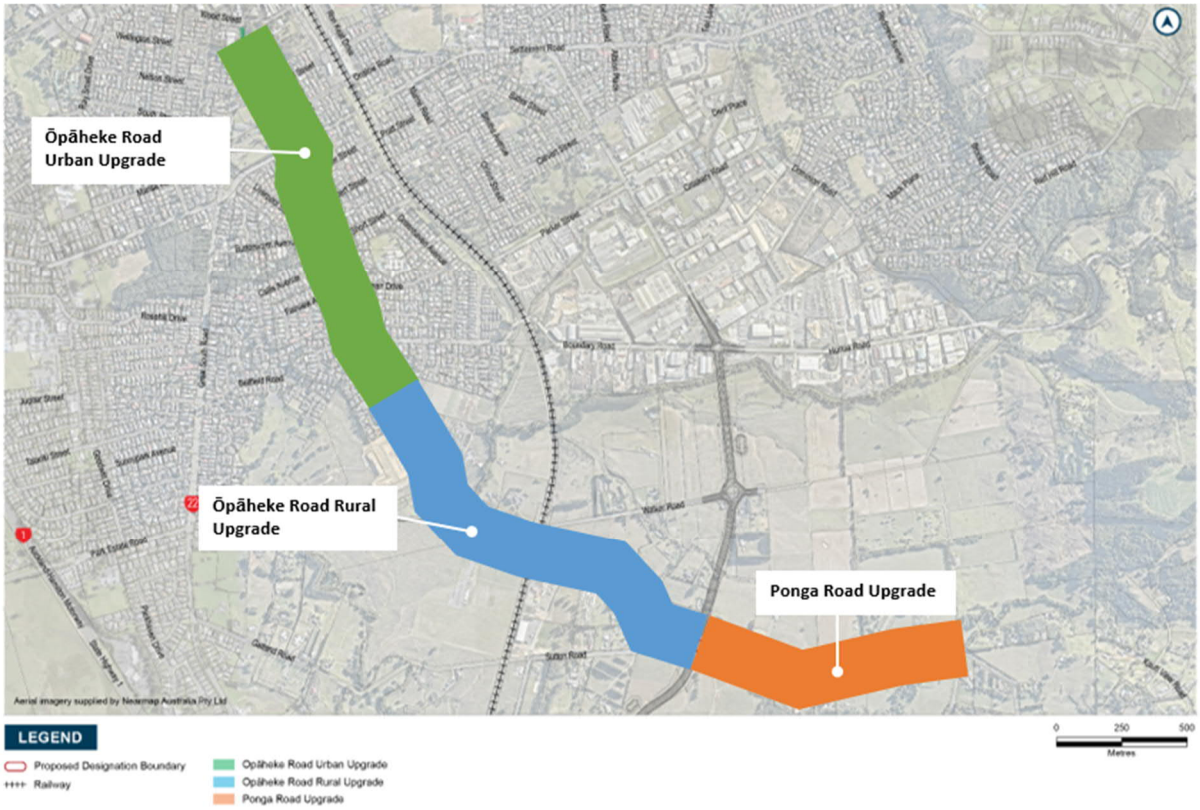


Figure 14-1 Overview of NoR D5 Alternative Assessment Sections

14.1 Ponga Road Upgrade

14.1.1 Overview

14.1.1.1 IBC / Corridor Assessment

TFUG recommended a new connection through the FUZ rather than upgrading the existing Ponga Road. The IBC investigated the upgrade of Hunua and Boundary Roads as well as the upgrade of Ōpāheke and Ponga Roads at the short list stage.

Although the upgrade of Ponga Road was identified to potentially affect a large number of properties (it was envisioned as a 30m wide cross section), particularly through earthworks, and works would be required in a floodplain and require stream crossings, it was recommended as a preferred corridor because, in combination with Ōpāheke Road, it was assessed to have greater network benefit function connecting FUZ areas to Papakura, employment areas to the north and the proposed Mill Road corridor over the upgrade of Hunua Road and Boundary Road. The Ponga Road connection was generally supported in public consultation.

The figures below show the long list and short list options considered in the IBC.

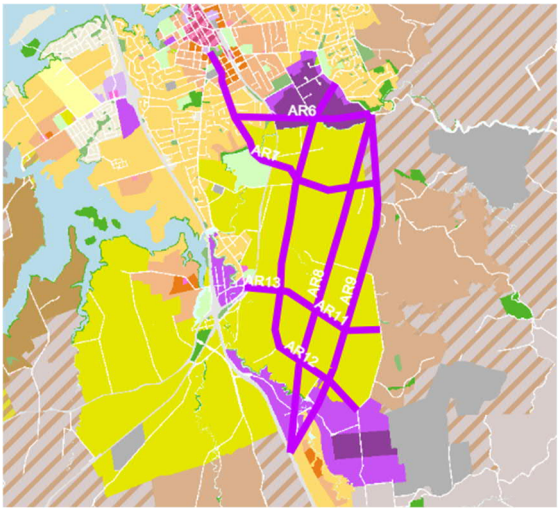


Figure 14-2: IBC Drury East Long List Options

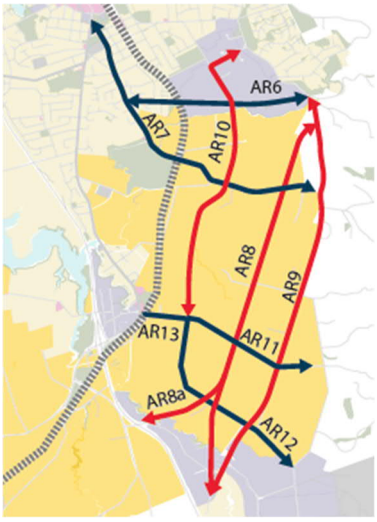


Figure 14-3: IBC Drury East Short List Options

14.1.1.2 Gap analysis

A gap analysis was undertaken for Ponga Road as described in Section 5.2.

Planning updates, developer aspirations, interdependencies with other projects for Ponga Road include:

- The intended future land use along the corridor (as per AC's Drury-Ōpāheke Structure Plan) is largely medium density residential and industrial land use in the northeast
- Although no new designations have been identified since the IBC phase, First Gas Ltd. is the requiring authority for Designation 9104, Pukekohe to East Tamaki Gas Pipeline, which bisects Ponga Road.
- No plan changes or developments are anticipated along or near to Ponga Road.

- Upgrade of Ponga Road needs to be aligned with development of the proposed Mill Road corridor, Ōpāheke Road and the new Ōpāheke N-S FTN Arterial

Through the gap analysis it was concluded that adequate alternatives had been assessed at the IBC. There was no additional new information that warranted additional investigation of an alternative corridor. Therefore, it was recommended that the corridor recommended at the IBC be taken forward for route refinement at the DBC to investigate which side of the road to widen.

14.1.1.3Form and Function Assessment

Following the methodology summarised in Section 5.3, a form and function assessment was undertaken for the Ponga Road Upgrade. Table 14-1 provides a summary of the assumptions and outcomes of the initial assessment for Ponga Road.

Table 14-1 Ponga Road Upgrade Form and Function Assumptions and Summary

Ponga Road		
Criteria	Summary	Comments
Place and Movement[8]	P1	Place value classified as P1 using the RASF typology. This typology is justified according to structure plan: Mixed-housing urban Zone, Light Industrial/Business Zone, Mixed housing suburban (minor). Assume it will be predominantly low/medium-density, with little variety in uses.
	M2	Movement value classified as M2 using the RASF typology. This typology is justified on the intended function, creating linkages to both town centre (northern end), neighbourhood centre and industrial area (southern end). North-south corridor to supplement Mill Road and GSR, performs both through movement and development access roles.
Land use	Low risk of change	Surrounding land use is zoned as FUZ, and the structure plan developed by council is unlikely to change dramatically.
Bus	No	No priority vehicle lanes due to low number of bus services (374 Ōpāheke East (10 min in peak and 20min in off-peak)
Active Modes	Protected Cycle lanes & Footpath on both sides	Segregated paths planned for active mode, as Ponga forms part of the secondary cycle route, connecting with Ōpāheke Rd, which is identified to form part of the primary cycle network
Flows	8,000 2 Lanes	Flows justify 2 lanes, with Average Daily Traffic Flows approximated to be 8,000 trips per day (based on the DBC 2048+ SATURN model).
Speed	50km	50kmh along this section as it travels through future urbanised areas.
Freight	OD, No priority	Not strategic freight route. However, Drury town centre is identified as a future freight generating area but also a minor future freight area nearby.
Outcome	Based on the above, of the typical cross sections used for the Supporting Growth Programme, a 24m two lane arterial was the preferred.	

[8] Based on the anticipated level of place and movement functions for the corridor



14.1.2 Route Refinement Option Development

Route refinement for the Ponga Road Upgrade included specialist assessment of three options from Ōpāheke Road to Jack Paterson Road:

- Option A – widening to the north of the existing road
- Option B – widening to the south of the existing road
- Option C – widening to both sides of the existing road

The three options for the Ponga Road Upgrade are shown in Figure 14-4.

14.1.3 Route Refinement Assessment

14.1.3.1 Assessment

The assessment undertaken for the Ponga Road Upgrade follows the route refinement assessment processes previously discussed in Section 6. The three options were assessed qualitatively against the MCA framework by each subject matter expert. Considerations made and constraints identified are shown in Figure 14-4 and Table 14-2 provides a summary of the qualitative assessment undertaken by technical specialists against the MCA framework. In determining the preferred option, the Project Team took into consideration the MCA assessment and the engagement undertaken with project partners including Manawhenua and Auckland Council.

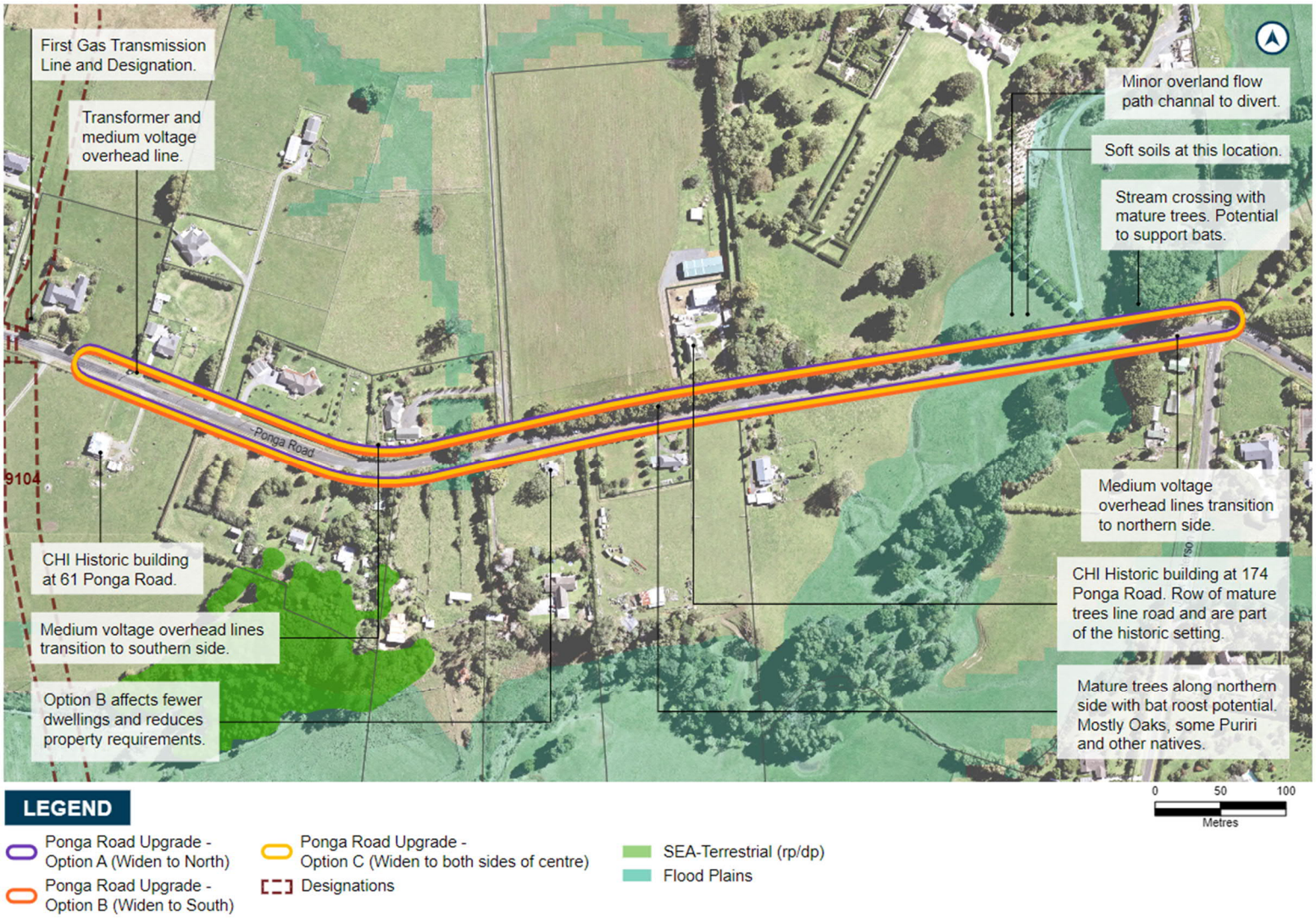


Figure 14-4 Ponga Road Upgrade Options for route refinement showing constraints and considerations

Table 14-2 Ponga Road Upgrade Options Assessment Findings Summary

Ponga Road Upgrade Options Assessment Findings Summary	
Performance against transport outcomes *Note: All three options achieve the transport outcomes and there is no differentiation between the three options with regard to these objectives.*	
Support growth and a more sustainable, quality urban form in Drury by improving connectivity to/through the Ōpāheke Area. The Ōpāheke/Ponga corridor provides a multimodal link between the Ōpāheke N-S FTN Arterial and Mill Road, connecting the FUZ to the Papakura centre and employment areas. Given the anticipated urbanisation in the area and centre connections, the form will need to provide for additional people-moving capacity and increase the demand for short trips and more diverse transport demands. However, the nuances between options A, B and C's alignment with this outcome were not significant in determining the preferred option, although, Option A for Ōpāheke Rural and Option B for Ponga Road both allowed for lesser impact on existing and live zoned property, arguably better supporting this planned growth. ***Achieve a transformational mode shift for trips to key destinations in Drury & Ōpāheke by providing high quality, safe and attractive PT and active mode facilities on Ōpāheke/ Ponga Road corridor*** The form of this corridor supports this outcome through the provision of high quality, safe and attractive active mode facilities. Priority lanes are not required as part of the cross section based on the form and function assessment, but a frequent bus route is proposed to use the corridor, providing wider PT access between the proposed centres/train stations in the Drury area and the existing centre/train station in Papakura. As discussed above, this is integral to supporting the anticipated growth and land-use adjacent to the corridor, and this will reduce the reliance on LOVs which will in turn have benefits for health and wellbeing and the environment.	
Wellbeing assessment	
Heritage	Option B is preferred, with only minor redesign required to preserve the mature trees screening the villa at 174 Ponga Road and define the limit of its curtilage. If Option A or C are adopted, or if the trees are affected by Option B, the adverse effects should be mitigated by planting a replacement alignment of mature trees to the north of the widened road.
Social	Future Land Use Integration: Widening to the south will reduce impacts on land proposed as town centre and park at the western extent of the corridor. Social: From a social impact perspective there is not a clear difference in impacts between options, due to the location of this project in the FUZ. All options provide opportunity to connect into the cycle and pedestrian plans for the park and active recreation with multi modal offerings of the corridor (pedestrian and cycle). For all options there will be temporary disruption to access to services, amenities and possible employment within Drury Village and Papakura during construction. Urban design: No significant differentiators between options. Land requirement: Generally, Option B is the preferred option along the route, but some tweaking may be desirable at a number of properties to avoid the reinstating of mature trees, and fencing. There is not likely to be any full purchases required, but some property improvements/structures and businesses (lessees) may be impacted.

	Health and Wellbeing: There is no major impact on health and wellbeing identified for any options. The current and planned residential houses along the corridor are to be considered at the time of plan changes / subdivisions in the area.
Environmental	Landscape and Visual Amenity: No differentiating factors between the options. No significant constraints or factors that would influence the alignment or which side of the road is widened. Stormwater: No significant differentiators between the three options with regard to stormwater. There is a minor overland flow path to divert on the northern side of the Mangapū Stream crossing, however this should not influence the alignment choice. Ecology: All options are likely to cause a loss of vegetation and habitat for native fish, bats, birds and lizards. Option B is preferred as it may avoid mature trees which may support roosting 'Threatened: Nationally Critical' long tailed bats. Natural hazards: No differentiation between the options relating to natural hazards.
Economic	Utilities: No significant differentiators between the three options. It is likely that works will be required to most existing utilities irrespective of the option chosen. Construction: All three options are similar in terms of construction complexity. Widening to the north (Option A) or south (Option B) has a slight advantage enabling existing traffic to be maintained while enabling a wider working area to construct the new area of road. However, widening both sides decreases the scale of property access modification work required.
Opportunities	
• For all options, the upgrade of Ponga Road presents the opportunity to enhance the connection with Ponga Mangapū Stream by using a 'floating' bridge structure and revegetation on the embankments. The opportunity also exists to coordinate with existing utilities in relation to planned upgrades (dependent on timing).	

14.1.3.2 Partner, Internal and Community Engagement

Throughout the various option assessment workshops, the Project Team engaged with project partners including Manawhenua and Auckland Council, to discuss the options.

The three options and the emerging preferred option was shared with Manawhenua at hui on 20 February 2020. No specific concerns or comments were raised by Manawhenua about the options. Manawhenua raised an area of interest in the high section of Ponga Road (out of the project area).

An internal engagement workshop was held with AT and Waka Kotahi representatives on 19 February 2020 to present the emerging preferred option and seek feedback. The protection of the mature trees along the northern side of Ponga Road was supported as they provide a good buffer between the future industrial and residential areas. Questions on whether freight movements from proposed industrial areas was taken into consideration and whether there is evidence behind the need for walking and cycling infrastructure in this area.

A workshop was held with representatives from Auckland Council on 22 January 2020 to present the options and identify the emerging preferred option. Council concurred widening to the north is most suitable to avoid impacts on the reserve and live zoned land.

In May 2020 community engagement was launched and an opportunity to provide feedback on the preferred options for the Waihoehoe Road East Upgrade, Ponga Road Upgrade and Ōpāheke Road

Rural Upgrade was provided. Feedback was sought from the public through Social Pinpoint using interactive tools such as surveys and interactive mapping. Specific feedback on the preferred option for the Ponga Road Upgrade was not given however feedback from respondents on Social Pinpoint was generally neutral, and there was general support for roundabouts over signalised intersections.

14.1.3.3Preferred Option

Following the MCA assessment and consideration of feedback received from project partners including Manawhenua and Auckland Council, a preferred option for the Ponga Road Upgrade was identified. The preferred option (Option B) is to widen generally to the south of the existing road corridor. The preferred option was chosen because:

- This option has less immediate effects on dwellings resulting in less property acquisition.
- This option reduces impacts on mature trees on the northern side of the road corridor which contribute to ecological, heritage and amenity values.

Through the assessment, it was noted that there were no evident differentiators between the three options with regard to social, urban design, landscape and visual amenity, health and wellbeing, stormwater and flooding, natural hazards and utilities. Although a number of heritage sites were identified, none of the options impact these. All route refinement options provided the same level of achievement against the Transport outcomes as outlined in Table 14-2.

Subsequent to the preferred option being identified, a revised national freshwater policy statement and new freshwater regulations came into effect (the National Policy Statement for Freshwater Management 2020 and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020), which gives greater protection to natural inland wetlands and streams. Given this new policy direction, the Project Team reconsidered the potential effects of the preferred options on identified natural inland wetlands and streams. Generally, the alignment and design refinement process for each proposed designation has sought to avoid or minimise impacts on high value natural wetlands and streams, unless there is a functional requirement for any such impacts or other high value environmental constraints. There will be further opportunities to minimise any impacts within the Project alignment during the detailed design of the Projects. As a result, no further design refinement is required at this stage.

14.1.3.4Discounted Options

The following table summarises the reasons for discounting the remaining two options.

Table 14-3 Discounted Options - Ponga Road Upgrade

Option	Reasoning
Option A	This option was discounted for the following reasons: • This option would impact on mature trees which contribute to heritage, ecological (trees may support roosting 'Threatened: Nationally Critical' long tailed bats) and amenity values. • This option will result in greater property impacts
Option C	This option was discounted for the following reasons: • This option would impact on mature trees which contribute to heritage, ecological (trees may support roosting 'Threatened: Nationally Critical' long tailed bats) and amenity values.

Option	Reasoning
	• This option will result in greater property impacts • Temporary traffic management during construction more complex

14.1.3.5 Intersection Form

Along this corridor, there is one intersection to be upgraded at Ōpāheke N-S FTN Arterial and Ōpāheke Road. This intersection is included in the Ōpāheke N-S FTN Arterial corridor and is assessed in Section 1.1.3.

14.1.4 Ponga Road Upgrade Summary

As outlined, through the assessment process and feedback from project partners including Manawhenua and Auckland Council, the preferred option for the Ponga Road Upgrade is Option B, widening to the south of the existing road corridor to reduce impacts where possible. Through the intersection form assessment, it was recommended that a roundabout be implemented at the Ponga Road intersection with Ōpāheke N-S FTN Arterial and Ōpāheke Road.

14.2 Ōpāheke Road Arterial Upgrade

14.2.1 Overview

14.2.1.1 IBC / Corridor Assessment

TFUG recommended upgrading Ōpāheke Road. During the corridor alternatives assessment, a number of new and upgraded arterials were investigated in Ōpāheke and Drury east. This included the upgrade of Hunua and Boundary Roads as well as the upgrade of Ōpāheke Road and Ponga Road at the short list stage. Upgrade of Ōpāheke Road included removal of a level crossing, which was identified to address safety concerns and assist in making the road run more efficiently (particularly for public transport) . It provides access to the proposed Ōpāheke N-S FTN Arterial and continuing onto Ponga Road to access the proposed Mill Road corridor and supports high demand for bus trips on Ōpāheke Road. The upgrade of Ōpāheke and Ponga Roads (AR 7 as shown in Figure 14-6) was assessed to have greater network benefit function connecting FUZ areas to Papakura, employment areas to the north and the proposed Mill Road corridor.

The IBC did indicate that upgrade of Ōpāheke Road could potentially affect a large number of properties (envisioned as a 30m wide cross section), particularly through earthworks, and that works in a floodplain and stream crossings would be required. The Ōpāheke Road connection was generally supported in public consultation.

The figures below show the long list and short list options considered in the IBC.

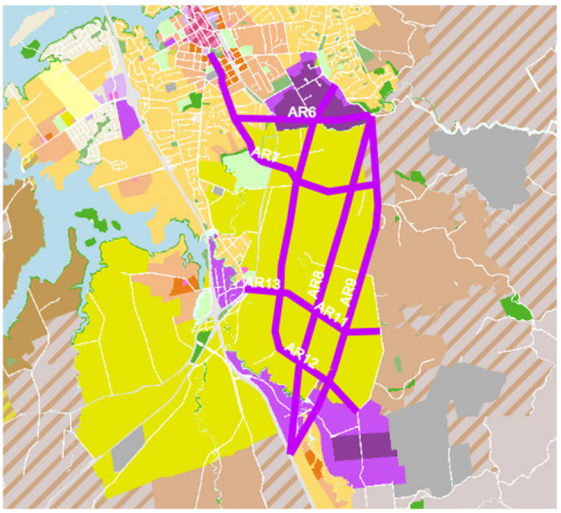


Figure 14-5: IBC Drury East Long List Options

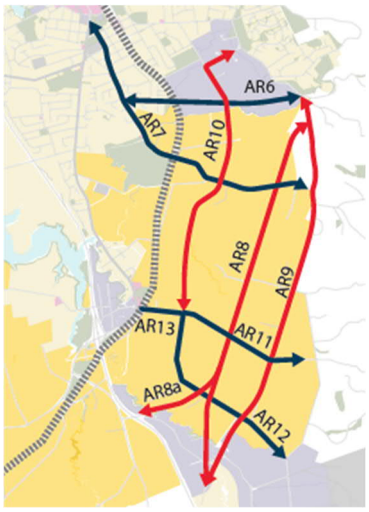


Figure 14-6: IBC Drury East Short List Options

14.2.1.2 Gap analysis

A gap analysis was undertaken for Ōpāheke Road as described in Section 5.2.

Planning updates, developer aspirations, interdependencies with other projects for Ōpāheke Road include:

- The intended future land use along the corridor (as per AC's Drury-Ōpāheke Structure Plan) is largely medium density residential, open space and industrial land use
- Although no new designations have been identified since the IBC phase, Counties Power Ltd is the requiring authority for Designation 3006, Substation which adjoins the alignment
- Upgrade of Ōpāheke Road needs to be aligned with development of the proposed Mill Road corridor, Ponga Road and the new Ōpāheke N-S FTN Arterial
- Development has begun at Bellfield Estate Special Housing Area to the west of Ōpāheke Road
- Preliminary concept plans for Ōpāheke Reserve Sports Fields have been developed for which the first stage has approval by the local board in 2018.

Through the gap analysis it was concluded that adequate alternatives had been assessed at the IBC. There was no additional new information that warranted additional investigation of an alternative corridor. Therefore, it was recommended that the corridor recommended at the IBC be taken forward for route refinement at the DBC to investigate which side of the road to widen.

14.2.1.3 Form and Function Assessment

Following the methodology summarised in Section 5.3, a form and function assessment was undertaken for the Ōpāheke Road Arterial Upgrade. Table 14-4 provides a summary of the assumptions and outcomes of the initial assessment for Ōpāheke Road.

Table 14-4 Ōpāheke Road Form and Function Assumptions and Summary

Ōpāheke Road		
Criteria	Summary	Comments
Place and Movement[9]	P1	Place value classified as P1 using the RASF typology. This typology is based on existing land use and zoning - FUZ (light industrial within the structure plan), mixed-housing suburban, mixed housing urban, THAB close to Papakura station). However, despite zoning intentions, land use is currently primarily low-density residential (little variation), uncertain if area will develop.
	M2	Movement value classified as M2 using the RASF typology. This typology is justified on the intended function, creating linkages to both town centre (northern end), neighbourhood centre and industrial area (southern end). North-south corridor to supplement Mill Road and GSR, performs both through movement and development access roles.
Land use	Low risk of change	Low risk of land use change based on existing land use and zoning intentions.
Bus	No	No priority vehicle lanes due to low number of bus services (374 Ōpāheke East (10 min in peak and 20min in off-peak)
Active Modes	Protected Cycle lanes & Footpath on both sides	Segregated paths planned for active mode. Ōpāheke identified to form part of the primary cycle network.
Flows	14,000 2 Lanes	Flows justify 2 lanes, with Average Daily Traffic Flows approximated to be 14,000 trips per day (based on the DBC 2048+ SATURN model).
Speed	50km	50kmh along this section as it travels through urbanised areas.
Freight	No priority	Not strategic freight route. However, Drury town centre is identified as a future freight generating area but also a minor future freight area nearby.
Outcome	Based on the above, of the typical cross sections used for the Supporting Growth Programme, a 24m two lane arterial was the preferred initially.	

14.2.1.4 Ōpāheke Road Urban Upgrade: Two Lane Cross Section Assessment (20m vs. 24m)

Ōpāheke Road was split into two sections for assessment purposes. The urban section, which is currently live zoned and developed, and the rural section which is currently rural and zoned FUZ.

In March 2020, an assessment was undertaken to consider the implications of providing either a 20 metre or 24 metre cross section along the established urban section of Ōpāheke Road and to determine whether a departure from a 24 m urban corridor was appropriate. The cross section assessed comprises the final road formation only and does account for the required construction footprint.

[9] Based on the anticipated level of place and movement functions for the corridor



Due to the inherent constraints associated with an existing urbanised corridor, further investigation was undertaken to assess the suitability of adopting the standard Supporting Growth urban cross section (24m cross section) for this corridor. The benefits and disbenefits of adopting either a 20 metre or 24 metre cross section on the urbanised section of Ōpāheke Road were assessed. The assessment recommended a departure from a 24m cross section along the Ōpāheke Road (urban) corridor and a 20m cross section adopted for the following reasons:

- The corridor is an existing urbanised area
- There are significant property constraints along the length of the corridor. Retaining the 20m cross section width will minimise impacts to existing properties
- Supporting Growth estimated the cost for property acquisition at around $25-30M, and the additional widening is not considered to deliver sufficient benefit to justify this high level of investment
- The majority of the corridor is low-density, meaning limited interface with the built form is required at these locations
- A 20m cross section would minimise impacts on social and recreational uses
- A 20m cross section would minimise or avoid impacts on scheduled heritage items
- The corridor is a low speed environment (50kph)
- There is limited value in enforcing consistency along the extended corridor
- A 20m cross section does not compromise pedestrian and cycling facilities
- A 20m corridor can provide for a median or berm to allow right turning movements or indented bus stops
- The corridor is expected to have low HCV flows, wider lane widths of the 24m corridor are only expected to benefit large vehicles

As the proposed 20m cross section will fit largely within the existing road corridor, no further route refinement is required to determine which side of the road is to be widened. However, along the alignment a pinch point exists at the Ōpāheke Road / Settlement Road intersection where the proposed upgrade requires additional land outside of the existing road corridor. As such, options were developed and assessed for the intersection.

In addition to the pinch point at the intersection identified above, the regrading of nine driveways along Ōpāheke Road will be required to accommodate the 20m corridor and maintain existing private property access. There are no other suitable alternatives to maintain this access, therefore an assessment of alternatives was not undertaken.

The remainder of this report section is separated into two assessments: one for the route refinement of the Ōpāheke Road Rural Upgrade (Section 14.2.2), and one for the route refinement of the Ōpāheke Road / Settlement Road intersection which forms part of the Ōpāheke Road Urban Upgrade (Section 0).

14.2.2 Ōpāheke Road Rural Upgrade

14.2.2.1 Route Refinement Option Development

The Ōpāheke Road Rural Upgrade will be upgraded to a 24m cross section, requiring additional land. Therefore, options were developed for this section to investigate which side of the road to widen. This included specialist assessment of three options from Ponga Road to just north of Lorelei Place (extent of the FUZ):

- Option A – widening to the northeast of the existing road
- Option B – widening to the southwest of the existing road
- Option C – widening to both sides of the existing road.

The three options for the Ōpāheke Road Rural Upgrade are shown in Figure 14-7.

14.2.2.2 Route Refinement Assessment

Assessment

The assessment undertaken for the Ōpāheke Road Rural Upgrade follows the processes previously discussed Section 6. The three options were qualitatively assessed against the MCA framework by each subject matter expert. Considerations made and constraints identified are shown in Figure 14-7 and Table 14-5 provides a summary of the qualitative assessment undertaken by technical specialists against the MCA framework. In determining the preferred option, the Project Team took into consideration the MCA assessment and the engagement undertaken with project partners including Manawhenua and Auckland Council.

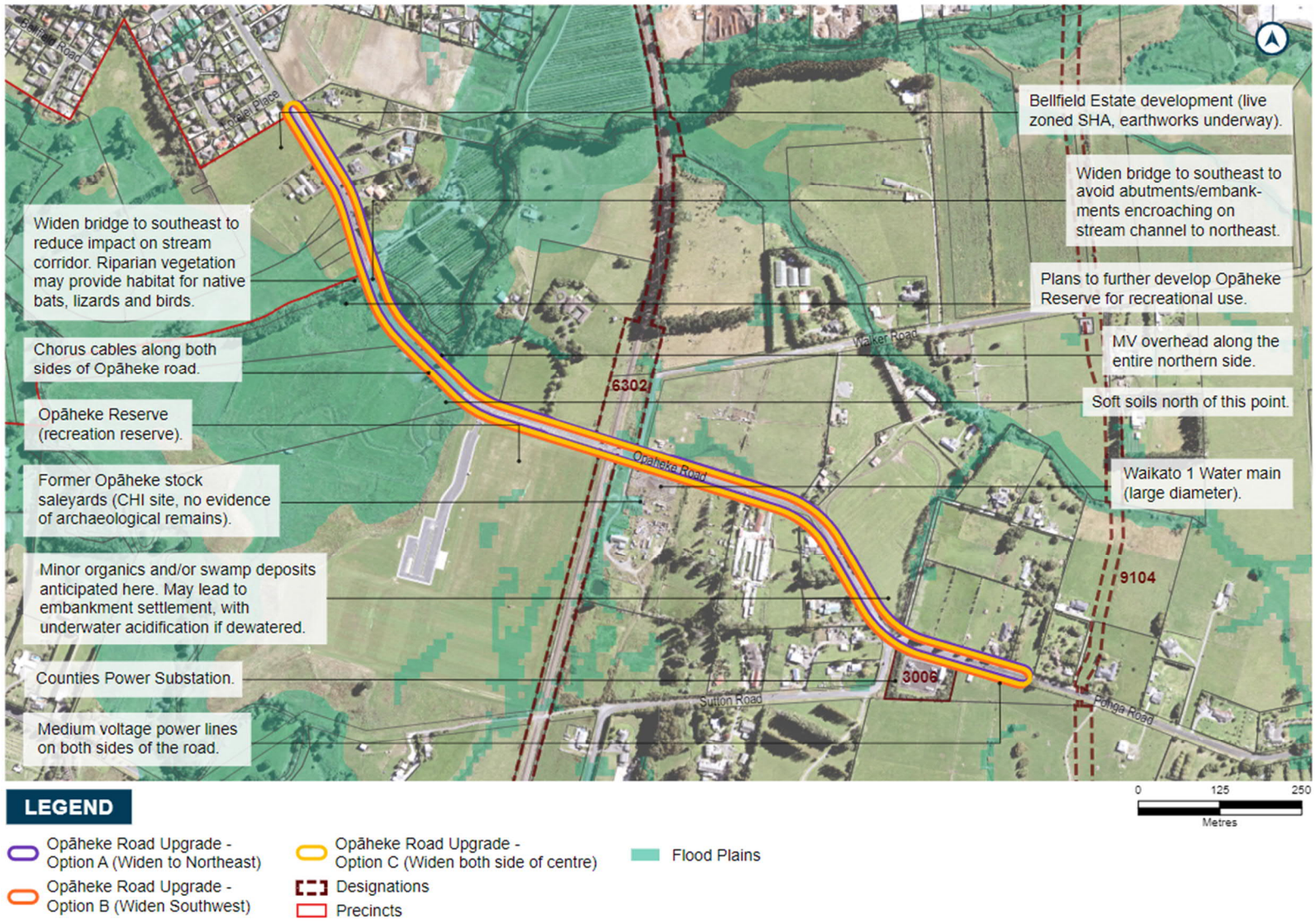


Figure 14-7 Ōpāheke Road Rural Upgrade Options for route refinement showing constraints and considerations

Table 14-5 Ōpāheke Road Rural Upgrade Options Assessment Findings Summary

Ōpāheke Road Rural Upgrade Options Assessment Findings Summary	
Performance against transport outcomes	
Support growth and a more sustainable, quality urban form in Drury by improving connectivity to/through the Ōpāheke Area. The Ōpāheke/Ponga corridor provides a multimodal link between the Ōpāheke N-S FTN Arterial and Mill Road, connecting the FUZ to Papakura centre and employment areas. Given the anticipated urbanisation in the area and centre connections, the form will need to provide for additional people-moving capacity and increase the demand for short trips more diverse transport demands. However, the nuances between options A, B and C's alignment with this outcome were not significant in determining the preferred option, although, Option A for Ōpāheke Rural and Option B for Ponga Road both allowed for lesser impact on existing and live zoned property, arguably better supporting this planned growth. ***Achieve a transformational mode shift for trips to key destinations in Drury & Ōpāheke by providing high quality, safe and attractive PT and active mode facilities on Ōpāheke/ Ponga Road corridor*** The form of this corridor supports this outcome through the provision of high quality, safe and attractive active mode facilities. Priority lanes are not required as part of the cross section based on the form and function assessment, but a frequent bus route is proposed to use the corridor, providing wider PT access between the proposed Drury Centres/Train Stations and the existing centre/train station in Papakura. As discussed above, this is integral to supporting the anticipated growth and land-use adjacent to the corridor, and this will reduce the reliance on LOVs which will in turn have benefits for health and wellbeing and the environment.	
Wellbeing assessment	
Historic heritage	Option A is preferred as most of the sites are located southwest or south of the alignment and the structure at 31 Ponga Rd could be avoided with this option. The second preference would be Option C, assuming it is possible to avoid direct impact on the structure. If Option B or C is selected it is recommended that the building at 31 Ponga Road is assessed and recorded by a built heritage specialist to determine its heritage significance and establish a permanent record of the structure.
Social	Future Land Use Integration: Widening to the northeast (Option A) will enable better integration with land uses including the Drury Sports Park, Ōpāheke Reserve and Bellfield Estate (a special housing area currently under construction). Therefore, Option A is preferred. Social: From a social impact perspective there is not a clear difference in impacts between options, due to the location of this project in the FUZ. All options provide opportunity to connect into the cycle and pedestrian plans for the park and active recreation with multi modal offerings of the corridor (pedestrian and cycle). For all options there will be temporary disruption to access to services, amenities and possible employment within Drury Village and Papakura during construction. Urban design: No significant differentiators for future urban design environment between options. Option A alignment preferred along the southern end of the corridor to allow for sufficient space to mitigate the impact of the electric substation through urban design. Land requirement: Generally, Option A is the preferred option along the route, but some tweaking may be desirable at 174 Ōpāheke Road to avoid the cost of reinstating the entrance wall and gates. There is not likely to be any full purchases, but some improvements and businesses (lessees) may be impacted. Option A has the least impact on land zoned for more intensive use (neighbourhood centre, and mixed urban) and Auckland Council parks land.

	Health and Wellbeing: There is no major impact on health and wellbeing identified for any options. The current and planned residential houses along the corridor are to be considered at the time of plan changes / subdivisions in the area.
Environmental	Landscape and Visual Amenity: No differentiating factors between the options. No significant constraints or factors that would influence the alignment or which side of the road is widened. Stormwater: Option B (widening to the south west) is preferred over Option A (widening to north east) as the resulting embankment of Option A would likely enter the stream channel. Ecology: All three options are likely to result in some loss of vegetation and habitat for native fish, bats, birds and lizard. All three options run parallel to a section of the Waipokapū Stream. Option A is the least preferred option as it is more likely to impact a longer section of stream. Natural hazards: No differentiation between options.
Economic	Utilities: The Waikato Watermain will need to be protected across all three options. The Counties Manukau Power Station is not affected by Option A (widening to the north). Option B and C will likely require substation to be relocated. Works will be required to most existing utilities irrespective of the option chosen. Construction: Widening to the northeast (Option A) or southwest (Option B) has a slight advantage enabling existing traffic to be maintained while enabling a wider working area to construct the new area of road, particularly advantageous for bridge structures. Options A or B are preferred. However, widening both sides decreases the scale of property access modification work required.
Opportunities	
• The upgrade of Ōpāheke Road presents the opportunity to enhance the connections with Ōtūwairoa Stream by minimising landform modification and creating a 'floating' structure across the creek as well as revegetation surrounding the bridge abutment. Opportunity also exists to improve habitats for native species, which could include the replacement of existing culverts that are potentially restricting flood water and fish passage as well as to restore riparian habitat along streams. There is also the possibility to retain larger, mature trees as an amenity feature. • An existing wetland in reserve land provides opportunity for stormwater treatment. There is also potential to coordinate with utilities in relation to their planned upgrades, dependent on timing.	

14.2.2.3 Partner, Internal and Community Engagement

Throughout the various option assessment workshops, the Project Team engaged with project partners including Manawhenua and Auckland Council, to discuss the options.

The three options and the emerging preferred option was shared with Manawhenua at hui on 20 February 2020. No specific concerns or comments were raised by Manawhenua.

An internal engagement workshop was held with AT and Waka Kotahi representatives on 19 February 2020 to present the emerging preferred option and seek feedback. Flooding concerns were raised as well as a concern of the integration (intersection) with, and effect on the Bellfield SHA development.

A workshop was held with representatives from Auckland Council on 22 January 2020 to present the options and identify the emerging preferred option. Council concurred widening to the north is most suitable to avoid impacts on the reserve and live zoned land.

In May 2020 community engagement was launched and an opportunity to provide feedback on the preferred options for Waihoehoe Road East Arterial, Ponga Road Arterial and Ōpāheke Road Arterial was provided. Feedback was sought from the public through Social Pinpoint using interactive tools such as surveys and interactive mapping. Specific feedback on the preferred option for Ōpāheke Road Rural was not given however feedback from respondents on Social Pinpoint was generally neutral, and there was general support for roundabouts over signalised intersections.

14.2.2.4Preferred Option

Following the MCA assessment and consideration of feedback received from project partners including Manawhenua and Auckland Council, a preferred option for the Ōpāheke Road Rural Upgrade was identified.

The preferred option (Option A) is to widen generally to the north-east of the existing road corridor. The preferred option was chosen because this option:

- Reduces property impacts including on live-zoned property and special housing area to the southwest that is currently under development.
- Has less impact on Auckland Council Parks land including the Ōpāheke Reserve and Drury Sports Park and conservation zoned land
- Reduces impact on cultural heritage sites
- Reduces impacts on utilities, specifically the Counties Power Substation.

Through the assessment, it was noted that there were no evident differentiators between the three options with regard to urban design, landscape and visual amenity, health and wellbeing and natural hazards. All route refinement options provided the same level of achievement against the Transport outcomes as outlined in Table 14-5.

Following identification of the preferred option, discussions with Watercare on the Waikato 1 watermain would be impacted by the rail bridge abutments on the eastern of the NIMT rail line. After further discussion with Watercare on the potential impacts, risks and costs, design refinement was undertaken to shift the alignment at this location further to the north (preferred side for widening) to reduce impacts on the watermain. This also provided other benefits including reducing impact on the Ōpāheke Reserve sports fields and meant the Ōpāheke NIMT bridge could be constructed offline which has construction traffic and programme benefits. This design change was discussed with all technical specialists at a team workshop and confirmed.

As a result of realigning Ōpāheke Road further to the north, access for the properties on the southern side of Ōpāheke Road would need to be re-routed. Two options were considered:

1. Utilise the existing Ōpāheke Road alignment providing a connection to the new alignment in the east
2. Provide a new connection to Walker Road in the north with access provided via Walker Road under the NIMT rail bridge.

Utilising the existing Ōpāheke Road alignment was discounted due to geometric and safety concerns of the angle of the connection to the new alignment and location of the connection on a corner. Therefore, providing a new link to Walker Road was recommended as it provided the access required and enabled a safe tie in with the proposed alignment.

Subsequent to the preferred option being identified, a revised national freshwater policy statement and new freshwater regulations came into effect (the National Policy Statement for Freshwater Management 2020 and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020), which gives greater protection to natural inland wetlands and streams. Given this new policy direction, the Project Team reconsidered the potential effects of the preferred options on identified natural inland wetlands and streams. Generally, the alignment and design refinement process for each proposed designation has sought to avoid or minimise impacts on high value natural wetlands and streams, unless there is a functional requirement for any such impacts or other high value environmental constraints. There will be further opportunities to minimise any impacts within the Project alignment during the detailed design of the Projects. As a result, no further design refinement is required at this stage.

14.2.2.5 Discounted Options

The following table summarises the reasons for discounting the remaining two options.

Table 14-6 Discounted Options - Ōpāheke Road Rural Upgrade

Option	Reasoning
Option B	This option was discounted for the following reasons: • Greatest impact on heritage features. • Greatest impact on property including on live zoned special housing area currently under development. • This option will result in greater property impacts • Relocation of the Counties Power Substation would be required.
Option C	This option was discounted for the following reasons: • Impacts on heritage features. • Greater impact on property including on live zoned special housing area currently under development. • Relocation of the Counties Power Substation would be required. • Temporary traffic management during construction more complex

14.2.2.6 Intersection Form

Along this corridor, there are two intersections to be upgraded. A summary of the assessment (described in Section 7) undertaken for these intersections is shown in Table 14-7, outlining the recommended outcomes for each

Table 14-7 Ōpāheke Road Rural Upgrade Intersection Form Assessment

Intersection		Form		Modal Priority			Justification/Constraints /Triggers	Preferred Intersection Form
Name	Arms	Lanes	Speed	PT	Active Mode	Freight		
Ōpāheke Rd / Bellfield Development	Ōpāheke Road (East-West) ← →	2	50kph	Med	Med	Med	• Roundabout works better for single lane approaches as an overall design	Roundabout
	Bellfield Development ↓↑	2	<30kph	Low	Med	Low		
Ōpāheke N-S FTN Arterial / Ōpāheke Road Intersection included within the Ōpāheke N-S Arterial Corridor. See Section 1.1.3.								

14.2.2.7 Ōpāheke Road NIMT Rail Crossing

The Ōpāheke Road Rural Upgrade includes an existing rail level crossing of the NIMT rail line. An additional options assessment step was undertaken which followed a "decision tree" approach. Table 14-8 set out this process and outcomes.

Table 14-8 Ōpāheke Road NIMT Rail Crossing Decision Tree Options Assessment

Decision #	Decision to be made	Decision / reasons
1	Does the Ōpāheke Road level crossing need to be removed, yes/no?	**Yes** – increasing number of rail tracks (two to four), increasing frequency of rail services (12tph in the peak direction), urbanisation of the surrounding area result in an increased safety risk/conflict between modes, increased barrier down time etc.
2	Can the Ōpāheke Road level crossing be closed, yes/no? (i.e. is the future network sufficiently resilient to operate without it?)	**No** – 2048 modelling shows significant increases in volumes along Boundary Road Ōpāheke N-S FTN Arterial Hunua Road if the Ōpāheke Road crossing is closed – over 6,000vpd displaced. Buses will also be affected. There will also be a loss of general urban form connectivity.
3	Can the Ōpāheke Road level crossing be grade-separated in the same location, yes/no? (or do multiple locations need to be assessed?)	**Yes** – grade-separation in the current location is possible, so multiple locations were not assessed.
4	What form will grade-separation take?	**Road overbridge** Tunnelling was ruled out due to increased cost/complexity of going under live rail tracks, potential to skew tracks and the location is in a floodplain.

14.2.3 Ōpāheke Road Urban Upgrade – Ōpāheke / Settlement Intersection

14.2.3.1 Route Refinement Option Development

The Ōpāheke Road Urban Upgrade will upgrade Ōpāheke Road to a 20m cross section improving the walking and cycling facilities along the corridor. Generally the proposed works can be accommodated within the existing road corridor except for the Ōpāheke Road / Settlement Road intersection. Therefore, options were developed for the Ōpāheke Road / Settlement Road intersection to investigate the most appropriate intersection treatment within the existing urban environment. This included specialist assessment of four options:

- Option A – signalised intersection with active modes
- Option B – roundabout in centre of existing intersection
- Option C – roundabout on eastern side (Settlement Road)
- Option D – roundabout on southern side (Ōpāheke Road)

The four options for the Ōpāheke Road / Settlement Road intersection are shown in Figure 14-8 to Figure 14-11.



Figure 14-8 Option A – Signalised intersection with active modes

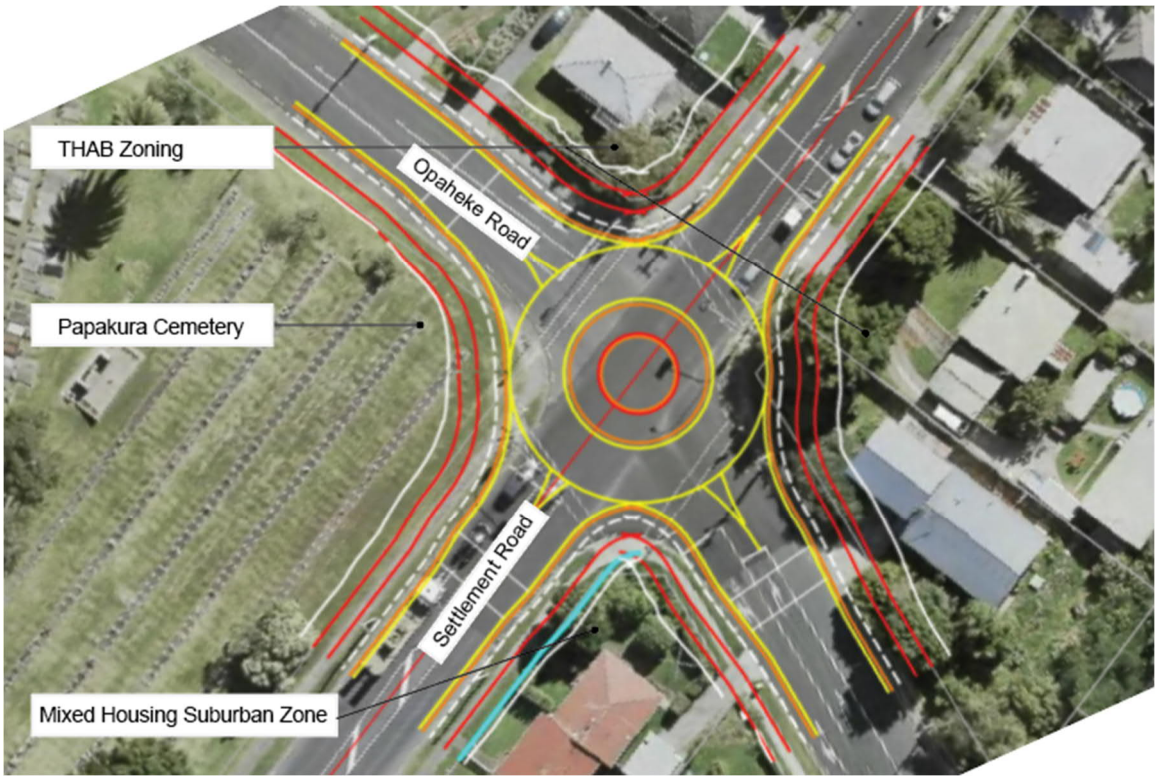


Figure 14-9 Option B – Roundabout in centre of existing intersection



Figure 14-10 Option C – Roundabout on eastern side (Settlement Road)

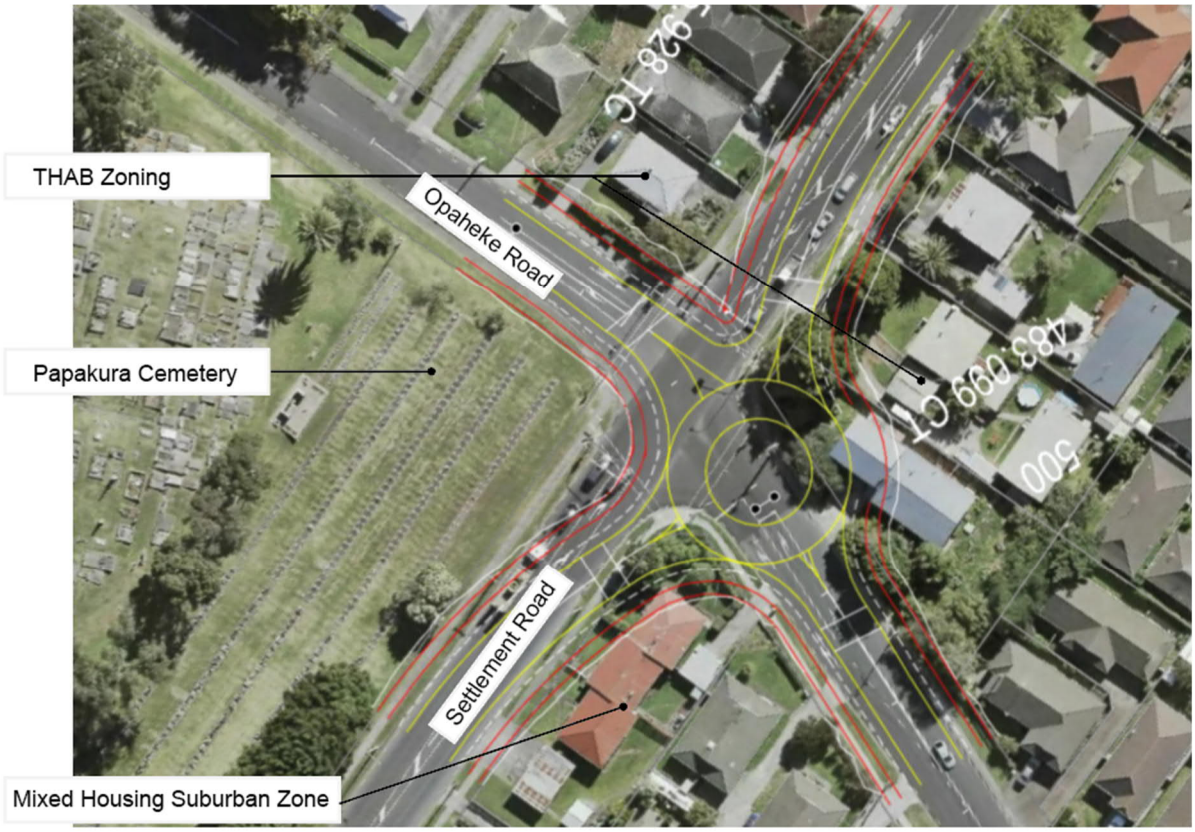


Figure 14-11 Option D – Roundabout on southern side (Ōpāheke Road)

14.2.3.2 Route Refinement Assessment

The assessment undertaken for the Ōpāheke Road Rural Upgrade follows the processes previously discussed Section 6. The four options were qualitatively assessed against the MCA framework by subject matter experts. Table 14-9 provides a summary of the qualitative assessment undertaken by technical specialists against the MCA framework. In determining the preferred option, the Project Team took into consideration the MCA assessment and the engagement undertaken with project partners including Manawhenua and Auckland Council.

Table 14-9 Ōpāheke Road Urban Upgrade Options Assessment Findings Summary

Ōpāheke Road Urban Upgrade: Ōpāheke Road / Settlement Road intersection Options Assessment Findings Summary	
Performance against transport outcomes and Transport matters	
Overall all the options align well with the transport outcomes and present positive improvements. The key distinction from a safety perspective is that all the roundabout options are much safer for all users when compared with the signalised intersection. Therefore, Option A is likely to perform marginally less against transport outcomes compared to the other three options. Both Option A and Option D presented the most positive features within the intersection form assessment as they were more likely to provide appropriate intersection treatment with regard to physical controls, road environment, road users and traffic management. Option B has the best roundabout layout between Option B, C and D however this option impacts on Papakura Cemetery (see assessment below). Option C and Option D present similar transport benefits but Option C is unlikely to be an appropriate treatment due to sharp turn radius in the south-western quadrant (from Ōpāheke Road left to Settlement Road). Option D is likely the most appropriate treatment of the four options, mainly linked to its superior safety benefit for all users and being more consistent with Vision Zero outcomes. The existing properties access adjacent to the improvements would need to be investigated to ensure access can be maintained safely.	
Wellbeing assessment	
Heritage	A Cultural Heritage Inventory site is located within the Papakura Cemetery with archaeological remains possible adjacent to the intersection. Option A, C or D are preferred as they generally do not impact upon memorials or burial plots.
Social	Future Land Use Integration: Existing land use zoning is unlikely to change in the future, however THAB zoning surrounding the intersection offers intensification and development potential. Option A is preferred as it enables more future development potential of the THAB zone both in land remaining and parcel shape. Social: A key social constraint adjoining the intersection is the Papakura Cemetery. Avoidance of the cemetery would be preferred through retaining walls, and pedestrian access maintained. Options A, C and D do not impact upon burial plots within the cemetery however Option A requires some works (including batters) within the Cemetery site. Therefore, Option C or D are preferred as impacts on the cemetery are avoided. Urban design: Option A (signalized intersection with active modes) is the preferred option. Whist this option does provide some minor negative impacts, in balance it provides the most support for reintegration and redevelopment of the residual corner parcel for the proposed THAB zoning. It also provides safe and legible prioritized crossings for active modes. Land requirement: Option A has the least property impacts, with Option C and D both impacting the most property. Health and Wellbeing: Construction dust and noise has the potential to impact residential development and visitors to the cemetery. These impacts will need to be managed for all options.
Environmental	Landscape and Visual Amenity: There are no landscape or visual factors that would influence the intersection. However, Option A provides a higher chance of retaining mature trees and vegetation surrounding the intersection. Stormwater: Floodplains, flood prone areas and overland flow paths that are impacted by each option. However, all options will be able to manage effects to similar levels therefore, there are no stormwater features that provide a differentiator between the four options.

	Ecology: Vegetation that may be impacted by the options is mostly exotic species. However, one mature rimu and one totara tree are likely to be impacted by Options B, C and D. Option A is not likely to impact on these trees. The native trees are singular trees on private property so are not particularly ecologically sensitive. Natural hazards: Soft soils are likely to exist on the north, south and east of the existing intersection. Option A is preferred as it is least likely to intercept these soils. Options C or D may require additional works to minimise differential settlements.
Economic	Utilities and Construction: Option A is the preferred solution as it will likely require the least amount of civil works (pavement construction and services/ utilities relocation), and no major change to the intersection layout, hence shortest programme duration and disruption to the live traffic / amenity of the area. It is also more likely to have lower construction costs and complexity.
Opportunities	
• Opportunity for improved landscape planting with the proposed upgrade to contribute to ecological values and landscape and visual amenity.	

14.2.3.3 Partner, Internal and Community Engagement

Throughout the options assessment the Project Team engaged with project partners including Manawhenua and Auckland Council, to discuss the options.

The three options and the emerging preferred option was shared with Manawhenua at hui on 2 July 2020. Manawhenua noted any upgrade to the intersection is a good outcome. They also noted they would prefer to retain any native vegetation.

Feedback on the four options was sought from AT representatives in late June 2020, and a workshop was held on 15 July 2020. In June, AT identified that Option A likely does not have sufficient space to accommodate the active modes upgrade (as well as adequate berm and kerb space) and is not an ideal outcome in an already constrained intersection. They identified that any of the roundabouts could work from a safety and transport perspective. However, it was identified that Option D has the most merit as it does not impact upon the cemetery. Further analysis of Option A and D was presented to AT in July. A consensus was reached to avoid the cemetery given the complexities around excavating burial plots and the associated reputational risk. It was also identified that properties adjacent to the intersection could be developed in the near future, therefore, the access of these properties at this intersection is not an ideal outcome. Specific comments on the options identified that Option A would lock in a sub-standard facility while Option D would provide more flexibility in the future. It was also identified that Option A takes slivers off the properties which looks to leave them not very viable for the owners for future development (in THAB zone).

A meeting with an Auckland Council representative was held onsite at the Papakura Cemetery on 19 June 2020 to discuss the proposed works. It was identified that AC have a preference for a 3-5m set back of built structures from memorials and burial plots structures to allow for maintenance and also to allow for secondary plots (if family want to be buried next to an existing grave). On site it was identified that there is not enough room from the nearest burial plot to upgrade the active modes to meet AT standards. AC identified that if the cemetery was impacted there would be interest from the Returned Services Association and Local Board. Additionally, the family of adjacent burial plots should be contacted if the Cemetery is impacted.

Key themes raised through landowner engagement about the preferred option (in October 2020) related to property (acquisition/loss of value/access), alignment of the proposed intersection and subsequent impact to their property. Timing for construction of the project was queried specifically regarding timing of property acquisition/compensation. One landowner queried how the proposed intersection upgrade will improve traffic safety. Another landowner indicated their support for improved walking and cycling facilities.

A community flyer drop took place on 3 October to all properties identified with access onto Ōpāheke Road and Settlement Road. A few community members shared their concerns online regarding the proposed upgrade of the intersection to a roundabout. A few members noted the current safety issues with the intersection (red light running, heavy vehicle trucks) and considered that a roundabout would not improve safety.

14.2.3.4Further Investigation

Following the MCA assessment and consideration of feedback received from project partners including Manawhenua and Auckland Council, two options (Options A and D) were identified for further investigation. This assessment focussed on enabling design refinement of Option A to minimise impacts on the cemetery, any compromise on walking and cycling facilities, comparative cost and safety for all road users.

In order to minimise impacts on the Papakura Cemetery, further design was undertaken on Option A. Based on a 3m buffer from burial plots informed by Auckland Council, the following compromise of active mode facilities from the AT agreed 5.25m width would need to be made:

- A reduction from a 5.25m active mode corridor to only a 3.3m shared path on the north western corner adjacent to the burial plots
- A reduction from 5.25m to 4.25m wide separated facilities further north adjacent to the burial plots on Ōpāheke Road
- On the north east corner on the opposite side of the cemetery, a reduction from 5.25m to 4.5m adjoining 14 Ōpāheke Road.

Option D does not compromise the active mode facilities.

Comparative costs of the two options are provided in the table below. Option A has a lower total cost of $4.5 million compared to $9 million for Option D.

Table 14-10 Comparative Cost of Option A and D

Cost Type	Option A costs (signals)	Option D costs (roundabout)
Property	$2.2 million	$4 million
Construction	$1.5 million	$3.3 million
P50 Estimate (including construction costs)	$2.3 million	$5 million
Total Costs	**$4.5 million**	**$9 million**

A roundabout, as proposed in Option D, provides improved safety for all road users at the intersection and would result in fewer crashes than a signalised intersection (Option A) as it reduces the number of potential conflicts between road users, and lower speed and angle where conflicts may occur.

14.2.3.5Preferred Option

Following further investigation and engagement with project partners, a preferred option for the Ōpāheke Road / Settlement Road intersection was identified. Although being more expensive and having more property impacts than Option A, the preferred option (Option D) is to upgrade the active mode facilities with a southern roundabout at the Ōpāheke Road/ Settlement Road intersection. The preferred option was chosen because:

- It meets transport outcomes (improves connectivity, mode shift, high quality active modes)
- Provides additional safety outcomes with a roundabout (reduces the number of potential conflicts.
- Has minimal impact on the Papakura Cemetery
- It does not compromise on, and allows enough room for a high quality, active mode upgrade for an area zoned for residential growth (THAB).

An opportunity recognised with this option was that it provides for more flexibility for any future upgrades on Settlement Road and connections to Papakura Station.

Through the assessment, it was noted that there were no evident differentiators between the four options with regard to landscape and visual amenity, health and wellbeing, stormwater, ecology and construction disruption.

14.2.3.6Discounted Options

The following table summarises the reasons for discounting the remaining three options.

Table 14-11 Discounted Options - Ōpāheke Road / Settlement Road Intersection

Option	Reasoning
Option A	This option was discounted for the following reasons: • Does not have sufficient space to accommodate the active modes upgrade as well as adequate berm and kerb space required. • Would lock in a sub-standard facility • Lower level of safety for road users (compared to the other options) • Requires works within the Papakura Cemetery • Proximity to bur ial plots – would require approval from Local Board and Auckland Council. Consultation with Returned Services Association and potentially the family of the adjacent burial plots. • Takes slivers off the properties which may compromise the viability for the owners for future development (in THAB zone).
Option B	This option was discounted because the significant impacts on burial plots in Papakura Cemetery.
Option C	This option was discounted for the following reasons: • Residual developable area would be more triangular shaped parcels, reducing the viability for reintegration of land for disposal after the Project • Unlikely to be an appropriate intersection treatment due to the sharp turn radius in the south-western quadrant

14.2.4 Ōpāheke Road Upgrades Summary

As outlined, through the assessment process and feedback from project partners including Manawhenua and Auckland Council, the preferred option for the Ōpāheke Road Rural Upgrade is Option A, widening to the northeast of the existing road corridor to minimise impacts where possible. This includes the grade separation (new bridge) crossing the NIMT.

Through the intersection form assessment for the Ōpāheke Road Rural Upgrade it was recommended that roundabouts be implemented at the Ōpāheke Road intersections with Bellfield Estate and Ōpāheke N-S FTN Arterial and Ponga Road.

The preferred option for the Ōpāheke Road / Settlement Road intersection is Option D, a southern roundabout on Ōpāheke Road because it avoids the Papakura Cemetery, has improved safety outcomes and is the most appropriate intersection treatment.

15 Summary of Preferred Options

The preferred options for each of the Projects within the Drury Package is outlined in Table 15-1.

Table 15-1 Drury Arterial Network Preferred Options

Notice	Project	Preferred Option
NoR D1	**SH22 Arterial Upgrade**	Combined Options A, B and C.
NoR D2	**Jesmond Road FTN Upgrade**	Option A – widen to the west
	Bremner Road FTN Upgrade	
	Jesmond to Bremner Link / Auranga Road 1	As agreed through Plan Change 6
	Bremner Central	Option B – widen to the south
	Bremner East	Option B – widen to the south
	Waihoehoe Road West FTN Upgrade	Option A – widen to the north
NoR D3	**Waihoehoe Road East Upgrade**	Combined Option A and B – widen to the north and south
NoR D4	**Ōpāheke North-South FTN Arterial**	Option A – central alignment, southern section refined
NoR D5	**Ponga Road Upgrade**	Option B – widen to the south
	Ōpāheke Road Upgrades	
	Ōpāheke Road Rural Upgrade	Option A – widen to the northeast
	Ōpāheke Road Urban Upgrade – Ōpāheke Road / Settlement Road intersection	Option D – southern roundabout on Ōpāheke Road

16 Conclusion

This report has considered alternatives and identified the preferred alignments, intersection treatment and methods for route protection of each of the Projects within the Drury Package. The recommended network is shown in Figure 16-1 and comprises five Notices of Requirement as follows:

- NoR D1: Alteration to existing Waka Kotahi Designation SH22 Upgrade
- NoR D2: Jesmond Road to Waihoehoe Road West FTN Upgrade
- NoR D3: Waihoehoe Road East Upgrade
- NoR D4: Ōpāheke North-South FTN Arterial
- NoR D5: Ponga Road and Ōpāheke Road Upgrade.

Supporting Growth, on behalf of AT and Waka Kotahi, adopted a systematic approach to considering alternative sites, routes and statutory methods for undertaking the Projects within the Drury Package. The MCA framework adopted to consider alternative options incorporated Part 2 RMA elements as well as matters appropriate to AT and Waka Kotahi's statutory functions.

The consideration of alternatives methodology adopted meets the statutory requirements set out in section 171(1)(b) of the RMA.

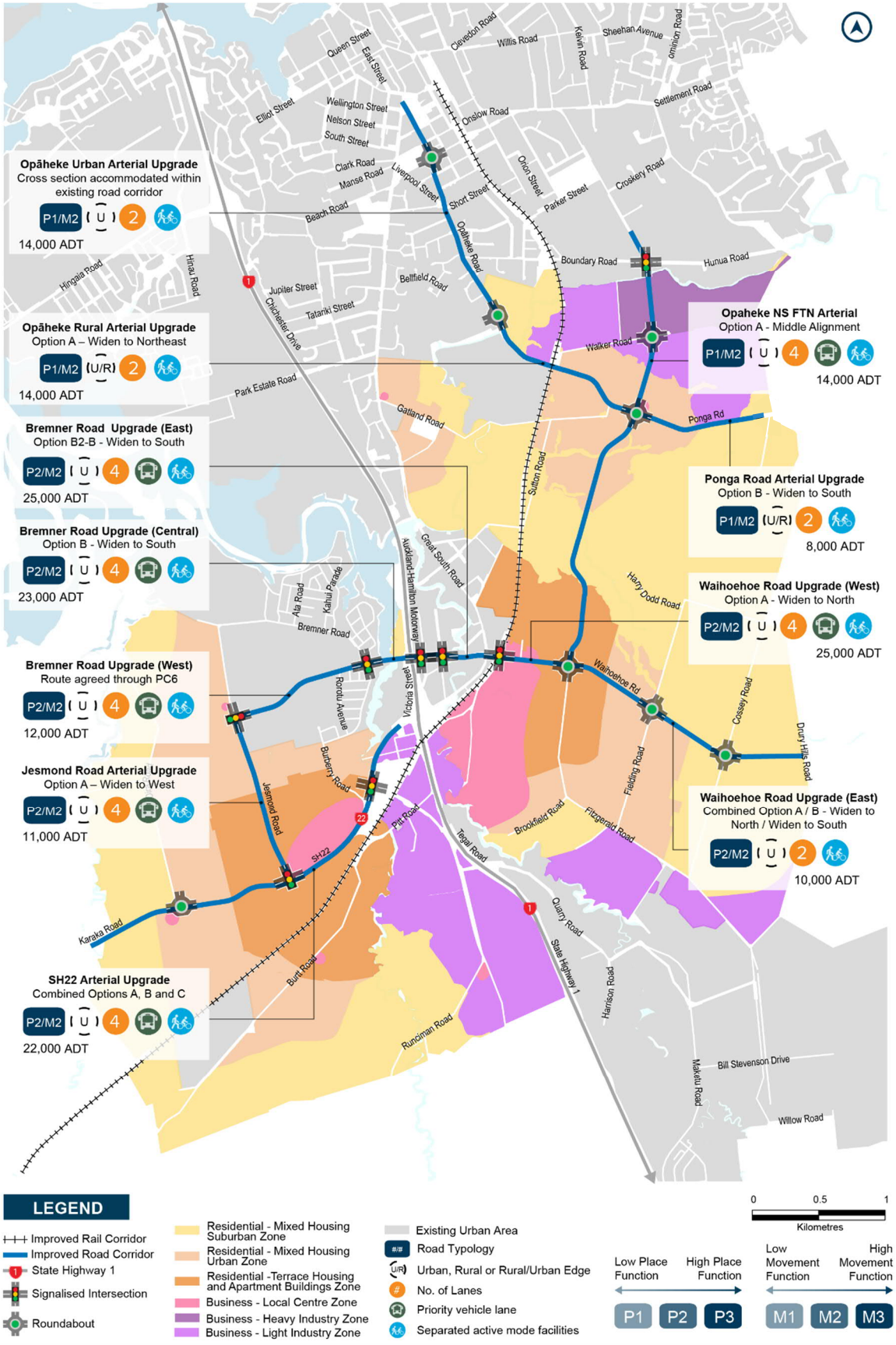


Figure 16-1 Recommended Drury Arterial Network showing Drury-Ōpāheke Structure Plan